Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Communications Marketplace Report	)	GN Docket No. 24-119

2024 COMMUNICATIONS MARKETPLACE REPORT

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By the Commission: Commissioners Carr and Simington dissenting and issuing separate statements.

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I. INTRODUCTION AND EXECUTIVE SUMMARY

1. The Commission is required to publish a *Communications Marketplace Report* every two years that assesses the state of competition across the broader communications marketplace.[1] The Commission must evaluate competition to deliver voice, video, audio, and data services among providers of telecommunications, providers of commercial mobile service, multichannel video programming distributors (MVPDs), broadcast stations, providers of satellite communications, Internet service providers (ISPs), and other providers of communications services.[2] As part of its evaluation, the Commission must consider all forms of competition, including "the effect of intermodal competition, facilities-based competition, and competition from new and emergent communications services."[3] The Commission also must assess whether laws, regulations, regulatory practices, or marketplace practices pose a barrier to competitive entry into the communications marketplace or to the competitive expansion of existing providers of communications service.[4] With this *2024 Communications Marketplace Report*,[5] the Commission fulfills its statutory mandate.[6] As required, this fourth *Report*[7] assesses the state of all forms of competition in the communications marketplace; the state of deployment of communications

[1] 47 U.S.C. § 163(a), (b)(1); *see also* Section 401 of the Repack Airwaves Yielding Better Access for Users of Modern Services Act of 2018, Pub. L. No. 115-141, 132 Stat. 1087 (codified at 47 U.S.C. § 163) (RAY BAUM'S Act of 2018).

[2] 47 U.S.C. § 163(a), (b)(1).

[3] *Id.* § 163(d)(1).

[4] *Id.* § 163(b)(3). In assessing the state of competition under subsection (b)(1) and regulatory barriers under subsection (b)(3) of the Act, the Commission must also "consider market entry barriers for entrepreneurs and other small businesses in the communications marketplace in accordance with the national policy under section 257(b)." *Id.* § 163(d)(3). The Commission must include the International Broadband Data Report (IBDR) required by section 103(b)(1) of the Broadband Data Improvement Act as part of the *Communications Marketplace Report* (CMR). *See* RAY BAUM'S Act of 2018 § 402(c), 132 Stat. at 1089; 47 U.S.C. §§ 163, 1303(b)(1).

[5] *See Office of Economics and Analytics Seeks Comment on the State of Competition in the Communications Marketplace*, GN Docket No. 24-119, Public Notice, DA 24-374 (OEA Apr. 22, 2024) (*2024 CMR Public Notice*). The Office of Economics and Analytics (OEA) released the *2024 CMR Public Notice* on April 22, 2024. The comment period ended June 6, 2024, and the reply comment period ended July 8, 2024. Appx. A of this *Report* provides a list of all the comments, replies, and *ex partes* that were filed in this proceeding.

[6] 47 U.S.C. § 163(a), (b)(1); *see also* RAY BAUM'S Act of 2018.

[7] For previous CMRs, *see Communications Marketplace Report*, GN Docket No. 22-203, 2022 Communications Marketplace Report, 37 FCC Rcd 15514 (2022) (*2022 Communications Marketplace Report*); *Communications Marketplace Report*, GN Docket No. 20-60, Report, 36 FCC Rcd 2945 (2020) (*2020 Communications Marketplace Report*); *Communications Marketplace Report et al.*, GN Docket No. 18-231 et al., Report, 33 FCC Rcd 12558 (2018) (*2018 Communications Marketplace Report*).

capabilities, including advanced telecommunications capability;[8] and barriers to competitive entry, including entry barriers for entrepreneurs and other small businesses.

2. Specifically, section II assesses the state of competition separately within several specific components of the broader communications marketplace, including the fixed broadband marketplace, the mobile wireless marketplace, the voice services marketplace, the satellite marketplace, the video marketplace, including cable industry prices, and the audio marketplace. In section III, we present information on access to advanced telecommunications capability, and provide a summary of the International Broadband Data Report (IBDR).[9] Section IV provides information on broadband adoption, affordability, and equitable access in order to better understand the digital divide in the United States. In section V, we consider entry conditions in the communications marketplace, including the fixed broadband marketplace, the mobile wireless marketplace, the satellite marketplace, the video marketplace, and the audio marketplace. Section VI considers Commission actions taken over the past two years to close the digital divide, enhance competition, and encourage the deployment of communications services within the communications marketplace.[10] Finally, in section VII, we consider the Commission's future plans to further encourage and promote investment, innovation, deployment, and competition to the benefit of the American consumer.[11]

3. As the Commission observed in 2022, the U.S. communications marketplace has experienced significant changes in recent years, beginning with fixed broadband. The federal government has directed billions in funding for broadband deployment and adoption, culminating in the $65 billion investment in the Bipartisan Infrastructure Law, and millions have been connected through these and related programs. The Commission's National Broadband Map now shows the public where broadband is and is not available at a more granular and detailed level than ever before. And new technologies, in particular 5G fixed wireless and low-Earth orbit (LEO) satellites provide additional intermodal options, especially for consumers in rural areas. Nevertheless, more than a third of Americans have only one provider of high-speed broadband or lack access altogether. For its part, the Commission has acted to increase competition and protect consumers in the marketplace, by mandating easy-to-understand consumer broadband labels, prohibiting digital discrimination of access, and reducing barriers to entry in apartment buildings.

4. The wireless marketplace has also changed over time. After the completion of the T-Mobile/Sprint merger, there are now three major nationwide wireless providers, down from four in 2019. At the same time, there is increasing convergence between all sectors of the marketplace, with DISH deploying a 5G Open Radio Access Network (RAN), cable companies investing in mobile virtual network operators (MVNOs) that take advantage of offloading traffic to Wi-Fi, and wireless providers increasingly competing with traditional fixed providers with their 5G home services. In fact, the Commission set up the world's first "Supplemental Coverage from Space" (SCS) framework to leverage cutting-edge satellite technology to extend the reach of wireless networks to remote areas.

5. And we have entered a new Space Age, this time led by commercial actors. Launch costs have plummeted and more satellites have been launched in the last five years than were launched in the preceding 50 years. The Commission has reorganized to support the new space economy, with the creation of the Space Bureau (SB) in 2023. And the Commission has worked to increase competition in the space economy, including by making more spectrum available to support commercial space launches

[8] 47 U.S.C. § 1302. The term "advanced telecommunications capability" is defined, without regard to any transmission media or technology, as high-speed switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology.

[9] The IBDR is attached as Appx. G.

[10] 47 U.S.C. § 163(a), (b)(5).

[11] *Id.* § 163(a), (b)(4).

and satellite communications, updating processing round rules for non-geostationary satellite orbit (NGSO) satellites to encourage reduce first-mover advantages and increase competitive entry, and adopting new rules to address orbital debris risks.

6. In the coming years, the Commission will continue to monitor what these trends in the communications marketplace mean for competition, consumers, and entry.

II. ASSESSMENT OF THE STATE OF COMPETITION

7. In assessing the state of competition in the communications marketplace, we report on several economic indicators. These include indirect measures of competition—such as the number of providers, along with measures of market concentration—that are recognized as being associated with the level of competition. We also report on, among other things, prices and product offerings. This assessment of the state of competition entails looking at the major factors that affect prices, including inputs such as spectrum, infrastructure, or video content, as well as the quality of the service being offered to consumers and quality-enhancing investment. This *Report* further recognizes that some market segments are interrelated, and so it assesses competition between some of these market segments, such as between fixed and mobile broadband, as well as between MVPDs, online video distributors (OVDs), and broadcast television stations.

8. This *Report* makes important updates to the data that we use for our analysis of fixed and mobile service availability. The Commission's *Communication Marketplace Reports* have for many years relied primarily on the FCC Form 477 deployment data to evaluate consumers' broadband options for fixed and mobile services.[12] Data from the Commission's Broadband Data Collection (BDC) were used for the first time in the *2024 Section 706 Report* that was released in March 2024,[13] and we also use these data for the first time in this *Report.* The FCC BDC data are the most granular, detailed collection of broadband service availability the Commission has ever gathered, and provide location-level information on fixed service availability across the United States as well as standardized coverage maps for 3G, 4G Long-Term Evolution (LTE), and 5G New Radio (5G-NR) mobile wireless services. The FCC BDC data represent significant improvements over FCC Form 477 deployment data because they use more precise location-by-location fixed data and mobile data based on standardized parameters, and because the data were checked and improved through public challenge processes and by conducting verifications and audits of provider-reported data.[14] We use the Commission's BDC data in our analysis of December 2022 and December 2023 fixed and mobile broadband service availability, and we continue to rely on FCC Form 477 data for historical trend purposes only.

9. Regarding fixed broadband service availability, Commission staff developed the Broadband Serviceable Location (BSL) Fabric, which consists of all locations in the United States where fixed broadband services can be serviced or installed.[15] Fixed providers must then report whether they

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[12] *Establishing the Digital Opportunity Data Collection; Modernizing the FCC Form 477 Data Program*, WC Docket Nos. 19-195, 11-10, Order, 37 FCC Rcd 14957 (2022) (*2022 Form 477 Order*) (sunsetting the collection of broadband deployment data through FCC Form 477). The Commission clarified that it will continue to collect broadband and voice subscription data using the FCC Form 477, but filers will submit their data through the FCC BDC system. *Id*. at 14957, para. 1.

[13] *Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, GN Docket No. 22-270, 2024 Section 706 Report, FCC 24-27 (Mar. 18, 2024) (*2024 Section 706 Report*).

[14] For additional information on how the BDC offers more precise availability data than FCC Form 477, *see 2024 Section 706 Report* at 28-29, paras. 53-55.

[15] 47 U.S.C. § 642(b)(1)(A). *See Broadband Data Task Force Announces the Availability of the Production Version of the Broadband Serviceable Location Fabric*, WC Docket Nos. 19-195 and 11-10, Public Notice, 37 FCC Rcd 7537 (2022) (announcing that broadband service providers and governmental entities could access the Fabric); FCC, (continued….)

make services "available," specifying the technology and maximum advertised speed, at each location identified in the Fabric.[16] Because the BDC collects service availability data below the census block level, it represents a significant increase in granularity over the FCC Form 477 deployment data. Regarding mobile service coverage, the BDC requires facilities-based mobile broadband service providers to submit their propagation models using specified propagation parameters, which allows coverage to be standardized across providers and technologies.[17]

10. While the BSL dataset contains locations, location types, and the number of units associated with each data point, these data points do not contain population information. In order to calculate the extent of fixed broadband service availability, Commission staff developed a population estimation methodology to distribute population to each BSL in the United States.[18] To measure mobile network population coverage, Commission staff overlaid BSLs, to which we have applied the block-level population estimation methodology, with 5G-NR outdoor stationary coverage at both speeds of at least 7/1 Mbps and at least 35/3 Mbps, and 4G LTE outdoor stationary coverage at speeds of at least 5/1 Mbps. Similarly, we calculate covered road miles by measuring the length of roads that intersect covered areas.

A. The Fixed Broadband Services Marketplace

11. In examining competitive factors in the fixed broadband marketplace, we consider various factors, such as trends in technologies, investment, churn, speed, and pricing. We note that actual speeds consumers experience vary by connection technology: when given a choice, most consumers subscribe to technologies that are capable of providing faster speeds. As of December 2023, approximately 66% of households had at least two options for services meeting at least a 100/20 Mbps speed threshold; and approximately 7% of households had at least two options for services meeting at least a 940/500 Mbps speed threshold.[19] We further note that pricing is a difficult metric to capture, as it varies with product characteristics and can change over time or with bundled offerings. This *Report* provides a snapshot of prices for Internet-only packages. The data show that generally prices increase as broadband speeds increase regardless of the last-mile technology.

1. Overview of the Fixed Broadband Marketplace

12. Figure II.A.1 presents the total number of providers of fixed broadband services, as well as the number of fixed broadband providers in rural and urban areas, from December 2019 through December 2023. As shown in the figure, there were 2,106 entities of varying sizes and deployment

(Continued from previous page)
Broadband Data Collection Help Center, *What is the Location Fabric?*, https://help.bdc.fcc.gov/hc/en-us/articles/5375384069659-What-is-the-Location-Fabric- (last visited Oct. 28, 2024).

[16] Terrestrial fixed and satellite providers can do this by either submitting a list of locations (by unique location ID) for which they can make their service "available" or by providing a polygon that can be overlaid onto the Fabric data. Similarly, terrestrial fixed wireless providers may either submit a list of locations or propagation maps and model details that reflect the speeds and latency of its service. *See* 47 CFR § 1.7004(c)(1); Broadband Data Collection, Data Specifications for Biannual Submission of Subscription, Availability, and Supporting Data at 21 (Mar. 30, 2023), https://us-fcc.app.box.com/v/bdc-availability-spec (FCC BDC Data Specifications).

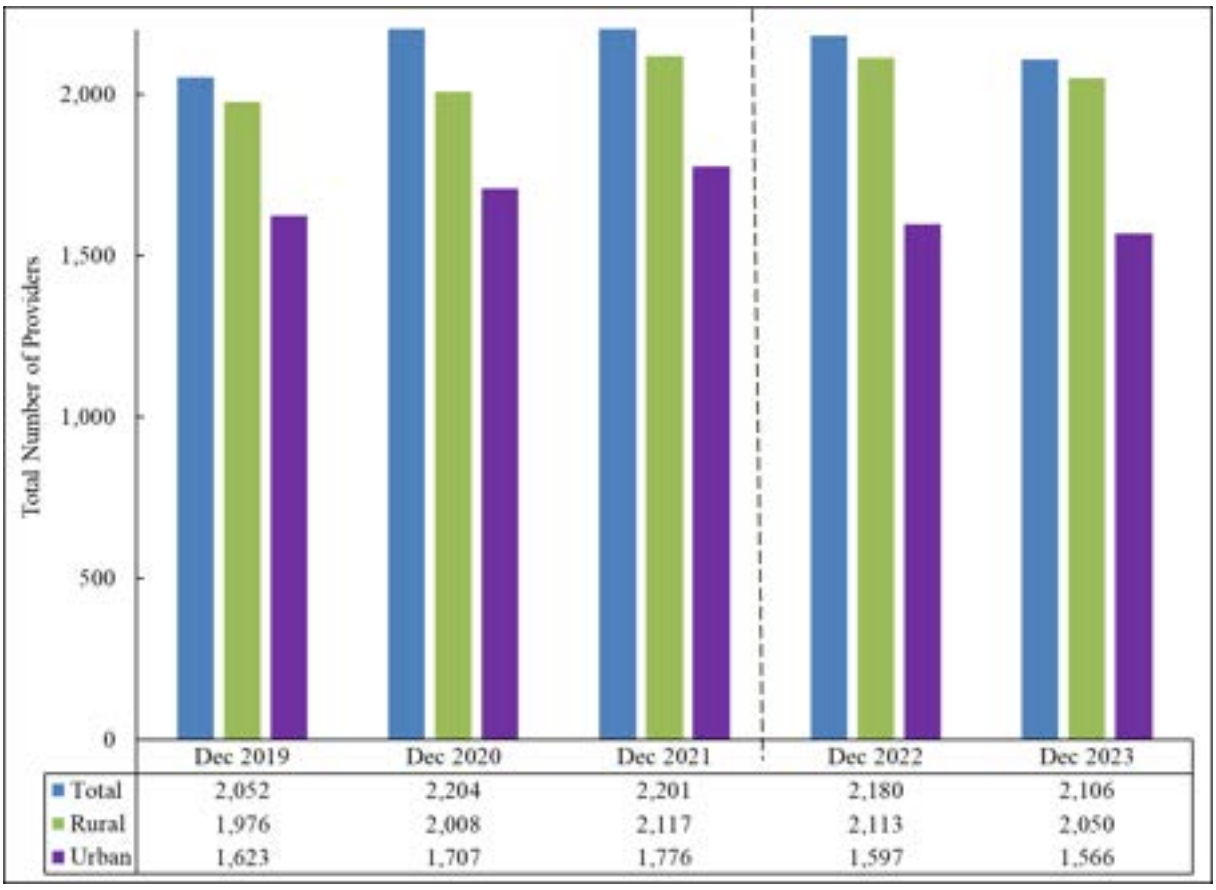
[17] Mobile broadband service providers submit separate coverage maps based on standardized propagation modeling parameters for 3G, 4G LTE, and 5G-NR technologies. *See* FCC BDC Data Specifications.

[18] This methodology was first implemented in our analysis in the *2024 Section 706 Report*. *See 2024 Section 706 Report* at 29-30, 124-126, paras. 54-55, Appx. A, paras. 1-4.

[19] *See infra* Fig. II.A.27. Some ISPs advertise 1 GB service; however, these services are not symmetric in terms of download and upload speeds. Further, 1 GB service is often marketed as providing speeds "up to" 1 GB. For example, Verizon Fios 1 GB service has maximum advertised speeds of 940/880 Mbps. Verizon, *Learn about Fios Gigabit Connection,* https://www.verizon.com/support/residential/internet/getting-started/fios-gigabit (last visited Sept. 10, 2024). When reporting speed throughout this *Report*□e.g., 100/20 Mbps□the first number is the download speed and the second number is the upload speed.

footprints that reported providing fixed broadband technology services to residential consumers in December 2023. Further, there were 2,050 providers of residential fixed broadband services in rural areas and 1,566 providers in urban areas. Due to the different parameters of the underlying data collections, the results for 2022 and 2023 are not directly comparable with previous years; hence, a dashed vertical line has been inserted between the 2021 and 2022 data in Figure II.A.1 to set off the years that use different data sources.[20]

Fig. II.A.1
Total Number of Providers of Residential Fixed Services over Time



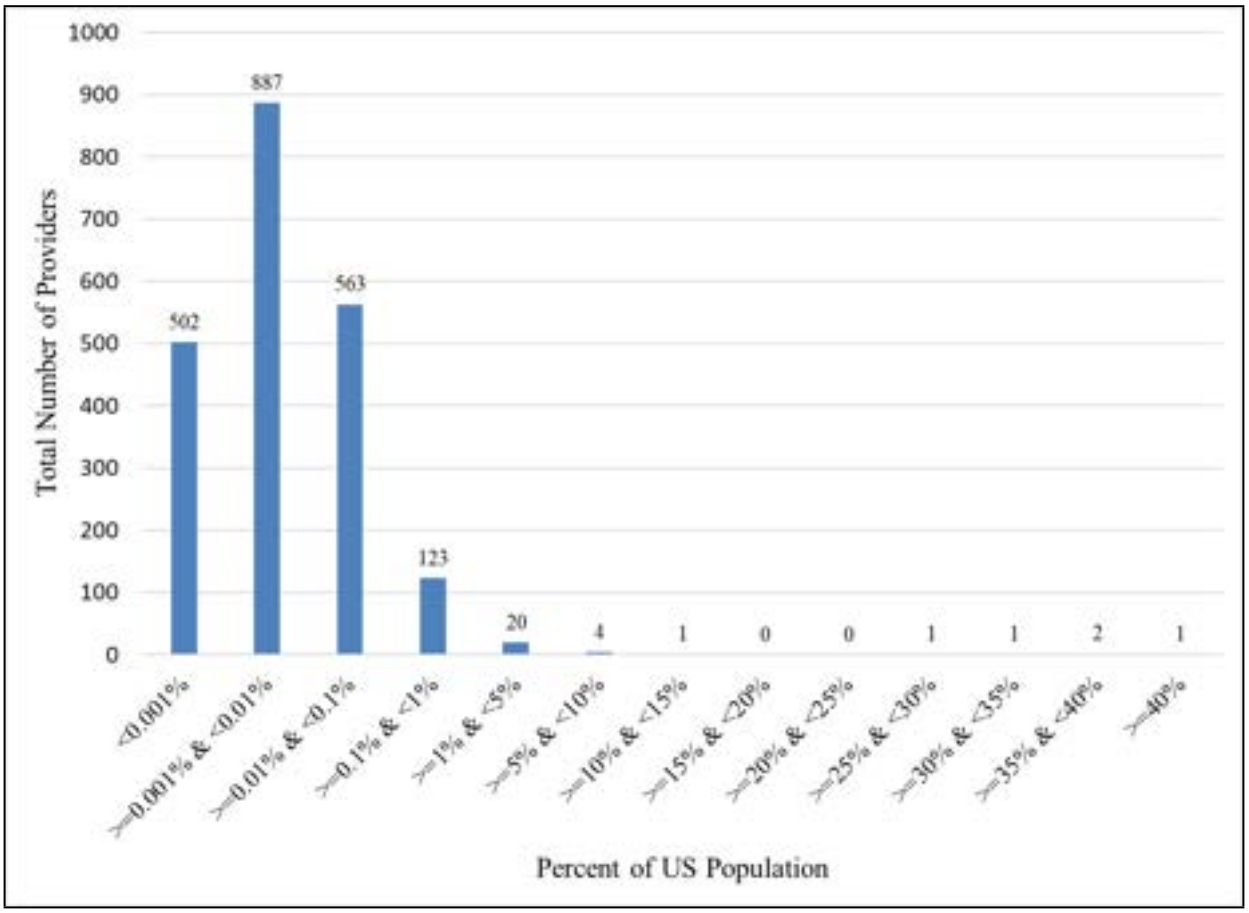
	Dec 2019	Dec 2020	Dec 2021	Dec 2022	Dec 2023
Total	2,052	2,204	2,201	2,180	2,106
Rural	1,976	2,008	2,117	2,113	2,050
Urban	1,623	1,707	1,776	1,597	1,566

Source: FCC Form 477 deployment data; FCC BDC data; Staff Block Estimates; 2010 and 2020 Census data.
Note: The vertical bar in Figure II.A.1 represents the transition from FCC Form 477 data to FCC BDC availability data. Data points to the left of the vertical bar use FCC Form 477 deployment data and the data points to the right of the vertical bar use FCC BDC data. Due to differences between the FCC Form 477 and FCC BDC data, caution should be exercised when examining any changes between 2021 and 2022 onwards.

13. *Top 10 Providers—Providers that cover at least 5% of the U.S. population*. While there are over 2,000 providers of residential fixed broadband services, there is considerable variation in provider size and deployment footprint. The overwhelming majority of providers cover less than 1% of the U.S. population. Figure II.A.2 shows that in December 2023, only 10 providers covered at least 5% of the U.S. population. As presented in Figure II.A.3, these providers are: Altice, AT&T, Lumen (CenturyLink), Charter, Comcast, Cox, Frontier, T-Mobile, Telephone & Data Systems (TDS), and Verizon.

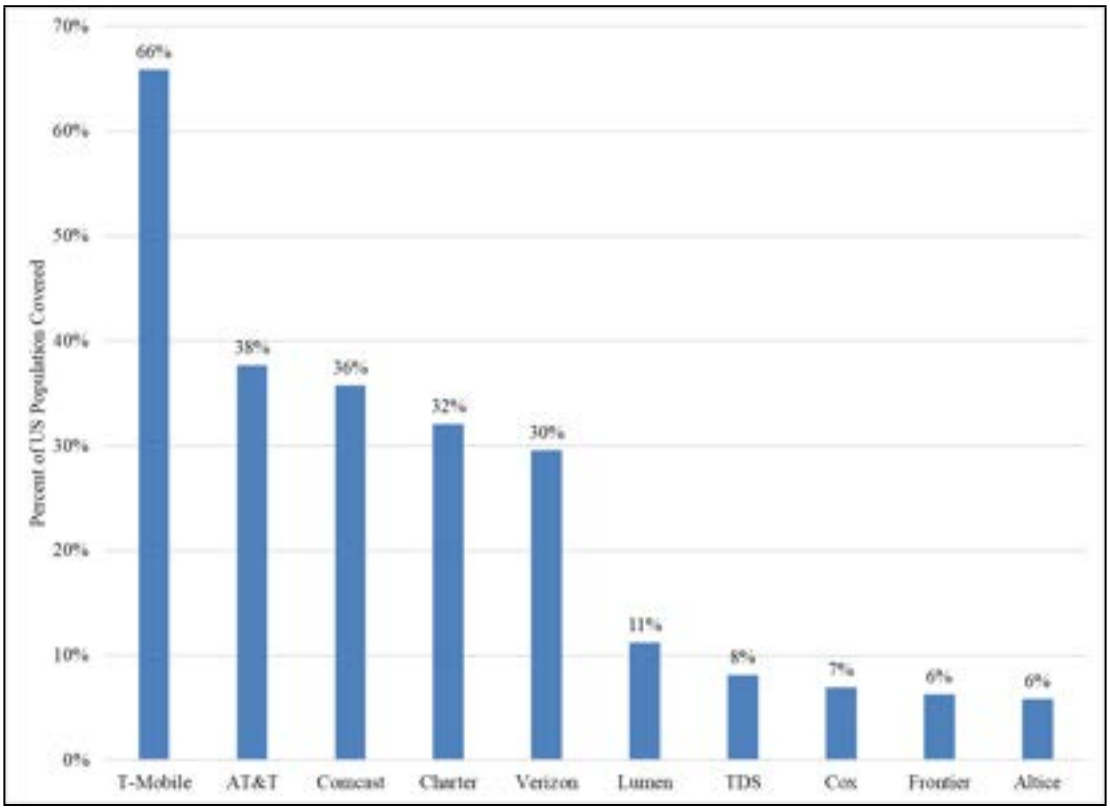
[20] Throughout this section, a vertical line displayed on certain figures between 2021 and 2022 indicates that different data sources are used between these time periods. Deployment data prior to June 2022 are based on FCC Form 477 data, while service availability data for June 2022 and later are based on the Commission's BDC data.

Fig. II.A.2
Total Number of Providers of Residential Fixed Services in the United States by Population Coverage (Dec. 31, 2023)



Source: FCC BDC data; Staff Block Estimates; 2020 Census data.

Fig. II.A.3
Top 10 Provider Footprints for Residential Fixed Services in the United States by Population Coverage (Dec. 31, 2023)



Source: FCC BDC data; Staff Block Estimates; 2020 Census data.

2. Technologies Deployed

14. Consumers access the Internet through a variety of fixed technologies, including cable broadband service, copper (including Digital Subscriber Line (DSL)), fiber-to-the-premises (FTTP), terrestrial fixed wireless service, and satellite service. These services differ in their availability, and also in characteristics, such as speed, latency, reliability, and price.[21] Figure II.A.4 provides an overview of consumer subscription to these services. It presents residential service availability and residential connections by technology as of December 2022, while Figure II.A.5 presents this information as of December 2023.[22]

[21] Latency refers to the time it takes for a data packet to travel from one endpoint of the network to another.

[22] Unless otherwise stated, the data we use in our analysis of the fixed broadband marketplace are for the 50 states, the District of Columbia, and the U.S. territories. The FCC BDC service availability data are grouped into the following categories: coaxial cable/hybrid fiber-coaxial (HFC) (technology code 40); copper wire (technology code 10); optical carrier/FTTP (technology code 50); satellite (technology codes 60 and 61); and terrestrial fixed wireless (technology codes 70, 71, and 72). For subscription data, we continue to rely on the FCC Form 477 subscription data.

Fig. II.A.4
Service Availability (millions) and Total Residential Connections (millions) of Fixed Services in the United States, by Technology, for Any Reported Speed (Dec. 31, 2022)

Technology	Service Availability		Residential Connections (millions)	Residential Adoption Rate[23]
	Households (millions)	Percentage		
All Technologies	126.8	100.0%	118.5	93.5%
Satellite	126.7	100.0%	1.9	1.5%
Terrestrial Technologies	126.0	99.4%	116.6	92.5%
Fixed Wireless	111.8	88.2%	4.5	4.0%
Wireline Technologies	120.7	95.2%	112.1	92.9%
Copper	68.4	53.9%	13.1	19.2%
Cable	110.1	86.8%	74.5	67.7%
FTTP	50.5	39.8%	24.4	48.4%

Source: FCC BDC data, Dec. 2022; FCC Form 477 subscription data; Staff Block Estimates.

Fig. II.A.5
Service Availability (millions) and Total Residential Connections (millions) of Fixed Services in the United States, by Technology, for Any Reported Speed (Dec. 31, 2023)

Technology	Service Availability		Residential Connections (millions)	Residential Adoption Rate
	Households (millions)	Percentage		
All Technologies	127.3	100.0%	120.8	94.9%
Satellite	127.3	100.0%	2.0	1.6%
Terrestrial Technologies	126.0	98.9%	118.8	94.3%
Fixed Wireless	106.3	83.5%	6.8	6.4%
Wireline Technologies	122.2	95.9%	112.0	91.7%
Copper	56.8	44.6%	10.6	18.7%
Cable	110.5	86.7%	73.4	66.4%
FTTP	56.9	44.6%	28.0	49.2%

Source: FCC BDC data, Dec. 2023; FCC Form 477 subscription data; Staff Block Estimates.

15. *Cable Broadband Service*. Cable broadband service delivers broadband using infrastructure originally deployed for cable television. Figures II.A.4 and II.A.5 indicate that the majority of residential consumers subscribe to cable services. This service is provisioned over coaxial cables that deliver cable TV programming and Internet service on separate channels (or frequencies). Between December 2022 and December 2023, the number of residential connections to cable services decreased slightly from 74.5 million to 73.4 million. Currently, most providers of cable broadband service have deployed a hybrid fiber-coaxial (HFC) technology that transmits signals over a fiber from the provider's facility to an optical node near the consumer.[24] These providers typically use coaxial cable to send the

[23] The fixed adoption rate is defined as the total residential connections divided by the total number of households where that technology is deployed.

[24] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15523, para. 18.

signal from the optical node to the customer's end location. In terms of speed, the weighted mean advertised download speed for cable broadband subscribers participating in the Commission's Measuring Broadband America (MBA) program was approximately 483 Mbps as of October 2022, which is a 58% increase compared to the prior year.[25] The weighted mean maximum advertised download speed for residential cable broadband connections reported in the December 2023 FCC Form 477 subscription data was approximately 496 Mbps.

16. *Copper*. Copper, including traditional DSL is used by traditional telephone companies, and it transmits data via a modem over traditional copper telephone lines.[26] Figures II.A.4 and II.A.5 show that, between December 2022 and December 2023, residential connections to copper services fell from 13.1 million to 10.6 million, a reduction of almost 19%. Although widely available because it is built on the existing telephone network, this service is generally slower than other types of broadband services.[27] The weighted mean advertised download speed for residential DSL subscribers participating in the Commission's MBA program was 31 Mbps, which is an approximate 28% increase compared to the prior year.[28] The weighted mean maximum advertised download speed for residential DSL connections reported in the December 2023 FCC Form 477 subscription data was approximately 33 Mbps.

17. *Fiber*. Fiber, specifically FTTP, uses optical fiber terminating at the end-user's location to deliver service.[29] Figures II.A.4 and II.A.5 show that between December 2022 and December 2023, residential FTTP connections increased from 24.4 million to 28 million, approximately a 15% increase. This service can offer the consumer the highest speed among all currently available services because the fiber connects directly to the consumer's residence.[30] The weighted mean advertised download speed for residential fiber connections participating in the Commission's MBA program was 586 Mbps, which is an approximate 15% increase compared to the prior year.[31] The weighted mean maximum advertised download speed for residential fiber connections reported in the December 2023 FCC Form 477 subscription data was approximately 791 Mbps.

18. *Terrestrial Fixed Wireless Broadband*. Terrestrial fixed wireless providers deliver broadband service to consumers using licensed, unlicensed, and shared access spectrum, while often relying on fiber optics for other parts of their network infrastructure (e.g., backhaul, backbone).[32] Terrestrial fixed wireless providers deliver service to a customer's fixed antenna from wireless transmitters on towers that are supported by fiber or microwave links.[33] Figures II.A.4 and II.A.5 indicate

[25] *See* FCC, Thirteenth Measuring Broadband America Fixed Broadband Report at 12 (2024), https://data.fcc.gov/download/measuring-broadband-america/2023/2023-Fixed-Measuring-Broadband-America-Report.pdf (*Thirteenth Measuring Broadband America Fixed Broadband Report*); *see infra* section II.A.8.

[26] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15523, para. 19. Fiber-to-the-node (FTTN) and Fiber-to-the-curb (FTTC) services are reported in FCC Form 477 as DSL service because this service is ultimately delivered to the end-user via twisted-pair copper wiring. *See* FCC BDC Data Specifications.

[27] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15523, para. 19.

[28] *Thirteenth Measuring Broadband America Fixed Broadband Report* at 12.

[29] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15524, para. 20. FTTN and FTTC services rely on a fiber-optic connection from a local central office to the neighborhood (node or curb) and then a twisted-pair copper wiring from the node or utility pole to the consumer's home. These services are typically slower than FTTP services because the connection to the consumer is over twisted-pair copper. *Id.* at 15524, para. 20; FCC BDC Data Specifications at 15.

[30] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15524, para. 20.

[31] *Thirteenth Measuring Broadband America Fixed Broadband Report* at 12.

[32] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15524-25, para. 22.

[33] *Id*.

terrestrial fixed wireless residential connections increased from 4.5 million to 6.8 million, approximately a 51% increase between 2022 and 2023. The weighted mean maximum advertised download speed for residential fixed wireless connections reported in the December 2023 FCC Form 477 subscription data was approximately 112 Mbps. Moreover, consumers are gaining additional options with the rapidly increasing deployment of 5G-NR services.[34]

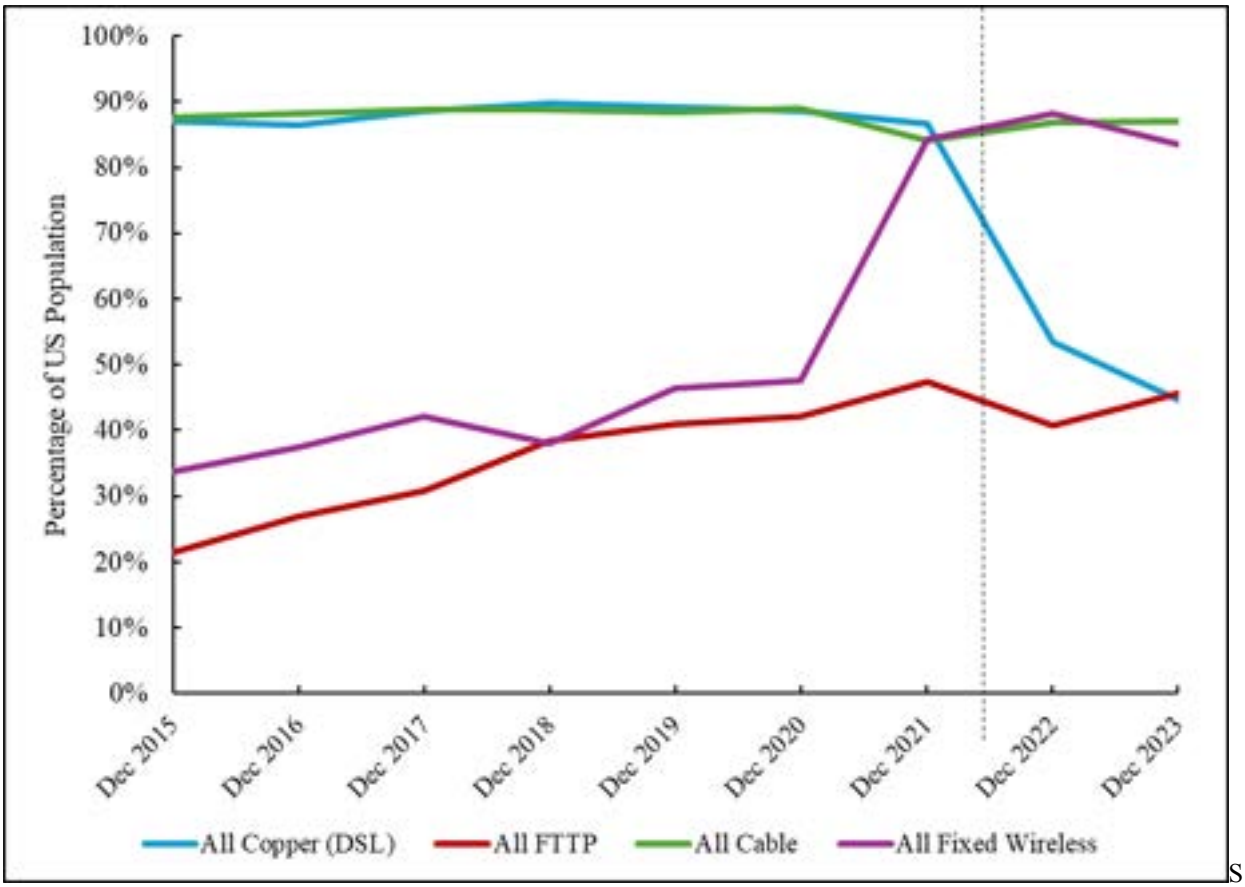
19. *Fixed Satellite Service (FSS)*. FSS is the transmitting and receiving of communications signals via satellite from consumers and earth stations. One of the benefits of satellite technology is its ability to deliver services in remote areas that are unserved or underserved by terrestrial services, and satellite can play a key role in delivering services in disaster areas and humanitarian efforts. As shown in Figures II.A.4 and II.A.5, satellite residential connections increased from 1.9 million to 2 million, an approximate 5% increase between 2022 and 2023. The weighted mean maximum advertised download speed for residential subscriber data reported in the December 2023 FCC Form 477 subscription data was approximately 60 Mbps.

a. Coverage by Technology

20. Figure II.A.6 shows how each fixed broadband technology covers the U.S. population over time. Between December 2022 and December 2023, there was approximately a 12% increase in population coverage of FTTP from approximately 41% to approximately 46% of the population. The percentage of population covered by cable technology remained relatively flat between 2022 and 2023 at approximately 87%. Conversely, between December 2022 and December 2023, there was about a 16% decrease in the population with access to copper (DSL) technology as providers continue to retire this technology, and as of December 2023, approximately 45% of the population had access to this technology. Similarly, there was also a slight decrease in the population with access to terrestrial fixed wireless technology and by December 2023, about 84% of the population had access to broadband via fixed wireless technologies.

[34] *Id*.

Fig. II.A.6
U.S. Population Coverage by Technology Over Time[35]



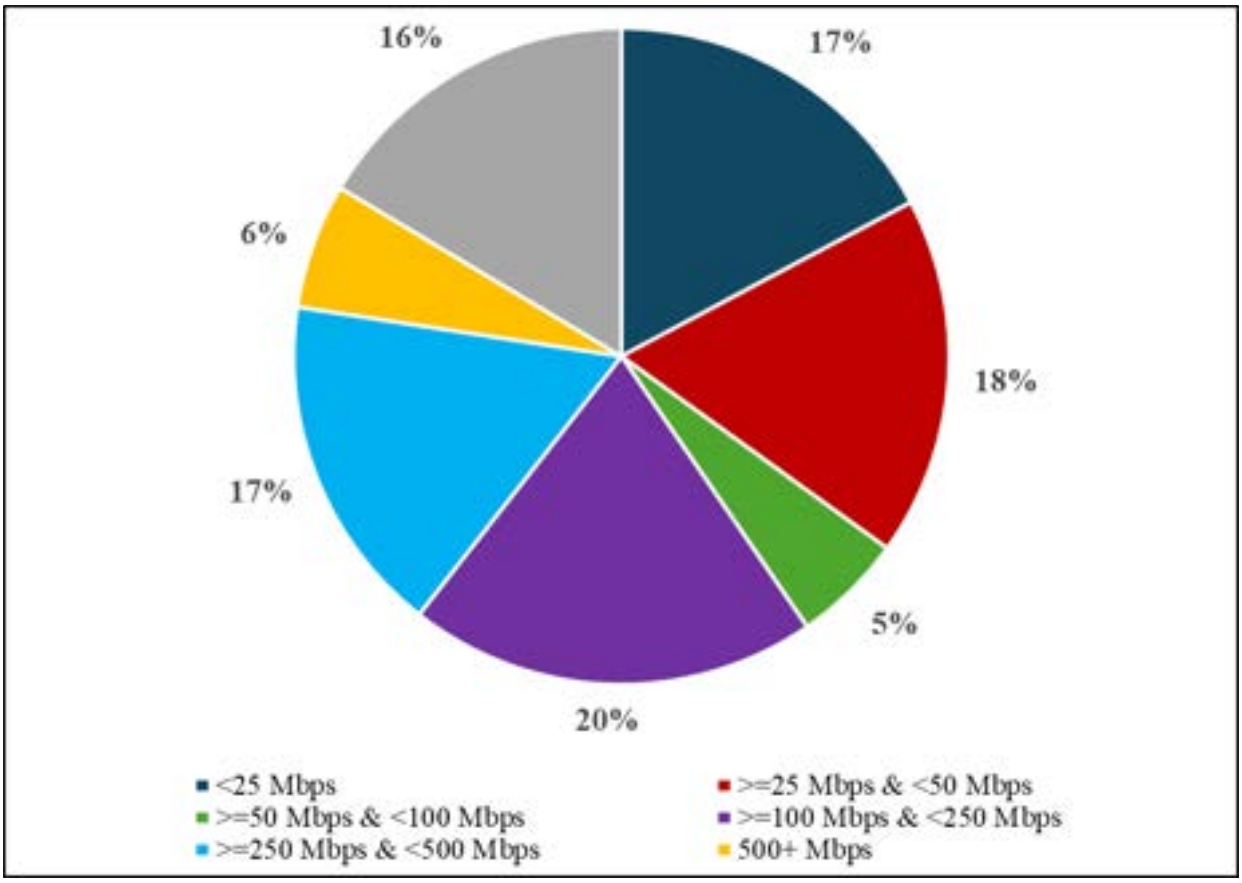
Source: FCC Form 477 deployment data; FCC BDC data; Staff Block Estimates.
Note: Due to differences in the FCC Form 477 and FCC BDC data, caution should be exercised when examining any changes between 2021 and 2022. Data points to the left of the vertical bar use FCC Form 477 deployment data and the data points to the right of the vertical bar use FCC BDC data.

21. Figure II.A.6 above shows that terrestrial fixed wireless technologies have expanded throughout the United States over time (except in 2023), while Figure II.A.7 presents the percentage of the U.S. population that is covered by terrestrial fixed wireless technology by maximum advertised download speed. As of December 2023, approximately 84% of the U.S. population had access to terrestrial fixed wireless technology, and approximately 43% of the U.S. population had access to this technology with an advertised download speed of at least 100 Mbps.[36] Figure II.A.7 also shows that approximately 23% of the U.S. population had access to this technology with download speeds between 25 Mbps and 100 Mbps. Finally, Figure II.A.7 shows that approximately 17% of the U.S. population had access to terrestrial fixed wireless technology at speeds lower than 25 Mbps.

[35] Prior *Reports* examined the U.S. population covered by FTTP and Cable DOCSIS 3.1; however, the FCC BDC data do not distinguish between different types of cable technology and, therefore, DOCSIS 3.1 can no longer be tracked.

[36] We note that while terrestrial fixed wireless is widely available, fixed wireless providers do not have enough capacity to simultaneously connect all subscribers.

Fig. II.A.7
Percentage of U.S. Population Covered by Terrestrial Fixed Wireless by Download Speed (Dec. 31, 2023)



Source: FCC BDC data; Staff Block Estimates.

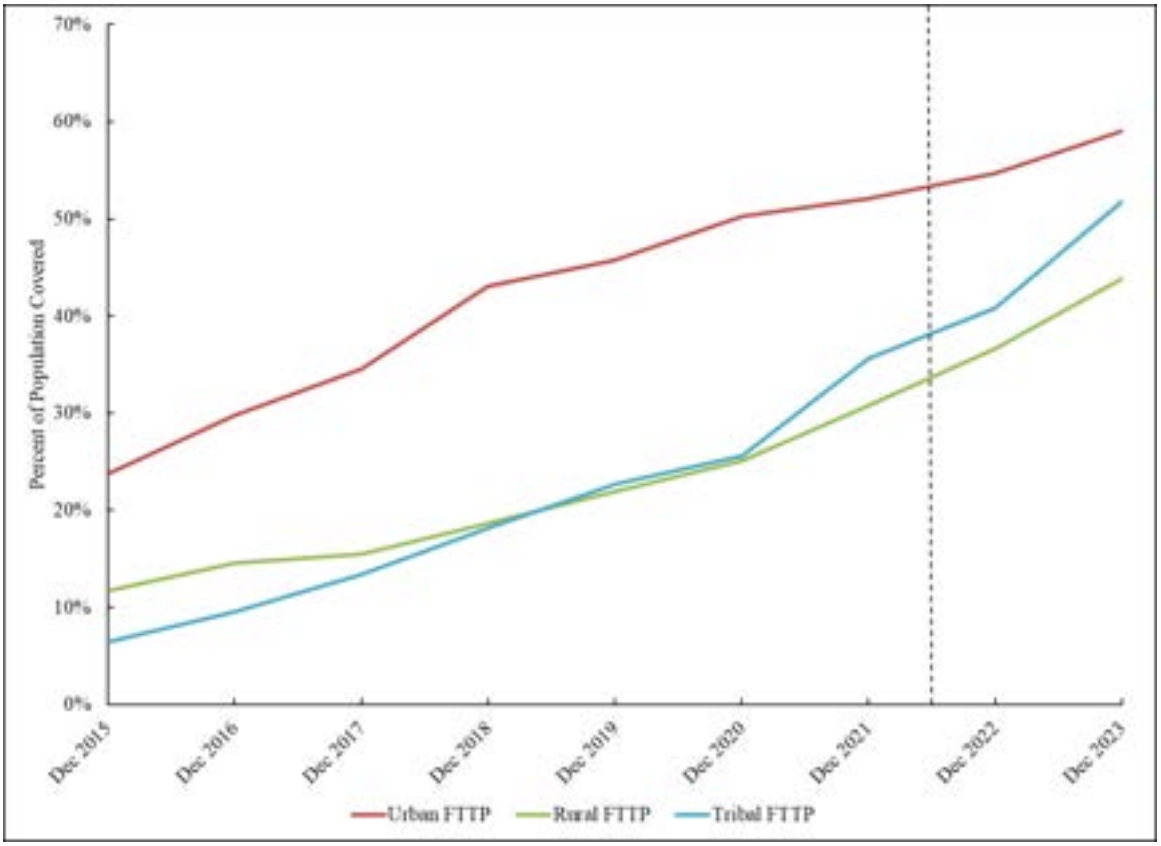
22. Commenters assert that access to FTTP technologies continues to increase over time.[37] Figure II.A.8 shows the change in population coverage of FTTP technology in rural, urban, and Tribal areas.[38] Access to FTTP is significantly lower in rural areas compared to urban areas; however, the growth rate of FTTP coverage is higher in rural areas compared to urban areas. Between December 2022 and December 2023, FTTP's population coverage increased by approximately 8% in urban areas, compared to approximately 20% in rural areas. Approximately 59% of the population living in urban areas had access to FTTP technology at the end of 2023, compared to approximately 44% of the population living in rural areas. The percentage of population with FTTP coverage in Tribal areas

[37] *See, e.g.,* FBA Oct. 2, 2024 *Ex Parte* at 1-2; *see also* FBA Comments at 2; FBA Reply at 2, FBA Dec. 13, 2024 *Ex Parte* at 1.

[38] The FCC Form 477 year-end deployment data for 2020 are based on the 2010 census geographies; accordingly, we use the 2010 Census urban/rural designation for these data. The 2021 FCC Form 477 data and 2022 and 2023 FCC BDC data for are based on 2020 census blocks; accordingly, we use the 2020 Census urban/rural designation for these data. Because of the change in census geographies during our data collection period, caution should be exercised when interpreting the change in the number of provider options between 2020 and 2021 for urban and rural areas. Our assessment of Tribal areas is conducted by examining the census blocks that have been identified by the U.S. Census Bureau as federally recognized Tribal areas for the decennial Census in place for the time period covered by the FCC Form 477 data (i.e., year-end data for 2018 to 2020 were collected using 2010 census block geographies, whereas year-end data for 2021 were collected using 2020 census block geographies).

increased by approximately 27% between December 2022 and December 2023, and over 52% of the population living in Tribal areas had access to FTTP technology by the end of 2023.

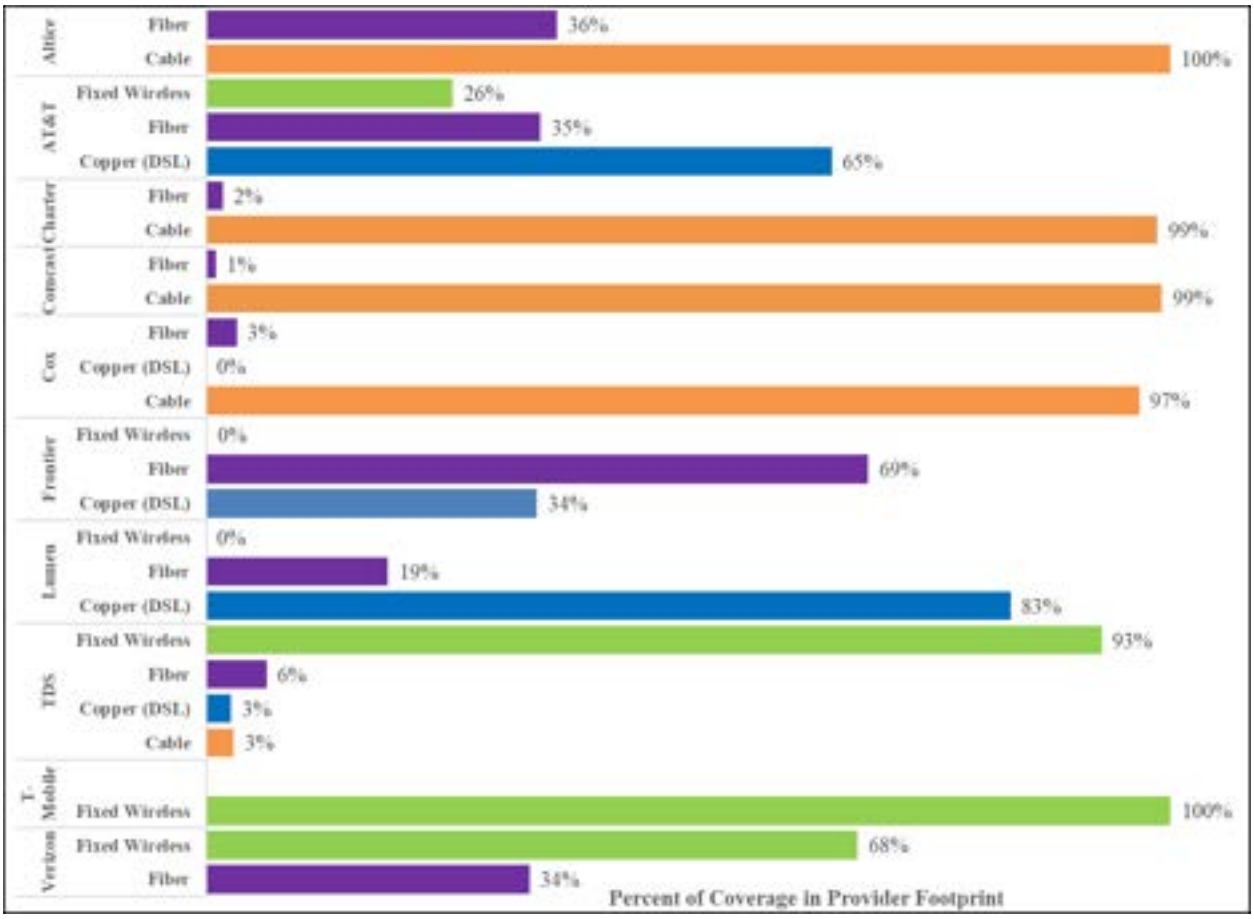
Fig. II.A.8
Rural, Urban, and Tribal Population Coverage for FTTP Technology



Source: FCC Form 477 deployment data; FCC BDC data; Staff Block Estimates.
Note: Due to differences in the FCC Form 477 and FCC BDC data, caution should be exercised when examining any changes between 2021 and 2022. Data points to the left of the vertical dashed bar use FCC Form 477 deployment data, while the data points to the right of the vertical bar use FCC BDC data.

23. *Top 10 Providers—Provider Footprint by Technology*. Figure II.A.9 provides a detailed breakdown of the technology composition of each provider's deployment footprint. As seen in Figure II.A.9, T-Mobile's entire fixed footprint is through terrestrial fixed wireless technology, whereas Comcast, Charter, and Cox almost exclusively provide fixed broadband through cable. In contrast, AT&T provides broadband access with a combination of technologies, covering approximately 65% of its service area with copper (DSL), approximately 35% of its service area with fiber, and approximately 26% with fixed wireless technology. Lumen (CenturyLink) and Frontier also each use a combination of technologies, covering most of their service areas either through DSL or fiber. Verizon covers almost 34% of their footprint with fiber and about 68% with terrestrial fixed wireless technology. Most of the TDS footprint is through terrestrial fixed wireless technologies.

Fig. II.A.9
Technology Composition of Provider Footprint for Residential Fixed Services in the United States (Dec. 31, 2023)



Source: FCC BDC data for residential consumers; Staff Block Estimates; 2020 Census data.
Note: The sum of the percentages for some providers can exceed 100% because these providers have deployed more than one technology to the same location. The percentages represent the percentage of the population in their footprint covered by that technology.

b. Technology and Speed

24. Figure II.A.10 shows the percentage of a provider's footprint by the maximum advertised download speed data and technology for the 10 largest providers in the United States as of December 31, 2023.[39] For purposes of this analysis, we report only those technologies that account for at least 5% of the provider's footprint. We segment the reported maximum download speeds for residential services into four categories: less than 25 Mbps; at least 25 Mbps but less than 100 Mbps; at least 100 Mbps and less than 940 Mbps; and at least 940 Mbps. As shown in Figure II.A.10, seven of the top 10 providers offer services of at least 940 Mbps to at least one-third of households in their respective footprints. The data indicate that four of the providers (Altice, Charter, Comcast, and Cox) are capable of providing services of at least 940 Mbps across more than 95% of their respective footprints.

[39] For Fig. II.A.10, the top 10 providers are defined as the top 10 non-satellite providers ranked by residential population served.

Fig. II.A.10
Top 10 Provider's Residential Footprint by Technology and Reported Maximum Advertised Download Speed (Dec. 31, 2023)

	Technology	Less Than 25 Mbps	At Least 25 Mbps & Less Than 100 Mbps	At Least 100 Mbps & Less Than 940 Mbps	At Least 940 Mbps
Altice	Cable	0%	0%	3%	96%
	FTTP	0%	0%	0%	36%
AT&T	Copper	25%	40%	8%	0%
	FTTP	0%	0%	0%	35%
	Fixed Wireless	1%	24%	3%	0%
Charter	Cable	0%	0%	0%	99%
Comcast	Cable	0%	0%	0%	99%
Cox	Cable	0%	0%	0%	96%
Frontier	Copper	30%	4%	1%	0%
	FTTP	0%	0%	0%	68%
Lumen (CenturyLink)	Copper	44%	35%	14%	0%
	FTTP	0%	0%	0%	19%
T-Mobile	Fixed Wireless	48%	52%	20%	0%
TDS	FTTP	0%	0%	0%	6%
	Fixed Wireless	56%	37%	2%	0%
Verizon	FTTP	0%	0%	0%	33%
	Fixed Wireless	0%	12%	50%	6%

Source: FCC BDC, Dec. 2023; Staff Block Estimates.
Note: The sum of the percentages for some providers (e.g., Altice) will exceed 100% because these providers have deployed more than one technology to the same location. We report technologies that account for at least 5% of the providers' residential footprint.

3. Residential Connections

25. This section reports fixed residential connections (subscriptions) in the United States, and includes all technologies for which the FCC Form 477 subscription data are collected. Figure II.A.11 shows the number of fixed residential connections for all technologies and for any reported speed for December 2020 to December 2023. Since 2020, the number of fixed residential connections in the United States has increased by approximately 8%, from approximately 112 million connections in 2020 to approximately 121 million connections in 2023. During this time period, residential FTTP, fixed wireless, and satellite connections increased, while residential copper-based services, including copper (DSL) connections, declined. Residential cable connections had periods of both growth and decline during this reporting period. Since 2020, FTTP residential connections increased by approximately 52%, and terrestrial fixed wireless grew approximately 247%. Cable continues to be the technology serving the largest portion of fixed residential broadband connections. In December 2023, approximately 61% of fixed residential connections were cable, approximately 23% were FTTP, approximately 9% were copper-based, approximately 6% were terrestrial fixed wireless, and the remaining approximately 2% were satellite.

Fig. II.A.11
Fixed Residential Connections (millions) for Any Reported Speed 2020-2023[40]

	2020	2021	2022	2023
Total Connections	111.621	115.792	118.536	120.860
Cable	72.543	74.599	74.533	73.386
Copper	16.983	15.269	13.101	10.636
FTTP	18.384	21.531	24.456	28.000
Satellite	1.752	1.692	1.949	2.037
Terrestrial Fixed Wireless	1.959	2.701	4.498	6.800

Source: FCC Form 477, Dec. 2023; FCC Form 477, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020.

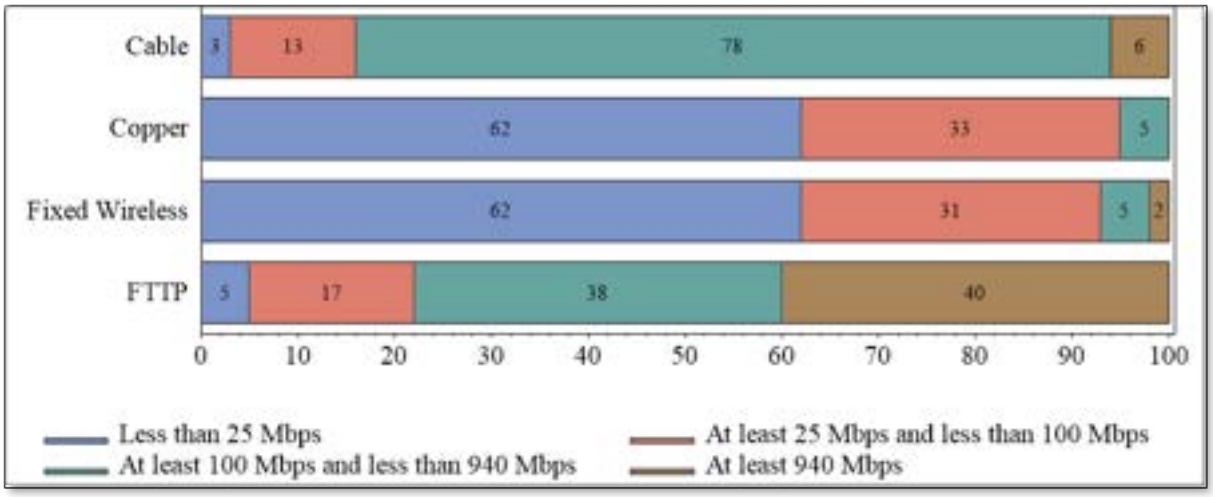
26. Figures II.A.12 and II.A.13 report the percentage of residential connections by technology and download speed as of December 31, 2020 and December 31, 2023, respectively.[41] For purposes of this analysis, we examine maximum advertised download speeds for four speed thresholds: less than 25 Mbps, at least 25 Mbps to less than 100 Mbps, at least 100 Mbps to less than 940 Mbps, and at least 940 Mbps.[42] Between 2020 and 2023, the percentage of connections with minimum advertised speeds of at least 940 Mbps increased from approximately 40% to approximately 55% for FTTP services, and from approximately 6% to almost 20% for cable services.

[40] FCC Form 477 defines an Internet access connection as a wired line or wireless channel that terminates at an end-user location or mobile device and enables the end-user to receive information from and/or send information to the Internet at information transfer rates exceeding 200 kilobits per second (kbps) in at least one direction. This definition, for purposes of the FCC Form 477, is established in section 1.7001(a)(1) of the Commission's rules. 47 CFR § 1.7001(c)(1). The number of fixed residential connections reported in Fig. II.A.11 above may differ from those in Fig. II.A.10 of the last *Report* because some filers have updated their connections data and the figures in this year's *Report* include all U.S. territories. *2022 Communications Marketplace Report*, 37 FCC Rcd at 15532-33, para. 30, Fig. II.A.10.

[41] We do not report these distributions for satellite connections to maintain firm confidentiality.

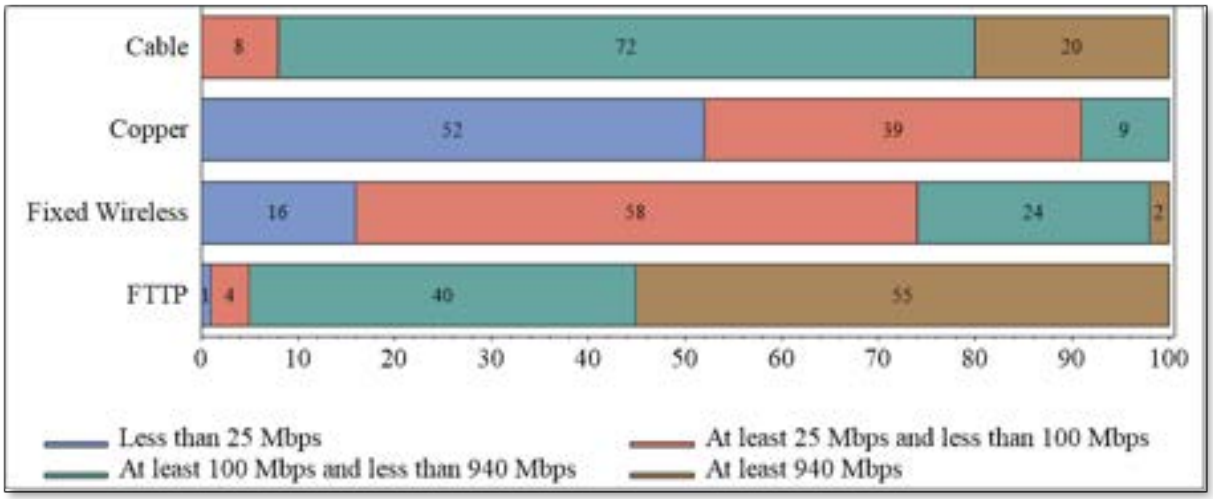
[42] For purposes of this *Report*, we use a download speed of 940 Mbps rather than 1,000 Gbps because, as noted above, that is the maximum advertised download speed reported by two of the largest providers of residential broadband service. In terms of residential broadband coverage, Verizon is ranked second and Lumen (CenturyLink) is ranked sixth.

Fig. II.A.12
Percentage of Residential Connections by Technology and Maximum Advertised Download Speed (Dec. 31, 2020)



Source: FCC Form 477, Dec. 2020.

Fig. II.A.13
Percentage of Residential Connections by Technology and Maximum Advertised Download Speed (Dec. 31, 2023)



Source: FCC Form 477, Dec. 2023.

27. Figure II.A.14a and Figure II.A.14b report the distribution of all fixed residential connections by maximum advertised download and upload speed for the entire United States, Urban Core Census tracts, and Non-Urban Core Census tracts.[43] As shown in Figures II.A.14a and II.A.14b, both the

[43] In the 2010 Urban Area Delineation Criteria, a census tract is designated as "Urban Core" if it has a land area less than three square miles and a population density of at least 1,000 people per square mile. In 2020, the Census Bureau instituted a block-based delineation in which tracts played no role. As a result, the official concept of an urban core tract is now obsolete. For the time being, the Commission will continue to designate Urban Core Tracts using the same criteria to maintain continuity, given the lack of a clearly superior definition. A census tract is designated as "Non-Urban Core" if it has not been designated as Urban Core. Because many census tracts are composed of urban and rural census blocks, the categorization of census tracts into Urban Core and Non-Urban Core categories will result in some urban census blocks being included in Non-Urban Core census tracts and some rural
(continued….)

download and upload speeds increased between 2020 and 2023 for all percentiles. Between 2020 and 2023, Figure II.A.14a shows that the 50th percentile (median) download speed purchased by residential consumers increased from 150 Mbps download to 400 Mbps for all census tracts, whereas the 50th percentile download speed purchased by residential consumers in Non-Urban Core census tracts increased from 100 Mbps to 300 Mbps as compared to 200 Mbps to 400 Mbps in Urban Core census tracts. Between 2020 and 2023, Figure II.A.14b shows that the 50th percentile (median) upload speed purchased by residential consumers increased from 10 Mbps to 20 Mbps upload for all census tracts, Non-Urban Core census tracts, and Urban Core census tracts.

Fig. II.A.14a
Distribution of Fixed Residential Connections in the United States by Download Speed (2020-2023)

Year	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
All Census Tracts					
2020	15 Mbps	50 Mbps	150 Mbps	300 Mbps	940 Mbps
2021	24 Mbps	50 Mbps	200 Mbps	400 Mbps	1,000 Mbps
2022	25 Mbps	100 Mbps	300 Mbps	800 Mbps	1,000 Mbps
2023	25 Mbps	100 Mbps	400 Mbps	940 Mbps	1,000 Mbps
Non-Urban Core Census Tracts					
2020	10 Mbps	25 Mbps	100 Mbps	200 Mbps	600 Mbps
2021	10 Mbps	30 Mbps	150 Mbps	400 Mbps	940 Mbps
2022	15 Mbps	50 Mbps	300 Mbps	500 Mbps	1,000 Mbps
2023	24 Mbps	100 Mbps	300 Mbps	800 Mbps	1,000 Mbps
Urban Core Census Tracts					
2020	25 Mbps	75 Mbps	200 Mbps	300 Mbps	940 Mbps
2021	30 Mbps	100 Mbps	200 Mbps	500 Mbps	1,000 Mbps
2022	50 Mbps	100 Mbps	300 Mbps	800 Mbps	1,000 Mbps
2023	50 Mbps	200 Mbps	400 Mbps	940 Mbps	1,000 Mbps

Source: FCC Form 477, Dec. 2023; FCC Form 477, Dec. 2022, FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020.

Fig. II.A.14b
Distribution of Fixed Residential Connections in the United States by Upload Speed (2020-2023)

Year	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
All Census Tracts					
2020	2 Mbps	5 Mbps	10 Mbps	20 Mbps	100 Mbps
2021	3 Mbps	5 Mbps	10 Mbps	30 Mbps	300 Mbps
2022	3 Mbps	10 Mbps	10 Mbps	35 Mbps	500 Mbps

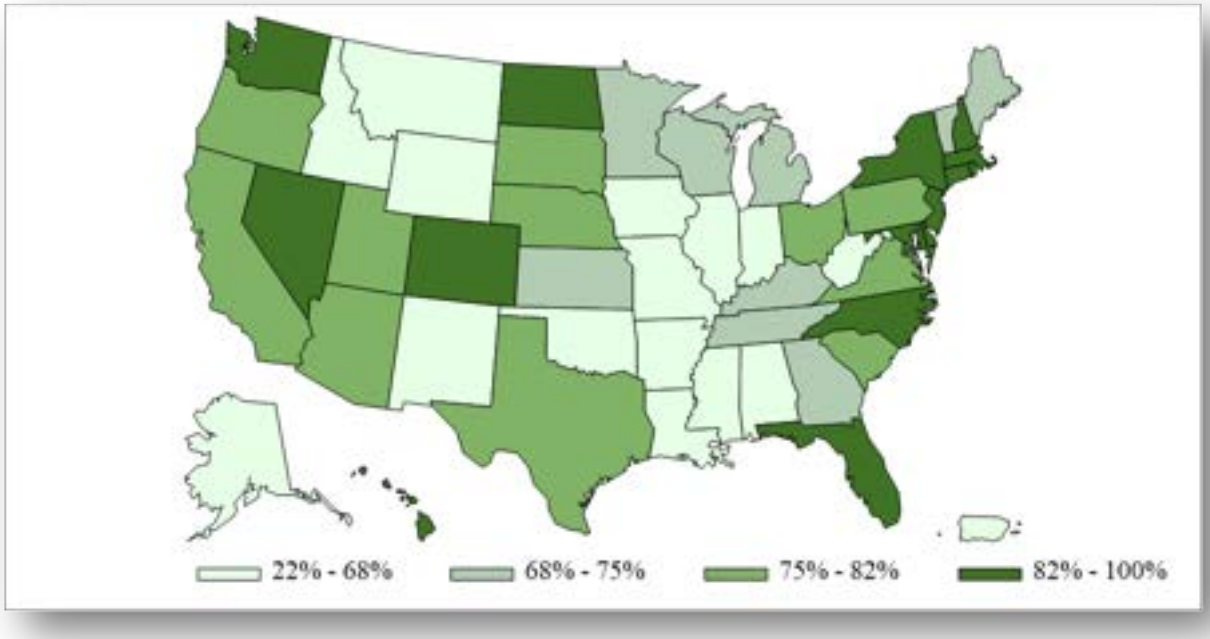
(Continued from previous page)
census blocks being included in Urban Core census tracts. Federal Register, *Urban Area Criteria for the 2010 Census* (Aug. 24, 2011), https://www.federalregister.gov/documents/2011/08/24/2011-21647/urban-area-criteria-for-the-2010-census.

Year	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
2023	4 Mbps	10 Mbps	20 Mbps	50 Mbps	880 Mbps
Non-Urban Core Census Tracts					
2020	1 Mbps	3 Mbps	10 Mbps	20 Mbps	100 Mbps
2021	1 Mbps	5 Mbps	10 Mbps	20 Mbps	100 Mbps
2022	2 Mbps	7 Mbps	10 Mbps	35 Mbps	300 Mbps
2023	3 Mbps	10 Mbps	20 Mbps	35 Mbps	750 Mbps
Urban Core Census Tracts					
2020	3 Mbps	5 Mbps	10 Mbps	30 Mbps	250 Mbps
2021	5 Mbps	10 Mbps	10 Mbps	35 Mbps	500 Mbps
2022	5 Mbps	10 Mbps	20 Mbps	35 Mbps	880 Mbps
2023	5 Mbps	10 Mbps	20 Mbps	50 Mbps	880 Mbps

Source: FCC Form 477, Dec. 2023; FCC Form 477, Dec. 2022, FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020.

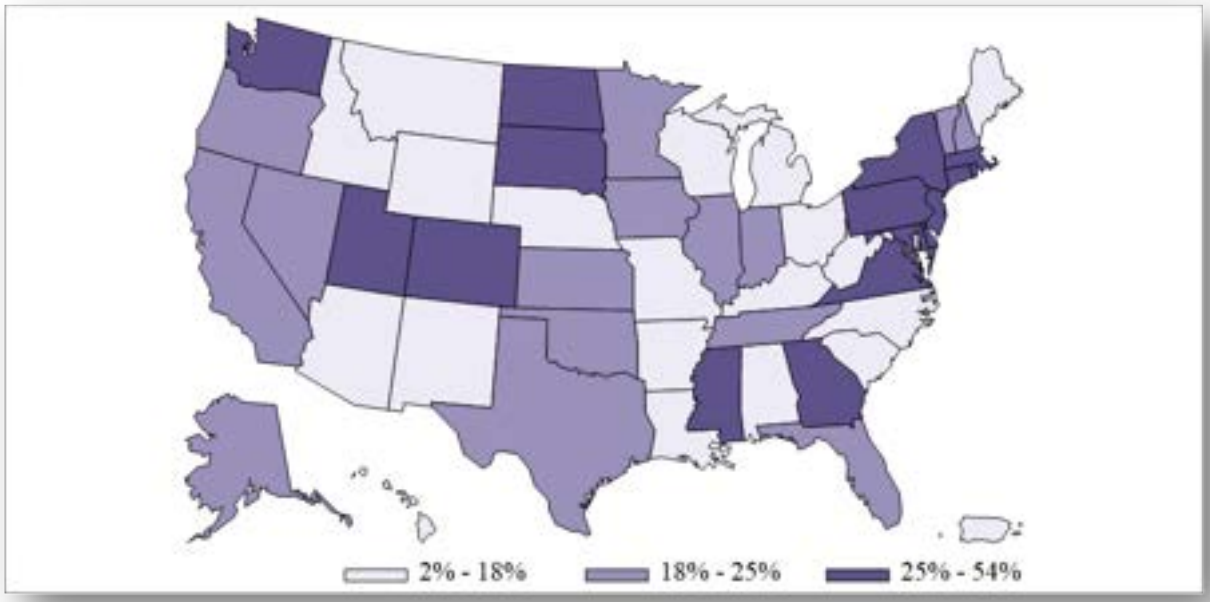
28. Figures II.A.15 and II.A.16 report subscribership ratios (the ratio of total fixed residential connections for all technologies to total households) for specified download speeds, regardless of whether the services are deployed in the area for each state, the District of Columbia, and Puerto Rico, as of December 31, 2023. Figure II.A.15 shows the subscribership ratio for services with at least 100 Mbps download speed and Figure II.A.16 shows the subscribership ratio for services with at least 940 Mbps download speed.

Fig. II.A.15
Subscribership Ratio with at Least 100 Mbps Download by State (Dec. 31, 2023)



Source: FCC Form 477, Dec. 2023; Staff Block Estimates.

Fig. II.A.16
Subscribership Ratio with at Least 940 Mbps Download by State (Dec. 31, 2023)



Source: FCC Form 477, Dec. 2023; Staff Block Estimates.

4. Pricing

29. Pricing for fixed services depends on several factors, including competition, costs, speed tier, technology, geographic area, contract length, and whether the broadband service is bundled with other services. To undertake our pricing analysis in this Report, we collected plan information directly from the providers' websites. Given the difficulty of collecting pricing data from provider websites, we focused this analysis on the stand-alone Internet plans of the top 10 fixed broadband providers in the United States: Altice, AT&T, Lumen (CenturyLink), Charter, Comcast, Cox, Frontier, TDS, T-Mobile, and Verizon. Plan information was gathered directly from each provider's website, and in many cases these plans are not available throughout the providers' service areas.[44] For each Internet-only plan advertised on a provider website, the following information was collected: advertised download speed, advertised monthly price, the monthly price on the associated Broadband Label,[45] and the

[44] Altice, *Optimum Internet Plans, Speeds & Prices*, https://www.optimum.com/internet (last visited Oct. 28, 2024); AT&T, *AT&T Internet Services*, https://www.att.com/ (last visited Oct. 28, 2024); Lumen (CenturyLink), *Fiber Internet with Unlimited Data,* https://www.centurylink.com/ (last visited Oct. 28, 2024); Charter, *Enjoy Faster Starting Speeds with Spectrum Internet,* https://www.spectrum.com/internet (last visited Oct. 28, 2024); Frontier, *Transform Your Connected Home*, https://www.buyfrontiernow.com/fiber/ (last visited Oct. 28, 2024); TDS, *Popular TDS Internet Speeds*, https://tdstelecom.com/shop/internet-services.html (last visited Oct. 28, 2024); T-Mobile, *Reliable Internet $50/month,* https://www.t-mobile.com/home-internet (last visited Oct. 28, 2024); Verizon, *Get Fios Internet and Save,* https://www.verizon.com/home/fios-fastest-internet (last visited Oct. 28, 2024); Comcast, *Xfinity Internet Deals*, https://www.xfinity.com/learn/deals/internet (last visited Oct. 28, 2024); Cox, *Cox Internet-only Service,* https://www.cox.com/residential/internet/internet-only-plans.html (last visited Oct. 28, 2024).

[45] The Commission adopted, as directed by Congress, labeling requirements to provide consumers with the information necessary to choose services that best meet their needs and match their budgets, while also reducing the risk of surprise at unexpected charges in its *Broadband Label Order*. *Empowering Broadband Consumers Through Transparency*, CG Docket No. 22-2, Report and Order and Further Notice of Proposed Rulemaking, 37 FCC Rcd 13686, 13687 (2022) (*Broadband Label Order*).

non-promotional price indicated on the Broadband Label.[46] There are likely legacy plans with grandfathered-in subscribers that are not advertised on the website and would therefore be excluded from this analysis. This *Report* focuses on the advertised price, and in most cases, this price includes a discount for paying with a credit card and/or paperless billing.[47]

30. In addition to manually collecting pricing data, we consider other pricing information. The Commission's 2024 Urban Rate Survey (URS) collected a total of 13,332 monthly rates that ranged from $11.40 to $1,000.00, with a weighted standard deviation ranging from approximately $9 to $90."[48] Also, the URS found the following weighted means for prices of Internet-only packages: $70.35 per month for copper (DSL), $93.91 per month for cable, $51.28 per month for fixed wireless, and $160.34 per month for fiber, which is in line with the prices we manually collected from provider websites.[49]

31. Figure II.A.17a and Figure II.A.17b show the advertised monthly price and advertised download speed for stand-alone Internet plans offered by the top 10 providers. The data indicate a direct relationship between price and download speed—as advertised download speeds increase, so do advertised prices. The least expensive Internet-only plan is $30 month for download speeds up to 100 Mbps, offered by both Cox and Charter, while the most expensive Internet-only plan is provided by Frontier at a monthly price of $300 for download speeds of approximately 7 Gbps.[50] Figure II.A.17a shows three providers advertise speeds up to 5 Gbps: AT&T, Altice, and Frontier. In addition, six providers advertise speeds up to 2 Gbps: Altice, AT&T, Comcast, Cox, Frontier, and Verizon.[51] None of the ten providers advertise plans on their website with speeds under 100 Mbps.

[46] Comcast and TDS both require an address to see advertised prices for Internet-only plans listed on their webpage. Staff used sample address information from metropolitan areas to obtain this pricing information. Prices may vary depending on the address used. Additionally, most providers required an address to see the Broadband Label associated with the service plan advertised on the provider website. When necessary, staff used sample address information from metropolitan areas to obtain the relevant Broadband Labels for all 45 plans analyzed. Additional plans returned upon address entry were excluded from this analysis because they were not listed on the provider's website prior to entering in an address.

[47] Some advertised prices include discounts for bundling with other products, like a mobile line. Staff did not include these discounts in the advertised price. Some providers may exclude taxes and fees from advertised prices, while others may not. Note that Fig. II.A.18, *infra*, compares this advertised price with the monthly price and the non-promotional price listed on the Broadband Label, which do not include these discounts.

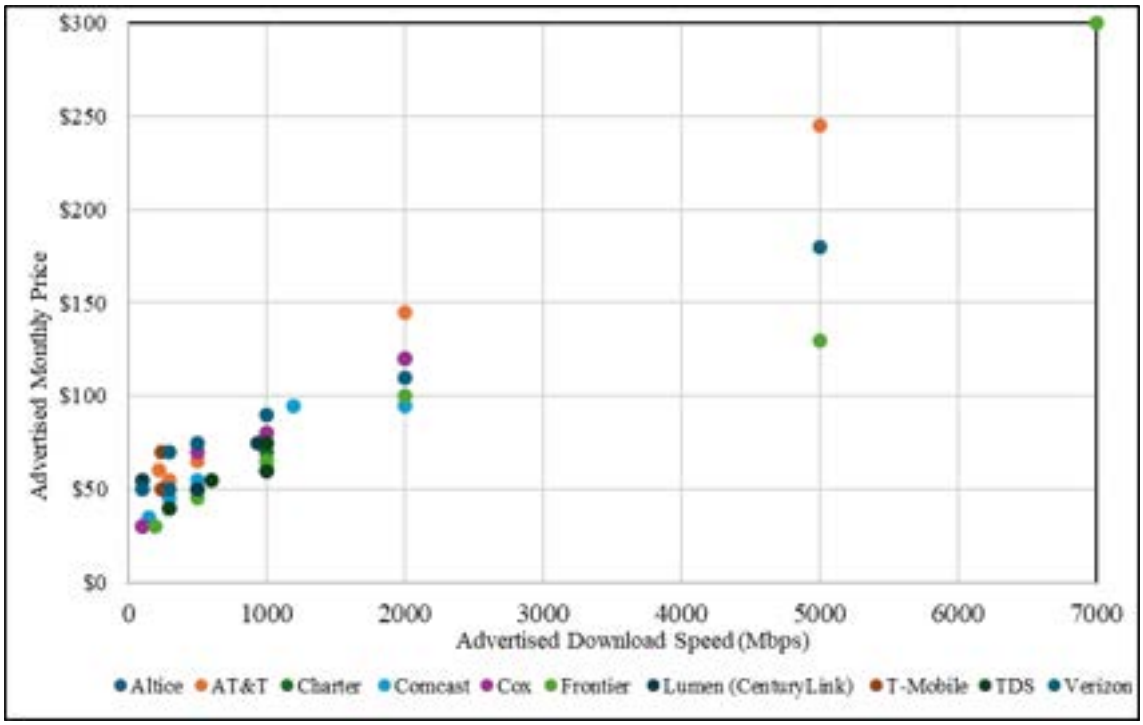
[48] The underlying sample design and weighting methodology for the URS can be found on the FCC survey's homepage. FCC, *Urban Rate Survey Data & Resources* (Dec. 18, 2023), https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources (*2024 FCC Urban Rate Survey*).

[49] *2024 FCC Urban Rate Survey.*

[50] Charter, *Enjoy Faster Starting Speeds with Spectrum Internet,* https://www.spectrum.com/internet (last visited Oct. 28, 2024); Cox, *Cox Internet-Only Service,* https://www.cox.com/residential/internet/internet-only-plans.html (last visited Oct. 28, 2024); Frontier, *Transform Your Connected Home*, https://www.buyfrontiernow.com/fiber/ (last visited Oct. 28, 2024). Many providers offer low-income plans, though qualifying criteria varies by provider. *See, e.g.*, Spectrum, *Spectrum Internet for Low-Income Households*, https://www.spectrum.com/internet/spectrum-internet-assist (last visited Dec. 9, 2024); Comcast, *Apply for Internet Essentials or Internet Essentials Plus from Xfinity*, https://www.xfinity.com/support/articles/comcast-broadband-opportunity-program (last visited Dec. 9, 2024).

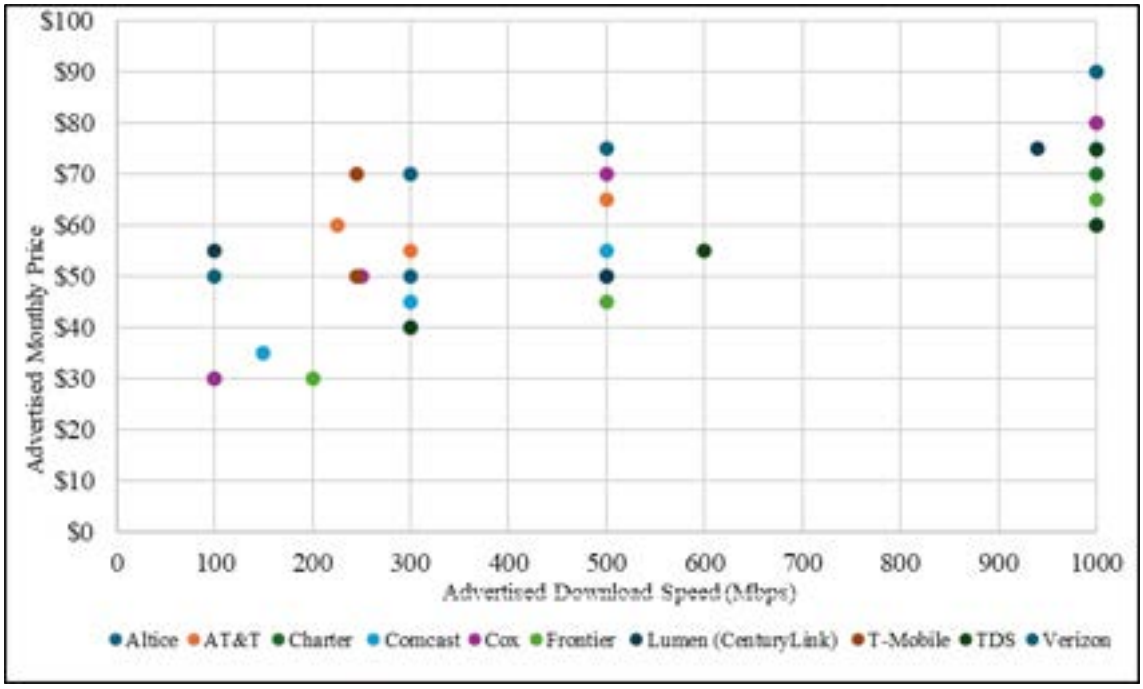
[51] Frontier and Comcast both offer speeds of 2G at similar prices, so it is difficult to see both distinct data points in the chart; *see* Fig. II.A.18 for more information.

Fig. II.A.17a
Monthly Price and Download Speed for Internet-Only Plans: All Speeds



Source: Staff analysis of service provider websites. Data collected as of Oct. 28, 2024.

Fig. II.A.17b
Monthly Price and Download Speed for Internet-Only Plans: Speeds Up to 1 GB



Source: Staff analysis of service provider websites. Data collected as of Oct. 28, 2024.

32. Many service providers offer introductory promotional rates for new customers, which can be considerably discounted from the plan's regular monthly price. Figure II.A.18 provides information on the advertised price, the price listed on the Broadband Label, and the non-promotional

price indicated on the Broadband Label. Of the 45 plans analyzed, all but three had a non-promotional price listed on the Broadband Label that was higher than the advertised price. In many cases, this is because the advertised price includes discounts for auto-pay and/or paperless billing. On average, the non-promotional price listed on the Broadband Label was approximately 20% higher than the advertised price on the website.

Fig. II.A.18
Advertised Internet-Only Plans for the Largest 10 Providers of Fixed Services

	Advertised Download Speed (Mbps)	Advertised Monthly Price	Monthly Price on Broadband Label	Non-Promotional Price on Label
Altice				
	300	$40	$45	$60
	1000	$60	$65	$80
	2000	$120	$125	$140
	5000	$180	$185	$200
AT&T				
(Fixed Wireless)	75-225	$60	$65	$65
	300	$55	$65	$65
	500	$65	$75	$75
	1000	$80	$90	$90
	2000	$145	$155	$155
	5000	$245	$255	$255
Charter				
	100	$30	$30	$50
	500	$50	$50	$80
	1000	$70	$70	$100
Comcast				
	150	$35	$45	$66
	300	$45	$55	$86
	500	$55	$65	$96
	1000	$75	$85	$116
	1200	$95	$105	$126
	2000	$95	$105	$126
Cox				
(Eligibility Required)	100	$30	$30	$30
	250	$50	$70	$70
	500	$70	$90	$90
	1000	$80	$120	$120
	2000	$120	$150	$150
Frontier				
	200	$29.99	$39.99	$39.99
	500	$44.99	$54.99	$54.99
	1000	$64.99	$74.99	$74.99
	2000	$99.99	$109.99	$109.99
	5000	$129.99	$139.99	$139.99
	7000	$299.99	$309.99	$309.99
Lumen (CenturyLink)				
	100	$55	$55	$55
	500	$50	$55	$55
	940	$75	$80	$80

	Advertised Download Speed (Mbps)	Advertised Monthly Price	Monthly Price on Broadband Label	Non-Promotional Price on Label
T-Mobile				
(Fixed Wireless)	72-245	$50	$55	$55
(Fixed Wireless)*	72-245	$70	$75	$75
TDS				
	300	$39.95	$39.95	$74
	600	$54.95	$54.95	$89
	1000	$74.95	$74.95	$104
(Lifetime Guarantee)	1000	$59.99	$59.99	$59.99
Verizon				
(Fixed Wireless)	100	$50	$60	$60
(Fixed Wireless)	300	$70	$80	$80
	300	$49.99	$59.99	$59.99
	500	$74.99	$84.99	$84.99
	1000	$89.99	$99.99	$99.99
	2000	$109.99	$119.99	$119.99

Source: Staff analysis of service provider websites. Data collected as of Oct. 28, 2024.
Note: Plans are included for a provider if they are advertised on their webpage prior to entering an address and a Broadband Label was obtained after address entry. * Indicates the plan comes with a Wi-Fi Mesh Access Point.

33. Figures II.A.19 through II.A.21 show the advertised monthly price for stand-alone Internet plans offered by the top 10 broadband providers for the following technologies: cable, copper (DSL), fiber, and terrestrial fixed wireless. Figure II.A.19 shows the advertised plan information for the five providers who provide services through cable; however, many of the advertised plans may be delivered only through FTTP technology. Of these five providers, Altice advertises the fastest download speeds of 5000 Mbps for $180 per month; however, all five providers advertise a plan between $30 and $40 a month, at speeds ranging between 100 Mbps and 300 Mbps. Figure II.A.20 shows the advertised plans for providers who offer services over copper (DSL); however, many of the advertised plans may be delivered only through FTTP technology. Although the provider section of this report shows AT&T and Lumen (CenturyLink) have significant copper (DSL) deployments, each provider's website indicates that their current offers are for plans on a 100% fiber-optic network and that they no longer offer DSL products to new subscribers.[52] However, subscribers remain on grandfathered copper (DSL) plans.[53] Pricing information for copper (DSL) plans can be found upon entering certain address information; however, these plans are excluded from the analysis because they were not advertised on the provider's website. Of these four providers, Frontier advertises the fastest download speeds of 7000 Mbps for $300 per month; however, all four providers advertise a plan between $30 to $55 a month, at speeds ranging between 100 Mbps and 300 Mbps. Lastly, Figure II.A.21 shows the advertised plan information for the three providers that offer stand-alone terrestrial fixed wireless technology: AT&T, T-Mobile, and Verizon. AT&T's least expensive offer is for download speeds up to 225 Mbps priced for $60, while T-Mobile's least expensive offer is for download speeds up to 245 Mbps priced for $50, and Verizon offers a plan for $50 for speeds up to 100 Mbps.[54]

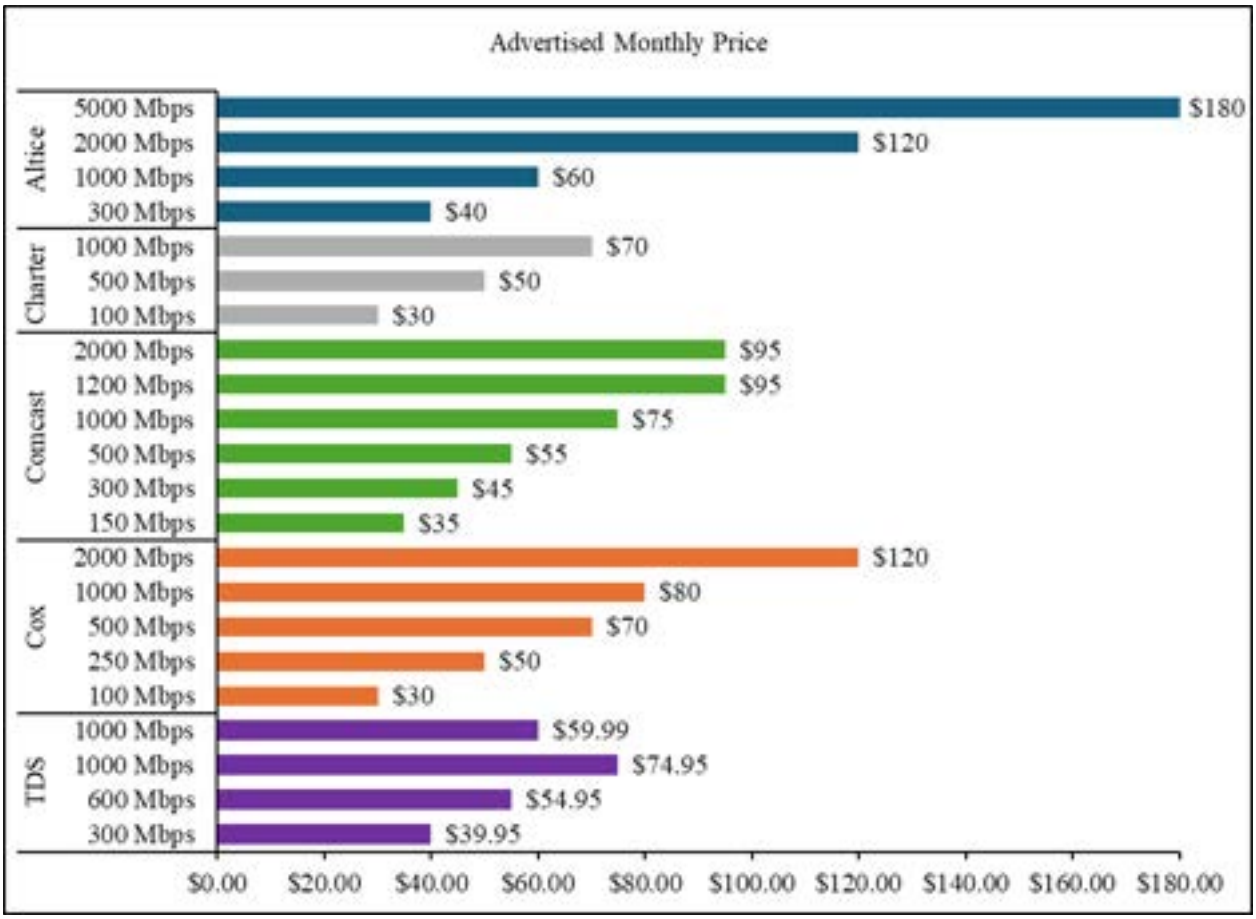
[52] Verizon, *Get Verizon Fios*, https://www.verizon.com/home/fios-fastest-internet/ (last visited July 19, 2024); AT&T, *AT&T Fiber*, https://www.att.com/internet/fiber/ (last visited July 19, 2024).

[53] FCC Form 477 subscription data show that many service providers have other technologies deployed that are not associated with a plan advertised on their website.

[54] Verizon and T-Mobile are the only providers who indicate speeds and prices for their fixed wireless products: Verizon, *Important Information about Verizon Broadband Internet Access Services*,

(continued….)

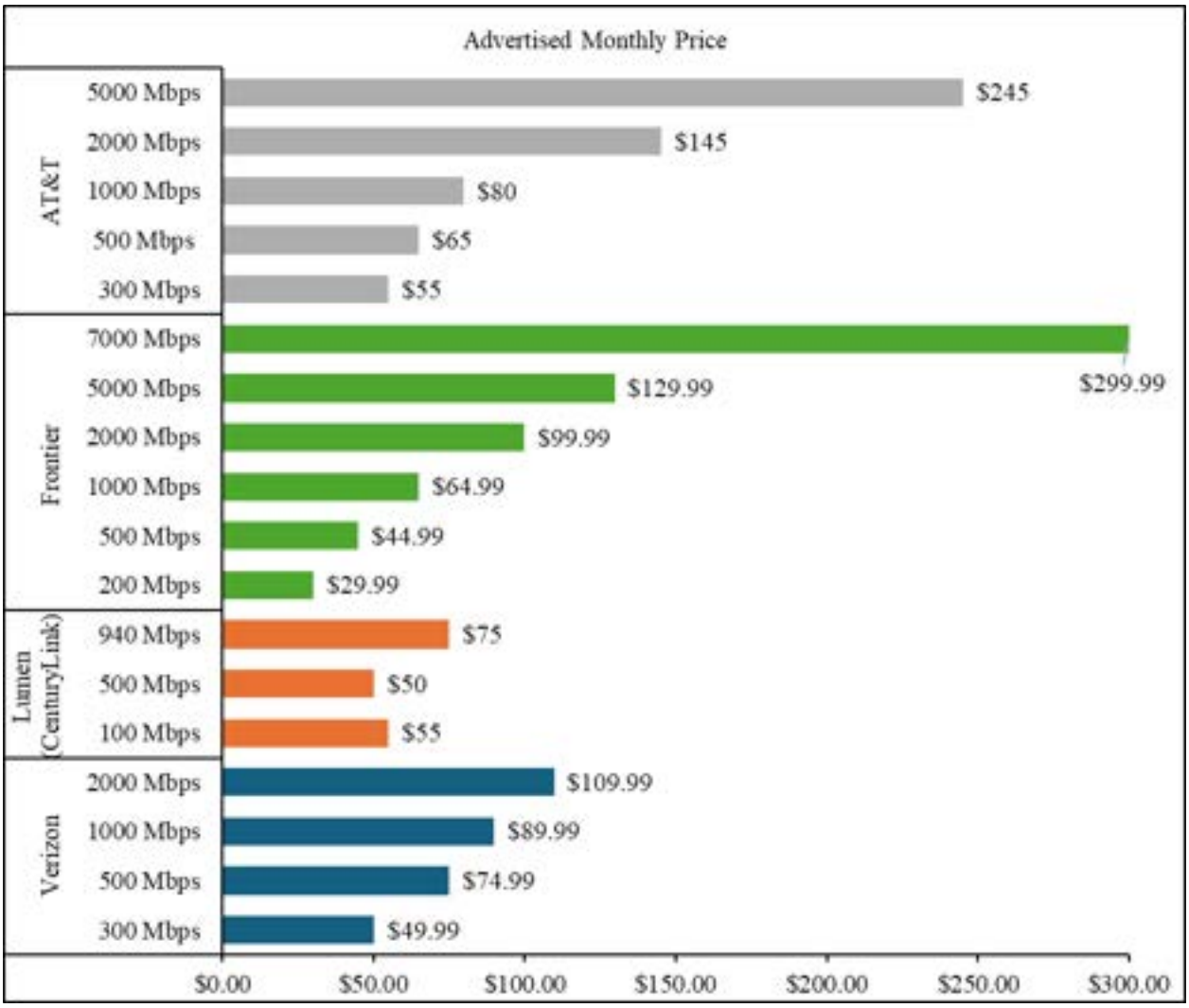
Fig. II.A.19
Monthly Prices for Stand-Alone Internet Offered through FTTP and/or Cable



Source: Staff analysis of service provider websites. Data collected as of Oct. 28, 2024.

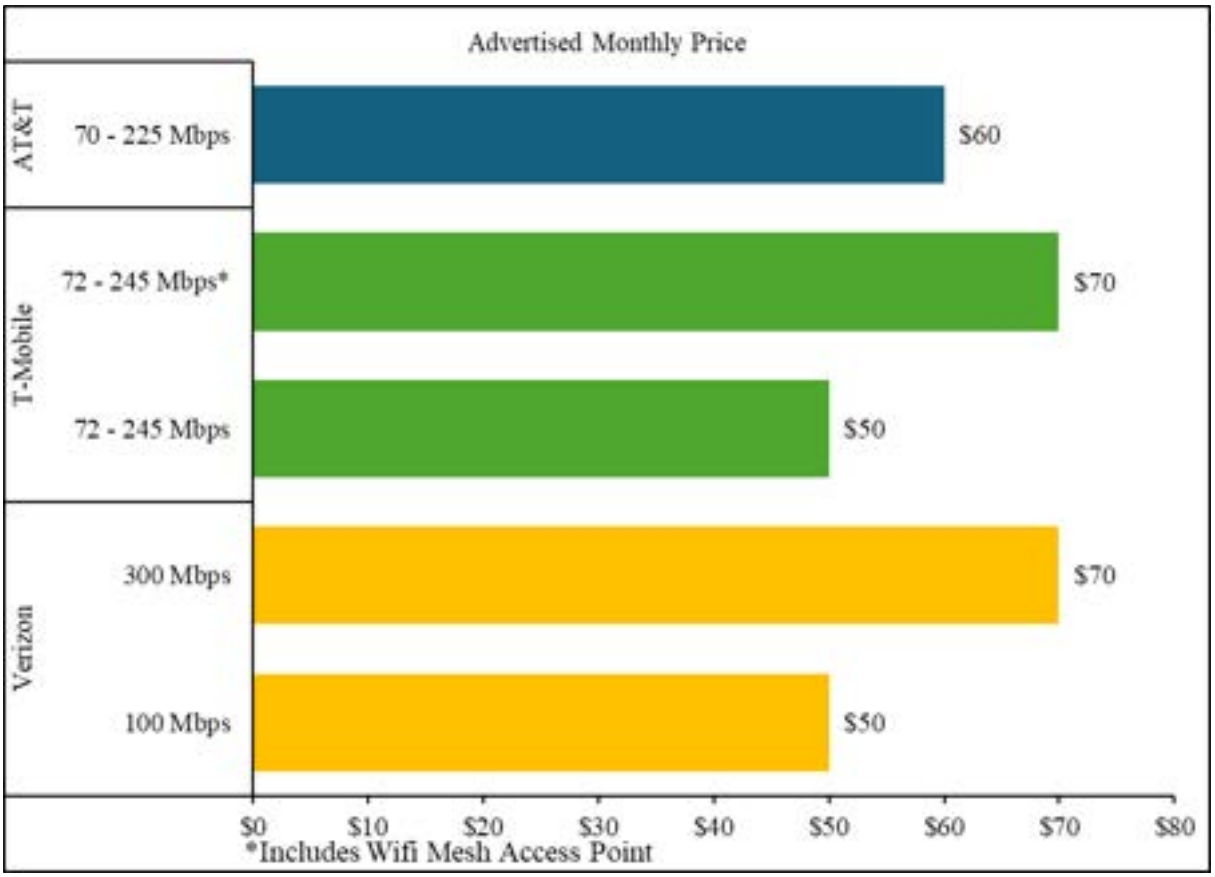
(Continued from previous page)
https://www.verizon.com/support/broadband-services/ (last visited July 19, 2024); T-Mobile, *Policies Open Internet*, https://www.t-mobile.com/responsibility/consumer-info/policies/internet-service (last visited July 19, 2024).

Fig. II.A.20
Monthly Prices for Stand-Alone Internet Offered through FTTP and/or Copper (DSL)



Source: Staff analysis of service provider websites. Data collected as of Oct. 28, 2024.

Fig. II.A.21
Monthly Prices for Stand-Alone Internet Offered through Terrestrial Fixed Wireless



Source: Staff analysis of service provider websites. Data collected as of Oct. 28, 2024.

5. Data Caps

34. In some cases, fixed providers offer service plans that have a data cap, which means that those who subscribe to that plan will be limited in the amount of data they can use each month. Once a customer reaches their data cap they either are charged for additional data they use or are subject to throttled speeds. BroadbandNow reports that 109 fixed terrestrial broadband providers and two satellite broadband providers employ data caps on at least one of their service plan offerings.[55]

35. Figure II.A.22 shows the 15 providers with the largest population coverage from BroadbandNow's list of providers with data caps. Excluding satellite providers, the largest five providers that specify data caps on at least one service offering are: AT&T, Comcast, Cox, EarthLink, and T-Mobile.[56] There are 109 providers with data caps that offer service plans using cable, copper (DSL), FTTP, or terrestrial fixed wireless technologies.[57] However, as shown in Figure II.A.23, the majority of terrestrial providers that have data caps—65 of the providers listed—provide service using terrestrial

[55] BroadbandNow, *Internet Providers with Data Caps* (June 25, 2024), https://broadbandnow.com/internet-providers-with-data-caps.

[56] *Id.*

[57] *Id.*

fixed wireless.[58] The next most prevalent technology using data caps is FTTP; there are a total of 24 fiber providers that use data caps.[59]

Fig. II.A.22
The Largest 15 Service Providers with Data Caps

Company	Population Covered	Technologies	Data Cap Amount
Hughesnet *	330,400,000	Satellite	15 – 200 GB
Viasat Internet	326,900,000	Satellite	100 – 660 GB
T-Mobile	324,300,000	Fixed Wireless	130 GB
Comcast (fixed) *	122,300,000	Cable	1200 GB[60]
EarthLink	120,500,000	Fixed Wireless	100 GB
AT&T *	120,300,000	DSL	1500 GB
Cox *	23,200,000	Cable, Fiber	1280 GB
Mediacom	7,400,000	Cable, Fixed Wireless	400 – 2000 GB
Ranch Wireless	3,200,000	Fixed Wireless	30 – 375 GB
DigitalPath	1,200,000	Fixed Wireless	150 – 2000 GB
DLS Internet Services	1,000,000	Fixed Wireless	50 – 175 GB
Ayera Technologies, Inc.	877,000	Fixed Wireless	100 – 6480 GB
Carolina West Wireless	828,000	Fixed Wireless	25 – 75 GB
VTel Wireless	827,000	Fixed Wireless	15 – 500 GB
All Points Broadband	799,000	Fixed Wireless	100 GB

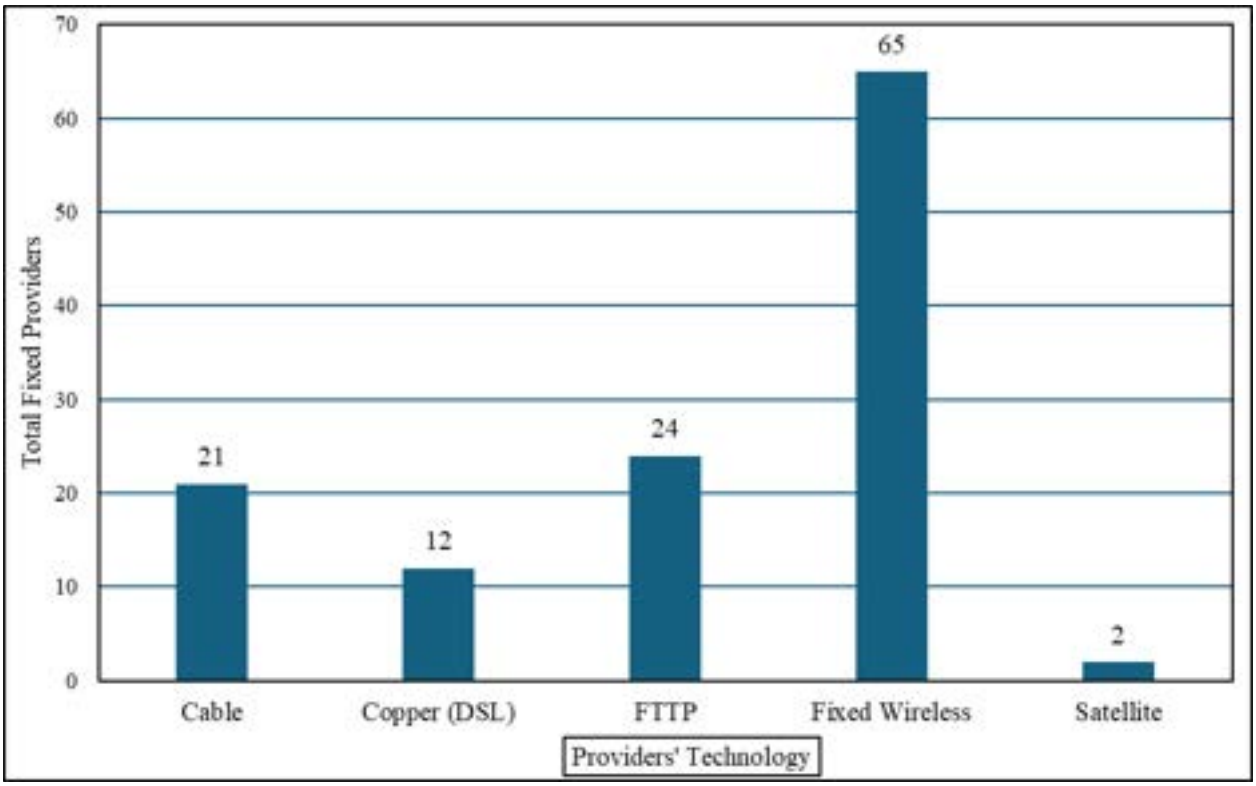
Source: BroadbandNow (Oct. 8, 2024). * Represents providers that BroadbandNow has noted as having data caps that may vary by region.

[58] BroadbandNow, *Internet Providers with Data Caps* (Oct. 8, 2024), https://broadbandnow.com/internet-providers-with-data-caps.

[59] *Id.*

[60] These data are collected by BroadbandNow and sourced from the providers' websites, call centers, and other marketing materials. For some providers, the data caps listed may be relevant to their mobile products. For instance, Comcast advertises a "By the Gig" line that offers 1 GB of data for a mobile line, but many of their fixed customers in select markets are automatically given a 1.2 Terabyte Data Plan. *See* Comcast, *How Does By the Gig Work?*, https://www.xfinity.com/support/articles/how-does-by-the-gig-work (last visited Nov. 20, 2024). Comcast, *All Internet is Powered by Data*, https://www.xfinity.com/learn/internet-service/data (last visited Nov. 20, 2024).

Fig. II.A.23
Total Fixed Terrestrial Providers with Data Caps by Technology



Source: BroadbandNow.

36. The monthly allowance on plans with data caps vary by service plan and provider. Figure II.A.24 illustrates the average minimum data cap by technology. The providers that offer only terrestrial fixed wireless have an average minimum data cap of 364 GB per month, the lowest of the four fixed broadband technologies.[61] The next lowest is for the providers that only offer cable services, with an average minimum data cap of 593 GB per month.[62] The average minimum data cap amount for these providers that offer only FTTP is 801 GB per month.[63] The average minimum data cap for satellite providers is 58 GB per month.[64]

37. Figure II.A.24 also shows how, for each technology, data caps have changed over time. From 2022 to 2024, the average allowance under the data cap increased by approximately 15%.[65] However, providers that only offer service through fixed wireless have increased their allowance under data cap by just 12% on average.[66] Furthermore, BroadbandNow's data indicate that the number of

[61] BroadbandNow, *Internet Providers with Data Caps* (Oct. 8, 2024), https://broadbandnow.com/internet-providers-with-data-caps.

[62] *Id.*

[63] *Id.*

[64] *Id.*

[65] BroadbandNow, *Internet Providers with Data Caps* (Nov. 14, 2022), https://broadbandnow.com/internet-providers-with-data-caps.

[66] BroadbandNow, *Internet Providers with Data Caps* (Nov. 14, 2022), https://broadbandnow.com/internet-providers-with-data-caps; BroadbandNow, *Internet Providers with Data Caps* (Oct. 8, 2024), https://broadbandnow.com/internet-providers-with-data-caps.

providers offering service plans with data caps fell by approximately 17% from 2022 to 2024, with the greatest decrease in cable and fixed wireless providers.[67] BroadbandNow reports that 18 fixed providers that offer at least one terrestrial or satellite broadband plan that has a monthly data allowance of 40 GB per month or less.[68] As seen in Figure II.A.25, four of these providers have a data allowance of less than 10 GB per month: Comcast, Bush-Tell, GCI Communications, and Fastwyre Broadband.[69]

Fig. II.A.24
Average Minimum Data Cap Amount by Technology[70]

	2022		2024	
Technology	**Average Data Cap Amt**	**Total Providers**	**Average Data Cap Amt**	**Total Providers**
Cable only	477 GB	25	593 GB	13
Copper (DSL) only	638 GB	6	699 GB	8
FTTP only	714 GB	14	801 GB	16
Fixed Wireless only	325 GB	72	364 GB	61
Satellite only	10 GB	1	58 GB	2
Multiple Technologies	400 GB	16	435 GB	11
Total	415 GB	134	479 GB	111

Source: BroadbandNow.

[67] BroadbandNow, *Internet Providers with Data Caps* (Nov. 14, 2022), https://broadbandnow.com/internet-providers-with-data-caps; BroadbandNow, *Internet Providers with Data Caps* (Oct. 8, 2024), https://broadbandnow.com/internet-providers-with-data-caps.

[68] BroadbandNow, *Internet Providers with Data Caps* (Oct. 8, 2024), https://broadbandnow.com/internet-providers-with-data-caps.

[69] *Id.*

[70] BroadbandNow reports the data cap amount for certain providers. In many cases they report these data cap amounts as a range. For this figure, the average data cap amount is calculated by using the minimum of the GB range provided by the provider.

Fig. II.A.25
18 Providers with the Lowest Minimum Data Cap Amount

Company	Population Covered	Technologies	Data Cap Amount
Bush-Tell	100	Copper (DSL)	5 – 40 GB
GCI Communication	523,000	Cable, Fixed Wireless	7 – 1000 GB
Fastwyre Broadband	50,000	DSL	8 - 12 GB
UUI Internet	9,000	DSL, Fixed Wireless, Fiber	10 - 100 GB
Supervision	600	Fixed Wireless	10 - 60 GB
Cairo Net	16	Fixed Wireless	10 GB
Hughesnet *	330,400,000	Satellite	15 - 200 GB
VTel Wireless	827,000	Fixed Wireless	15 - 500 GB
Adak Eagle Enterprises	100	Fiber, DSL	15 - 150 GB
101 Netlink	180,000	Fixed Wireless	20 - 1000 GB
Big River Telephone	64,000	Fixed Wireless	20 - 50 GB
Nushagak Electric & Telephone Cooperative	2,000	DSL, Cable	20 - 80 GB
Carolina West Wireless	828,000	Fixed Wireless	25 - 75 GB
Pine Telephone Company	67,000	Fixed Wireless	25 - 100 GB
Ranch Wireless	3,200,000	Fixed Wireless	30 - 375 GB
Basin Broadband	310,000	Fixed Wireless	40 GB
A Better Wireless	56,000	Fixed Wireless	40 - 300 GB

Source: Broadband Now. * Providers that BroadbandNow has noted as having data caps that may vary by region.

38. The Infrastructure Investment and Jobs Act (Infrastructure Act)[71] provided $14.2 billion to modify and extend the Emergency Broadband Benefit (EBB) Program to a longer-term broadband affordability program called the Affordable Connectivity Program (ACP).[72] The ACP supported discounted broadband service to qualifying low-income households by providing a monthly benefit of up to $30 per month or up to $75 per month for eligible households on qualifying Tribal lands.[73] The Infrastructure Act also directed the Commission to establish an annual mandatory collection "of data relating to the price and subscription rates of each Internet service offering of a participating provider under the Affordable Connectivity Program . . . to which an eligible household subscribes."[74]

39. In May 2024, the Commission published data from the ACP Transparency Data Collection (ACP Data Collection).[75] Figure II.A.26 shows part of the published data. ACP participants

[71] Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, div. F, tit. V, § 60502(a), 135 Stat. 429, 1238 (2021) (Infrastructure Act); *id.*, div. J, tit. IV, 135 Stat. at 1382 (appropriating $14.2 billion to the Commission for the Affordable Connectivity Program (ACP)); *see also 2024 Section 706 Report* at 61, para. 103 & n.317.

[72] *2024 Section 706 Report* at 61-62, para. 103 & n.318.

[73] 47 U.S.C. § 1752(a)(7).

[74] Infrastructure Act, div. F, tit. V, § 60502(c)(1), 135 Stat. at 1243.

[75] *The Office of Economics and Analytics and the Wireline Competition Bureau Announce Publication of Affordable Connectivity Program Transparency Data Collection Summary*, WC Docket No. 21-450, Public Notice, DA 24-504 (WCB May 30, 2024).

were allowed to apply the ACP benefit to any broadband service offering of the participating provider.[76] Of the 19,732,049 ACP households for which data were reported as of August 1, 2023,[77] approximately 51% were on a plan that did not have any type of data cap, approximately 10% were on a plan with a soft data cap, approximately 9% were on a plan with a hard data cap, approximately 21% were on a plan with a multi-tier data cap, and approximately 8% were on a plan with an "other" data cap.[78] Of the ACP participants who had a service plan that included a data cap, the hard data cap averaged 463 GB and the soft data cap averaged 32 GB.[79] Approximately 11% of ACP households on a plan with a hard data cap hit the cap, whereas over 60% of ACP households hit their soft data cap.[80] Lastly, ACP households paid more for plans without data caps, with an average base monthly price of $67.59.[81] Conversely, ACP households that were on plans with multi-tiered data caps paid the least, averaging a $36.10 base monthly price.[82] In addition, the ACP Data Collection required providers that participated in the ACP to submit information regarding fees they charged. This included information on what providers charged for installation, service activation, and for service termination. 187 providers indicated they charged a termination fee on non-legacy plans. The weighted average of the reported termination fees was approximately $162.[83]

[76] *Affordable Connectivity Program*, WC Docket No. 21-450, Report and Order and Further Notice of Proposed Rulemaking, 37 FCC Rcd 484, 529-538, paras. 92-109 (2022) (*ACP Report and Order and Further Notice*).

[77] An ACP household is a household that successfully enrolled into the ACP. The ACP Data Collection instructed providers to submit information about the service plans of their total ACP households as of Aug. 1, 2023. For more details on a household definition in the ACP, *see* 47 CFR § 54.1800(l).

[78] A data cap refers to any "data usage restrictions on both pre-paid and post-paid plans." 47 CFR § 54.1813(a); *see also Affordable Connectivity Program*, WC Docket No. 21-450, Report and Order and Further Notice of Proposed Rulemaking, 37 FCC Rcd 13773, 13796, para. 48 (2022). A "hard cap" refers to a limit after which a user's access to the Internet is discontinued. A "soft cap" for a plan is a limitation after which a user is limited in using the service to access the Internet. "De-prioritization" refers to slowing data speeds during times of network congestion. "Throttling" refers to when data speeds are slowed regardless of network congestion. A "multi-tiered" cap refers to a data cap structure where a user may experience a single data cap type after a certain level of usage and then a different cap at a higher level of usage. For example, a plan that throttles usage after a data cap and then a hard cap after a second level of usage would be considered a "multi-tiered" cap. FCC, *OEA and WCB Announce Publication of the ACP Transparency Data Collection* (May 30, 2024), https://www.fcc.gov/document/oea-and-wcb-announce-publication-acp-transparency-data-collection.

[79] FCC, *OEA and WCB Announce Publication of the ACP Transparency Data Collection* (May 30, 2024), https://www.fcc.gov/document/oea-and-wcb-announce-publication-acp-transparency-data-collection.

[80] *Id*.

[81] *Id*.

[82] *Id*.

[83] The reported fee data from the ACP Data Collection can be found in the 'ACP Data Plan Updated' file, located on the FCC website: FCC, *OEA and WCB Announce Publication of the ACP Transparency Data Collection,* https://www.fcc.gov/document/oea-and-wcb-announce-publication-acp-transparency-data-collection (last visited December 5, 2024).

Fig. II.A.26
ACP Households Data Cap Amount

Plan Detail	Total ACP households on Plan	Weighted Average Variable	Weighted Average	Total Providers with ACP households
Plan with No Data Cap	10,079,464	Base Monthly Price	$67.59	1,483
Plan with Soft Data Cap	2,062,478	Base Monthly Price	$50.15	108
Plan with Hard Data Cap	1,804,884	Base Monthly Price	$56.43	58
Plan with Mult-Tier Data Cap	4,122,378	Base Monthly Price	$36.10	47
Plan with "Other" Data Cap	1,662,845	Base Monthly Price	$43.71	48
Soft Data Cap Amount	2,062,478	Data Cap Amount	32.45 GB	108
Hard Data Cap Amount	1,804,884	Data Cap Amount	463.23 GB	58
Multi-Tier Data Cap Amount	4,122,378	Data Cap Amount	19.94 GB	47
Other Data Cap Amount	1,662,845	Data Cap Amount	657.81 GB	48
Total ACP Households Hit Hard Cap	197,004	Base Monthly Price	$37.56	73
Total ACP Households Hit Soft Cap	1,244,237	Base Monthly Price	$45.26	110
Charges for Additional Data Usage per Gigabyte	1,460,234	Overage Amount Paid	$4.56	70
GB Hard Cap Overage	66,953	Overage Amount	82.51 GB	56
Hard Cap Overage Amount Paid	15,323	Overage Amount Paid	$44.37	31
GB Soft Cap Overage	1,119,535	Overage Amount	14.41 GB	104
Soft Cap Overage Amount Paid	55,827	Overage Amount Paid	$9.48	31

Source: ACP Data Collection.

6. Churn

40. Customer churn refers to the percentage of customers who stop paying for a service or product over a specified time period. Companies aim for lower churn rates because higher customer churn leads to a reduction in revenue and increase in costs.[84] A report by Analysys Mason, for example, found that "churn rates are higher in markets with high levels of competition and a wide choice of retail

[84] The reduction in revenue results from the loss of customers. In addition, even if a company has the same total number of customers at the beginning and end of a churn measurement period, enduring a higher churn rate requires the company to expend more in customer acquisition expense (e.g., marketing) to acquire the customers to replace those that have switched.

service providers, all other things being equal."[85] One study conducted by Recurly Research determined that the churn rate for subscription based services or products averaged 4.1% per month.[86] However, the average churn rates for the fixed broadband marketplace tend to be lower than the typical subscription-based product.[87] For example, Frontier reported a churn rate in the United States of 1.47% in first-quarter 2024, up from 1.43% a year prior.[88] Additionally, NRTC surveyed 84 rural broadband providers and found subscriber churn was 0.68% for customers on higher speed tiers compared to 1.14% for those on lower speed tiers.[89]

41. Many factors impact customer churn in the fixed broadband marketplace. Contract length and automatic payment options are two factors that impact churn, and both are common features in the U.S. fixed broadband marketplace. Providers can also use bundles as a strategy to reduce churn for fixed broadband, and one study found that bundling reduces churn in markets "where a significant amount of turnover in services and/or service providers exists."[90] Further, price and price increases affect a consumer's decision to pay for a product and therefore impact overall churn rates. According to Recurly Research, 71% of survey respondents cite price increases as the number one reason for customer loss.[91] Additionally, Recurly Research reported churn rates by the average revenue per customer, and found churn rates are 3% for subscriptions less than $10, 4.9% for subscriptions between $25 and $50, and 3.7% for subscriptions greater than $250.[92] Government subsidy programs can also impact the monthly rate that subscribers pay. On December 31, 2021, the Commission launched the ACP, which allowed for eligible households to receive an up to $30 per month discount toward Internet service and up to $75 per month for households on qualifying Tribal lands.[93] However, due to lack of additional funding from Congress, as of June 1, 2024, ACP households could no longer receive the ACP benefit, leaving millions of households with increased bills.[94] Subsequently, many providers, like Charter, AT&T, and Verizon,

[85] Analysys Mason, *There is Still Scope for Many Operators to Reduce Their Fixed Broadband Churn Rates* (July 16, 2021), https://www.analysysmason.com/research/content/articles/fixed-churn-reduction-rdmb0/.

[86] Recurly Research, *What is a Good Churn Rate*, https://recurly.com/research/churn-rate-benchmarks/ (last visited June 4, 2024). We note that the "study examined a sample of over 1,200 subscription sites processing subscription billing on the Recurly platform. The study period ran over 12 months (January 2023 to December 2023). Transaction data was aggregated and anonymized; no personally identifiable data was used in the study. Churn rates are monthly, calculated by dividing the number of subscribers who churn during the month by the number of subscribers at the beginning of the month. The study uses median, 25th, and 75th percentile values which eliminate outliers and provide a more accurate representation of the data. The involuntary churn number excludes sites that may choose to leave a subscription active despite declined payments." *Id.*

[87] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15549-50, para. 44.

[88] Frontier Communications Parent, Inc., SEC Form 10-Q (filed May 3, 2024), https://www.sec.gov/ix?doc=/Archives/edgar/data/20520/000156276224000120/fybr-20240331x10q.htm; Statista, *Customer Monthly Churn Rate of Frontier Communications from 2014 to 2023* (Aug. 20, 2024), https://www.statista.com/statistics/692110/frontier-communications-monthly-churn/.

[89] NRTC, Rural Broadband Operations Benchmarking Report at 18 (Feb. 2024), https://www.nrtc.coop/wp-content/uploads/2024/01/Rural-Broadband-Operations-Benchmarking-Report-2024.pdf.

[90] Prince, J. and Greenstein, S., *Does Service Bundling Reduce Churn?*, Journal of Economics & Management Strategy, 23: 839-75 (2014).

[91] Recurly Research, *Churn Rates by Average Revenue Per Customer (ARPC)*, https://recurly.com/research/churn-rate-benchmarks/ (last visited Oct. 30, 2024).

[92] *Id.*

[93] Press Release, FCC, FCC Launches Affordable Connectivity Program (Dec. 31, 2021), https://www.fcc.gov/document/fcc-launches-affordable-connectivity-program; *ACP Report and Order and Further Notice*, 37 FCC Rcd at 610-12, paras. 281-86.

anticipated heightened churn rates as a result of the end of the ACP,[95] and subsequently attributed the end of the program as one reason for customer losses.[96]

42. Service quality and competition are two additional factors that impact churn rates. Subscribers receiving higher quality services are more likely to be satisfied and thus less likely to switch to a new provider.[97] Providers may couple price increases with improvements to download speeds to reduce price-related churn.[98] Some providers have implemented new customer service technology to mitigate churn rates. For example, Frontier introduced digital self-service tools through an Artificial Intelligence (AI) chat bot in 2023 and saw a reduction in fiber broadband churn from 1.38% to 1.32%.[99] Relatedly, the introduction of new technologies can affect churn. For example, research by Ookla found that the introduction of T-Mobile and Verizon 5G fixed wireless led to an increase in churn for cable and DSL providers as subscribers switched to fixed wireless services.[100] T-Mobile has indicated that churn in its fixed wireless subscriptions has declined as the service has matured.[101] Similarly, a report by Fiber Broadband indicated that fiber service was the main beneficiary of churn.[102] The report also echoed Ookla's findings that many consumers shifted from cable and DSL service to fixed wireless service.

7. Access to Multiple Providers

43. We provide an assessment of the number of fixed broadband provider options available to consumers in the United States from December 2020 to December 2023. Our analysis considers

(Continued from previous page)

[94] FCC, *Affordable Connectivity Program (ACP) Fact Sheet*, https://www.fcc.gov/sites/default/files/ACP-Fact-Sheet-Post-ACP-Ending.pdf (last visited July 16, 2024) (explaining the impact of the end of the ACP benefit on households).

[95] Market Insider, *Charter Communications Faces Subscriber Churn and Financial Headwinds as ACP Ends: Maintaining Hold Rating* (Apr. 9, 2024), https://markets.businessinsider.com/news/stocks/charter-communications-faces-subscriber-churn-and-financial-headwinds-as-acp-ends-maintaining-hold-rating-1033233483#:~:text=The%20ACP%E2%80%99s%20likely%20end%20is%20expected%20to%20result,services%20or%20require%20promotional%20offers%20to%20remain%20subscribed.

[96] *See* Charter, *Charter Announces Second Quarter 2024 Results* (July 26, 2024), https://ir.charter.com/news-releases/news-release-details/charter-announces-second-quarter-2024-results (stating that decreases in residential Internet customers in the second quarter of 2024 were "largely driven" by the end of the ACP); Jake Neenan, *AT&T's Fixed Wireless Access Shows Solid Growth in Second Quarter* (July 24, 2024), https://broadbandbreakfast.com/at-ts-fixed-wireless-access-shows-solid-growth-in-second-quarter/ ("[AT&T CEO John Stankey] also attributed the lower-than-expected fiber adds in part to the end of the Affordable Connectivity Program, a federal subsidy mechanism that provided low-income households with a $30 discount on their broadband bills"); Jake Neenan, *Verizon Reports Drop in Prepaid Subscribers After ACP Sunset* (July 22, 2024), https://broadbandbreakfast.com/verizon-reports-drop-in-prepaid-subscribers-after-acp-sunset/.

[97] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15550, para. 46.

[98] Analysys Mason, *Multi-Gigabit Tariffs Can Help to Boost Fixed Broadband Revenue, But Operators' Approaches Vary* (May 21, 2024), https://www.analysysmason.com/research/content/articles/multi-gigabit-tariffs-rdmb0/.

[99] Frontier, *SEC Schedule 14A Proxy Statement* at 3 (May 15, 2024), https://s201.q4cdn.com/129601114/files/doc_financials/2024/ar/04898e1d-6b8c-4e6e-82e3-b1071c2abfe4.pdf.

[100] Ookla Research, *U.S.–The Rise of 5G FWA & The Battle for Fixed Broadband Customers* (Dec. 20, 2023), https://www.ookla.com/articles/fixed-wireless-access-us-q3-2023. We note that Ookla Research calculated churn to T-Mobile and Verizon fixed wireless from Q2 2022–Q3 2023, though the methodology used is unclear.

[101] Telecompetitor, *Despite the Critics, T-Mobile CFO Touts Decline in Fixed Wireless Churn* (June 20, 2023), https://www.telecompetitor.com/despite-the-critics-t-mobile-cfo-touts-decline-in-fixed-wireless-churn/.

[102] Fiber Broadband Association & RVA LLC, *The Status of U.S. Broadband: The Growing Preference to Fiber Broadband* at 8 (Aug. 14, 2023), https://fiberbroadband.org/wp-content/uploads/2023/08/The-Status-of-U.S.-Broadband-2023.pdf.

options for fixed terrestrial services meeting two different speed thresholds—100/20 Mbps and 940/500 Mbps.[103] For year-end 2020 and 2021, our analysis uses broadband deployment data collected through FCC Form 477 and, for year-end 2022 and 2023, our analysis uses broadband availability data collected through the BDC. While the BDC collects service availability for individual locations, FCC Form 477 required providers to submit a list of census blocks where they made service available. As the Commission has previously noted, a provider indicating through FCC Form 477 that it provided service in a census block did not necessarily mean that the provider could provision services to all locations in the census block or that it could provide the reported speed to all locations in the census block.[104] Accordingly, the number of providers reported in the figures below for 2020 and 2021 do not necessarily reflect the number of choices available to a particular household and do not purport to measure actual head-to-head competition. This caveat does not apply to the numbers presented for 2022 and 2023 because the data collected in these periods were not collected at the level of the census block, but rather by residential location. In addition, due to the different parameters of the underlying data collections, the results for 2022 and beyond should not be directly compared with previous years. Finally, the availability of fixed terrestrial service provided over mobile spectrum does not mean that every household can simultaneously receive such service.

44. Figure II.A.27 reports estimates of the percentage of U.S. households where zero, one, two, and three or more providers of residential fixed broadband services are available.[105] From 2022 to 2023, the percentage of households with at least three provider options for a 100/20 Mbps service increased from approximately 19% to approximately 29%.[106] While the overall availability of 940/500 Mbps has increased, only about 46% of households had access and only about 7% of households had more than one provider option in December 2023 at those minimum speeds.[107]

[103] 100/20 Mbps is the Commission's fixed speed benchmark for advanced telecommunications capability or purposes of its analysis under section 706 of the Telecommunications Act of 1996, and 1,000/500 Mbps is the Commission's long-term speed goal. *2024 Section 706 Report* at 13, 26, paras. 22, 47.

[104] *See, e.g.*, *Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, GN Docket No. 20-269, Fourteenth Broadband Deployment Report, 36 FCC Rcd 836, 848, para. 22 (2021).

[105] The FCC Form 477 deployment data for 2020 are based on the 2010 Census geographies; whereas the FCC Form 477 data deployment for 2021 and the FCC BDC data for 2022 and 2023 are based on 2020 Census geographies. Due to this discrepancy, it is not possible to hold constant the underlying configuration of census blocks or the characteristics of the census blocks. We therefore caveat our results for changes between 2020 and 2021. Throughout this section, percentages provided may not sum to exactly 100% due to rounding.

[106] Appx. B-1 reports estimates of the percentage of households where zero, one, two, and three or more providers of residential fixed broadband services with speeds of at least 100/20 Mbps are available in 2023 by state, the District of Columbia, and U.S. territory.

[107] Appx. B-2 reports estimates of the percentage of households where zero, one, two, and three or more providers of residential fixed broadband services with speeds of at least 940/500 Mbps are available in 2023 by state, the District of Columbia, and U.S. territory.

Fig. II.A.27
Percentage of U.S. Households with Multiple Provider Options for Fixed Terrestrial Services (2020-2023)

Provider Options	2020	2021	2022	2023
100/20 Mbps				
Zero	8.3%	5.4%	6.8%	4.8%
One	34.4%	30.5%	36.6%	28.9%
Two	41.6%	42.8%	37.5%	36.8%
At Least Three	15.7%	21.3%	19.2%	29.4%
940/500 Mbps				
Zero	63.8%	54.9%	60.7%	54.2%
One	31.1%	41.0%	35.5%	38.5%
Two	4.6%	3.7%	3.7%	6.8%
At Least Three	0.5%	0.4%	0.2%	0.4%

Source: FCC BDC data, Dec. 2023; FCC BDC data, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477; Dec. 2020; Staff Block Estimates.

45. *Provider Options in Rural, Urban, and Tribal Areas.* We next evaluate the percentage of households that have a choice among multiple fixed terrestrial broadband service providers in rural and urban areas, and in Tribal areas. As shown in Figure II.A.28, for services meeting a minimum 100/20 Mbps speed threshold, the data suggest improvements in the percentage of households with at least two provider options. However, there is a significant difference in the percentage of households with at least two provider options in urban areas compared to those in rural areas and in Tribal areas. While approximately 75% of the households living in urban areas had at least two provider options for 100/20 Mbps service, only approximately 35% of households living in rural areas and 49% of households in Tribal areas had at least two options for this service tier. Currently, for services meeting a 940/500 Mbps threshold, approximately 9% of households in urban areas had at least two options, compared to approximately 3% of households in rural areas and 5% of households in Tribal areas.

Fig. II.A.28
Percentage of U.S. Households in Rural Areas, Urban Areas, and Tribal Areas with Multiple Provider Options for Residential Fixed Terrestrial Services (2020-2023)

Provider Options	2020	2021	2022	2023
100/20 Mbps - Rural Areas				
Zero	31.5%	22.1%	27.3%	20.0%
One	47.1%	48.9%	48.2%	45.5%
Two	18.2%	23.5%	19.6%	24.4%
At Least Three	3.1%	5.5%	4.8%	10.1%
100/20 Mbps - Urban Areas				
Zero	2.4%	1.2%	1.3%	0.7%
One	31.1%	25.9%	33.5%	24.3%
Two	47.6%	47.6%	42.2%	40.2%
At Least Three	18.9%	25.2%	23.0%	34.7%
100/20 Mbps - Tribal Areas				
Zero	38.0%	23.4%	22.9%	16.6%
One	38.9%	43.0%	45.2%	34.7%
Two	21.6%	30.0%	24.8%	26.2%
At Least Three	1.4%	3.5%	7.2%	22.6%
940/500 Mbps - Rural Areas				
Zero	81.8%	75.7%	75.9%	67.2%
One	16.9%	22.2%	22.9%	29.9%
Two	1.3%	1.9%	1.2%	2.7%
At Least Three	0.0%	0.2%	0.1%	0.1%
940/500 Mbps - Urban Areas				
Zero	59.3%	49.7%	56.7%	50.7%
One	34.7%	45.6%	38.8%	40.9%
Two	5.4%	4.1%	4.3%	8.0%
At Least Three	0.6%	0.5%	0.2%	0.5%
940/500 Mbps - Tribal Areas				
Zero	79.0%	71.5%	72.1%	64.4%
One	19.1%	24.9%	25.4%	30.8%
Two	1.9%	3.3%	2.4%	4.5%
At Least Three	0.0%	0.3%	0.1%	0.3%

Source: FCC BDC data, Dec. 2023; FCC BDC data, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020; Staff Block Estimates.

46. *Alternative Estimates of the Number of Provider Options*. We also provide alternative estimates of the number of provider options available to households in an attempt to present a more

comprehensive assessment. To reduce the effect of the factors that could result in an underestimate or overestimate of the percentage of households with a choice of multiple providers, we incorporate information from our confidential subscriber data before assessing the number of providers. In Figure II.A.29, we present alternative estimates of the number of provider options for 100/20 Mbps and 940/500 Mbps based on three scenarios that include *all* fixed technologies.[108] These alternative estimates include satellite service, as well as any of the other fixed technologies, to the extent that the service meets the speed threshold and the scenario criteria. For comparison purposes, Scenario I presents fixed broadband coverage for all reported technologies and relies on the filer's availability data as released by the Commission. The two remaining scenarios include the filer's availability data only if the filer's residential connections data meet the minimum adoption rate for the scenario. Scenario II compares each filer's BDC availability data to its FCC Form 477 residential connections data and excludes the filer's availability data from the Census tract if the filer does not attain a 1% adoption rate.[109] Scenario III increases the adoption rate in Scenario II from 1% to 5%. Scenarios II and III analyze adoption rates without regard to subscription speed to account for consumers opting to subscribe to slower speed services than the maximum advertised speed offered by a provider.[110]

47. The first column of Figure II.A.29 replicates the last column of Figure II.A.27 for comparison purposes. Comparing Scenario I to Scenario II and Scenario III shows the impact of adoption adjustments on the estimates of the number of provider options when a filer failed the adoption rate criteria for the scenario and its availability data are excluded. For example, comparing Scenario I to Scenario II for 100/20 Mbps suggests that the percentage of households with at least two provider options would fall from approximately 95% to approximately 66%, while comparing the Scenario I to Scenario III suggests that the percentage would fall from approximately 95% to approximately 55%.

[108] These estimates include FSS. The estimates for Scenarios II and III rely on confidential residential connections (subscriber) data.

[109] We define the adoption rate as the filer's total number of residential connections in the tract divided by the filer's number of deployed households meeting the speed threshold in the census tract.

[110] *See infra* Fig. IV.A.1, reporting Overall Adoption Rates for the United States; *see also infra* Fig. III.A.4, reporting alternative deployment estimates. The percentages reported in Fig. III.A.4 for service availability are based on population whereas the percentages reported in Fig. II.A.29 are based on deployed households.

Fig. II.A.29
Alternative Estimates for the Percentage of Households with Multiple Provider Options for Fixed Services (Dec. 31, 2023)

	From Fig. II.A.27: (Excludes Satellite)	Scenario I: All Technologies	Scenario II: All Technologies, 1% Adoption Rate	Scenario III: All Technologies, 5% Adoption Rate
100/20 Mbps				
Zero	4.8%	0.0%	1.6%	4.4%
One	28.9%	5.0%	32.8%	40.9%
Two	36.8%	28.9%	42.5%	41.4%
At Least Three	29.4%	66.2%	23.1%	13.3%
940/500 Mbps				
Zero	54.2%	54.2%	55.6%	56.4%
One	38.5%	38.5%	37.9%	37.5%
Two	6.8%	6.8%	6.3%	5.9%
At Least Three	0.4%	0.4%	0.3%	0.2%

Source: FCC BDC data, Dec. 2023; FCC Form 477, Dec. 2023; Staff Block Estimates.
Note: Scenario I includes all technologies. Scenario II compares each filer's BDC availability data to its confidential FCC Form 477 residential connections data, and excludes a filer's services from a location if the filer does not attain a 1% adoption rate in the tract to which the location belongs. Scenario III increases the adoption rate to 5%.

8. Measuring Broadband America Report

48. Our assessment of non-price competition in fixed broadband services also considers quality measures including the actual speed of service experienced by consumers, consistency of actual speeds experienced as compared to advertised speeds, latency, and packet loss. Each of these measures focuses on a different aspect of the consumer experience. Every page, image, and video on the Internet comes to home devices as small pieces of data (packets). Upload and download speed refer to throughput, the rate at which packets reach their destination within a specific time period. Different types of online applications require different minimum speeds. The speed experienced by a consumer may fluctuate during the day, typically due to variations in traffic demand and the resulting stress on different parts of the network infrastructure. Consistency measures examine how dramatic these fluctuations are across a particular network. Moreover, a significant reduction in speed for more than a few seconds can reduce video resolution or cause intermittent lapses in service. Consumers using services with high latency may experience reduced quality for interactive services; e.g., video chat, video conferencing, and online multiplayer games. Finally, packet loss measures the fraction of data packets sent that fail to be delivered to the intended destination. If packet loss occurs with interactive services and streaming applications, it may affect the consumer's quality of service.

49. The discussion below summarizes results from the Commission's recently released *Thirteenth Measuring Broadband America Fixed Broadband Report*,[111] which provides a snapshot of

[111] *See Thirteenth Measuring Broadband America Fixed Broadband Report*. The MBA program is a nationwide study of consumer broadband performance that relies upon a sample that aims to include those tiers that constitute the top 80% of the subscriber base per ISP. *Thirteenth Measuring Broadband America Fixed Broadband Report* at 7 & n.2. The *Thirteenth Measuring Broadband America Fixed Broadband Report* is based on data gathered from (continued….)

fixed broadband Internet access service performance in the United States.[112] The *Thirteenth Measuring Broadband America Fixed Broadband Report* is based on data collected from 12 ISP/technology configurations between September 12-13, and 16-21, 2022 (inclusive), and October 4-6, 11-13, 15-17, and 19-31, 2022 (inclusive).[113] The Report measures the network performance realized on selected service offerings to a representative sample set of the population. The volunteer panelists were drawn from subscribers of ISPs that collectively serve a large percentage of the residential fixed broadband consumers in the United States.[114] The results presented in the *Thirteenth Measuring Broadband America Fixed Broadband Report* suggest that consumer experience varies noticeably with the connection technology.[115]

50. *Actual Speed*. The *Thirteenth Measuring Broadband America Fixed Broadband Report* presents an actual speed for each provider, for each of the advertised tiers that were included in the study. As reported, this actual speed is the median speed experienced by the sampled panelists within a specific speed tier, by ISP.[116] Further, overall performance is calculated for each ISP/technology configuration by determining the ratio of the median speed for each tier to the advertised tier speed and then calculating the weighted average of these based on the subscriber count per tier.[117] The analysis shows that consumers' actual broadband service speeds for most ISPs are close to or exceeding the advertised speed.[118] Of the 12 ISP/technology configurations included in this report, eight met or exceeded their advertised download speeds, and the remaining four were between 86% to 90% of their advertised download speed.[119]

51. *Consistency.* Consistency of speed may be more important to consumers using applications such as video content.[120] The *Thirteenth Measuring Broadband America Fixed Broadband Report* considers one metric of speed consistency. The "80/80 consistent speed" metric considers how speeds experienced by an ISP's sampled panelists vary during the day. More specifically, the "80/80

(Continued from previous page)
2,025 volunteer panelists across the United States and includes only panelists that remained in the dataset after the measurement data were processed and cleaned. *Id.* at 23.

[112] The full *Thirteenth Measuring Broadband America Fixed Broadband Report* is attached as Appx. C.

[113] *Thirteenth Measuring Broadband America Fixed Broadband Report* at 7-8 & n.1. This specific set of 30 days was chosen to avoid dates when outages arising from hurricanes and other natural disasters resulted in a lower number of reporting measurement devices (known as whiteboxes). *Id.* at 7 & n.1. The *Thirteenth Measuring Broadband America Fixed Broadband Report* is based upon data for ten ISPs: Altice, Lumen (CenturyLink), Charter, Cincinnati Bell, Comcast, Cox, Frontier, Mediacom, Verizon, and Windstream. *Id*. at 22. The participants in the *Thirteenth Measuring Broadband America Fixed Broadband Report* provide service by copper (DSL), cable, or fiber (FTTP). *Id.* at 11. Participation in the program by ISPs is voluntary. *Id.* at 22.

[114] *Id.* at 7. The measurements that provide the underlying data for the report were conducted between MBA measurement devices and MBA measurement servers. The measurement devices (known as whiteboxes) were situated in the homes of the panelists that receive services from the participating ISPs. *Id.* at 22.

[115] *Id.* at 14-21.

[116] The service tiers that are included in *Thirteenth Measuring Broadband America Fixed Broadband Report* represent the top 80% (therefore, "most popular") of an ISP's set of tiers based on subscriber numbers. *Id.* at 11. The tests for download speed (upload speed) measures the download speed (upload speed) of each whitebox over a 10-second period, once per hour during peak hours (7:00 pm to 11:00 pm) and once during each of the following periods: midnight to 6:00 am, 6:00 am to noon, and noon to 6:00 pm. *Id.* at 24-25.

[117] *Id.* at 14-15.

[118] *Id.* at 15. The ISP/technology configurations are: DSL (Lumen (CenturyLink), Cincinnati Bell DSL, Frontier DSL, and Windstream); Cable (Altice, Charter, Comcast, Cox, and Mediacom); and FTTP (Lumen (CenturyLink), Cincinnati Bell Fiber, Frontier Fiber, and Verizon Fiber). *See id.* at 11.

[119] *Id.* at 15.

[120] *Id.* at 16.

consistent speed" metric measures the minimum percentage of the advertised speed that at least 80% of subscribers experience at least 80% of the time over peak periods.[121] Cable and fiber ISPs performed better than DSL ISPs with respect to their provision of consistent speeds.[122] Most customers using cable and fiber technologies experienced median download speeds that were fairly consistent; i.e., most of these ISPs provided 100% or greater than the advertised speed during peak usage period to more than 80% of their panelists for more than 80% of the time.[123] In contrast, the 80/80 consistent download speed for the DSL providers ranged from 63% to 72% of the advertised speed.[124]

52. *Latency.* In general, higher speed service tiers have lower latency, as it takes less time to transmit each packet.[125] Median latencies ranged from 7 ms to 34 ms in our measurements. Measured DSL latencies (between 23 ms to 34 ms) were slightly higher than those for cable (12 ms to 24 ms), and fiber latencies were the lowest (7 ms to 14 ms).[126]

53. *Packet Loss.* The MBA program denotes a packet as lost if the latency exceeds three seconds or if the packet is never received.[127] According to industry publications and International Telecommunication Union (ITU) standards, a 1% standard for packet loss is the point at which highly interactive applications such as Voice over Internet Protocol (VoIP) would experience significant degradation in quality.[128] ISPs using fiber technologies have the lowest packet loss (0% to 3% of subscribers experience 1% or greater packet loss), while ISPs using DSL and cable technologies have higher packet loss (0% to 4% and 1% to 4% of subscribers experience 1% or greater packet loss, respectively).[129]

B. The Mobile Wireless Marketplace

54. As we have noted many times over the past years, consumers continue to rely more heavily on mobile wireless services; thus, they have become an essential part of everyday life.[130] In addition to the three facilities-based nationwide mobile wireless service providers, the mobile wireless marketplace consists of a new facilities-based entrant, EchoStar, numerous regional and local facilities-based providers, MVNOs that purchase mobile wireless services wholesale, cable providers that rely on a hybrid wholesale/hotspot arrangement to offer service, and mobile satellite providers that currently focus primarily on niche services.

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[121] *Id*. at 8.

[122] *Id*. at 16.

[123] *Id.* at 16.

[124] *Id.* at 16.

[125] *Id.* at 17.

[126] *Id.* at 18. Satellite providers no longer participate in the program; however, the *Eighth Measuring Broadband America Fixed Broadband Report* states that, "Technology-determined latencies are typically small for terrestrial broadband services and are thus unlikely to affect the perceived quality of applications. The higher latencies of geostationary satellite-based broadband services may impair the perceived quality of such highly interactive applications." FCC, Eighth Measuring Broadband America Fixed Broadband Report at 8 (2018), https://www.fcc.gov/reports-research/reports/measuring-broadband-america/measuring-fixed-broadband-eighth-report (*Eighth Measuring Broadband America Fixed Broadband Report*).

[127] *Thirteenth Measuring Broadband America Fixed Broadband Report* at 19.

[128] *Id.* at 19.

[129] *Id.* at 20.

[130] *See, e.g., 2022 Communications Marketplace Report*, 37 FCC Rcd at 15563, para. 62; *2024 Section 706 Report* at 1-2, para. 1.

55. In this section, we consider various competitive factors in the mobile wireless marketplace, including pricing, churn, investment, spectrum holdings, and coverage. We also consider the relationship between fixed and mobile broadband service. We note that the Commission will pay close attention to competitive indicators and trends as the mobile wireless marketplace continues to evolve, including those indicators that reflect the competitive effects of mergers and acquisitions.

1. Overview of the Mobile Wireless Marketplace

a. Service Providers

56. *Facilities-Based Service Providers.* As of December 31, 2023, there were three facilities-based mobile wireless service providers in the United States that this *Report* refers to as nationwide service providers: AT&T, T-Mobile, and Verizon. Although none of these three nationwide service providers has a network that is truly ubiquitous, these three service providers have networks that they report cover a substantial majority of the country—each reports covering at least 95% of the U.S. population and at least 68% of U.S. road miles with their 4G LTE networks,[131] and at least 75% of the U.S. population and at least 35% of road miles with their 5G-NR networks at speeds of at least 7/1 Mbps.[132] Collectively, these three nationwide service providers account for approximately 371 million U.S. postpaid and prepaid connections.[133] In addition to the three nationwide service providers, EchoStar, formerly known as DISH,[134] has built its own facilities-based network that covers over 70% of the U.S. population.[135] UScellular,[136] currently the fourth largest facilities-based service provider in the United States by postpaid and prepaid connections,[137] is best characterized as a multi-regional service provider.[138] UScellular has deployed wireless networks and customer service operations in portions of 21 states,[139] and, as of December 31, 2023, it accounted for approximately 4.6 million connections.[140] There are also

[131] *See* Appx. D-6.

[132] *See infra* Fig. II.B.35.

[133] *See infra* Fig. II.B.3.

[134] On January 2, 2024, EchoStar Corporation announced the completion of its acquisition of DISH Network Corporation. Press Release, EchoStar, EchoStar Corporation Completes Merger with DISH Network Corporation (Jan. 2, 2024), https://ir.echostar.com/news-releases/news-release-details/echostar-corporation-completes-merger-dish-network-corporation. In the remainder of this *Report*, we will refer to the merged entity as EchoStar.

[135] Letter from Joel Taubenblatt, Chief, Wireless Telecommunications Bureau, to Jeffrey Blum, Executive Vice President, DISH, WT Docket No. 22-212, at 1 (Sept. 29, 2023); *see also infra* section II.B.6: Network Coverage.

[136] On May 28, 2024, UScellular and T-Mobile announced an agreement to sell its wireless operations and a portion of its wireless spectrum to T-Mobile. Press Release, UScellular, UScellular and TDS Announce Sale of Wireless Operations and Select Spectrum Assets to T-Mobile for Approximately $4.4 Billion in Cash and Assumed Debt (May 28, 2024), https://investors.uscellular.com/news/news-details/2024/UScellular-and-TDS-Announce-Sale-of-Wireless-Operations-and-Select-Spectrum-Assets-to-T-Mobile-for-Approximately-4.4-Billion-in-Cash-and-Assumed-Debt/. On September 13, 2024, T-Mobile and UScellular filed their applications for this proposed transaction with the Commission. Applications of T-Mobile US, Inc. and United States Cellular Corporation for Transfer of Control and Assignment of Certain Licenses, Authorizations, and Leases, GN Docket No. 24-286, ULS File No. 0011180491 (filed Sept. 13, 2024) (Lead Section 310(d) Application); Application of T-Mobile US, Inc. and United States Cellular Corporation for Assignment of International Section 214 Authorization, ICFS File No. ITC-ASG-20240913-00139 (filed Sept. 13, 2024) (Section 214 Application).

[137] *See infra* Fig. II.B.3.

[138] United States Cellular Corporation, SEC Form 10-K, at 1 (filed Feb. 16, 2024).

[139] United States Cellular Corporation, SEC Form 10-K, at 1 (filed Feb. 16, 2024). UScellular is a majority-owned (83%) subsidiary of TDS. *Id*.

[140] *Id.*

dozens of other facilities-based mobile wireless service providers throughout the United States, many of which provide service in a single, often rural, geographic area.[141]

57. *Mobile Virtual Network Operators (MVNOs).* Traditionally, MVNOs have not owned any network facilities, but instead purchase mobile wireless services on a wholesale basis from facilities-based service providers and resell these services to consumers.[142] In March 2023, T-Mobile announced its proposed acquisition of Ka'ena Corporation and its subsidiaries and brands, Mint Mobile and Ultra Mobile,[143] that closed in 2024.[144] Two of the largest MVNOs are cable operators, Charter (Spectrum Mobile) with 7.8 million subscribers,[145] and Comcast (Xfinity Mobile) with approximately 6.6 million subscribers.[146] Other large MVNOs include EchoStar's Boost Mobile, which has approximately 7.4 million subscribers,[147] Consumer Cellular, which has approximately four million customers,[148] and Google's Google Fi Wireless, which has an estimated two million customers.[149]

58. *Cable Providers.* As described above, two of the largest MVNOs are owned by cable providers who have entered the mobile wireless marketplace through these MVNO arrangements, and also have begun to deploy their own facilities-based networks. These service offerings rely on combining the mobile networks of facilities-based partners with hotspot or small-cell networks that send traffic through the cable provider's own infrastructure.[150] In 2016, both Comcast and Charter, the nation's two largest cable providers, activated MVNO options they held with Verizon.[151] In 2023, both companies

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[141] Examples of regional facilities-based service providers include Appalachian Wireless, Carolina West Wireless, Cellcom, Choice Wireless, GCI, Nex-Tech Wireless, and Sagebrush Cellular. *2022 Communications Marketplace Report,* 37 FCC Rcd at 15565, para. 64.

[142] *Id.* at 15565, para. 65. The Commission is not able to provide an exact figure of the number of MVNOs that currently offer mobile wireless services. There are several reasons for this: (1) MVNOs are not Commission licensees and typically do not file section 214 applications; (2) MVNOs do not have their own telephone numbers; and (3) as the Commission has found in prior wireless competition reports, "[c]omprehensive data on MVNO subscribers are generally not reported by either MVNOs or facilities-based providers that host MVNOs. *Id.* at para. 65 & n.142.

[143] Press Release, T-Mobile, T-Mobile to Acquire and Turbocharge Mint Mobile and Ultra Mobile, Brands Will Continue Delivering Value on the Un-carrier's 5G Network (Mar. 15, 2023), https://www.t-mobile.com/news/business/t-mobile-to-acquire-mint-and-ultra-mobile.

[144] Press Release, T-Mobile, Mint and Ultra: Welcome to the T-Mobile Family! (May 1, 2024), https://www.t-mobile.com/news/business/t-mobile-closes-acquisition-mint-and-ultra-mobile.

[145] Press Release, Charter, Charter Announces Fourth Quarter and Full Year 2023 Results (Feb. 2, 2024), https://ir.charter.com/news-releases/news-release-details/charter-announces-fourth-quarter-and-full-year-2023-results.

[146] Press Release, Comcast, Comcast Reports 4th Quarter 2023 Results (Jan. 25, 2024), https://www.cmcsa.com/news-releases/news-release-details/comcast-reports-4th-quarter-2023-results.

[147] EchoStar, *2023 Annual Report* (Year Ended Dec. 31, 2023) at 74 (Mar. 20, 2024), https://ir.echostar.com/static-files/5d00519f-e471-4572-8cea-add688bc551e.

[148] Consumer Cellular, *Our Story*, https://www.consumercellular.com/about-us/our-story (last visited Oct. 8, 2024).

[149] prepaidcompare, *Google Fi Profile*, https://prepaidcompare.net/profiles/google-fi.html (last visited June 14, 2024).

[150] Chris Mills and Fiona Armstrong, Tutela, Special Report: State of MVNOs at 18 (Oct. 2019), https://www.tutela.com/blog/usa-state-of-mvnos-19 ("The most immediate solution for wireless traffic offload are the networks of public or semi-public hotspots operated by the cable companies. Comcast . . . claims to operate a network of 18 million 'xfinitywifi' hotspots nationwide"); *see also id.* at 21 ("Altice Mobile is also well positioned to exploit future technology improvements and spectrum deployments to embrace the 'hybrid MVNO' model. Altice operates the core network, device SIMs, and in some cases has infrastructure agreements in place with Sprint for small cells.").

began to deploy CBRS spectrum to offload traffic from Verizon's network onto their own 5G small-cell networks in high-traffic markets.[152] Altice,[153] another cable provider, launched its Optimum Mobile service in September 2019 and had 322,000 subscribers by the end of 2023.[154] In addition, Cox, the nation's fourth largest cable company, launched its Cox Mobile service on Verizon's network in 2023.[155]

b. Connections/Subscribers and Market Share

59. To estimate the number of mobile wireless subscribers/connections, this *Report* uses Numbering Resource Utilization/Forecast (NRUF) data,[156] which track how many phone numbers have been assigned to mobile wireless handsets and other connected devices,[157] and data from CTIA□The Wireless Association (CTIA).[158] As shown in Figure II.B.1 below,[159] NRUF data indicate that there were

(Continued from previous page)

[151] Colin Gibbs, Fierce Wireless, *Comcast to Launch Wireless Service in 2017 with Verizon MVNO, 15M Wi-Fi Hotpots* (Sept. 20, 2016), http://www.fiercewireless.com/wireless/comcast-to-launch-wireless-service-2017-verizon-mvno-15m-wi-fi-hotspots; Diana Goovaerts, Fierce Video, *Rutledge: Charter Has Asked Verizon to Activate MVNO Agreement* (Sept. 21, 2016), https://www.fiercevideo.com/cable/rutledge-charter-has-asked-verizon-to-activate-mvno-agreement.

[152] Comcast, *Comcast in Wireless–Building a Strategy for Sustained Growth* (Sept. 12, 2023), https://corporate.comcast.com/stories/comcast-wireless-building-strategy-sustained-growth; *see also* Light Reading, *Charter Pushes HFC Upgrade Timeline to 2026 as Rural Builds Accelerate* (Feb. 2, 2024), https://www.lightreading.com/cable-technology/charter-pushes-hfc-upgrade-timeline-to-2026-as-rural-builds-accelerate.

[153] Altice describes itself as an "infrastructure-based Mobile Virtual Network Operator," as it operates its own core network infrastructure to provide wireline broadband, though it does not have its own for its mobile offering. The distinction in Altice's ability to leverage its own facilities has allowed it to obtain numbers directly under waiver. *See Numbering Policies for Modern Communications; Number Resource Optimization*, WC Docket No. 13-97 and CC Docket No. 99-200, Order, 33 FCC Rcd 12501 (WCB 2018).

[154] Press Release, Altice, Altice USC Reports 4th Quarter and Full Year 2023 Results (Feb. 14, 2024), https://investors.alticeusa.com/news-events/press-releases/detail/182/altice-usa-reports-fourth-quarter-and-full-year-2023-results.

[155] Monica Alleven, Fierce Wireless, *Cox Looks to Aggressively Grow Mobile Subs in 2024* (Jan 11, 2024), https://www.fierce-network.com/wireless/cox-looks-aggressively-grow-mobile-subs-2024.

[156] NRUF data indicate the number of phone numbers that a wireless service provider has assigned in a particular rate center (there are approximately 18,000 rate centers in the country). *See* 47 CFR § 52.15(e)(5). Rate centers are geographic areas used by local exchange carriers (LECs) for a variety of reasons, including the determination of toll rates. Harry Newton, Newton's Telecom Dictionary at 660 (19th ed. 2003). The Commission calculates the total number of wireless subscribers from the total number of assigned phone numbers reported by wireless service providers in their required NRUF reports. For purposes of geographical analysis, the rate center data can be associated with a geographic point, and all points that fall within a county boundary can be aggregated together and associated with larger geographic areas based on counties. We note that the aggregation to larger geographic areas reduces the level of inaccuracy inherent in combining non-coterminous areas, such as rate center areas and counties.

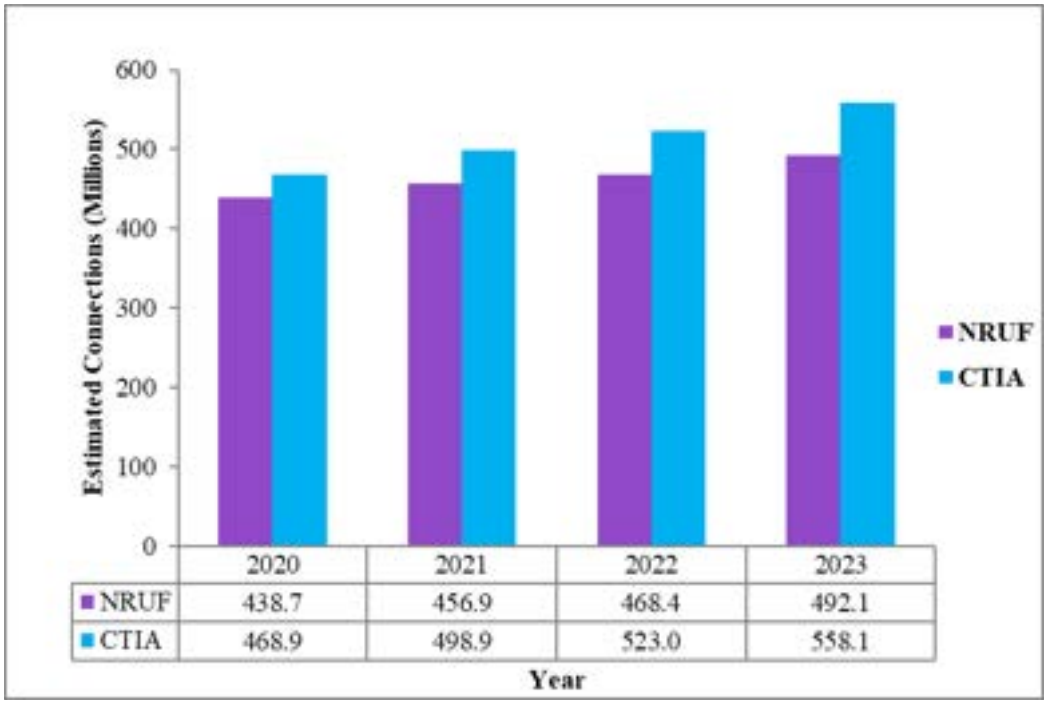
[157] While NRUF provides a measure of the number of wireless connections or connected devices that have assigned telephone numbers, the data have limitations, such as providing only the quantity of mobile wireless connections that have a telephone number, rather than the number of consumers subscribed to mobile broadband or voice service. *2022 Communications Marketplace Report,* 37 FCC Rcd at 15569, para. 73 & n. 182. If a mobile broadband or voice subscriber uses a device that does not have a telephone number assigned to it (e.g., Internet of Things (IoT) devices), then that subscriber will not be recorded. These data also do not reflect when consumers move to a different state and retain the same telephone number. *Id.* at 15569, para. 73 & n. 182.

[158] Different sources refer to their data as connections or subscribers, and when discussing the different data, we will use the terminology most currently used by the source and, where possible, provide a definition of this term. For example, CTIA explains its use of the terms "subscribers" and "connections" as follows: "Traditionally, the term 'subscribers' was used as a term of art, reflecting the number of revenue-generating units, equally describable as 'wireless connections'—the equivalent of wired telephone 'lines.' The term 'subscriber' does not indicate a unique

(continued….)

approximately 468 million mobile wireless connections at year-end 2022, an increase of approximately 3% from year-end 2021. At year-end 2023, NRUF data indicate that there were approximately 492 million mobile wireless connections, an increase of approximately 5% from year-end 2022. CTIA estimates of mobile wireless connections at year-end 2022 were approximately 523 million, an increase of approximately 5% from year-end 2021, and at year-end 2023, the figure was approximately 558 million, which represents an increase of approximately 7% from year-end 2022.[160]

Fig. II.B.1
Total Mobile Wireless Connections 2020-2023



	2020	2021	2022	2023
NRUF	438.7	456.9	468.4	492.1
CTIA	468.9	498.9	523.0	558.1

Source: NRUF; CTIA Year-End 2023 Wireless Industry Indices Report.

60. Figure II.B.2 presents data on the use of connected devices compared with traditional handsets (i.e., mobile phones). Connected devices, which include data-only devices such as tablets, laptops, and wireless modems, as well as connected cars, wearables, and other Internet of Things (IoT) devices, have been an integral driver of the growth in connections over the past several years. In 2023, they accounted for approximately 43% of all wireless connections, up from approximately 40% in 2022. Parks Associates estimates that the number of connected devices per household with Internet access had increased to 17 in 2023 from 12 in 2020.[161]

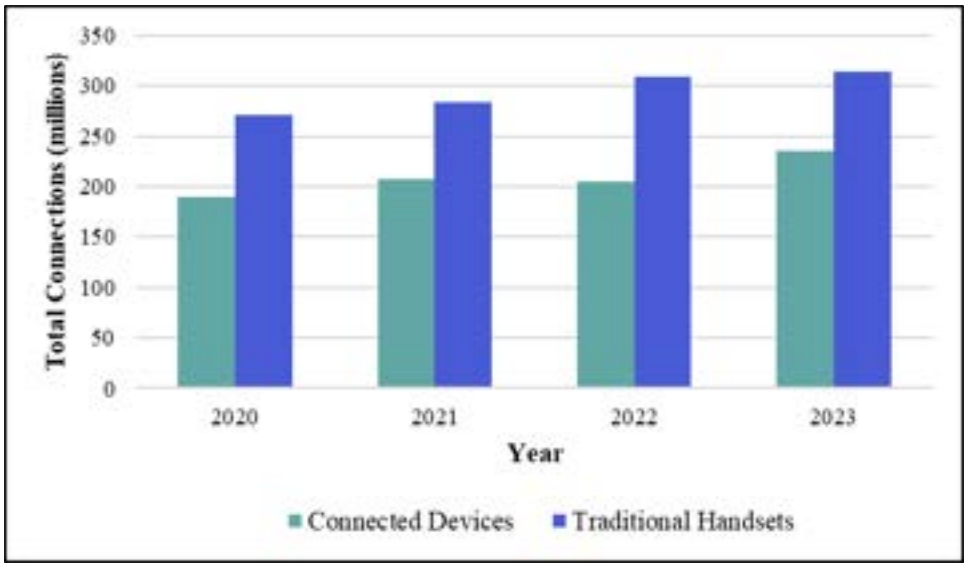
(Continued from previous page)
individual person. Indeed, the growing number and variety of non-traditional devices and machine-to-machine (M2M) applications mean that the term 'subscribers' is increasingly less descriptive of a growing share of the universe of active units." CTIA Year-End 2023 Wireless Industry Indices Report at 17.

[159] For details of total mobile wireless connections over time, *see infra* Appx. D-1 of this *Report*.

[160] CTIA Year-End 2023 Wireless Industry Indices Report at 23.

[161] Parks Associates, *Parks: Average U.S. Internet Home Had 17 Connected Devices in 2023* (Jan. 10, 2024), https://www.parksassociates.com/blogs/in-the-news/parks-average-us-internet-home-had-17-connected-devices-in-2023.

Fig. II.B.2
Connected Devices vs. Traditional Handsets (2020-2023)



Source: CTIA Year-End 2020-2023 Wireless Industry Indices Reports.

61. Figure II.B.3 presents data on total mobile wireless connections for the largest publicly traded facilities-based mobile service providers operating in the United States, including an estimate of their respective market shares as of year-end 2023.[162]

Fig. II.B.3
Reported Postpaid and Prepaid Connections for Publicly Traded Facilities–Based Mobile Wireless Service Providers (in thousands): 2020–2023

Service Providers	*YE 2020*	*YE 2021*	*YE 2022*	*YE 2023*	*YE 2023 (% Market Share)*
AT&T	95,256	100,562	103,876	106,340	28.3
T-Mobile	102,064	108,719	113,598	119,700	31.9
Verizon	120,880	142,806	143,253	144,751	38.6
UScellular	4,911	4,893	4,740	4,557	1.2
Top 4 Providers Total	**323,111**	**356,980**	**365,467**	**375,348**	

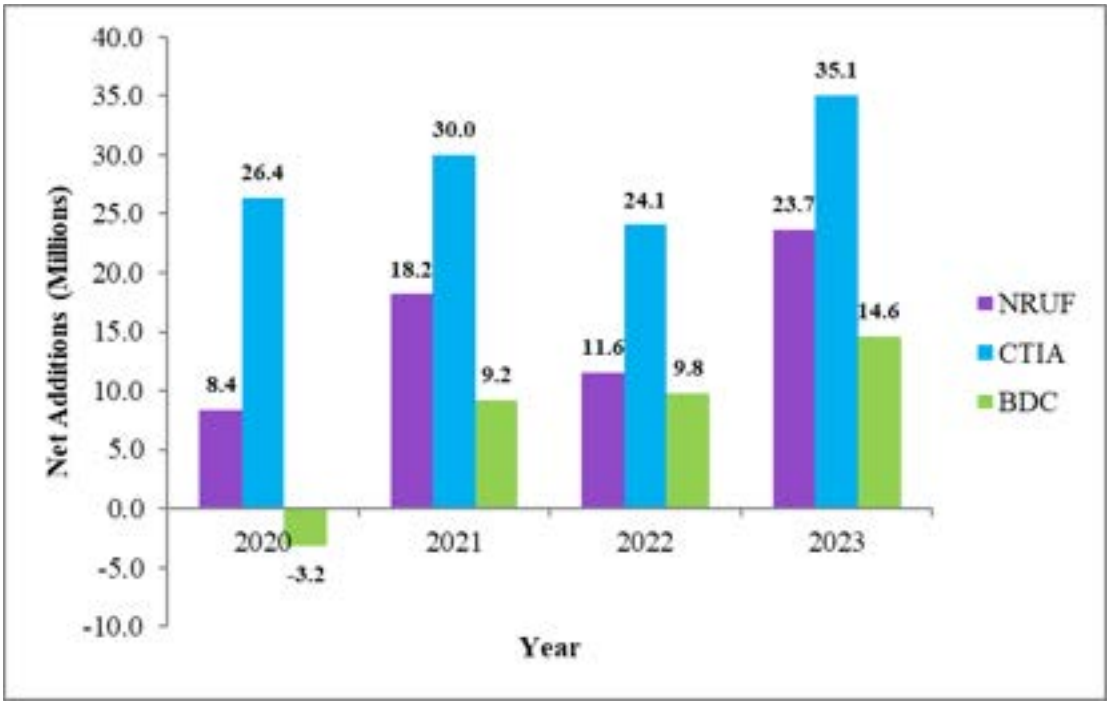
Source: Annual Reports from AT&T, T-Mobile, Verizon, and UScellular. In addition to postpaid and prepaid connections, AT&T also reported approximately 135 million connected device and wholesale connections for the fiscal year ending Dec. 31, 2023. These categories of connections are not reported by other providers, and so are excluded from this table to provide a direct comparison of similarly reported data. This figure includes data only for the service providers reported.

62. Estimates of the number of net additions in 2022 and 2023 vary by source, which is likely due to differences in the way connections are measured. As shown in Figure II.B.4, in 2022, there were approximately 11.6 million net additions based on NRUF data and 9.8 million additions based on FCC BDC data, compared with CTIA data showing more than double that with 24.1 million net additions. In

[162] The size of a company, typically measured by service revenues or subscribers, relative to the total size of the industry determines its market share. *See, e.g.*, MIT Dictionary of Modern Economics 268 (4th ed. 1992).

2023, FCC BDC data showed 14.6 million net additions,[163] NRUF showed 23.7 million net additions, and CTIA showed 35.1 million net additions.

Fig. II.B.4
Total Mobile Wireless Connections Annual Net Additions
2020-2023



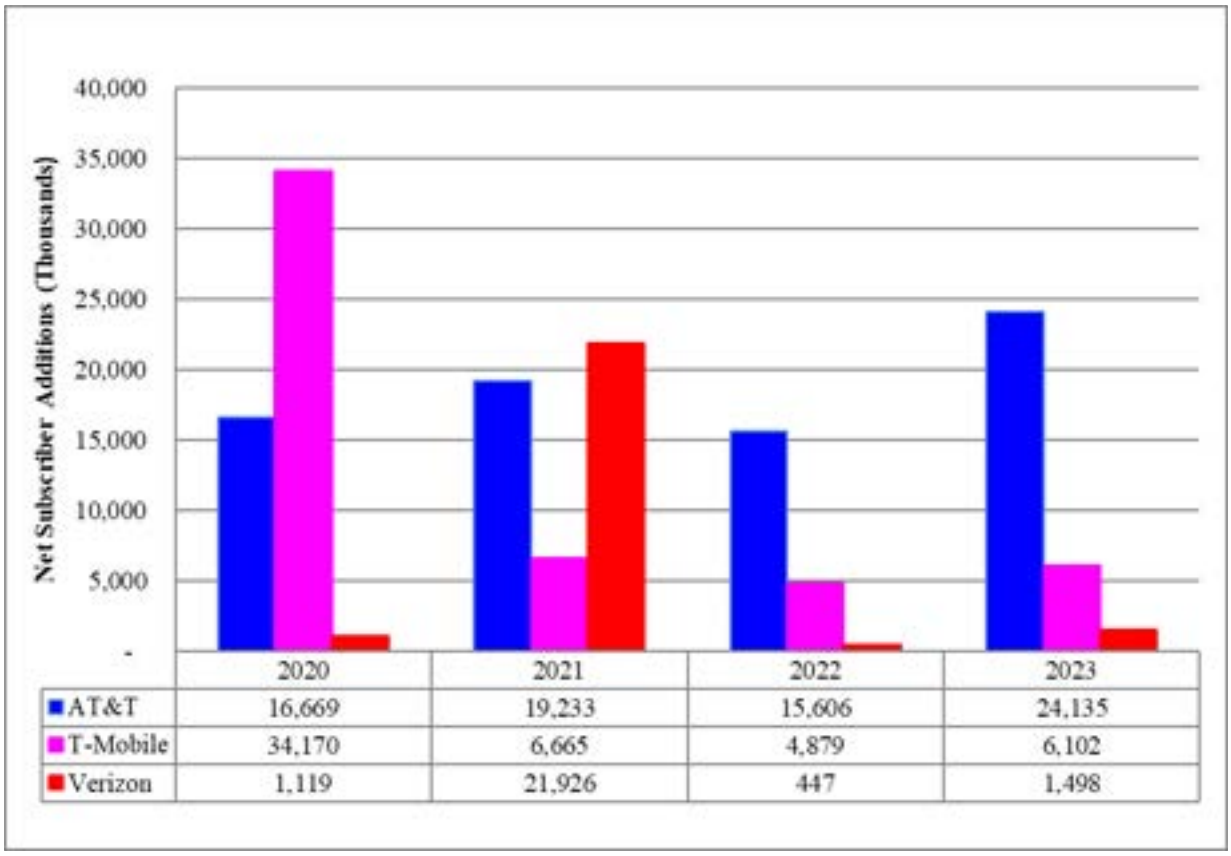
Source: NRUF; CTIA Year-End 2023 Wireless Industry Indices Report; FCC BDC data.

63. Figure II.B.5 shows net subscriber additions by the nationwide service providers from 2020 through 2023. T-Mobile's 2020 subscriber additions reflect the effect of its merger with Sprint, while Verizon's 2021 subscriber additions reflect Verizon's acquisition of TracFone.[164]

[163] Based on December 2023 FCC BDC data, the total number of mobile voice telephone subscriptions at year-end 2023 was approximately 386 million, as compared to approximately 372 million at year-end 2022. FCC, Office of Economics and Analytics, Voice Telephone Services: Status as of December 31, 2023 at 8-9, Tbl. 1 (Nov. 2024), https://docs.fcc.gov/public/attachments/DOC-407308A1.pdf (December 2023 Voice Telephone Services Report). These data do not include non-voice devices.

[164] *Application of Verizon Communications Inc. and América Móvil, S.A.B. de C.V. for Consent to Transfer Control of International Section 214 Authorization*, GN Docket No. 21-112, Memorandum Opinion and Order, 36 FCC Rcd 16994 (2021) (*Verizon-TracFone Order*); *Applications of T-Mobile US, Inc., and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, Memorandum Opinion and Order, Declaratory Ruling, and Order of Proposed Modification, 34 FCC Rcd 10578 (2019) (*T-Mobile-Sprint Order*).

Fig. II.B.5
Annual Net Additions by Service Provider: 2020-2023



	2020	2021	2022	2023
AT&T	16,669	19,233	15,606	24,135
T-Mobile	34,170	6,665	4,879	6,102
Verizon	1,119	21,926	447	1,498

Source: Annual Reports from AT&T, T-Mobile, and Verizon. Totals were calculated from all reported wireless connections for all U.S. segments from company filings (e.g., Consumer, Business, Wholesale, etc.).

64. *Market Concentration.* High market concentration levels in any market may raise some concern that a marketplace is not competitive.[165] To measure mobile wireless market concentration, the Commission employs the Herfindahl-Hirschman Index (HHI), a measure widely used in competition analysis.[166] In this *Report*, we calculate HHIs based on the NRUF data by Economic Area (EA) to maintain continuity with past reports and to ensure that we do not compromise the confidential information found in the NRUF data. As of year-end 2017, prior to the April 2018 announcement of the T-Mobile/Sprint merger, the weighted average HHI (weighted by population across the 172 EAs in the United States) for mobile wireless services was 3,106.[167] As of year-end 2021, the weighted average HHI for mobile wireless services by EA was 3,596,[168] and as of year-end 2023, the weighted average HHI by EA was 3,550. Figure II.B.6 shows the changes in the weighted HHI between 2016 and 2023.

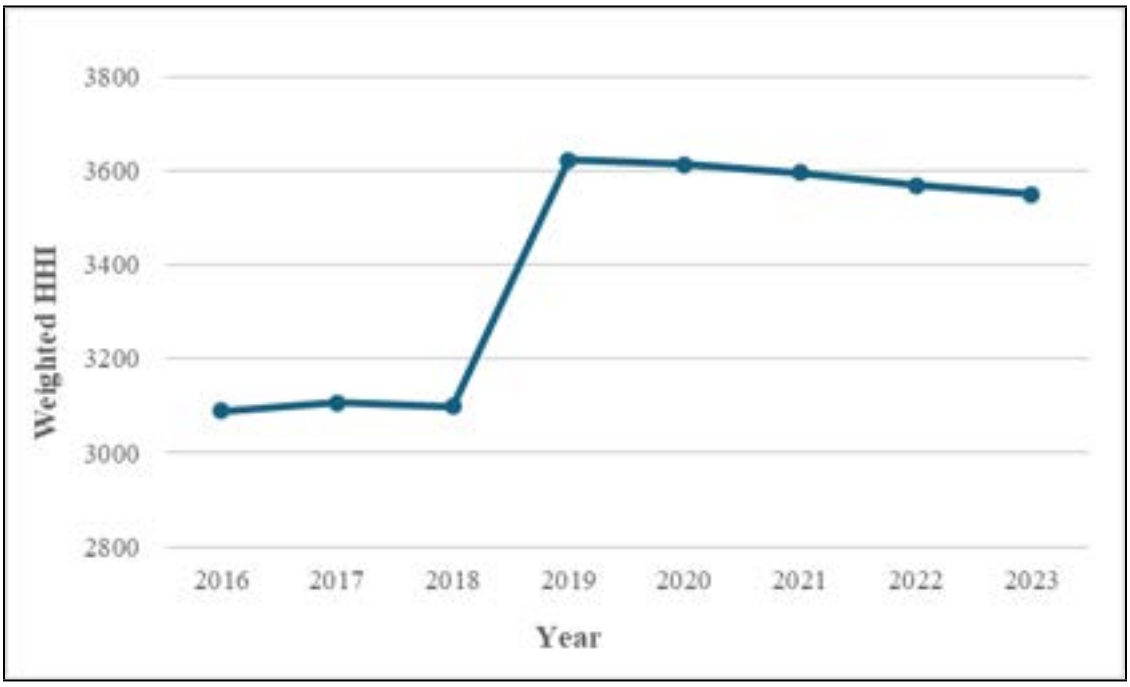
[165] To the extent that this section uses the term "markets," we do not intend it to be interpreted as synonymous with the antitrust concept of the "relevant market," which the Commission defines in the context of secondary market transactions review. *See*, *e.g.*, *T-Mobile-Sprint Order*, 34 FCC Rcd at 10601, para. 55.

[166] The HHI is calculated by summing the squared market shares of all firms in the given market.

[167] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15573-74, para. 78.

[168] *Id*.

Fig II.B.6
Nationwide HHI Weighted by EA: 2016-2023



Source: NRUF; staff analysis.

c. Churn

65. Churn measures the percentage of connections that are disconnected from mobile wireless service during a given time period.[169] The churn rate is a business metric that measures the turnover of a service provider's subscriber base. A low churn rate indicates low customer attrition. A service provider's overall churn rate depends on many factors, such as the distribution of its customers between postpaid and prepaid service plans,[170] customer satisfaction with their service provider,[171] and switching costs.[172] High levels of industry churn can indicate that consumers are not only willing but are also able to switch easily between service providers. For 2023, CTIA reported an annual industry-wide churn rate of 18.5%, and a monthly rate of 1.5%.[173] In this *Report*, for the first time, we collected churn

[169] CTIA defines churn as "a measure of the number of subscribers disconnecting from service during the period." CTIA Year-End 2023 Wireless Industry Indices Report at 35. Churn is calculated by dividing the aggregate number of wireless connections that terminated service, including both voluntary and involuntary disconnects, during a time period by the average of total number of wireless connections at the beginning and the end of that time period. For an annual calculation, if a service provider has an average monthly churn rate of 2%, the service provider would lose 24% of its subscribers over the course of a year. Service providers publish their monthly churn rate information as part of their quarterly filings with the SEC.

[170] Prepaid service plans tend to have higher churn rates than postpaid service plans. Therefore, if a service provider has a relatively large share of prepaid consumers in their customer mix, that service provider would likely have a higher weighted average churn rate than a service provider with a smaller share of prepaid customers.

[171] According to Recon Analytics, the top reasons for customers to leave a wireless service provider include high prices ("too expensive"), slow speeds ("slow data speed"), and inferior plan features (find "a better plan"). Recon Analytics *Ex Parte* at 24.

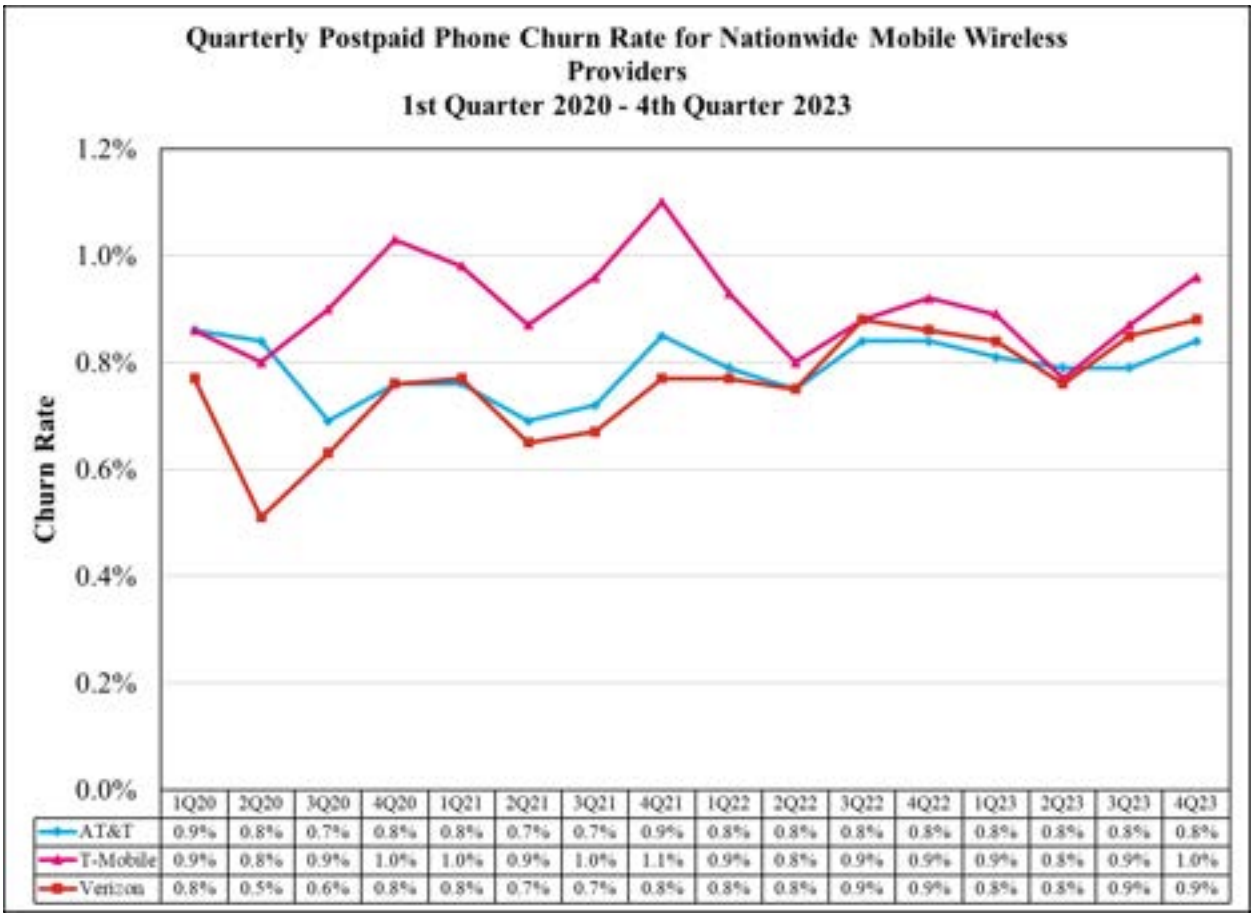
[172] 2022 Communications Marketplace Report, 37 FCC Rcd at 15574, para. 79.

[173] CTIA Year-End 2023 Wireless Industry Indices Report at 36. For prepaid services, CTIA reported an annual industry-wide churn rate of 37.3% and a monthly churn rate of 3.1%. *Id*. at Appx. C, 16-17.

data directly from service providers' quarterly financial reports. The two types of churn that service providers consistently reported across the sample period were postpaid phone and prepaid, which we report.[174] Figure II.B.7 shows the postpaid phone churn rates for the nationwide providers by quarter. The churn rate remained between 0.7% and 0.9% across this time period for AT&T. For T-Mobile, the churn rate reached a peak of 1.1% in the fourth quarter of 2021, but stabilized in 2022 and 2023. The churn rate for Verizon increased slightly across the sample period, from a low of 0.5% in the second quarter of 2020 to 0.9% in the fourth quarter of 2023. Figure II.B.8 shows the prepaid churn rates for the nationwide providers by quarter. The churn rates for AT&T and T-Mobile remained between 2.5% and 3% across the sample period, while the churn rate for Verizon remained between 3.7% and 4.9%.

[174] Provider churn was collected from quarterly earnings releases: AT&T, T-Mobile, and Verizon do not report prepaid phone churn in their earnings releases. Note that prepaid churn can include non-phone devices. *See* T-Mobile, Earnings Release, Q4 2023, at 2 (Jan. 25, 2024), https://s29.q4cdn.com/310188824/files/doc_financials/2023/q4/Q4-2023-TMUS-Earnings-Release.pdf; T-Mobile, Earnings Release, Q2 2023, at 2 (July 27, 2023), https://s29.q4cdn.com/310188824/files/doc_financials/2023/q2/Q2-2023-Earnings-Release-vFinal.pdf; T-Mobile, Earnings Release, Q4 2022, at 2 (Feb. 1, 2023), https://s29.q4cdn.com/310188824/files/doc_financials/2022/q4/4Q_2022-Earnings-Release.pdf; T-Mobile, Earnings Release, Q2 2022, at 2 (July 27, 2022), https://s29.q4cdn.com/310188824/files/doc_financials/2022/q2/2Q_2022-Earnings-Release.pdf; T-Mobile, Earnings Release, Q4 2021, at 2 (Feb. 2, 2022), https://s29.q4cdn.com/310188824/files/doc_financials/2021/q4/TMUS-12_31_2021-EX-99.1-vFinal.pdf; T-Mobile, Earnings Release, Q2 2021, at 2 (July 29, 2021), https://s29.q4cdn.com/310188824/files/doc_financials/2021/q2/2Q_2021-Earnings-Release.pdf; T-Mobile, Earnings Release, Q4 2020, at 2 (Feb. 4, 2021), https://s29.q4cdn.com/310188824/files/doc_financials/2020/q4/NG_TMUS-12_31_2020-EX-99.1-Final-(1).pdf; T-Mobile, Earnings Release, Q2 2020, at 2 (Aug. 6, 2020), https://s29.q4cdn.com/310188824/files/doc_financials/2020/q2/Release.pdf; AT&T, Financial and Operational Trends, Q4 2023, at 7 (Jan. 24, 2024), https://investors.att.com/~/media/Files/A/ATT-IR-V2/financial-reports/quarterly-earnings/2023/4q-2023/T_4Q23_Trending_Schedule.pdf; AT&T, Financial and Operational Trends, Q1 2023, at 7 (Apr. 20, 2023), https://investors.att.com/~/media/Files/A/ATT-IR-V2/financial-reports/quarterly-earnings/2023/1Q23/T_1Q23_Trending_Schedule.pdf; AT&T, Financial and Operational Trends, Q1 2022, at 7 (Apr. 21, 2022), https://investors.att.com/~/media/Files/A/ATT-IR-V2/financial-reports/quarterly-earnings/2022/1Q22/1Q22_Trending_Schedule.pdf; Verizon, Financial and Operating Information: Conference Call Webcast, Q4 2023, at 8 (Jan. 23, 2024), https://www.verizon.com/about/investors/quarterly-reports/4q-2023-earnings-conference-call-webcast; Verizon, Financial and Operating Information: Conference Call Webcast, Q4 2022, at 8 (Jan. 24, 2023), https://www.verizon.com/about/investors/quarterly-reports/4q-2022-earnings-conference-call-webcast; Verizon, Financial and Operating Information: Conference Call Webcast, Q4 2020, at 8 (Jan. 26, 2021), https://www.verizon.com/about/investors/quarterly-reports/4q-2020-earnings-conference-call-webcast.

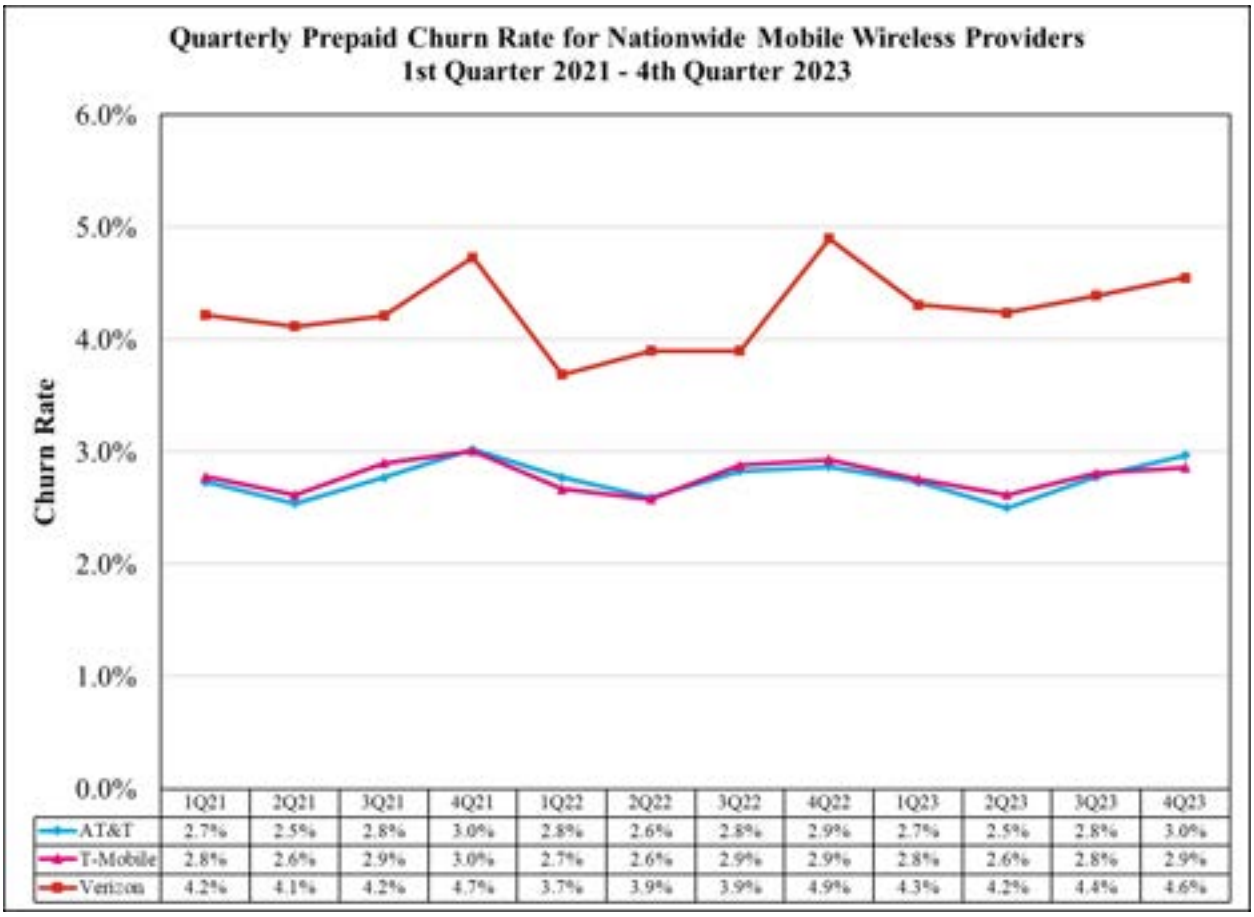
Fig. II.B.7



	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23
AT&T	0.9%	0.8%	0.7%	0.8%	0.8%	0.7%	0.7%	0.9%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%
T-Mobile	0.9%	0.8%	0.9%	1.0%	1.0%	0.9%	1.0%	1.1%	0.9%	0.8%	0.9%	0.9%	0.9%	0.8%	0.9%	1.0%
Verizon	0.8%	0.5%	0.6%	0.8%	0.8%	0.7%	0.7%	0.8%	0.8%	0.8%	0.9%	0.9%	0.8%	0.8%	0.9%	0.9%

Source: 2020-2023 Quarterly Earnings Releases: AT&T, T-Mobile, and Verizon.

Fig. II.B.8



	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23
AT&T	2.7%	2.5%	2.8%	3.0%	2.8%	2.6%	2.8%	2.9%	2.7%	2.5%	2.8%	3.0%
T-Mobile	2.8%	2.6%	2.9%	3.0%	2.7%	2.6%	2.9%	2.9%	2.8%	2.6%	2.8%	2.9%
Verizon	4.2%	4.1%	4.2%	4.7%	3.7%	3.9%	3.9%	4.9%	4.3%	4.2%	4.4%	4.6%

Source: 2021-2023 Quarterly Earnings Releases: AT&T, T-Mobile, and Verizon.

d. Data Usage

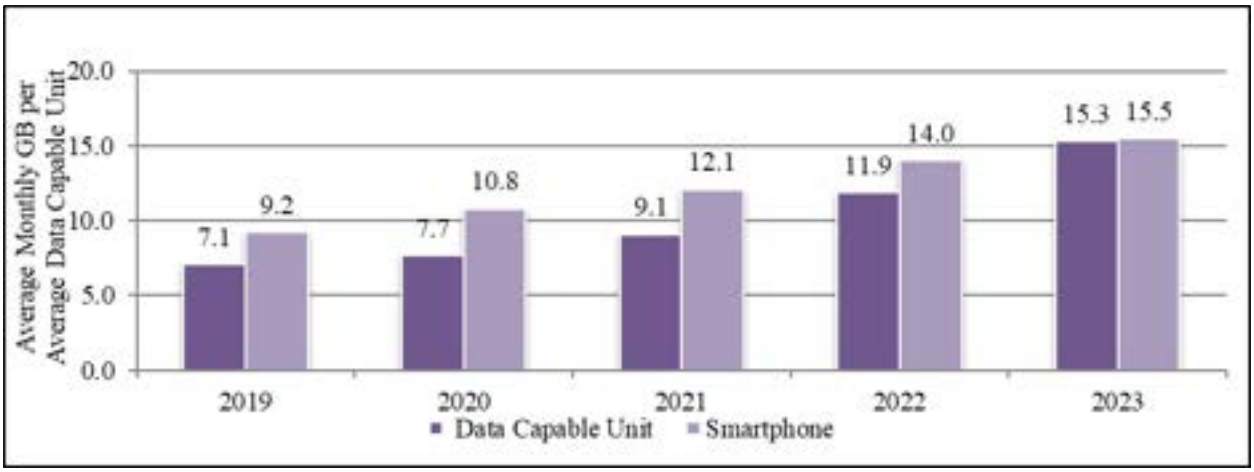
66. As shown in Figure II.B.9, monthly data usage per smartphone subscriber rose to an average of 15.5 GB per subscriber per month in 2023, an increase of approximately 11% from year-end 2022 to year-end 2023.[175] In addition, the difference in data usage between smartphones and all devices shrunk dramatically as they are now approximately the same: 15.5 GB per month and 15.3 GB per month, respectively.[176] Figure II.B.10 further shows that total network annual data usage increased by approximately 36% from 2022 to 2023, and by approximately 88% from 2021 to 2023. Meanwhile, total minutes of voice use and total messaging traffic both experienced small declines, falling by approximately 2% and less than 1%, respectively, from 2022 to 2023.[177]

[175] CTIA Year-End 2023 Wireless Industry Indices Report at 62.

[176] A recent survey by Pew which found that over 90% of cellphone users are smartphone users. Pew Research Center, *Mobile Fact Sheet* (Jan. 31, 2024), https://www.pewresearch.org/internet/fact-sheet/mobile/.

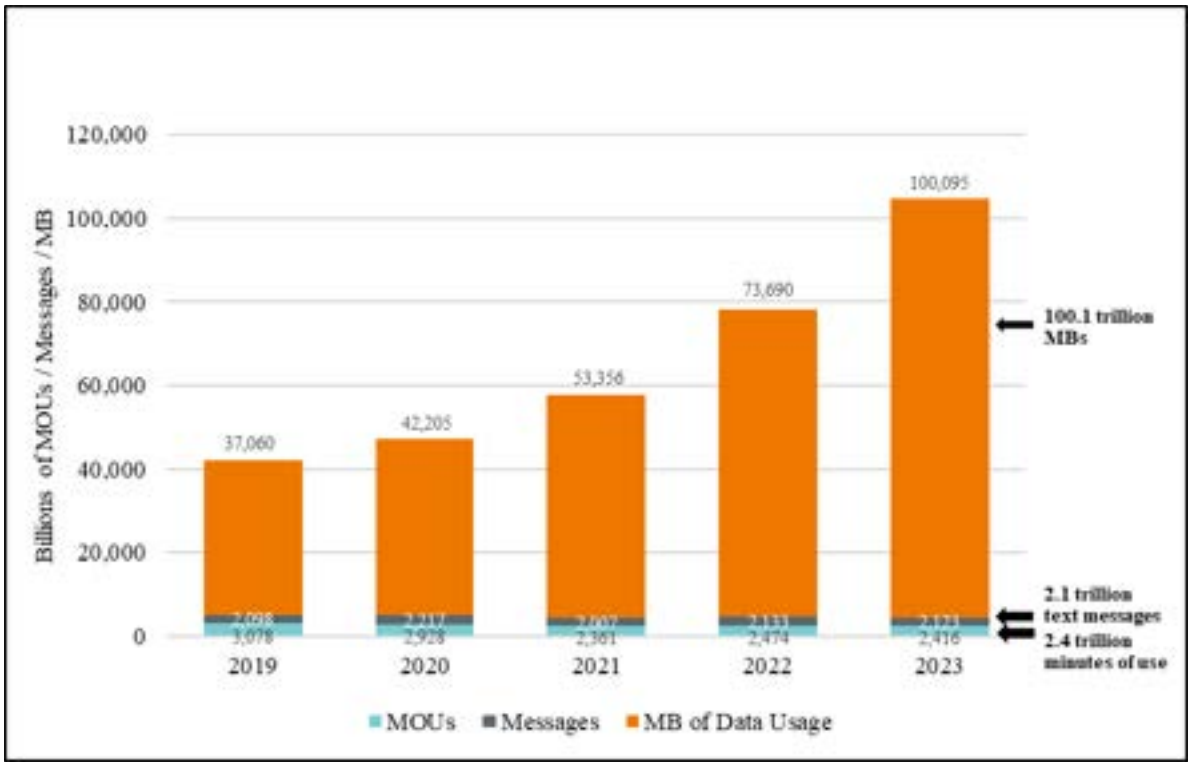
[177] CTIA Year-End 2023 Wireless Industry Indices Report at 67. This provider-reported messaging traffic does not include traffic from over-the-top (OTT) messaging applications and services, which would only appear in the total data traffic figures, thereby contributing to the total MB of data traffic. *Id.* at 62.

Fig. II.B.9
Mobile Data Usage Per Subscriber (2019-2023)



Source: CTIA Year-End 2023 Wireless Industry Indices Report at 62.

Fig. II.B.10
Annual Minutes, Messages, and Megabytes of Wireless Traffic (2019-2023)



Source: CTIA Year-End 2023 Wireless Industry Indices Report at 67, Chart 28.

2. Mobile Wireless Spectrum

67. Spectrum is a critical input in the provision of mobile wireless services.[178] It can affect whether, when, and where existing service providers and potential entrants will be able to expand capacity or deploy networks.[179] Incumbent service providers may need additional spectrum to increase their coverage or capacity, while new entrants need access to spectrum to enter a geographic area at all. Spectrum bands vary in their propagation characteristics, and these variations have implications for how spectrum is deployed.[180] The effective supply of spectrum capacity available for mobile wireless service depends on several aspects of spectrum policy, including allocation and licensing policies, as well as interference and technical rules.[181] Increasing the total supply of spectrum bandwidth that the Commission allocates and licenses to mobile wireless service providers can increase network capacity and reduce the degree of frequency reuse required to achieve a given level of capacity.[182] The efforts of the Commission to make available more spectrum to meet consumer demand for mobile broadband services and to fuel innovation and investment in the mobile wireless marketplace are detailed in sections VI and VII below, although we note at the outset that the Commission's authority to auction spectrum expired in March 2023, and has not been restored by Congress.[183]

68. Subject to Commission approval, licensees may transfer spectrum licenses, in whole or in part (through partitioning and/or disaggregation), on the secondary market.[184] In reviewing proposed transfers of control of spectrum, the Commission uses an initial spectrum screen[185] to help identify, for case-by-case review, local markets where changes in spectrum holdings resulting from a proposed transaction may raise competitive concerns.[186] In addition, the Commission has determined that increased

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[178] Non-spectrum inputs in the provision of mobile wireless services include cellular base stations and towers to carry transmissions and backhaul, which routes voice and data traffic from base stations to mobile switching centers. Backhaul may be provided via wireless spectrum, copper wire, or optical fiber cable, though we note copper may lack sufficient capacity for current data demands.

[179] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15577-78, para. 82; *Policies Regarding Mobile Spectrum Holdings Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, WT Docket No. 12-269, GN Docket No. 12-268, Report and Order, 29 FCC Rcd 6133, 6134, para. 2 (2014) (*Mobile Spectrum Holdings Report and Order*).

[180] Spectrum below 1 GHz (low-band spectrum) has certain propagation advantages for network deployment over long distances, and for penetrating buildings and urban canyons, while mid-band (and high-band) spectrum allow for the better transmission of large amounts of information as the spectrum bandwidths are larger. *Id.* at 6135, para. 3. Further, the Commission has sought comment on the proposed establishment of a mid-band spectrum screen and other changes to its mobile spectrum holdings policies and rules. *Wireless Telecommunications Bureau and Office of Economics and Analytics Seek Comment on AT&T Petition for Rulemaking and Mobile Spectrum Holdings Policies*, WT Docket No. 23-319, Public Notice, DA 23-891 (WTB/OEA Sept. 22, 2023); *see also* AT&T Petition for a Rulemaking to Establish a Mid-Band Spectrum Screen (filed Sept. 1, 2021).

[181] *2022 Communications Marketplace Report,* 37 FCC Rcd at 15577-78, para. 82; *2020 Communications Marketplace* Report, 36 FCC Rcd at 2964, para. 29.

[182] *See* Theodore Rappaport, Wireless Communications: Principles and Practice at 58 (2d ed. 2002).

[183] *See* 47 U.S.C. § 309(j)(11) (terminating Commission authority to grant licenses by competitive bidding on March 9, 2023, with specified exceptions); *see also* Press Release, FCC, Chairwoman Rosenworcel Statement on the Expiration of FCC Spectrum Auction Authority (Mar. 10, 2023), https://www.fcc.gov/document/chairwoman-rosenworcel-expiration-spectrum-auction-authority.

[184] As part of its secondary market policies, the Commission also permits mobile wireless licensees to lease all or a portion of their spectrum usage rights for any length of time within the license term and over any geographic area encompassed by the license. *See, e.g.*, 47 CFR §§ 1.9010, 1.9020.

[185] The Commission includes spectrum that it finds suitable and available for the provision of mobile wireless services in the spectrum screen. *See, e.g.*, *T-Mobile-Sprint Order*, 34 FCC Rcd at 10607-08, paras. 70-72; *Mobile Spectrum Holdings Report and Order*, 29 FCC Rcd at 6169, para. 71.

aggregation of below-1-GHz spectrum would be treated as an "enhanced factor" under its case-by-case review of license transfers if post-transaction the acquiring entity would hold approximately one-third or more of the currently suitable and available spectrum below 1 GHz in the relevant geographic market.[187]

69. In the context of its review of secondary market transactions, as well as in rulemakings, the Commission periodically has determined that additional spectrum was suitable and available for mobile wireless use, and therefore subject to inclusion in the spectrum screen.[188] The current suitable and available spectrum included in the spectrum screen, with an associated spectrum trigger of 385 megahertz, for identifying transactions that may be examined more closely, is shown in Figure II.B.11.[189]

(Continued from previous page)

[186] *See, e.g.*, *T-Mobile-Sprint Order*, 34 FCC Rcd at 10607-08, paras. 70-72; *Mobile Spectrum Holdings Report and Order*, 29 FCC Rcd at 6221-22, para. 225. In the case of transfer of business units, the Commission's initial HHI screen identifies, for further case-by-case market analysis, those markets in which, post-transaction: (1) the HHI would be greater than 2800 and the change in HHI would be 100 or greater; or (2) the change in HHI would be 250 or greater, regardless of the level of the HHI. *See, e.g.*, *T-Mobile-Sprint Order*, 34 FCC Rcd at 10614-15, para. 87 & n.277; *Mobile Spectrum Holdings Report and Order*, 29 FCC Rcd at 6140-41, para. 13 & n.34.

[187] *See, e.g.*, *T-Mobile-Sprint Order*, 34 FCC Rcd at 10614-15, para. 87; *Mobile Spectrum Holdings Report and Order*, 29 FCC Rcd at 6238-40, paras. 282-88.

[188] *See Facilitating Shared Use in the 3100-3550 MHz Band*, WT Docket No. 19-348, Second Report and Order, Order on Reconsideration, and Order of Proposed Modification, 36 FCC Rcd 5987, 6025-26, paras. 108-109 (2021); *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2343, 2383-84, paras. 87-88 (2020); *2.5 GHz Report and Order*, 34 FCC Rcd at 5481, 5482-83, para. 96 & n.279, paras. 99-100; *Incentive Auction Closing and Channel Reassignment*, AU Docket No. 14-252, Public Notice, 32 FCC Rcd 2786 (WTB 2017); *Applications of SprintCom, Inc., Shenandoah Personal Communications, LLC, and NTELOS Holdings Corp. for Consent To Assign Licenses and Spectrum Lease Authorizations and To Transfer Control of Spectrum Lease Authorizations and an International Section 214 Authorization*, WT Docket No. 15-262, Memorandum Opinion and Order, 31 FCC Rcd 3631, 3637-38, paras. 15-16 (WTB/IB 2016); *Mobile Spectrum Holdings Report and Order*, 29 FCC Rcd at 6172-90, paras. 82-134; *Applications of AT&T Mobility Spectrum LLC, New Cingular Wireless PCS, LLC, Comcast Corporation, Horizon Wi-Com, LLC, NextWave Wireless, Inc., and San Diego Gas & Electric Company for Consent To Assign and Transfer Licenses*, WT Docket No. 12-240, Memorandum Opinion and Order, 27 FCC Rcd 16459, 16470-71, para. 31 (2012); *Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band*, WT Docket No. 07-293, Report and Order, 25 FCC Rcd 11710, 11711, para. 1 (2010); *Applications of Sprint Nextel Corporation and Clearwire Corporation for Consent To Transfer Control of Licenses, Leases, and Authorizations*, WT Docket No. 08-94, Memorandum Opinion and Order, 23 FCC Rcd 17570, 17598-99, paras. 70, 72 (2008); *Applications of AT&T Inc. and Dobson Communications Corporation for Consent To Transfer Control of Licenses and Authorizations*, WT Docket No. 07-153, Memorandum Opinion and Order, 22 FCC Rcd 20295, 20307-08, para. 17 (2007).

[189] 3.7 GHz and 3.45 GHz spectrum are not available for use in Hawaii, Alaska, and the territories. *See Facilitating Shared Use in the 3100-3550 MHz Band*, WT Docket No. 19-348, Second Report and Order, Order on Reconsideration, and Order of Proposed Modification, 36 FCC Rcd 5987, 6028, para. 114 (2021); *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2380, para. 80 (2020). In these areas, the total amount of suitable and available spectrum is 743 megahertz, and the associated spectrum screen trigger is 250 megahertz.

Fig. II.B.11
Spectrum Included in the Spectrum Screen

Spectrum Band	***Megahertz (Amount)***
600 MHz	70
700 MHz	70
Cellular	50
SMR	14
Broadband PCS	130
AWS-1	90
AWS-3	65
AWS-4	40
H Block	10
WCS	20
BRS	67.5
EBS	116.5
3.7 GHz	280
3.45 GHz	100
Total Amount of Spectrum	***1,123.0***

Abbreviations for spectrum bands: SMR (Specialized Mobile Radio Service), PCS (Personal Communications Service), AWS (Advanced Wireless Services), WCS (Wireless Communications Service), BRS (Broadband Radio Service), and EBS (Educational Broadband Service).

70. Regarding high-band spectrum, the Commission has made available nearly 19 gigahertz of licensed and unlicensed millimeter wave (mmW) spectrum. The 57-71 GHz band is available for unlicensed use,[190] and an additional 4,950 megahertz is available for licensed use, as shown in Figure II.B.12 below.[191] The Commission adopted a separate threshold for mmW spectrum holdings, with an associated trigger of 1,850 megahertz, as an initial analytical tool to aid in identifying certain markets for further review in proposed secondary market transactions.[192]

[190] *See* 47 CFR § 15.255.

[191] *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.*, GN Docket No. 14-177, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, 33 FCC Rcd 5576 (2018); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988, 10990, para. 2 (2017) (*Spectrum Frontiers Second Report and Order*); *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, et. al*., GN Docket No. 14-177, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016) (*Spectrum Frontiers Report and Order*).

[192] See, e.g., *T-Mobile-Sprint Order*, 34 FCC Rcd at 10614-15, para. 87; *Application of Verizon Communications Inc. and Straight Path Communications, Inc. for Consent To Transfer Control of Local Multipoint Distribution Service, 39 GHz, Common Carrier Point-to-Point Microwave, and 3650-3700 MHz Service Licenses*, ULS File No. 0007783428, Memorandum Opinion and Order, 33 FCC Rcd 188, 194-95, paras. 18-19 (WTB 2018); *Spectrum Frontiers Second Report and Order*, 32 FCC Rcd at 11009-11, paras. 70, 74 & n.189; *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8082, para. 185.

Fig. II.B.12
Spectrum Included in the mmW Spectrum Threshold

Spectrum Band	*Megahertz (Amount)*
24 GHz	700
28 GHz	850
Upper 37 GHz	1,000
39 GHz	1,400
47 GHz	1,000
Total Amount of Spectrum	***4,950***

71. *Service Providers' Spectrum Holdings.* Figures II.B.13 and II.B.14 present spectrum holdings by service provider in the spectrum bands included in the spectrum screen.[193] As of June 2024, the three nationwide service providers, AT&T, T-Mobile, and Verizon, together held approximately 82% of all the spectrum included in the spectrum screen, measured on a MHz-POPs basis. Figure II.B.15 shows the population-weighted average megahertz spectrum holdings of licensees by frequency band.[194] Figure II.B.16 presents average megahertz holdings by service provider in the mmW spectrum bands.

[193] The population-weighted average megahertz for each provider is calculated by multiplying that provider's spectrum in a county by the county's population (MHz-POPs), summing for all counties, and then dividing by the 2020 Census total U.S. population.

[194] We consider population-weighted spectrum holdings in order to account for customer density in different geographic areas. A spectrum license in Los Angeles or New York City, for example, covers more customers than a spectrum license over the same amount of land area in White Sands, New Mexico.

Fig. II.B.13
Percentage Spectrum Holdings, Measured on a MHz-POPs Basis by Licensee, by Frequency Band

Spectrum	600 MHz	700 MHz	Cellular	SMR	PCS	H Block	AWS-1	AWS-3	AWS-4	WCS	BRS	EBS	3.45 GHz	3.7 GHz
AT&T	0.0%	42.4%	44.5%	0.0%	29.0%	0.0%	15.8%	33.7%	0.0%	99.0%	0.0%	0.0%	40.1%	28.5%
EchoStar	26.3%	6.6%	0.0%	0.0%	0.0%	100.0%	0.0%	34.8%	100.0%	0.0%	0.0%	0.0%	31.0%	0.0%
T-Mobile	45.0%	15.0%	0.1%	96.5%	51.1%	0.0%	41.4%	5.4%	0.0%	0.0%	96.4%	95.1%	12.0%	9.8%
Verizon	0.1%	31.1%	48.1%	0.0%	17.2%	0.0%	40.8%	19.8%	0.0%	0.0%	0.0%	0.8%	0.0%	57.4%
UScellular	2.6%	3.3%	3.8%	0.0%	1.1%	0.0%	0.8%	1.8%	0.0%	0.0%	0.0%	0.1%	3.8%	1.8%
Other	26.1%	1.6%	3.5%	3.5%	1.6%	0.0%	1.3%	4.6%	0.0%	1.0%	3.6%	4.0%	13.1%	2.5%

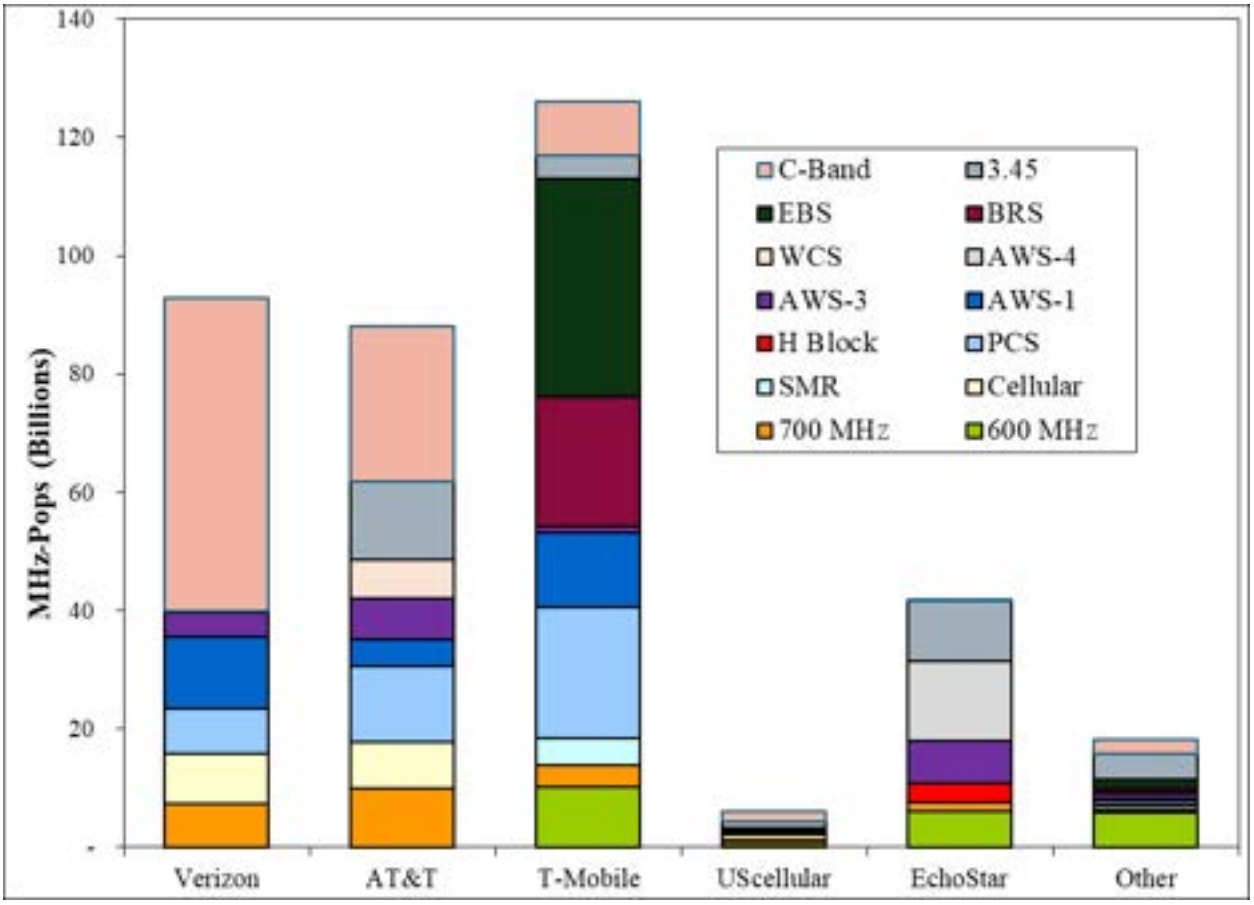
Staff estimates as of June 2024. Numbers may not sum to 100% due to rounding.

Fig. II.B.14
Population-Weighted Average Megahertz Holdings by Licensee, by Frequency Band

Spectrum	600 MHz	700 MHz	Cellular	SMR	PCS	H Block	AWS-1	AWS-3	AWS-4	WCS	BRS	EBS	3.45 GHz	3.7 GHz	TOTAL
AT&T	0.0	29.6	23.5	0.0	37.6	0.0	14.1	20.4	0.0	19.6	0.0	0.0	39.9	79.6	264.3
EchoStar	17.8	4.6	0.0	0.0	0.0	10.0	0.0	21.1	39.9	0.0	0.0	0.0	30.8	0.0	124.1
T-Mobile	30.4	10.5	0.0	13.8	66.3	0.0	37.1	3.3	0.0	0.0	65.0	110.0	11.9	27.2	375.6
UScellular	1.7	2.3	2.0	0.0	1.4	0.0	0.7	1.1	0.0	0.0	0.0	0.1	3.8	4.9	18.0
Verizon	0.0	21.7	25.3	0.0	22.3	0.0	36.6	12.0	0.0	0.0	0.0	0.9	0.0	160.1	278.9
Other	17.6	1.2	1.9	0.5	2.1	0.0	1.1	2.8	0.0	0.2	2.5	4.6	13.0	7.0	54.5

Staff estimates as of June 2024. The total for AWS-3 sums to 60.8 megahertz because some licenses have not been granted.

Fig. II.B.15
Spectrum Holdings by Band Weighted by Population



Source: Staff estimates as of June 2024.

Fig. II.B.16
Population-Weighted Average Megahertz Holdings by Licensee, by mmW Frequency Band

	24 GHz	28 GHz	Upper 37 GHz	39 GHz	47 GHz	TOTAL
AT&T	254	0	4	784	0	1,042
EchoStar	17	29	8	0.4	609	663
T-Mobile	335	123	0	321	381	1,161
UScellular	26	22	4	26	0	78
Verizon	7	618	975	124	0	1,724
Other	60	56	9	145	10	279

Source: Staff estimates as of June 2024.

72. *Unlicensed Spectrum Use*. The demand for wireless broadband continues to grow over time. A large proportion of mobile data traffic is delivered on an unlicensed basis through Wi-Fi, Bluetooth, and similar protocols. Telecom Advisory Services asserts that the economic benefits associated with Wi-Fi in the United States will rapidly grow to $2.4 trillion in 2027, including an estimated $514 billion in consumer benefit, $624 billion in producer surplus, and $1,286 billion in GDP

contribution.[195] According to LightReading, the average Verizon subscriber offloads approximately 78% of their data onto Wi-Fi, for example, while Comcast subscribers offload approximately 94%.[196]

73. The Commission adopted the *6 GHz Order and Further Notice* in 2020, which made 1,200 megahertz of spectrum in the 6 GHz band (5.925–7.125 GHz) available for unlicensed use in order to meet the increasing consumer demand for low-cost wireless connectivity.[197] The *6 GHz Order and Further Notice* authorizes two different types of unlicensed operations—standard-power and low-power indoor operations.[198] In 2023, the Commission adopted the *6 GHz and Mid-Band Spectrum Order, Further Notice and Opinion* that added operations of Very Low Power (VLP) devices to two parts of the band, which operate at an even lower level than low power devices.[199] VLP devices will be especially useful for augmented reality/virtual reality, in-car connectivity, wearable on-body devices, healthcare monitoring, short-range mobile hotspots, high accuracy location and navigation, and automation.[200] In 2024, the Commission approved seven automated frequency coordination systems for commercial 6 GHz standard operations to prevent interference.[201]

74. The Commission adopted the *5.9 GHz Report and Order* in 2020, designating the lower 45 megahertz of the band for unlicensed use and the upper 30 megahertz of spectrum for Intelligent Transportation System (ITS) services, in particular Cellular Vehicle-to-Everything (C-V2X) technology.[202] In 2022, the U.S. Court of Appeals for the District of Columbia Circuit upheld the *5.9 GHz Report and Order* and the Commission's broad authority to manage the nation's airwaves in the public interest.[203] In 2024, the Commission denied a petition by the Alliance for Automotive Innovation to reconsider or redesignate the 5.9 GHz band.[204]

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[195] Telecom Advisory Services, *Assessing the Economic Value of Wi-Fi in the United States* at 7 (Sept. 2024), https://wififorward.org/wp-content/uploads/2024/09/Assessing-the-Economic-Value-of-Wi-Fi.pdf.

[196] Jeff Baumgartner, LightReading, *Comcast, Charter to Rake in 16.5M Mobile Lines by 2025-Forecast* (Apr. 18, 2022), https://www.lightreading.com/cable-technology/comcast-charter-to-rake-in-16-5m-mobile-lines-by-2025-forecast; *see also* Sean Buckley, Lightwave, *Comcast Pursues New Opportunities to Offload Wireless Traffic to Wi-Fi* (Sept. 12, 2023), https://www.lightwaveonline.com/broadband/article/55026312/comcast-pursues-new-opportunities-to-offload-wireless-traffic-to-wi-fi.

[197] *Unlicensed Use of the 6 GHz Band*, ET Docket No. 18-295, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852 (2020) (*6 GHz Order and Further Notice*), *review denied in part and granted in part sub nom. AT&T Services, Inc. v. FCC,* 21 F.4th 41 (D.C. Cir. 2021).

[198] *Id.* at 3854, para. 3. Standard-power access points can be deployed anywhere as part of hotspot networks, rural broadband deployments, or network capacity upgrades where needed. Low-power indoor access points are ideal for connecting devices in homes and businesses, such as smartphones, tablet devices, laptops, and IoT devices, to the Internet. *Id.*

[199] *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, ET Docket No. 18-295, GN Docket No. 17-183, Second Report and Order, Second Further Notice of Proposed Rulemaking, and Memorandum Opinion and Order on Remand, 38 FCC Rcd 10523, 10524-25, para. 2 (2023).

[200] *Id.* at 10532, para. 18.

[201] *OET Announces Approval of Seven 6 GHz Band Automated Frequency Coordination Systems for Commercial Operation and Seeks Comment on C3 Spectra's Proposed AFC System*, ET Docket No. 21-352, Public Notice, DA 24-166, at 1, para. 1 (OET Feb. 23, 2024).

[202] *Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138, First Report and Order, Further Notice of Proposed Rulemaking, and Order of Proposed Modification, 35 FCC Rcd 13440 (2020) (*5.9 GHz First Report and Order*) (corrected by Erratum (OET Dec. 11, 2020) and Second Erratum, 36 FCC Rcd 1444 (OET 2021)); *see also* Press Release, FCC, FCC Modernizes 5.9 GHz Band for Wi-Fi and Auto Safety (Nov. 18, 2020), https://docs.fcc.gov/public/attachments/DOC-368228A1.pdf.

[203] *ITS America v. FCC*, 45 F.4th 406 (D.C. Cir. 2022). In the *5.9 GHz First Report and Order*, the Commission repurposed the 5.850-5.895 GHz portion of the 5.850-5.925 GHz (5.9 GHz) band (lower 45 megahertz) from ITS

(continued….)

3. Wireless Infrastructure

75. Wireless infrastructure facilities constitute another critical input in the provision of mobile wireless services.[205] In addition to towers and other tall structures, such as lattice towers, guyed towers, monopoles, rooftops, water towers, and steeples, wireless infrastructure also includes distributed antenna systems (DAS) and small cells.[206] In order to expand or to improve coverage in existing service areas, and to accommodate newer technologies, mobile service providers have deployed additional cell sites. The Wireless Infrastructure Association (WIA) estimates that there were 153,400 standalone cellular towers operating in the United States at the end of 2023,[207] up from 142,100 at the end of 2022.[208] WIA estimates that 244,800 macrocell sites were in operation at the end of 2023,[209] up from 209,500 at

(Continued from previous page)
use to provide more flexible unlicensed use, while continuing to dedicate the 5.895-5.925 GHz portion of the 5.9 GHz band (upper 30 megahertz) for vital ITS applications. The Commission also adopted technical and operating rules to minimize the potential for unlicensed operations in the lower 45 megahertz to cause harmful interference to incumbent 5.9 GHz band services—including federal incumbents and ITS operations. *5.9 GHz First Report and Order*.

[204] Federal Communications Commission, Use of the 5.850-5.925 GHz Band, Notice, 89 Fed. Reg. 24835, 24835-36 (Mar. 18, 2024).

[205] Another component is the backhaul connections that link a mobile wireless service provider's cell sites to the mobile switching centers that provide connections to the provider's core network, the public switched telephone network, or the Internet, carrying wireless voice and data traffic for routing and onward transmission. Backhaul facilities are generally provided by incumbent local exchange carriers, competitive local exchange carriers, competitive fiber and microwave wholesalers, cable providers, tower companies, and independent backhaul operators using fiber, microwave, copper, and satellite. *See, e.g.*, *2022 Communications Marketplace Report*, 37 FCC Rcd at 15586, para. 92 & n.254; *see also* Crown Castle Inc., SEC Form 10-K, at 4 (filed Feb. 23, 2024) (Crown Castle 2023 Annual Report) ("We refer to our towers, small cells and fiber assets collectively as "communications infrastructure"); Siklu by Ceragon, *Wireless Backhaul 101: Key Factors to Consider When Designing a Reliable Wireless Backhaul Network,* https://www.siklu.com/custom-blog/wireless-backhaul-explained/ (last visited July 12, 2024).

[206] A DAS takes the radio frequency (RF) signal from a standard third-party cellular base station and conveys it through a series of active and passive network elements via fiber, copper or coaxial cabling to an array of relatively low-power antennas throughout a building, venue or campus. The HetNet Forum, DAS and Small Cells Evolve to Meet Today's and Tomorrow's Connectivity Needs at 2 (Aug. 2019), https://wia.org/wp-content/uploads/2023/08/HetNetForum_DAS_SmallCell_2019.pdf. A small cell is a low-cost radio access point with low RF power output, footprint and range. It can be deployed indoors or outdoors, and in licensed, shared or unlicensed spectrum. Small Cell Forum, *Small Cell Definition,* https://www.smallcellforum.org/small-cells/ (last visited Oct. 24, 2024).

[207] WIA, Wireless Infrastructure By The Numbers: 2023 Key Industry Statistics at 6 (2024), https://8967849.fs1.hubspotusercontent-na1.net/hubfs/8967849/WIA/Whitepapers%2c%20Reports%2c%20Briefs/Wireless%20Infrastructure%20By%20The%20Numbers%202023/WIA_WP_MobileConnectivity24.pdf (WIA 2023 Wireless Infrastructure Report); WIA Comments at 1. This figure comprises only the towers that support cellular networks and does not include towers designed for broadcast, municipalities, other government, emergency services, educational, or other users. WIA 2023 Wireless Infrastructure Report at 6. Outdoor small cells, defined as being less than 50 feet from ground level, are also not included in this count. *Id*.

[208] WIA, Wireless Infrastructure By The Numbers: 2022 Key Industry Statistics at 4 (2023), https://8967849.fs1.hubspotusercontent-na1.net/hubfs/8967849/WIA/Whitepapers%20+%20Reports/Wireless%20Infrastructure%20By%20The%20Numbers%202022/WIA_WP_MobileConnectivity23.pdf (WIA 2022 Wireless Infrastructure Report).

[209] WIA 2023 Wireless Infrastructure Report at 7; WIA Comments at 1. WIA notes that this "figure includes macrocells mounted on towers and rooftops and refers only to macrocells used for cellular and Fixed Wireless
(continued….)

the end of 2022.[210] According to CTIA, cell sites in commercial use increased from 395,562 in 2019 to 417,215 in 2020, and to 418,887 in 2021, decreased slightly to 414,571 in 2022, but then increased to 432,469 at year-end 2023.[211]

76. Mobile service providers have increased deployment of small cells and DAS to fill local coverage gaps, to densify networks and increase local capacity, and to expand their 5G networks.[212] Mobile service providers deploy small cells in cities across the country, often through attaching small-scale antenna/radios near the top of light and small utility poles.[213] Small cells mostly have fiber backbones.[214] CTIA estimates that 156,787 small cells and DAS were in service across the United States as of year-end 2023, compared to 142,057 in 2022 and 125,293 in 2021.[215] WIA estimates that 202,100 outdoor small cells were in use at the end of 2023, supporting 466,850 small cell nodes.[216] A reported

(Continued from previous page)
Access (FWA) networks," and that "sites used exclusively for municipal, government, and emergency services networks are not included in this count." WIA 2023 Wireless Infrastructure Report at 7.

[210] WIA 2022 Wireless Infrastructure Report at 5.

[211] CTIA Year-End 2023 Wireless Industry Indices Report at 54, Chart 19. The reported cell sites, and their antennas, may be located on rooftops, monopoles, and other pre-existing structures, as well as on lattice towers. In addition, multiple cell sites may be co-located, with their antennas on a single structure. Therefore, the reported cell sites should not be equated with "towers." *Id*. The 432,469 cell sites in active service at year-end 2023 include traditional macro cells, small cells, DAS nodes, and other cell-extending devices. *Id*. The inclusion of small cells and DAS nodes is probably the reason that the cell site count in the CTIA report is much higher than the microcell site count in the WIA 2023 Wireless Infrastructure Report.

[212] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15587, para. 93; *see also* T-Mobile 2023 Annual Report, Part I at 7 ("approximately 80,000 macro cell sites and 48,000 small cell/distributed antenna system sites"); AT&T 2023 Annual Report at 30 ("Industry-wide network densification and 5G technology expansion efforts . . . will involve significant deployment of "small cell" equipment."); Verizon Communications Inc., SEC Form 10-K, at 7 (filed Feb. 9, 2024) (Verizon 2023 Annual Report) ("We are densifying our networks by utilizing macro and small cell technology, in-building solutions and distributed antenna systems."); Crown Castle 2023 Annual Report at 4 ("approximately 115,000 small cells on air or under contract"); Crown Castle Q1 2024 Earnings Call Transcript at 4 (Apr. 17, 2024) (expecting 16,000 new billable small cell nodes in 2024 in comparison to 8,000 nodes in 2023), https://investor.crowncastle.com/static-files/6b745487-d5a4-4f09-a683-e123aefc1ee2.

[213] *See 2022 Communications Marketplace Report*, 37 FCC Rcd at 15587 & n.258; *see also* City of Los Angeles, *Small Cell Locations*, https://web.archive.org/web/20240528041647/https://catalog.data.gov/dataset/small-cell-locations (last visited May 2, 2024) (with over 2,900 small cell locations as of May 2024); City of Eugene, *Small Cell Technology*, https://www.eugene-or.gov/4134/Small-Cell (last visited May 2, 2024) ("The telecommunications industry is installing more and more small cell technology in cities across the country, often attaching the systems on existing poles in the right-of-way, for example, on light or utility poles."); City of San Jose, *Small Cell Deployment*, https://www.sanjoseca.gov/your-government/departments-offices/information-technology/broadband-strategy-and-small-cell-deployment (last visited July 11, 2024) ("Small cells are small radio antenna equipment installed on streetlights, rooftops, and other locations as a primary way to deliver 5G (Fifth Generation) mobile technology"); City of Fremont, California, *Small Cell Project*, https://www.fremont.gov/government/departments/engineering/development-utilities/small-cell-project (last visited May 6, 2024) ("has two executed Master License Agreements (MLA) and is continuing to work with local wireless service providers to allow the installation of small cells on City-owned street light . . . ."); Crown Castle, *Small Cells 101*, https://www.crowncastle.com/communities/small-cell-information (last visited May 6, 2024) ("Small cells are . . . usually attached to existing infrastructure in the public right of way like utility poles or streetlights").

[214] *See, e.g.*, Fiber Optic Association, *Reference Guide*, https://www.thefoa.org/tech/ref/appln/SmallCells.html (last visited May 22, 2024) ("Small cells are designed to operate on fiber backbones directly from the small cell to a central office or head end . . . ."); *see also* Crown Castle, *Small Cells 101*, https://www.crowncastle.com/communities/small-cell-information (last visited May 22, 2024) ("Small cells are connected by fiber optic cable").

[215] CTIA Year-End 2023 Wireless Industry Indices Report at 53.

total of 775,800 indoor small-cell nodes also were in operation at the end of 2023,[217] compared with 747,400 at the end of 2022.[218]

77. Today, there are more than 129 tower operators in the United States,[219] and a majority of towers are now owned or operated by independent tower companies rather than by mobile wireless service providers.[220] In most cases, tower operators and property owners lease antenna, rooftop, and other site space to multiple wireless service providers.[221] The three largest publicly traded neutral host providers[222] are American Tower, Crown Castle, and SBA Communications.[223] According to one estimate, as of April 2024, these three infrastructure providers owned or operated approximately 100,371 towers (not including DAS and small cells).[224] At the end of December 2023, Crown Castle and SBA had an average of 2.5 and 1.9 tenants per tower site, respectively.[225] The three major tower companies also have significant capacity available for additional antennas or tenants.[226]

(Continued from previous page)

[216] WIA 2023 Wireless Infrastructure Report at 8; WIA Comments at 1.

[217] WIA 2023 Wireless Infrastructure Report at 9; WIA Comments at 1.

[218] WIA 2022 Wireless Infrastructure Report at 7.

[219] Wireless Estimator, *Top 100 Tower Companies in the U.S.*, http://wirelessestimator.com/top-100-us-tower-companies-list/ (last visited May 6, 2024) (towers do not include small cells and DAS).

[220] Major nationwide wireless service providers have sold their towers to neutral third-party tower companies. *See 2022 Communications Marketplace Report*, 37 FCC Rcd at 15588 & n.263; *see also* WIA 2023 Wireless Infrastructure Report at 6.

[221] *See, e.g.*, American Tower 2023 Annual Report, Part I at 1 ("Our primary business is the leasing of space on communications sites to wireless service providers . . . ."); *see also* Crown Castle 2023 Annual Report at 4 ("Our core business is providing access, including space or capacity, to our shared communications infrastructure via long-term contracts . . . ."); Verizon 2023 Annual Report at 64 ("We lease network equipment including towers, distributed antenna systems, small cells . . . ."); AT&T 2023 Annual Report at 90 (leasing towers from Crown Castle); T-Mobile 2023 Annual Report at 88 (leasing towers from Crown Castle).

[222] A neutral host is a company that owns telecommunications infrastructure, such as cell towers, and leases it to multiple service providers. *See* 5G Americas, Neutral Host Opportunities for 5G & Beyond White Paper at 4 (Aug. 2024), https://www.5gamericas.org/wp-content/uploads/2024/07/Neutral-Host-Opportunities-for-5G-Beyond-PDF.pdf ("Neutral Host Networks (NHN) are shared wireless communication infrastructure that allow multiple network providers to offer connectivity and coverage.").

[223] Wireless Estimator, *Top 100 Tower Companies in the U.S.*, https://wirelessestimator.com/top-100-us-tower-companies-list/ (last visited May 6, 2024).

[224] *Id.* (Crown Castle at 40,033, American Tower at 42,943, and SBA at 17,395, not including DAS and small cells); *see also* American Tower 2023 Annual Report, Part I at 1 (42,905 communications sites in the United States and Canada as of Dec. 31, 2023); Crown Castle 2023 Annual Report at 4 (more than 40,000 towers and other structures, such as rooftops in the United States); SBA Communications Corporation, SEC Form 10-K, at 3 (filed Feb. 28, 2024) (SBA 2023 Annual Report) (owned 17,487 sites in the United States and its territories as of Dec. 31, 2023).

[225] Castle 2023 Annual Report at 7 (average of 2.5 tenants per tower); SBA 2023 Annual Report, Item 1 at 1 (average of 1.9 tenants per tower).

[226] American Tower 2023 Annual Report, Part I at 5 ("We believe that the majority of our towers have capacity for additional tenants and that substantially all of our towers that are currently at or near full structural capacity can be upgraded or augmented to meet future tenant demand with relatively modest capital investment."); SBA 2023 Annual Report, Item 1 at 1 ("Most of our towers have significant capacity available for additional antennas"); Crown Castle 2023 Annual Report at 4 ("We seek to increase our site rental revenues by adding more tenants on our shared communications infrastructure").

4. Pricing Levels and Trends

78. Mobile service providers continue to offer nationwide pricing plans throughout their service areas, with little variation in monthly recurring charges between rural and non-rural markets.[227] The majority of mobile wireless subscribers in the United States are "postpaid" subscribers, billed each month after service has been provided, while "prepaid" subscribers pay for services in advance of receiving them.[228]

a. Postpaid Service

79. In 2023, service providers continued the trend of offering "unlimited" data plans,[229] as opposed to plans with specified quantities of data allowances, such as 40 GB per month, with major providers offering tiered unlimited data plans and often highlighting their highest-end multi-line plans.[230] T-Mobile, for example, introduced a new unlimited plan to its lineup in April 2023, Go5G Plus.[231] Go5G Plus comes with unlimited talk, text, and 4G LTE and 5G high-speed data, 50 GB of mobile hotspot data, Apple TV+ and Netflix Standard with Ads included, up to 15 GB of high-speed data in Mexico and Canada, and up to 5 GB of high-speed data in an additional 215+ countries and destinations for $62 per line per month for three lines with autopay (including monthly taxes and fees).[232] In August 2023,

[227] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15590-91, para. 99. As mobile service providers offer nationwide pricing plans throughout their service area, with little pricing disparity between rural and urban markets, it is unnecessary to undertake a separate standalone rate survey authorized in the 2011 Order that modernized the universal service program for awarding support to mobile service providers in high-cost areas. *See Connect America Fund, et al*., WC Docket No. 10-90, et al., Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663, 17694, 17708-09, paras. 85, 113, 114 (2011).

[228] The prepaid and postpaid versions of a given pricing plan or promotion still differ somewhat, largely because prepaid subscribers may lack the credit background or income necessary to qualify for postpaid service. To prevent credit losses and mitigate the credit risk associated with the prepaid segment, service providers require advance payment for both prepaid service and handsets. *2022 Communications Marketplace Report*, 37 FCC Rcd at 15590-91, para. 99.

[229] While a majority of unlimited plans are offered to postpaid subscribers, some providers now also offer unlimited plans to their prepaid subscribers. *See, e.g.*, AT&T, *AT&T Prepaid Phone Plans*, https://www.att.com/prepaid/plans/ (last visited June 17, 2024); T-Mobile, *Flexible Prepaid Plans for Everyone*, https://prepaid.t-mobile.com/ (last visited June 17, 2024); Verizon, *Enjoy Multiple Ways to Save with Verizon Prepaid*, https://www.verizon.com/plans/prepaid/ (last visited June 17, 2024). We note that while "unlimited," such plans may have data allowances, which, if reached, can lead to deprioritization (the temporary slowing of data rates during periods of congestion).

[230] Postpaid subscribers who use up their plan's data allowance in a given month generally experience data deprioritization only during network congestion. *See, e.g.*, T-Mobile, *Go5G*, https://www.t-mobile.com/commerce/cell-phone-plans (last visited June 17, 2024); Verizon, *Important Plan Information*, https://www.verizon.com/support/important-plan-information/ (last visited June 17, 2024); AT&T, *AT&T Unlimited Extra® EL*, https://www.att.com/plans/unlimited-data-plans/ (last visited June 17, 2024).

[231] Press Release, T-Mobile, Introducing T-Mobile's Latest Un-carrier Move "Phone Freedom" (Apr. 20, 2023), https://www.t-mobile.com/news/un-carrier/un-carrier-move-phone-freedom.

[232] T-Mobile, *Compare Our Plans*, https://www.t-mobile.com/commerce/plan-details (last visited June 17, 2024). In addition, T-Mobile launched Go5G for those consumers looking for more data (as compared to T-Mobile's Essentials plan)—plus additional versions of the Go5G and Go5G Plus plans for 55+ customers, veterans, and first responders. T-Mobile, *Phone & Discount Plans*, https://www.t-mobile.com/commerce/cell-phone-plans (last visited June 17, 2024).

T-Mobile unveiled a new premium plan, Go5G Next, which includes all of the features of Go5G Plus along with the ability to upgrade devices yearly for $72 per line per month for three lines with autopay.[233]

80. In May 2023, Verizon introduced myPlan, a customizable phone plan where customers choose from two unlimited network options, Unlimited Welcome or Unlimited Plus.[234] Unlimited Welcome starts at $30 per line per month when customers sign up for four or more lines with a $10 per line autopay discount, plus taxes and fees.[235] Unlimited Plus offers 30 GB of premium mobile hotspot data, up to 50% off a watch, tablet, hotspot or Hum plan, and the price customers pay is guaranteed for three years (excluding taxes and fees).[236] After choosing a plan, customers have the option to choose various types of content and services for an additional $10 per month.[237]

81. In March 2024, AT&T changed the names of its main wireless plans to Unlimited Starter SL, Unlimited Extra EL, and Unlimited Premium PL.[238] Unlimited Premium PL comes with unlimited talk, text, and high-speed data that AT&T claims will not be slowed down based on how much the customer uses, 60 GB of hotspot data, and unlimited talk, text, and high-speed data in 20 Latin American countries.[239] In July 2024, EchoStar consolidated its Boost Infinite postpaid service with Boost Mobile, its prepaid brand, reducing the distinction between its postpaid and prepaid service offerings.[240]

b. Prepaid Service

82. The three nationwide service providers also offer prepaid service under their own prepaid brands in addition to selling mobile wireless service wholesale capacity to MVNOs. T-Mobile now has the largest share of prepaid subscribers among the nationwide service providers[241] and completed its acquisition of Ka'ena Corporation, which includes direct-to-consumer (D2C) prepaid wireless brands, Mint Mobile, internationally-focused value brand, Ultra Mobile, and wholesale wireless solutions provider, Plum, in May 2024.[242] Verizon has the second largest share of prepaid subscribers,[243] and has

[233] Press Release, T-Mobile, T-Mobile Unveils Go5G Next, A New Plan that Guarantees the Freedom to Upgrade Every Year (Aug. 21, 2023), https://www.t-mobile.com/news/un-carrier/t-mobile-unveils-go5g-next.

[234] Verizon, *Verizon Redefines Wireless Freedom, Launches First in U.S. Plan that Puts Customers in Charge* (Aug. 29, 2023), https://www.verizon.com/about/news/myplan.

[235] *Id.*

[236] *Id*. The Hum plan is an in-car Wi-Fi device. *Id*.

[237] Wireless Zone, *Verizon myPlan Perks*, https://wirelesszone.com/data-plan-perks/ (last visited Oct. 15, 2024). For example, customers could choose the Disney Bundle perk for $10 per month, or the Netflix + Max bundle.

[238] Eli Blumenthal, CNET, *AT&T Is Raising the Rates for Its Unlimited Plans, Bumping Hotspot Data* (Jan. 12, 2024), https://www.cnet.com/tech/mobile/at-t-is-raising-the-rates-for-its-unlimited-plans-bumping-hotspot-data/.

[239] AT&T, *Unlimited Possibilities*, https://www.att.com/plans/wireless/ (last visited June 17, 2024).

[240] Press Release, EchoStar, Boost Mobile—The Newest Wireless Carrier—Launches New State-of-the-Art Nationwide 5G Network, Plans, and Branding (July 17, 2024), https://ir.echostar.com/news-releases/news-release-details/boost-mobile-newest-wireless-carrier-launches-new-state-art. "Boost Mobile is now the only nationwide carrier with both prepaid and postpaid mobile services under one name because Boost believes how you pay is not a product."

[241] Monica Alleven, Fierce Network, *T-Mobile Surpasses Verizon as Biggest Prepaid Carrier* (Nov. 7, 2023), https://www.fierce-network.com/wireless/t-mobile-surpasses-verizon-biggest-prepaid-carrier.

[242] Press Release, T-Mobile, Mint and Ultra: Welcome to the T-Mobile Family! (May 1, 2024), https://www.t-mobile.com/news/business/t-mobile-closes-acquisition-mint-and-ultra-mobile. T-Mobile's prepaid brands also include Metro by T-Mobile (formerly MetroPCS).

[243] Alan Friedman, Phone Arena, *T-Mobile Tops Verizon to Become the Largest U.S. Wireless Provider in this Segment of the Industry* (Nov. 7, 2023), https://www.phonearena.com/news/t-mobile-tops-verizon-as-us-prepaid-leader_id152373.

multiple prepaid brands including Visible by Verizon and TracFone.[244] AT&T also pursues a multi-brand prepaid strategy through AT&T Prepaid and Cricket Wireless.

83. EchoStar's mobile brand, Boost Mobile,[245] offers a number of different phone plans that can be either prepaid or postpaid.[246] These plans include Unlimited, which offers unlimited talk, text, and data and other features for $25 per month, Unlimited+, which offers unlimited talk, text, and data, a hotspot, and other features for $50 per month, and Unlimited Premium, which offers unlimited talk, text, and data, a hotspot, 5GB of data while roaming in Canada and Mexico, and other features for $60 per month.[247]

84. Further, as postpaid offerings have shifted away from term contracts and equipment subsidies, facilities-based service providers have adopted pricing plans and promotions for their high-end prepaid monthly service offerings that are similar to their postpaid offerings. For example, in June 2023, Verizon introduced new multi-line promotions for its Unlimited and Unlimited Plus prepaid plans offering 5 GB of mobile hotspot data, additional lines for $30 per month, and two-line accounts starting at $80 per month for the Unlimited plan and access to 5G Ultra Wideband, 50 GB of premium network access, 25 GB of premium mobile hotspot data, and Global Choice free calls to one country starting at $40 per month per line with autopay for the Unlimited Plus plan.[248] In June 2023, T-Mobile's Metro by T-Mobile formally reintroduced its $25 unlimited talk, text, and 5G data plan for single lines.[249] AT&T launched its new Unlimited Max Plus plan for $65 per month with autopay ($75 without autopay) in September 2023, which offers high-speed data with 5G access, unlimited talk and text, 35 GB of mobile hotspot usage and 500 minutes of long distance calling from the United States to more than 30 countries.[250] In January 2024, EchoStar's Boost Mobile offered new customers, for a limited time, a $100 per month Family Plan that includes unlimited talk, text and high-speed data.[251] Generally, prepaid subscribers who reach the limit of their high-speed data allowance in a given month may continue to use their handsets for data service an unlimited basis, but at reduced speeds.[252] For example, Cricket Wireless

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[244] TracFone has a portfolio of prepaid brands including Net10 Wireless, Straight Talk, Clearway, Walmart Family Mobile, SIMPLE Mobile, Total by Verizon, SafeLink Wireless, Page Plus, and GoSmart Mobile, which target different market and demographic segments, such as premium, Hispanic, or low-income subscribers. TracFone Wireless, *Brands*, http://www.tracfonewirelessinc.com/en/brands/ (last visited June 17, 2024).

[245] DISH, *DISH Enters Retail Wireless Market with Close of Boost Mobile, Advances Build of the Nation's First Standalone 5G Network* (July 1, 2020), http://about.dish.com/2020-07-01-DISH-enters-retail-wireless-market-with-close-of-Boost-Mobile-advances-build-of-the-nations-first-standalone-5G-network.

[246] Press Release, EchoStar, Boost Mobile—The Newest Wireless Carrier—Launches New State-of-the-Art Nationwide 5G Network, Plans, and Branding (July 17, 2024), https://ir.echostar.com/news-releases/news-release-details/boost-mobile-newest-wireless-carrier-launches-new-state-art; Boost Mobile, *Prepaid Phone Plans That Don't Feel Like Prepaid Phone Plans*, https://www.boostmobile.com/plans/prepaid-plans (last visited Sept. 27, 2024) (navigate to "Which Prepaid Plans Do You Offer" subheading under "FAQs" heading).

[247] Boost Mobile, *Boost Mobile Plans*, https://www.boostmobile.com/plans (last visited Sept. 27, 2024).

[248] Verizon, *Verizon Prepaid Launches Biggest Discount Yet on Unlimited Plans with New Multiline Deals* (June 7, 2023), https://www.verizon.com/about/news/verizon-prepaid-launches-unlimited-plans-new-multiline-deals.

[249] Joe Paonessa, BestMVNO.com, *Metro by T-Mobile Formally Brings Back Its $25/Month Unlimited Data for Single Lines Offer* (June 15, 2023), https://bestmvno.com/metropcs/metro-by-t-mobile-formally-brings-back-its-25-month-for-single-lines-offer/.

[250] Monica Alleven, Fierce Network, *AT&T Launches New Prepaid Plan at Walmart, Target* (Sept. 1, 2023), https://www.fierce-network.com/wireless/att-launches-new-prepaid-plan-walmart-target.

[251] Press Release, Boost Mobile, Boost Mobile Unveils Unbeatable Tax Season Offers: 4 Lines for $100/mo. Family Plan and Buy One Get One Free Deals (Jan. 26, 2024), https://boostmobile.mediaroom.com/2024-01-26-Boost-Mobile-Unveils-Unbeatable-Tax-Season-Offers-4-lines-for-100-mo-Family-Plan-and-Buy-One-Get-One-Free-Deals.

reduces data download speeds to a maximum of 128 kbps after the customer's high-speed data allowance is used.[253]

c. Price Indicators for Mobile Wireless Services

85. As can be seen from the discussion above, it is difficult to directly compare prices between providers or over time, because providers offer a variety of plans, frequently under multipart pricing and bundling schemes. Plans also vary in non-price terms and features, such as the imposition of usage limits and the consequences of reaching or exceeding such limits.[254] Figure II.B.17 presents monthly postpaid prices for the three nationwide service providers' basic, mid-level, and premium unlimited plans, including now-common discounts for automatic payments.[255] Basic unlimited postpaid plans generally offer little more than unlimited talk, text, and data, and speeds that are deprioritized during network congestion. Mid-level postpaid plans typically offer some combination of increased data before deprioritization, some high-speed mobile hotspot data, cloud data storage, discounted or free subscription to online video and/or music streaming services (e.g., Apple TV+, Prime Video, or Disney+), and improved video streaming quality. Premium postpaid plans typically offer increased mobile hotspot data limits, video quality, and other varying features across the providers. Figure II.B.18 shows the current monthly prices for major prepaid service providers. Unlimited service is also the primary offering of prepaid plans, although postpaid users frequently are given priority over prepaid users on a given network during times of peak congestion.[256] Further, both postpaid and prepaid users may also experience deprioritized speeds during periods of peak network congestion after they have exceeded certain monthly data thresholds, depending on their plan type. The limits are shown in Figures II.B.19 and II.B.20.

(Continued from previous page)

[252] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15593, para. 105.

[253] Cricket Wireless, *Mobile Broadband Information*, https://www.cricketwireless.com/legal-info/mobile-broadband-information.html (last visited Nov. 30, 2024).

[254] It is therefore difficult to identify sources of information that track mobile wireless service prices in a comprehensive and consistent manner. In addition, data on subscribership is not available at the plan level. Thus, a comparison of average prices would require assumptions regarding the number of customers who subscribe to each plan that each company offers, which would not likely be accurate due to a lack of data. *See, e.g.*, *2022 Communications Marketplace Report*, 37 FCC Rcd at 15593-15594, para. 106 & n.313.

[255] In addition, T-Mobile incorporates taxes and fees into its advertised prices for its Go5G plans. As these fees vary by locality, we are unable to fully account for the differences in pricing in Fig. II.B.17 in this *Report*.

[256] For example, Metro in its Terms and Conditions indicates that "a feature differentiating Metro by T-Mobile-branded service and plans from T-Mobile or Sprint-branded services, is that data of customers who choose T-Mobile branded or Sprint service plans other than T-Mobile Essentials or Sprint Essentials has precedence over data of customers who choose non T-Mobile-branded service plans, such as Metro by T-Mobile, when the network is presented with competing demands." *See* Metro by T-Mobile, *Metro by T-Mobile Open Internet*, https://www.metrobyt-mobile.com/terms-and-conditions/open-internet (last visited Oct. 15, 2024); *see also* Cricket, *Mobile Broadband Information*, https://www.cricketwireless.com/legal-info/mobile-broadband-information.html (last visited Oct. 15, 2024) ("One network management practice we use to manage our wireless network resources may affect customers with unlimited mobile data plans ('Cricket Unlimited Data Plans'). During periods of congestion, these customers may experience reduced data speeds and increased latency as compared to other customers using the same cell site.").

Fig. II.B.17
Monthly Postpaid Unlimited Prices for Top Three Service Providers

	Plan Type					
	Basic		Mid-Level		Premium	
Provider	1 Line	4 Lines	1 Line	4 Lines	1 Line	4 Lines
AT&T	$65.99	$143.96	$75.99	$163.96	$85.99	$203.96
T-Mobile	$60	$100	$75	$155	$100	$225
Verizon	$65	$120	$80	$180	$90	$260

Source: The prices for unlimited data plans in Figures II.B.17 and II.B.18 were taken from service providers' websites on Aug. 1, 2024.

Fig. II.B.18
Monthly Prepaid Unlimited Prices for Top Four Service Providers[257]

	Plan Type			
	Basic		Premium	
Provider	**1 Line**	**4 Lines**	**1 Line**	**4 Lines**
Boost Mobile	$25	$100	$60	$240
Cricket	$55	$100	$60	$130
Metro	$50	$155	$70	$175
Straight Talk	$45	$100	$65	$180

Source: The prices for unlimited data plans in Figures II.B.17 and II.B.18 were taken from service providers' websites on Aug. 1, 2024.

Fig. II.B.19
Data Deprioritization Limits for Top Three Postpaid Service Providers[258]

	Plan Type		
Provider	**Basic**	**Mid-Level**	**Premium**
AT&T	Congestion	75 GB	No Limit
T-Mobile	50 GB	100 GB	No Limit
Verizon	Congestion	No Limit	No Limit

Source: The deprioritization limits in Figures II.B.19 and II.B.20 were taken from service providers' websites on Aug. 1, 2024.

[257] Prices include any per line charges indicated by the service provider, but exclude fees and taxes. Prices do not include any additional charges such as for equipment installment plans, insurance, international use, or mobile hotspots. If a service provider includes any such feature as part of its unlimited data plan without extra charge, the above price would include this feature. Further, the above prices do not include any one-time charges paid, such as activation fees and termination fees, nor promotions that are advertised as short-term. Prices and the features of the plans are subject to change.

[258] "Congestion" indicates that users are deprioritized when there is congestion on the network, regardless of the amount of data a customer has consumed in a given month. "No Limit" indicates that users are never deprioritized, regardless of the amount of data they have consumed in a given month.

Fig. II.B.20
Data Deprioritization Limits for Top Four Prepaid Service Providers

	Plan Type	
Provider	**Basic**	**Premium**
Boost Mobile	30 GB	50 GB
Cricket	Congestion	Congestion
Metro	35 GB	35 GB
Straight Talk	Congestion	Congestion

Source: The deprioritization limits in Figures II.B.19 and II.B.20 were taken from service providers' websites on Aug. 1, 2024.

86. The single-line pricing for Verizon has remained constant or has dropped for all tiers of service relative to 2022, while AT&T has increased prices by 99 cents per month in all three tiers for a single line. T-Mobile has held its basic plan the same since 2022, raised its mid-level plan by $5 per month, and raised its premium plan by $15 per month. T-Mobile's premium plan now allows consumers to obtain a new device annually. Multi-line service has followed a similar trend for all three providers: Verizon has lowered the price of its basic plan, while holding the price steady for its mid-level plans and increasing the price of its premium plan, which, like T-Mobile's premium plan, includes regular phone upgrades; AT&T has increased its four-line price by $3.96 for all tiers; and T-Mobile has lowered the price of its multi-line basic plan while increasing the prices of its mid-level and premium plans.[259] For prepaid service, Boost has reduced the price of its basic plan, but no longer offers multi-line discounts, while Straight Talk and Cricket both offer the same single-line pricing as in 2022. In addition, Straight Talk has now introduced multi-line discounts, while Cricket's multi-line pricing also has been constant since 2022. Metro has increased its prices, for all plan types and number of lines.[260]

87. *Consumer Price Index (CPI).* The CPI is a measure of the average change over time in the prices consumers pay for a fixed market basket of goods and services. As documented in previous Reports, the Wireless Telephone Services CPI[261] shows that mobile wireless prices have declined significantly since the mid-1990s.[262] In 2022 and 2023, this trend continued, with decreases of 0.5% and

[259] *See 2022 Communications Marketplace Report*, 37 FCC Rcd at 15594, Fig. II.B.15. Single-line pricing for AT&T ranged from $65-$85, and 4 lines from $140-$200; for T-Mobile, a single line ranged from $60-$85, and 4 lines from $105-$170; and for Verizon, a single line ranged from $70-$90, while four lines ranged from $140- $220. Neither this *Report* nor prior CMRs can completely account for all features offered by every plan, nor any fees that may be in addition to the monthly service rates.

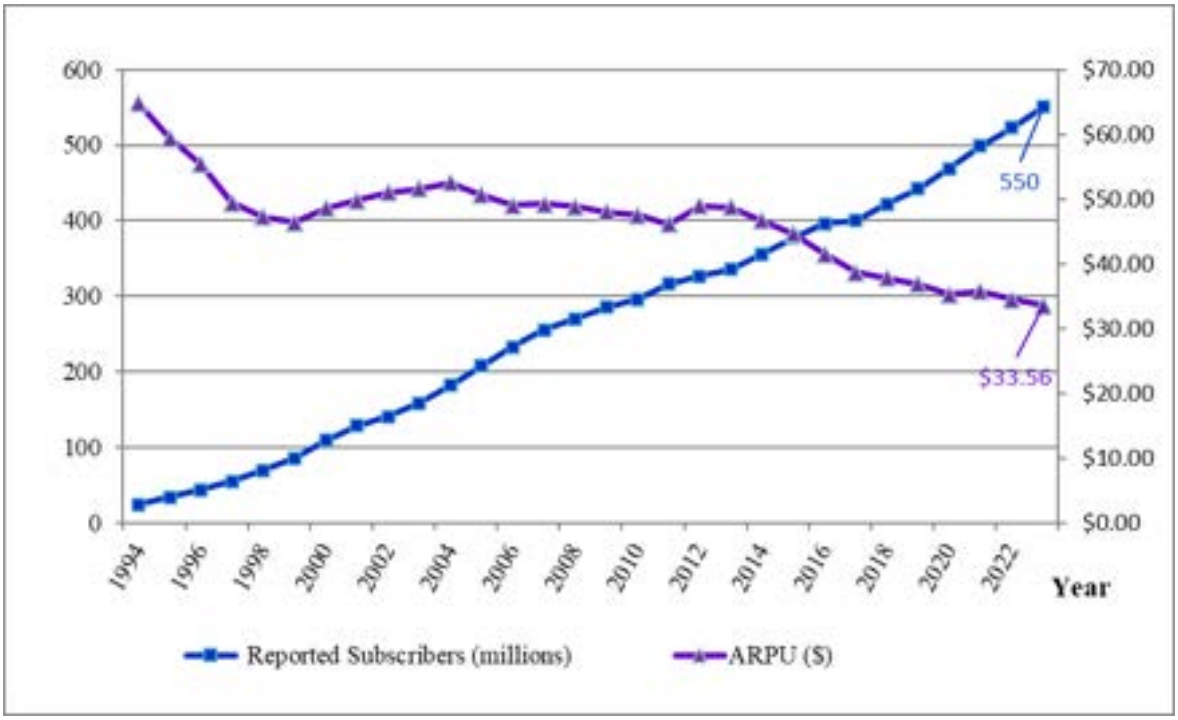
[260] *Id.* at 15595, Fig. II.B.16. Single-line pricing for Boost Mobile ranged from $50-$60, and 4 lines from $140-$180; for Cricket, a single line ranged from $55-$60, and 4 lines from $100-$130; for Metro, a single line ranged from $40-$60, and 4 lines from $100-$120; and for Straight Talk, a single line was priced from $45-$65, with no discount for four lines. Neither the current *Report* nor prior CMRs attempt or have attempted to completely account for all features offered by every plan, nor any fees that may be in addition to the monthly service rates.

[261] All CPI figures were taken from U.S. Bureau of Labor Statistics (BLS) databases. U.S. Bureau of Labor Statistics, *Home Page*, http://www.bls.gov (last visited Aug. 6, 2024). The index used in this analysis, the CPI for All Urban Consumers (CPI-U), represents over 90% of the total U.S. population. U.S. Bureau of Labor Statistics, *Consumer Price Index: Frequently Asked Questions*, https://www.bls.gov/cpi/questions-and-answers.htm (last visited Aug. 6, 2024). The CPI category "Telephone Services" has two components: Wireless telephone services and Residential telephone services (previously known as "Landline telephone services"); *see also* U.S. Bureau of Labor Statistics, *Consumer Price Index: How the Consumer Price Index Measures Price Change for Telephone Services*, https://www.bls.gov/cpi/factsheets/telephone-services.htm (last visited Aug. 6, 2024).

0.3%, respectively. The Wireless CPI increased in 2020 and 2021. During those same two years, the broader Telephone Services CPI increased by 0.4% and 0.6%, while the overall CPI increased by approximately 8.0% and 4.1%.[263]

88. *Average Revenue Per Unit (ARPU).* Various measures of ARPU are frequently used as a proxy for price, particularly in industries with multiple pricing plans and complicated rate structures, such as mobile wireless services.[264] As shown in Figure II.B.21 below, which is based on CTIA data, between 2021 and 2023 industry ARPU declined from $35.74 to $33.56, a decline of approximately 6%.[265] Pricing changes by service providers, such as the removal of overage charges, the move toward unlimited data plans, multiple line pricing, and Equipment Installment Plans have all contributed to the reported decline in ARPU over the last decade.[266]

Fig II.B.21
Total Wireless Subscribers/Connections, ARPU
1994-2023



Source: CTIA Year-End 2023 Wireless Industry Indices Report at 24-25, 44.

(Continued from previous page)

[262] *See, e.g.*, *2022 Communications Marketplace* Report, 37 FCC Rcd at 15596, para. 108; *2020 Communications Marketplace* Report, 36 FCC Rcd at 2977, para. 45; *2018 Communications Marketplace Report*, 33 FCC Rcd at 12574, para. 19.

[263] For changes in the CPI over time, *see infra* Appx. D-2 of this *Report*.

[264] *See, e.g.*, *2022 Communications Marketplace* Report, 37 FCC Rcd at 15596, para. 109 & n. 323; Patrick McCloughan and Sean Lyons, *Accounting for ARPU: New evidence from international panel data*, Telecommunications Policy 30, 521-32 (2006); Eun-A Park and Krishna Jayakar, *Competition between Standards and the Prices of Mobile Telecommunication Services: Analysis of Panel Data*, TPRC 2015 (Aug. 15, 2015).

[265] CTIA reported an industry average measure of ARPU which is "based on annual service revenues and average active revenue-generating subscriber units." CTIA Year-End 2023 Wireless Industry Indices Report at 44.

[266] Fig. II.B.21 presents more than 30 years of subscribers/connections and ARPU. For additional details on ARPUs from 1993 to 2023, *see infra* Appx. D-3 of this *Report*.

89. *Revenue Share by Service Provider.* As shown in Figure II.B.22, AT&T, T-Mobile, and Verizon experienced steadily increasing service revenues from 2021 through 2023. From 2020 to 2023, Verizon reported higher revenues than AT&T and T-Mobile, with AT&T and T-Mobile reporting nearly identical wireless service revenues as each other from 2021 to 2023.

Fig. II.B.22
Service Revenues and Shares Among Nationwide Wireless Service Providers 2020-2023 ($ millions)

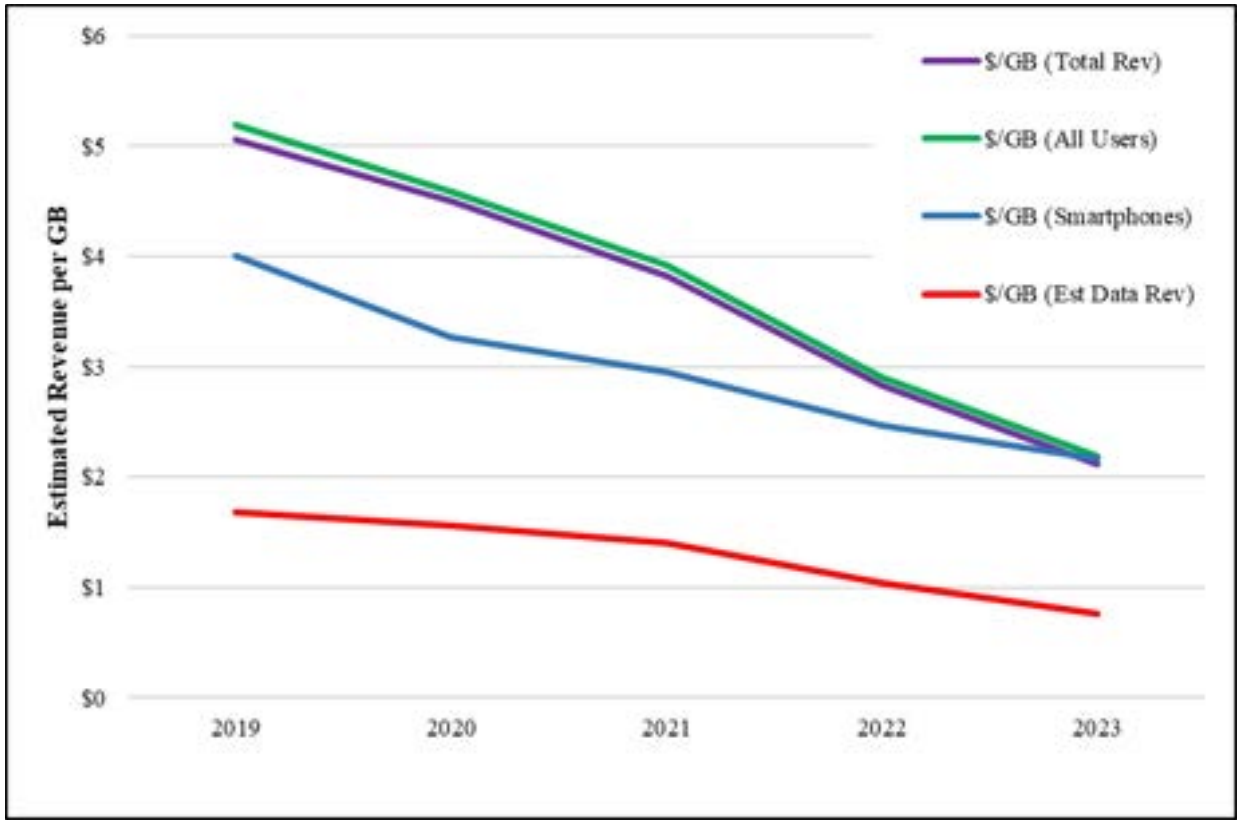
Service Providers	2020		2021		2022		2023	
	Revenue	*Revenue Share*	*Revenue*	*Revenue Share*	*Revenue*	*Revenue Share*	*Revenue*	*Revenue Share*
AT&T	55,542	29.5%	57,590	31.2%	60,499	30.8%	63,175	31.1%
T-Mobile	50,395	26.8%	58,369	31.6%	61,323	31.3%	63,241	31.1%
Verizon	82,433	43.8%	68,649	37.2%	74,354	37.9%	76,730	37.8%

Source: Annual and Quarterly SEC Filings from AT&T, T-Mobile, and Verizon.
Note: Verizon's Business Group did not completely separate wireless service revenues from other revenues in its filings prior to 2021, and accordingly its revenues are likely overstated in 2020. However, over 95% of business connections are wireless, so we expect the majority of business revenue to be associated with wireless connections.

90. *Estimated Average Revenue Per GB.* Given the variation in data plans, including shared plans, the lack of information on how much data users consume across these different plans, and the fact that revenues specific to data consumption are no longer reported by service providers, we lack the necessary information to precisely measure the price per GB of mobile broadband data. By making certain assumptions,[267] however, we can provide various industry-wide estimates of the average revenues per GB. Figure II.B.23 below shows four different estimates of the average revenue per GB, based on data from CTIA and the U.S. Census Bureau. All four estimates indicate that average revenue per GB has been declining. Specifically, as of year-end 2023, these estimates show a decrease of approximately 12% to 27% compared to 2022, and a decrease of approximately 46% to 58% compared to 2019.

[267] To derive $/GB (Total Rev), we divide the Total Service Revenues by the Total Wireless Data Traffic, assuming that 100% of service revenues are attributable to data. CTIA Year-End 2023 Wireless Industry Indices at 39, 12. To derive $/GB (All Users) and $/GB (Smartphones) we divide ARPU by the monthly average GB data usage, and we calculate this metric both for all users and for smartphone users only. This assumes that 100% of revenues are attributable to data and that average revenue is the same for both smartphone users and non-smartphone users. CTIA Year-End 2023 Wireless Industry at 44, 15. Finally, for $/GB (Est. Data Rev), we estimate the percentage of total revenues that are attributable to data by dividing Internet Access Service Revenues by Total Revenues for NAICS 5172. U.S. Census Bureau, *Service Annual Survey Latest Data (NAICS-basis): 2020* (Nov. 23, 2021), https://www.census.gov/data/tables/2022/econ/services/sas-naics.html (navigate to "Table 4: Estimated Sources of Revenue for Employer Firms: 2013 through 2022"). The 2023 data percentage was estimated based on the average growth rate across 2019 to 2022. We then applied these percentages to the CTIA data (Total Service Revenues/Total Wireless Data Traffic). CTIA Year-End 2023 Wireless Industry Indices at 39, 12. This does not take into account the fraction of revenues that are made up of messaging.

Fig. II.B.23
Estimates of Average Revenue per GB: 2019-2023



Source: CTIA Year-End 2023 Wireless Industry Indices Report at 12, 15, 39, 44; U.S. Census Bureau, 2020 Annual Service Survey.

5. Non-Price Factors

a. Investment

91. In the past five years, according to CTIA,[268] mobile wireless service providers invested nearly $163 billion in their networks, with service providers reporting nearly $30.2 billion in capital investment in 2023, down approximately 22% from $38.7 billion in 2022.[269] Alternatively, based on the most current data from their annual reports, the three largest providers, AT&T, T-Mobile, and Verizon, invested an estimated combined $32.6 billion in 2023.[270] From 2020 through 2022, as shown in Figure II.B.24, these three providers steadily increased their capital investment, although that figure declined in 2023. In 2023, these three providers spent 16.1% of their revenues on capital expenditure.[271] Based on estimates from their respective 10-Ks, in 2023, AT&T invested 19% of its wireless service revenue on

[268] CTIA Year-End 2023 Wireless Industry Indices Report at 47.

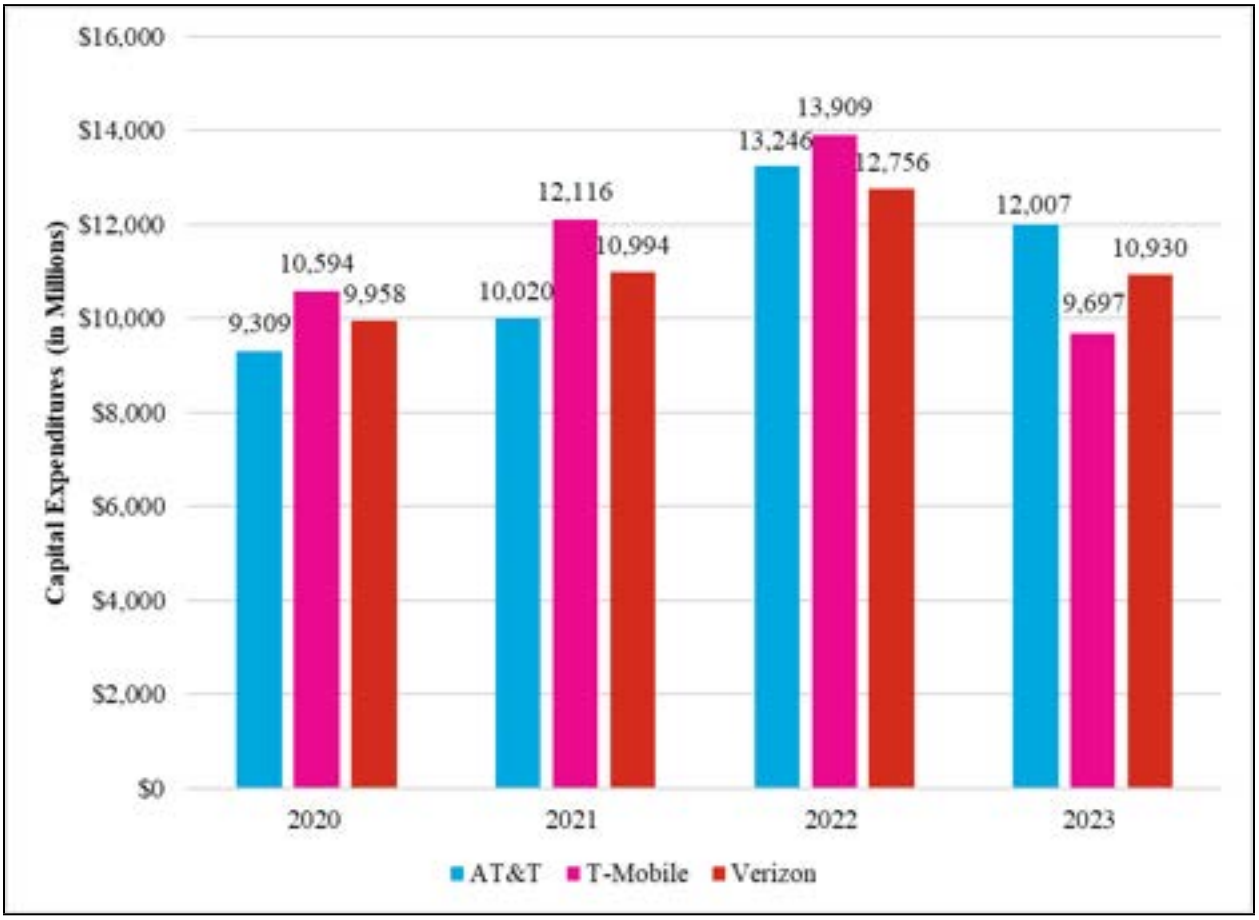
[269] *Id*.

[270] T-Mobile US, Inc., SEC Form 10-K, at 57 (filed Feb 2, 2024); AT&T Inc., SEC Form 10-K, at 24, 57 (filed Feb. 23, 2024); Verizon Communications, Inc., SEC Form 10-K, at 56, 100 (filed Feb. 9, 2024). AT&T and Verizon do not report wireless network investment separate from other business segments. To derive an estimate of wireless investment, we have divided wireless service revenues by total revenues and apply that fraction to the reported investments.

[271] T-Mobile US, Inc., SEC Form 10-K, at 57 (filed Feb 2, 2024); AT&T Inc., SEC Form 10-K, at 24, 57 (filed Feb. 23, 2024); Verizon Communications, Inc., SEC Form 10-K, at 56, 100 (filed Feb. 9, 2024).

capital expenditure, surpassing T-Mobile at 15.3% and Verizon at 14.2%.[272] Meanwhile, EchoStar has spent $2.6 billion in capital expenditures for wireless equipment in each of 2022 and 2023 to build out its own facilities-based 5G network.[273]

Fig. II.B.24
Wireless Capital Expenditures by Provider: 2020-2023



Source: Annual Reports for AT&T, T-Mobile, and Verizon.

92. The heightened level of capital investment has helped speed up wireless deployments. According to CTIA, for example, the three major wireless providers constructed their nationwide 5G networks 1.5 times more quickly than they constructed their 4G networks.[274] EchoStar indicates that it will have spent $10 billion to build the first nationwide cloud-native 5G network.[275] On July 14, 2023, it filed its buildout status report to the Commission, asserting that, as of June 14, 2023, it offered broadband

[272] T-Mobile US, Inc., SEC Form 10-K, at 57 (filed Feb. 2, 2024); AT&T Inc., SEC Form 10-K, at 24, 57 (filed Feb. 23, 2024); Verizon Communications, Inc., SEC Form 10-K, at 56, 100 (filed Feb. 9, 2024).

[273] EchoStar Corporation, SEC Form 10-K, at 93 (filed Feb. 29, 2024).

[274] CTIA Comments at ii.

[275] *See* EchoStar Corporation, SEC Form 10-K, at F-71 (filed Feb. 29, 2024) ("We currently expect capital expenditures, excluding capitalized interest, for our 5G Network Deployment to be approximately $10 billion . . . ").

coverage to over 246 million people in the United States, or approximately 73% of the U.S. population,[276] to meet its construction requirements.[277]

b. Innovation and Technological Change

93. In the past two years 5G coverage has further expanded: 5G's high bandwidth and low latency allow for greater scale and time-sensitivity for applications, in a way that was not possible with 4G LTE. 5G deployments have also generated various new streams of research and development in the wireless industry during the last few years.

94. *5G Deployment.* AT&T indicated covering over 300 million U.S. consumers with 5G, and over 24,900 cities and towns, as of June 2024.[278] Verizon stated that it expects to meet its target of 250 million consumers covered by 5G in 2024, and T-Mobile estimated that its 5G network covered 330 million people across two million square miles, as of March 2024.[279] As previously noted, EchoStar reported that as of June 2023, it covered 70% of the U.S. population with 5G.[280] According to FCC BDC data, in December 2023, approximately 97% of the U.S. population was covered by at least one 5G-NR service provider at speeds of at least 7/1 Mbps in an outdoor stationary environment and approximately 93% of the U.S. population was covered by at least one 5G-NR service provider at speeds of at least 35/3 Mbps in an outdoor stationary environment.[281]

95. *Massive Multiple Input, Multiple Output (MIMO) Technology.* One of the major advances of 5G-NR is that it has enabled adoption of Massive MIMO antenna technology in higher frequency bands.[282] Massive MIMO antennas, which consist of many more active antenna elements, allow for more paths for data transmission, leading to increased capacity.[283] These antennas also employ

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[276] DISH, *DISH Files 5G Network Buildout Status Report with the Federal Communications Commission (FCC)* (July 17, 2023), https://about.dish.com/2023-07-17-DISH-Files-5G-Network-Buildout-Status-Report-with-the-Federal-Communications-Commission-FCC; *see also supra* section II.B.1.

[277] *See Applications of American H Block Wireless L.L.C., DBSD Corporation, Gamma Acquisition L.L.C., and Manifest Wireless L.L.C. for Extension of Time*, WT Docket No. 18-197, Order of Modification and Extension of Time to Construct, 35 FCC Rcd 9599, Attach. A (WTB 2020).

[278] AT&T, *AT&T Rolls Out 5G+ Across the U.S.*, https://about.att.com/pages/5g-plus.html (last visited June 24, 2024).

[279] Seeking Alpha, *Verizon Communications Inc. (VZ) 2023 Wells Fargo 7th Annual TMT Summit Conference (Transcript)* (Nov. 28, 2023), https://seekingalpha.com/article/4654682-verizon-communications-inc-vz-2023-wells-fargo-7th-annual-tmt-summit-conference-transcript; T-Mobile, *From Big Cities to Small Towns and Places In Between, T-Mobile Customers are Getting a Massive 5G Boost* (Mar. 6, 2024), https://www.t-mobile.com/news/network/from-big-cities-to-small-towns-and-places-in-between-t-mobile-customers-are-getting-a-massive-5g-boost.

[280] DISH, *The DISH 5G Network is Now Available to Over 70 Percent of the U.S. Population* (June 15, 2023), https://about.dish.com/2023-06-15-The-DISH-5G-Network-is-Now-Available-to-Over-70-Percent-of-the-U-S-Population.

[281] FCC BDC data also show that AT&T covered approximately 85% and 55% of the U.S. population at speeds of at least 7/1 Mbps and 35/3 Mbps 5G, respectively, while T-Mobile covered approximately 92% and 84% at these speeds, and Verizon covered approximately 74% and 67%.

[282] Ericsson, *Massive MIMO for 5G Networks* at 4 (Feb. 2023), https://www.ericsson.com/49318c/assets/local/reports-papers/white-papers/massive-mimo-for-5g-networks.pdf. High bandwidth and low-latency use cases suited to massive MIMO include transportation, smart cities, smart manufacturing, high-density retail, augmented reality/virtual reality marketing, and healthcare. Larbi Belkhit, ABI Research, *5G Massive MIMO: What Is It and How Is It Being Used in Mobile Networks?* (Nov. 11, 2023), https://www.abiresearch.com/blogs/2023/11/30/massive-mimo/.

"beamforming" to steer a narrow beam to specific users, which lowers interference and improves signal quality.[284] Massive MIMO antennas therefore provide significant improvements to network capacity, coverage, and user experience.[285] Verizon, AT&T, T-Mobile, and EchoStar are all deploying massive MIMO antennas.[286]

96. *Carrier Aggregation.* Wireless service providers have also begun using different spectrum channels simultaneously to improve service quality, in a process called "carrier aggregation."[287] For example, carrier aggregation technology can coordinate between a low-band uplink and a high- or mid-band downlink, thus improving coverage, capacity, and speed.[288] Carrier aggregation is likely to play a key role in realizing service quality gains in standalone 5G networks.[289] AT&T, for example, was the first in the United States to aggregate two carriers in a standalone 5G uplink in 2023.[290] T-Mobile began rolling out four-carrier aggregation on its standalone 5G network in July 2023.[291] In January 2024, T-Mobile began working with Ericsson and Qualcomm to deploy a six-carrier aggregation, which, it stated, should result in speeds above 3.6 Gbps.[292]

97. *Network Slicing*. Another technology that takes advantage of the 5G standards is network slicing, where multiple virtual networks are run on a single network.[293] Slicing allows each of the

(Continued from previous page)

[283] Ericsson, Massive MIMO Handbook—Technology Primer at 32-34 (3rd ed. 2024), https://foryou.ericsson.com/massive-mimo-extended-third-edition-registration.html.

[284] Ericsson, *Massive MIMO for 5G Networks* at 4-6 (Feb. 2023), https://www.ericsson.com/49318c/assets/local/reports-papers/white-papers/massive-mimo-for-5g-networks.pdf.

[285] Larbi Belkhit, ABI Research, *5G Massive MIMO: What Is It and How Is It Being Used in Mobile Networks?* (Nov. 11, 2023), https://www.abiresearch.com/blogs/2023/11/30/massive-mimo/.

[286] Verizon has deployed over 130,000 Open RAN capable radios in its network which includes massive MIMO radios. Karen Schulz, Verizon, *Verizon Advances O-RAN Technology by Deploying 130,000 New O-RAN Capable Radios in Its Network* (Feb. 5, 2024), https://www.verizon.com/about/news/verizon-advances-o-ran-technology. Ericsson will deploy Open RAN massive MIMO solutions on AT&T's network as part of a $14 billion network transformation. Ericsson, *Ericsson and AT&T Strategic Agreement to Pioneer Networks of the Future* (Dec. 4, 2023), https://www.ericsson.com/en/news/2023/12/ericsson-and-att-in-major-future-network-of-the-future-deal. Use of 5G Multi-user MIMO appears to improve performance on T-Mobile's network. Monica Alleven, Fierce Network, *T-Mobile's 5G Network Gets Capacity Boost from MU-MIMO: Report* (Jan. 18, 2023), https://www.fierce-network.com/tech/t-mobiles-5g-network-gets-capacity-boost-mu-mimo-report. EchoStar's Open RAN includes Samsung massive MIMO radios. Press Release, Samsung, DISH Wireless Selects Samsung Electronics for 5G Open Radio Access Network Rollout (May 3, 2022), https://www.samsung.com/global/business/networks/insights/press-release/0502-dish-wireless-selects-samsung-electronics-for-5g-open-radio-access-network-rollout/.

[287] Ericsson, *Carrier Aggregation in 5G*, https://www.ericsson.com/en/ran/carrier-aggregation (last visited June 26, 2024).

[288] *Id.*

[289] Nokia, *5G Carrier Aggregation Explained*, https://www.nokia.com/about-us/newsroom/articles/5g-carrier-aggregation-explained/ (last visited June 26, 2024).

[290] Jason Sikes, AT&T, *Taking 5G to the Next level with Standalone 5G* (Apr. 18, 2023), https://about.att.com/blogs/2023/standalone-5g-innovations.html.

[291] Press Release, T-Mobile, T-Mobile Revs Up 5G with Four-Carrier Aggregation (July 25, 2023), https://www.t-mobile.com/news/network/t-mobile-revs-up-5g-with-four-carrier-aggregation.

[292] Press Release, T-Mobile, T-Mobile Delivers Another World's First with 6-Carrier Aggregation (Jan. 4, 2024), https://www.t-mobile.com/news/network/t-mobile-delivers-another-worlds-first-with-6-carrier-aggregation

[293] Gary Hilson, Verizon, *What is 5G Network Slicing?*, https://www.verizon.com/business/resources/articles/s/5g-network-slicing-do-you-have-the-team-you-need/ (last visited June 26, 2024).

component networks to be optimized for its own specific use case, thus increasing the efficiency and flexibility of the network as a whole.[294] Potential use cases exist in healthcare, mining, energy, manufacturing, and education.[295] Numerous firms have been working on 5G network slicing, including Verizon,[296] T-Mobile,[297] Cisco in conjunction with EchoStar,[298] and Nokia, A1 in conjunction with Microsoft.[299]

98. *Standalone 5G.* Most of the initial deployments of 5G were non-standalone—that is, the use of 5G radios but built around an LTE core.[300] A non-standalone deployment allows the network provider to switch between 5G and 4G LTE depending on the application and on the devices its subscriber is seeking to connect to a network antenna/cell. However, standalone 5G, in which the core is also 5G, has been deployed in some areas by T-Mobile, AT&T, and EchoStar.[301] Standalone 5G is faster, provides more coverage through carrier aggregation, and supports higher device density, lower latencies, real-time usage, and better security.[302] Moreover, a particular benefit of standalone 5G is that it permits network slicing. Equipment vendor, Spirent, for example, predicts much more deployment of standalone 5G in 2024.[303]

99. *Open Radio Access Network (RAN).* Traditional RAN hardware is proprietary to its

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[294] Christ Stokel-Walker, Business Insider, *Network Slicing Can Make 5G Even More Effective, but It Introduces Risk. Here's What You Need to Know to Build a Resilient Network* (Nov. 7, 2023), https://www.businessinsider.com/network-slicing-5g-more-effective-risks-2023-11. Haseeb Akhtar, Ranjeet Bhattacharya, and Jeffrey Marks, Ericsson, *Network Slicing for 5G Success* (Oct. 26, 2023), https://www.ericsson.com/en/blog/2023/10/network-slicing-for-5g-success.

[295] Haseeb Akhtar, Ranjeet Bhattacharya, and Jeffrey Marks, Ericsson, *Network Slicing for 5G Success* (Oct. 26, 2023), https://www.ericsson.com/en/blog/2023/10/network-slicing-for-5g-success.

[296] Karen Schulz, Verizon, *Verizon Accelerates Network Slicing Technology with New Public Safety Use Case* (Nov. 28, 2023), https://www.verizon.com/about/news/network-slicing-technology-public-safety; Dan Jones, Fierce Network, *Verizon: Network Slicing Operational but In Trials* (Apr. 1, 2024), https://www.fierce-network.com/5g/verizon-network-slicing-operational-trials.

[297] Kelly Hill, RCR Wireless News, *T-Mobile US Expands Network Slicing Beta Access, Unveils 'Security Slice' Service* (Sep. 27, 2023), https://www.rcrwireless.com/20230927/5g/t-mobile-us-expands-network-slicing-beta-access-unveils-security-slice-service.

[298] Cisco, *Cisco and DISH Wireless Test 5G Hybrid Cloud Network Slicing Solution, Speeding Launch of New Enterprise Services* (Feb. 21, 2024), https://newsroom.cisco.com/c/r/newsroom/en/us/a/y2024/m02/cisco-and-dish-wireless-test-5g-hybrid-cloud-network-slicing-solution-speeding-launch-of-new-enterprise-services.html.

[299] Press Release, Nokia, Nokia, A1 and Microsoft Deploy Industry's First 5G Edge Cloud Network Slicing Solution for Enterprises (Feb. 13, 2024), https://www.5gamericas.org/nokia-a1-and-microsoft-deploy-industrys-first-5g-edge-cloud-network-slicing-solution-for-enterprises/; Dan Meyer, SDxCentral, *Nokia and Microsoft Run Multimedia Network-slicing Trial* (Feb. 15, 2024), https://www.sdxcentral.com/articles/news/nokia-and-microsoft-run-multimedia-network-slicing-trial/2024/02/.

[300] Karim Yaici, GSMA, *Faster Speeds and the Promise of New Use Cases is Driving 5G SA* Adoption (July 31, 2024), https://www.gsma.com/get-involved/gsma-membership/gsma_resources/faster-speeds-and-the-promise-of-new-use-cases-is-driving-5g-sa-adoption/.

[301] Alan Friedman, Phone Arena, *Verizon Trails T-Mobile and AT&T Over Use of the Superior 5G Standalone Network* (Jan. 7, 2024), https://www.phonearena.com/news/verizon-use-of-5g-sa-network-delayed_id154094; Dave Bolan, Dell'Oro Group, *Exploring the 5G Core Market Landscape in 2024* (Jan. 10, 2024), https://www.delloro.com/exploring-the-5g-core-market-landscape-in-2024/.

[302] Ericsson, *5G Standalone*, https://www.ericsson.com/en/5g/5g-sa (last visited Aug. 15, 2024).

[303] David Maliniak, Microwaves & RF, *2024 5G Outlook: Standalone Deployments and Private Networks Dominate* (Apr. 2, 2024), https://www.mwrf.com/technologies/communications/wireless/article/55001272/2024-5g-outlook-standalone-deployments-and-private-networks-dominate.

manufacturer and is not compatible with components from other vendors. Wireless service providers are therefore locked-in to a single vendor by a "closed" RAN system. Open RAN is an alternative architecture in which all components follow standards that allow interoperability with other Open RAN components.[304] The elimination of vendor lock-in allows greater flexibility in network design and maintenance, which could increase performance.[305] It could also potentially reduce costs by allowing more competition in the markets for components.[306] Open RAN also can facilitate virtualized RAN by allowing network architecture that would not be possible under proprietary closed solutions.[307]

100. Currently, the largest Open RAN deployment in the United States is EchoStar's 5G network, covering an estimated 246 million Americans.[308] Beginning in 2020, Inland Cellular has deployed Open RAN in rural areas of Idaho.[309] OptimERA in Alaska is also developing an Open RAN.[310] In 2023, AT&T announced it would spend $14 billion over 5 years to shift 70% of its wireless traffic to Open RAN.[311] In 2024, Verizon reported that its network had 130,000 radios capable of using Open RAN specifications.[312]

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[304] *Promoting the Deployment of 5G Open Radio Access Networks*, GN Docket No. 21-63, Notice of Inquiry, 36 FCC Rcd 5947, 5949, para. 5 (2021). The deployment of Open RAN can only occur using standalone 5G networks, thus the Commission has allocated up to an additional $900 million of support in conjunction with implementation of the 5G Fund solely for the purpose of incentivizing providers to deploy Open RAN. *Establishing a 5G Fund for Rural America*, GN Docket No. 20-32, Second Report and Order, Order on Reconsideration, and Second Further Notice of Proposed Rulemaking, FCC 24-89, at 71-72, para. 139 (Aug. 29, 2024).

[305] *See*, *e.g.*, Airhop Comments, GN Docket No. 21-63, at 4; ARM Comments, GN Docket No. 21-63, at 4; AT&T Comments, GN Docket No. 21-63, at 11; CTIA Comments, GN Docket No. 21-63, at 9; Fujitsu Comments, GN Docket No. 21-63, at 6; HPE Comments, GN Docket No. 21-63, at 7; Google Comments, GN Docket No. 21-63, at 3; Samsung Comments, GN Docket No. 21-63, at 3-4; Telefonica Comments, GN Docket No. 21-63, at 3; Verizon Comments, GN Docket No. 21-63, at 11; VMware Comments, GN Docket No. 21-63, at 7; OTI Reply, GN Docket No. 21-63, at 1; VMware Reply, GN Docket No. 21-63, at 2.

[306] *See*, *e.g.*, CCA Comments, GN Docket No. 21-63, at 3; CommScope Comments, GN Docket No. 21-63, at 2; Dell Comments, GN Docket No. 21-63, at 5; Fujitsu Comments, GN Docket No. 21-63, at 6, 12; NTT Comments, GN Docket No. 21-63, at 10; ONF Comments, GN Docket No. 21-63, at 5; ORPC Comments, GN Docket No. 21-63, at 23; Rakuten Comments, GN Docket No. 21-63, at 3; Samsung Comments, GN Docket No. 21-63, at 3; Telefonica Comments, GN Docket No. 21-63, at 3; Xlinx Comments, GN Docket No. 21-63, at 7; Altiostar Reply, GN Docket No. 21-63, at 2; Dell Reply, GN Docket No. 21-63, at 1; OTI Reply, GN Docket No. 21-63, at 2.

[307] Nokia, *Update: Open RAN Explained*, https://www.nokia.com/about-us/newsroom/articles/open-ran-explained/ (last visited June 26, 2024).

[308] DISH, *DISH Wireless Awarded $50 Million NTIA Grant for 5G Open RAN Integration and Deployment Center* (Jan. 10, 2022), https://about.dish.com/2024-01-10-DISH-Wireless-Awarded-50-Million-NTIA-Grant-for-5G-Open-RAN-Integration-and-Deployment-Center.

[309] Bevin Fletcher, Fierce Network, *Inland Cellular Tests Out Open RAN for Rural Areas* (Apr. 14, 2022), https://www.fierce-network.com/tech/inland-cellular-tests-out-open-ran-rural-areas; Jeanne Whalen, Washington Post, *A Remote Corner of Idaho Has Become the Best Hope for the U.S. Challenge to Huawei* (June 29, 2020), https://www.washingtonpost.com/business/2020/06/29/huawei-alternative-oran-idaho/.

[310] Hema Kadia, TeckNexus, *Current State of Open RAN—Americas* (Nov. 5, 2023), https://tecknexus.com/5g-network/5g-magazine-open-ran-june-2021/current-state-of-open-ran-americas/; PR Newswire, *OptimERA Selects Parallel Wireless to Bring Wireless Broadband in Alaska* (Sep. 16, 2019), https://www.prnewswire.com/news-releases/optimera-selects-parallel-wireless-to-bring-wireless-broadband-in-alaska-300917935.html.

[311] Ericsson, *AT&T to Accelerate Open and Interoperable Radio Access Networks (RAN) in the United States Through New Collaboration with Ericsson* (Dec. 4, 2023), https://www.ericsson.com/en/press-releases/2023/12/att-to-accelerate-open-and-interoperable-radio-access-networks-ran-in-the-united-states-through-new-collaboration-with-ericsson.

101. *Fixed Wireless Access (FWA).* 5G's increased spectral efficiency has made it a viable technology for FWA. 5G achieves this spectral efficiency through the use of Massive MIMO, beamforming to fixed modems, and switching between beams for optimal signal quality.[313] Moreover, FWA can be less costly and more-rapidly deployed compared to other types of fixed broadband service,[314] and consumer antennas can be installed by consumers themselves without the need for company installers.[315] In some areas, AT&T, Verizon, T-Mobile, and UScellular offer FWA services using their 5G networks as they compete for fixed broadband customers.[316] According to one research group, while cable and wireline telephone companies suffered net losses of over 140,000 fixed wireline broadband subscribers in 2023, FWA had over 3.6 million net additions over the same period.[317] Verizon and T-Mobile together added over 3.1 million FWA customers in 2022 and over 3.6 million FWA customers in 2023.[318] Further, AT&T had over 200,000 FWA customers as of April 2024.[319] Regional service providers such as Carolina West Wireless, Cellcom, Cellular One, and Union have also been using fixed wireless to serve remote areas,[320] and UScellular has been exploring FWA using standalone 5G.[321]

102. *Internet of Things (IoT).* IoT refers to networks of physical objects that can communicate with each other through Internet connections.[322] Several wireless device-connectivity IoT solutions have appeared in recent years, including Low-Power Wide-Area Networks, Narrowband IoT, and Long Range.[323] 5G can be especially useful for IoT given its high bandwidth, speed and reliability, low latency, and its ability to handle many devices at the same time.[324] CISCO and TELUS are launching IoT services

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[312] Karen Schulz, Verizon, *Verizon Advances O-RAN Technology by Deploying 130,000 New O-RAN Capable Radios in Its Network* (Feb. 5, 2024), https://www.verizon.com/about/news/verizon-advances-o-ran-technology.

[313] Robert Wyrzykowski, Open Signal, *5G Fixed Wireless Access (FWA) Success in the US: A Roadmap for Broadband Success Elsewhere?* (June 6, 2024), https://www.opensignal.com/2024/06/06/5g-fixed-wireless-access-fwa-success-in-the-us-a-roadmap-for-broadband-success-elsewhere.

[314] CTIA Comments at 15.

[315] Nick Ludlum, CTIA, *5G Home Broadband Continues to Bring Real Competition to Cable* (Jan. 31, 2024), https://www.ctia.org/news/5g-home-broadband-continues-to-bring-real-competition-to-cable.

[316] Mark Giles, Ookla, *U.S.—The Rise of 5G FWA & The Battle for Fixed Broadband Customers* (Dec. 20, 2023), https://www.ookla.com/articles/fixed-wireless-access-us-q3-2023.

[317] Leichtman Research Group, Research Notes 1Q 2024 at 4 (2024), https://leichtmanresearch.com/wp-content/uploads/2024/03/LRG-Research-Notes-1Q-2024.pdf.

[318] *Id.*

[319] Jeff, Baumgartner, Light Reading, *AT&T Doubles 'Internet Air' Subscriber Tally in Q1* (Apr. 24, 2024), https://www.lightreading.com/fixed-wireless-access/at-t-doubles-internet-air-subscriber-tally-in-q1.

[320] CTIA, Regional Wireless Providers: Closing the Digital Divide & Growing Local Economies Across the U.S. at 6-8, 10, 16 (Mar. 2024), https://api.ctia.org/wp-content/uploads/2024/03/Regional-Wireless-Providers-Report.pdf.

[321] Monica Alleven, Fierce Network, *UScellular Eyes FWA for First 5G SA Use Case* (May 16, 2024), https://www.fierce-network.com/wireless/uscellular-eyes-fwa-first-5g-sa-core-use-case.

[322] Oracle, *What is IoT?*, https://www.oracle.com/internet-of-things/what-is-iot/ (last visited June 25, 2024).

[323] George Hardesty, Data Alliance, *Top 20 Wireless Technologies Poised for Fast Growth in 2024* (Dec. 3, 2023), https://www.data-alliance.net/blog/top-20-wireless-technologies-poised-for-significant-growth-in-2023-and-2024/.

[324] Telia Company, *Real-World Examples of How 5G Is Reshaping IoT* (May 15, 2024), https://www.iotforall.com/real-world-examples-of-how-5g-is-reshaping-iot; Gary Wang, *5G Networks Can Catapult AI, IoT Capabilities Throughout the Defense Sector* (Feb. 29, 2024), https://federalnewsnetwork.com/commentary/2024/02/5g-networks-can-catapult-ai-iot-capabilities-throughout-the-defense-sector/.

to take advantage of 5G capabilities, with a focus on connected cars.[325] Sateliot planned to launch four LEO satellites with global coverage in July 2024 to support 5G standards for IoT.[326] AI and edge computing can further enhance the efficiency of IoT processes by allowing real-time and local information processing that is rapidly transmitted by 5G.[327] Industrial settings are particularly well suited to 5G IoT as 5G allows synchronized orchestration of many devices in factories without expensive-to-maintain wiring systems.[328] The 3rd Generation Partnership Project (3GPP)[329] recently introduced a new tier of reduced capability "RedCap" devices as a version of 5G-NR that is more suited to the medium-performance requirements of IoT applications,[330] and service providers, including AT&T, have expressed interest in 5G RedCap.[331]

103. *Private Networks*. 5G is also enabling the introduction and use of Private Networks—small wireless networks dedicated to the services of a single private entity.[332] 5G's high bandwidth and low-latency make private wireless networks a potential replacement for private wired networks,[333] and several large corporations and entities, including, for example, Tesla, Johnson & Johnson, Audi,

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[325] Cisco, *Cisco and TELUS Pave the Road for Enhanced Connected Car Experiences and New Revenue Opportunity for Carmakers* (Feb. 25, 2024), https://newsroom.cisco.com/c/r/newsroom/en/us/a/y2024/m02/cisco-and-telus-5g-standalone-network-paves-the-road-for-enhanced-connected-car-experiences-and-revenue-opportunity-for-carmakers.html.

[326] Joe O'Halloran, *Sateliot to Launch Four Satellites in 5G IoT Programme* (June 4, 2024), https://www.computerweekly.com/news/366587456/Sateliot-to-launch-four-satellites-in-5G-IoT-programme.

[327] Joe McKendrick, *AI at the Edge: 5G and the Internet of Things See Fast Times Ahead* (Dec. 8, 2023), https://www.zdnet.com/article/ai-at-the-edge-fast-times-ahead-for-5g-and-the-internet-of-things/.

[328] Industrial Ethernet Book, *2023 Industrial Wireless Technology Update* (Nov. 20, 2023), .https://iebmedia.com/technology/iiot/2023-industrial-wireless-technology-update/; David Joosten, Forbes, *5G, AI and IoT: The Dream Team for Modern Manufacturing* (July 24, 2023), https://www.forbes.com/sites/forbestechcouncil/2023/07/24/5g-ai-and-iot-the-dream-team-for-modern-manufacturing/?sh=5aa1dc1d290a.

[329] 3GPP unites seven telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as "Organizational Partners" providing their members with a stable environment to produce the Reports and Specifications that define 3GPP technologies. 3GPP specifications cover cellular telecommunications technologies, including radio access, core network and service capabilities, which provide a complete system description for mobile telecommunications. The 3GPP specifications also provide hooks for non-radio access to the core network, and for interworking with non-3GPP networks. 3GPP, *Introducing 3GPP,* https://www.3gpp.org/about-us/introducing-3gpp (last visited Sept. 25, 2024).

[330] Kiran Mukkavilli, Qualcomm, *5G NR-Light (RedCap): Revolutionizing IoT | Qualcomm* (July 18, 2022), https://www.qualcomm.com/news/onq/2022/07/what-is-5g-nr-light--a-k-a--redcap--and-how-will-it-accelerate-t; Ericsson, RedCap - Expanding the 5G Device Ecosystem for Consumers and Industries at 3-4 (Feb. 2023), https://www.ericsson.com/493d70/assets/local/reports-papers/white-papers/redcap-5g-iot-for-wearables-and-industries.pdf.

[331] Joe O'Halloran, Computer Weekly, *Qualcomm Reveals Operator Support for 5G RedCap* (Nov. 10, 2023), https://www.computerweekly.com/news/366559033/Qualcomm-reveals-operator-support-for-5G-RedCap; Jason Sikes, AT&T, *5G for Internet of Things Gains Ground* (Aug. 3, 2023), https://about.att.com/blogs/2023/5g-redcap.html.

[332] Keith Shaw, Verizon, *What is a Private Network*?, https://www.verizon.com/business/resources/articles/s/what-is-a-private-network/ (last visited June 25, 2024).

[333] SNS Telecom & IT, *Private 5G Networks: 2024–2030–Opportunities, Challenges, Strategies & Forecasts* (July 2024), https://www.snstelecom.com/private5g.

Cummins, Nvidia and the Disc Golf Pro Tour,[334] have expressed interest in deploying them in the automotive, manufacturing, healthcare, ports, logistics, and entertainment fields.[335] 5G private network deployments could either involve dedicated physical infrastructure and spectrum or network slicing on a public network.[336] These networks could allow new capabilities, such as augmented reality applications, precision robotics and real-time decision making, in addition to improving speed, innovation, security and savings.[337]

104. *Artificial Intelligence (AI).* AI is likely to transform the future of wireless networks.[338] Over the last few years, the use of AI in many applications has increased rapidly.[339] As networks grow ever more complex, AI and machine learning (ML) are expected to be essential in optimizing network configuration and spectrum utilization.[340] Cisco has suggested that AI can be used to increase automation, monitor network health, and more effectively troubleshoot networks.[341] Many companies have already incorporated AI in communication tasks such as troubleshooting, power saving, and MIMO detection.[342] Qualcomm predicts AI will optimize distributed clouds, create intelligent disaggregated networks, evolve air interface design, and optimize smart edge devices.[343] In addition, to AI helping improve 5G wireless networks, these same wireless networks may also enhance AI applications. For example, with better

[334] Mike Dano, Light Reading, *High-profile Clientele Help Accelerate Private Wireless* (June 4, 2024), https://www.lightreading.com/private-networks/high-profile-clientele-help-accelerate-private-wireless.

[335] Anne Morris, Fierce Network, *Private 5G or a Network Slice? Depends on the Use Case, Say BT and Telenor* (May 8, 2024), https://www.fierce-network.com/wireless/private-5g-or-network-slice-depends-use-case-say-bt-and-telenor.

[336] RedHat, *What is private 5G?*, https://www.redhat.com/en/topics/5g-networks/what-is-private-5g (last visited Aug. 15, 2024).

[337] Juan Pedro Tomás, RCR Wireless News, *How Will Private Networks Accelerate Digital Transformation?* (June 6, 2024), https://www.rcrwireless.com/20240606/fundamentals/private-networks-enable-firms-accelerate-digital-transformation.

[338] While AI is difficult to define, AI generally refers to computational technology that is highly effective at performing an action and taking account of the environment. For example, a popular AI textbook lists eight different historical definitions of AI in its introductory chapter. Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach 2 (3d ed. 2010) (Russell and Norvig, 2010).

[339] Nestor Maslej, et al., Artificial Intelligence Index Report 2024 at 3-4 (Apr. 2024), https://aiindex.stanford.edu/wp-content/uploads/2024/04/HAI_2024_AI-Index-Report.pdf.

[340] George Hardesty, Data Alliance, *Top 20 Wireless Technologies Poised for Fast Growth in 2024* (Dec. 3, 2023), https://www.data-alliance.net/blog/top-20-wireless-technologies-poised-for-significant-growth-in-2023-and-2024/; Kristen Beckman, WIA, *What's Ahead for Wireless in 2024? Industry Leaders Weigh In* (Jan. 8, 2024), https://wia.org/whats-ahead-for-wireless-in-2024-industry-leaders-weigh-in/; Help Net Security, *Future of Wireless Technology: Key Predictions for 2024* (Dec. 22, 2023), https://www.helpnetsecurity.com/2023/12/22/wireless-technology-2024-predictions/.

[341] Cisco, *What is Artificial Intelligence in Networking?* https://www.cisco.com/c/en/us/solutions/artificial-intelligence/artificial-intelligence-machine-learning-in-networking.html (last visited June 26, 2024).

[342] Erin Winick, ENGINEERING.com, *The Next Generation of Wireless Will Be Powered by AI* (Oct. 12, 2023), https://www.engineering.com/story/the-next-generation-of-wireless-will-be-powered-by-ai.

[343] Taesang Yoo, Tingfang Ji, & Danny Tseng, Qualcomm, *Wireless AI: Igniting the 5G Advanced Technology Revolution* (July 13, 2023), https://www.qualcomm.com/news/onq/2023/07/wireless-ai-igniting-the-5g-advanced-technology-revolution.

wireless devices, on-device AI learning may become possible, which could allow learning to be distributed across millions of devices and also personalized to particular users.[344]

105. *Edge Computing.* Edge computing refers to the placement of computational resources close to data sources in networks.[345] Placing computational resources close to users can reduce latency, increase security, and lower cost.[346] Edge computing is complementary to 5G because 5G reduces latency from device to the radio tower, and edge computing reduces latency from the radio tower to the computing resources.[347] Many applications of edge computing are IoT based and can be bundled with 5G private networks.[348] The need for fast computation in AI is increasing demand for edge computing, with one Lenovo executive estimating that "75% of data compute is moving to the edge."[349]

106. *Supplemental Coverage from Space (SCS).* Improvements in beamforming and antenna technology and more affordable LEO satellites now allow mobile wireless services to use satellites as transmission sites instead of cell towers.[350] In 2022, the 3GPP adopted 5G standards for connecting satellites with mobile devices.[351] The Commission has referred to this new technology as SCS.[352] In 2024, the Commission adopted final rules to establish the SCS framework, allowing mobile wireless service providers and satellite operators to collaborate to enable smartphone users to stay connected even in areas where there is no terrestrial mobile service.[353] Under this framework, wireless service providers, together with satellite operators seek Commission authorization to operate space stations on certain licensed, flexible-use spectrum currently allocated to wireless services, provided they satisfy certain licensing prerequisites—including having a spectrum lease from a terrestrial licensee within a specified geographic area.[354] Once authorized, a satellite operator can then serve a wireless provider's customers should they need connectivity outside of coverage areas. SCS provides one means to facilitate Satellite

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[344] Gareth Owen, Light Reading, *5G Advanced and Wireless AI Set to Transform Cellular Networks, Unlocking True Potential* (Dec. 3, 2023), https://www.lightreading.com/5g/5g-advanced-and-wireless-ai-set-to-transform-cellular-networks-unlocking-true-potential.

[345] IBM, *What is Edge Computing?,* https://www.ibm.com/topics/edge-computing (last visited June 26, 2024); Accenture, *What is Edge Computing?,* https://www.accenture.com/us-en/insights/cloud/edge-computing-index (last visited June 26, 2024).

[346] IBM, *What is Edge Computing?,* https://www.ibm.com/topics/edge-computing (last visited June 26, 2024); Accenture, *What is Edge Computing?,* https://www.accenture.com/us-en/insights/cloud/edge-computing-index (last visited June 26, 2024).

[347] Telefónica, *What is the Relationship Between 5G and Edge Computing,* https://www.telefonica.com/en/communication-room/blog/relationship-5g-edge-computing/ (last visited June 26, 2024).

[348] Ericsson, Edge Computing and Deployment Strategies for Communication Service Providers, 2023 Edition at 7 (2023), https://www.ericsson.com/49f4a5/assets/local/edge-computing/doc/edge-computing-deployment-report-2023.pdf.

[349] Ryan Heath, Axios, *AI Drives Explosion in Edge Computing* (Feb. 16, 2024), https://www.axios.com/2024/02/16/ai-edge-computing-5g,

[350] Lucas Laursen, IEEE Spectrum, *Satellites Are Becoming the New Cellphone Towers* (Jan. 29, 2024), https://spectrum.ieee.org/satellite-cellphone-starlink.

[351] MSSA Comments at 2-3.

[352] *Single Network Future: Supplemental Coverage From Space; Space Innovation*, GN Docket No. 23-65, IB Docket No. 22-271, Report and Order and Further Notice of Proposed Rulemaking, 39 FCC Rcd 2622 (2024) (*Supplemental Coverage from Space Report and Order*).

[353] *Id.*

[354] *Id.* at 2623, para. 4.

Direct-to-Device (D2D) communications.[355] In section II.D.2, we discuss provision of D2D services using Mobile Satellite Service (MSS) spectrum.[356]

107. In 2022, T-Mobile and SpaceX announced their "Direct to Cell" service, which would eventually use SpaceX's LEO satellite network to provide "universal coverage" for wireless services, and suggested global expansion for satellite-based roaming.[357] SpaceX intends to provide text SCS starting in Fall 2024, and voice, data, and IoT SCS starting in 2025.[358] On November 26, 2024, SB authorized SpaceX to provide SCS within the United States and to operate on certain frequency bands for the purpose of direct-to-cellular operations outside the United States using its previously authorized 7,500 Gen2 Starlink satellites.[359] SpaceX has also requested and received Special Temporary Authority (STA) to provide SCS in areas of the United States affected by Hurricanes Helene and Milton.[360] Similarly, AT&T and AST SpaceMobile have sought Commission approval for a spectrum lease agreement that would allow AST SpaceMobile to use AT&T's spectrum to offer direct-to-cellular service.[361] Relatedly, AST is seeking a U.S. license for its SpaceMobile satellite system with a planned constellation of 248 LEO satellites.[362] Numerous other companies have been developing application of mobile satellite

[355] *See generally* MSSA Comments; *see also* EchoStar Comments at 26-27; SIA Reply at 12-13.

[356] Compared to terrestrial spectrum, MSS frequencies can be quickly implemented for satellite D2D service, but require mobile phones that are able to access the MSS frequencies. By comparison, terrestrial spectrum has the advantage that it is backwardly-compatible with existing mobile phones. *See* Lluc Palerm & Jiachen Zhang, Analysys Mason, *Satellite Direct-to-Device Technology Needs to Evolve Through Four Phases Before Reaching its Full Potential* (Mar. 4, 2024), https://www.analysysmason.com/research/content/articles/satellite-d2d-phases-nsi039/.

[357] Press Release, T-Mobile, T-Mobile Takes Coverage Above and Beyond with SpaceX (Aug. 25, 2022), https://www.t-mobile.com/news/un-carrier/t-mobile-takes-coverage-above-and-beyond-with-spacex; *see also Single Network Future: Supplemental Coverage from Space*; *Space Innovation*, GN Docket No. 23-65, IB Docket No. 22-271, Notice of Proposed Rulemaking, 38 FCC Rcd 2790, 2793, para. 7 (2023) (*Supplemental Coverage from Space NPRM*).

[358] Starlink, *Starlink Direct to Cell*, https://www.starlink.com/business/direct-to-cell (last visited June 27, 2024).

[359] *Space Exploration Holdings, LLC, Request for Deployment and Operating Authority for the SpaceX Gen2 NGSO Satellite System, Application for Authority for Modification of the SpaceX NGSO Satellite System to Add a Direct to Cellular System, Application for Modification of the SpaceX V-band Satellite System, Space Bureau and Wireless Telecommunications Bureau Seek Comment on Filings of SpaceX and T-Mobile Requesting to Establish Supplemental Coverage from Space*, SAT-LOA-20200526-00055, SAT-AMD-20210818-00105, SAT-AMD-20221216-00175, SAT-AMD-20241017-00228, Call Sign: S2992/3069, SAT-MOD-20230207-00021, SAT-AMD-20240322-00061, Call Sign: S3069, SAT-MOD-20240423-00089, Call Sign: S2992/3069, GN Docket No. 23-135, Order and Authorization, DA 24-1193, at 2, 11, paras. 1, 16 (SB Nov. 26, 2024).

[360] *See* ICFS File Nos. SAT-STA-20241007-00215 (granted Oct. 4, 2024 and renewed Oct. 23, 2024); SAT-STA20241007-00216 (granted Oct. 7, 2024 and renewed Oct. 23, 2024).

[361] ULS File Nos. 0010538493 (lead), 0010538588, 0010538610, 0010538635, 0010538647, 0010538661, and 0010538682; *see also* Rachel Jewett, Via Satellite, *AT&T Signs Commercial Agreement With AST SpaceMobile for Satellite-to-Cell Service* (May 16, 2024), https://www.satellitetoday.com/connectivity/2024/05/16/att-signs-commercial-agreement-with-ast-spacemobile-for-satellite-to-cell-service/; David Jarvis et al., Deloitte Center for Technology, Media & Telecommunications, *Signals From Space: Direct-to-Device Satellite Phone Connectivity Boosts Coverage* (Nov. 29, 2023), https://www2.deloitte.com/us/en/insights/industry/technology/technology-media-and-telecom-predictions/2024/future-of-global-satellite-direct-to-device-communications.html.

[362] *See* AST & Science LLC, Amendment to Petition for Declaratory Ruling, ICFS File No. SAT-APL-20230717-00172 Call Sign S3065 (filed July 17, 2023); AST & Science LLC, Amendment to Petition for Declaratory Ruling, ICFS File No. SAT-APL-20201028- 00126 Call Sign S3065 (filed Oct. 28, 2020) (amending ICFS File Nos. SAT-PDR-20200413-00034 and SAT-APL20200727-00088); *see also Supplemental Coverage from Space Report and Order*, 39 FCC Rcd at 2628-29, para. 15.

technology using MSS and other spectrum alternatives in the last few years, including Lynk Global, Omnispace, Ligado, Globalstar, Apple, Viasat, Skylo Technologies, and Iridium.[363]

c. Mobile Wireless Devices and Handset Unlocking

108. In addition to competing on price and network quality, mobile service providers also compete using device promotions, differentiated service plans, bundled services, and advertising campaigns. As noted in section II.B.4, plans may differ in features, such as data limits and deprioritization and/or throttling thresholds, hotspot data availability, cloud storage, streaming quality, and international service availability. Service providers may also bundle their plans with subscriptions to certain video streaming services.[364]

109. *Mobile Devices.* From July 2023 to June 2024, 14 mobile wireless handset manufacturers distributed approximately 230 mobile wireless handset models, including 144 5G-capable handset models, to mobile wireless service providers in the United States.[365] Eight of these handset manufacturers each offered at least ten handset models.[366] When offering device promotions, mobile wireless service providers frequently offer device discounts for customers porting their numbers from

[363] Lynk Global, which in 2022 received International Bureau (IB) authority to operate a NGSO satellite system at locations outside the United States, has obtained agreements with mobile service providers and requisite local regulatory authority to provide service. IB authorized Lynk to deploy ten NGSO MSS satellites as part of a "cellular-based satellite communications network." *See Supplemental Coverage from Space Report and Order*, 39 FCC Rcd at 2627-28, para. 14. Omnispace and Ligado signed a memorandum of understanding (MOU) to combine their spectrum to support satellite-to-device solutions for mobile service. Press Release, Ligado Networks, Omnispace and Ligado Networks Join Forces to Create Largest Portfolio of Licensed, Satellite Spectrum for Global Direct-to-Device Voice, Text and Data Connectivity (Feb. 23, 2023), https://ligado.com/press/omnispace-ligado-networks-join-forces-create-largest-portfolio-licensed-satellite-spectrum-global-direct-device-voice-text-data-connectivity/. Apple uses 85% of the Globalstar network to support emergency satellite connectivity for iPhone customers outside of cellular networks using MSS frequencies. Aria Alamalhodaei, *Apple-backed Globalstar Inks $64M Launch Contract with SpaceX* (Sep. 1, 2023), https://techcrunch.com/2023/09/01/apple-backed-globalstar-inks-64m-launch-contract-with-spacex/; *Supplemental Coverage from Space Report and Order*, 39 FCC Rcd at 2625, para. 10; MSSA Comments at 2-3. In November of 2023, Viasat, Skylo Technologies, and Ligado announced the launch of the first global D2D network that will support smartphone, IoT, automotive and defense applications. Viasat, *Viasat and Skylo Technologies Launch First Global Direct-to-Device Network* (Nov. 16, 2023), https://news.viasat.com/viasat-and-skylo-technologies-launch-first-global-direct-to-device-network. In 2024, Iridium announced Project Stardust, a standards-based solution that would provide D2D and IoT services. Press Release, Iridium, Iridium Unveils Project Stardust; Developing the Only Truly Global, Standards-based IoT and Direct-to-Device Service (Jan. 10, 2024), https://investor.iridium.com/2024-01-10-Iridium-Unveils-Project-Stardust-Developing-the-Only-Truly-Global,-Standards-Based-IoT-and-Direct-to-Device-Service. A number of these companies initially obtained experimental licenses from the Office of Engineering and Technology (OET) to test their communications technologies. *Supplemental Coverage from Space Report and Order*, 39 FCC Rcd at 2626-27, para. 13.

[364] *See, e.g.*, T-Mobile, *Apple TV+ Included with Our Best Go5G Plans*, https://www.t-mobile.com/tv-streaming/apple-tv-plus-deal (last visited June 24, 2024); Verizon, *Get the Disney Bundle for the Best Movies, Shows, and Sports*, https://www.verizon.com/solutions-and-services/disneyplus/ (last visited June 4, 2024).

[365] These figures are based on data from hearing aid compatibility reports filed by handset manufacturers in July 2024 for the reporting period from July 1, 2023 to June 30, 2024, available at the FCC Hearing Aid Compatibility status reporting site: FCC, *Hearing Aid Compatibility Reports: Device Manufacturers Summary,* https://www.fcc.gov/wireless/systems-utilities/universal-licensing-system/hearing-aid-compatibility-status-reporting-1 (last visited Oct. 7, 2024) (with the file name "List of All Handsets Offered by Manufacturers"). These reports include information (such as handset maker, model name, starting available date and end available date) for each handset model offered by the reporting handset manufacturer during the reporting period.

[366] Apple, ASUS, Google, Honeywell, Motorola, Samsung, TCL, and Zebra Technologies offered 12, 10, 13, 10, 79, 27, 47, and 12 handset models, respectively.

competitors, or customers who add new lines to their accounts.[367] For example, in July 2024, AT&T, Verizon, and T-Mobile all offered promotions involving the Apple iPhone 15[368] and Samsung Galaxy S24. AT&T offered up to a $700 discount on any iPhone 15 with an eligible device trade-in, with the discount being applied in the form of credits paid over a 36-month period.[369] For the Samsung Galaxy S24, AT&T offered a $404.36 discount applied via 36 monthly billing credits.[370] Similarly, Verizon offered up to an $830 discount on the purchase of an iPhone 15 when adding a new service line, with an eligible trade in and the discount applied via 36 monthly billing credits.[371] For the Samsung Galaxy S24, Verizon offered an $800 discount applied via 36 monthly billing credits with a new line on an Unlimited Plus or Unlimited Ultimate plan.[372] Finally, T-Mobile offered up to an $830 discount on the purchase of an iPhone 15 when adding a new service line, with an eligible trade in and the discount applied via 24 monthly billing credits.[373] For the Samsung Galaxy S24, T-Mobile offered up to an $800 discount applied via 24 monthly billing credits when adding a new service line or with an eligible trade in on a Go5G Plus or Go5G Next plan.[374]

110. *Satellite*. Technological advances have resulted in satellite serving as a connectivity option for mobile devices, which is commonly referred to as "Direct to Device" (D2D) communications.[375] The Satellite Industry Association (SIA) found in their State of the Satellite Industry Reports that more than 10 satellite operators are now developing or deploying these D2D systems, two of which are already providing limited initial services, such as SOS messaging to specialized devices or specific geographies.[376]

111. *Mobile Device Unlocking.* Mobile broadband providers have the ability to lock the devices they sell to consumers on their own networks, thus preventing the use of the device on other providers' networks.[377] Providers lock devices to ensure that devices will be active for a certain period of time or amount of usage on the network of the service provider that sold the device with a subsidy (or discount) or with a device installment plan.[378] Unlocking a mobile device allows consumers to move their cell phone from one network to another compatible network.[379] Device locking policies vary by

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[367] *See, e.g.*, T-Mobile, *Explore Our Best Deals on iPhone, Apple Watch and More*, https://www.t-mobile.com/offers/apple-iphone-deals?INTNAV=tNav%3ADeals%3AApple (last visited June 24, 2024).

[368] Charlie Osborne, ZDNET, *The Best iPhone Deals of 2024: Free iPhone 15s, Cheap iPads, Budget-friendly Accessories* (May 23, 2024), https://www.zdnet.com/article/iphone-deals/.

[369] AT&T, *Apple iPhone 15*, https://www.att.com/buy/phones/apple-iphone-15.html (last visited June 24, 2024).

[370] AT&T, *Samsung Galaxy S24*, https://www.att.com/buy/phones/samsung-galaxy-s24.html (last visited July 23, 2024).

[371] Verizon, *Apple iPhone 15*, https://www.verizon.com/smartphones/apple-iphone-15/ (last visited June 24, 2024).

[372] Verizon, *Samsung Galaxy S24*, https://www.verizon.com/smartphones/samsung-galaxy-s24/ (last visited July 23, 2024).

[373] T-Mobile, *Apple iPhone 15*, https://www.t-mobile.com/commerce/cell-phone/apple-iphone-15 (last visited June 24, 2024).

[374] T-Mobile, *Our Best Deals on Samsung Galaxy Phones, Tablets and More*, https://www.t-mobile.com/offers/samsung-phone-deals?INTNAV=tNav%3ADeals%3ASamsung (last visited July 23, 2024).

[375] SIA Reply at 12.

[376] *Id.* at 12-13.

[377] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15608, para. 128; *see also* FCC, Wireless Telecommunications Bureau, Cell Phone Unlocking, https://www.fcc.gov/general/cell-phone-unlocking (last visited Oct. 15, 2024) (WTB Unlocking Guide).

[378] WTB Unlocking Guide.

provider[380] and increase switching costs for consumers who are tethered to a specific provider.[381] Mobile device unlocking facilitates consumer choice among mobile broadband providers by freeing consumers from having to replace their handset to use another network, thereby reducing switching costs.[382]

112. In 2013, the Wireless Telecommunications Bureau (WTB) negotiated an industry agreement on mobile device unlocking.[383] In accord with this agreement, CTIA added a section to its "Consumer Code for Wireless Service" (CTIA Consumer Code) that included device unlocking policies.[384] While this CTIA Consumer Code is voluntary, providers who choose to adopt the code agree to unlock phones when the postpaid service contract or financing plan is fulfilled.[385] For prepaid phones, service providers agree to unlock devices within one year after activation.[386] The participating CTIA member service providers are required to implement all of the unlocking disclosure policies within a year of signing the agreement, and all of the major service providers fulfilled this commitment by February 11, 2015.[387] While adherence to the CTIA Consumer Code is voluntary, compliance with the unlocking polices in the CTIA Consumer Code is required for many providers by virtue of their annual certifications as eligible telecommunications carriers (ETCs).[388] Many ETCs take advantage of a "safe harbor" that allows the companies to certify that they will comply with the CTIA Consumer Code in lieu of otherwise

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[379] *Id.*

[380] *Id.*

[381] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15608, para. 128; *see also Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services*, WT Docket No. 15-125, Eighteenth Report, 30 FCC Rcd 14515, 14610-11, para. 152 (2015) (*Eighteenth Mobile Wireless Competition Report*) ("The ability to unlock a handset in order to activate it on another service providers network enables consumers to exercise greater choice in choosing or switching providers and lowers switching costs.").

[382] *2022 Communications Marketplace Report,* 37 FCC Rcd at 15608, para. 128; *see also Eighteenth Mobile Wireless Competition Report*, 30 FCC Rcd at 14610-11, para. 152. Previously, phones had a subscriber identity module (SIM) card in the device that identifies and authenticates the device to a cellular network. T-Mobile, *What Is a SIM Card?*, https://www.t-mobile.com/dialed-in/wireless/what-is-a-sim-card (last visited Sept. 26, 2024). Cellphones today all use newer eSIM technologies that do not require a physical SIM card. Mushfiq Rahman, US Mobile, *Always Up-to-date List of eSim Compatible Devices* (Sept. 3, 2024), https://www.usmobile.com/blog/list-of-esim-compatible-devices/. The eSIM allows consumers with unlocked devices to switch between providers with minimal effort and time.

[383] Letter from Steve Largent, President and CEO, CTIA, to Thomas E. Wheeler, Chairman, and Commissioners, FCC (Dec. 12, 2013), https://www.fcc.gov/document/ctia-letter-carrier-unlocking-voluntary-agreement-fcc-statements (on Carrier Unlocking Agreement).

[384] CTIA, *Consumer Code for Wireless Service*, https://www.ctia.org/the-wireless-industry/industry-commitments/consumer-code-for-wireless-service (last visited July 2, 2024).

[385] *Id.* (navigate to the "Postpaid Unlocking Policy" subsection of the "Mobile Wireless Device Unlocking" section).

[386] *Id.*

[387] Roger C. Sherman & Kris Monteith, FCC, *Wireless Providers Fulfill Commitment to Let Consumers Unlock Mobile Phones* (Feb. 11, 2015), https://www.fcc.gov/blog/wireless-providers-fulfill-commitment-let-consumers-unlock-mobile-phones.

[388] All ETCs requesting federal high-cost or low-income universal service support must annually file reports providing financial and operational information that is used to validate support disbursed to ETCs from the high-cost and Lifeline support mechanisms. 47 U.S.C. § 254; 47 CFR §§ 54.313, 54.422. ETCs that receive low-income support are further required to certify that they comply with applicable service quality and consumer protection standards. 47 CFR §§ 54.202(a)(3), 54.422(b)(3).

demonstrating how they meet certain standards.[389] ETCs that rely upon this safe harbor must annually certify their compliance with the unlocking provisions in the CTIA Consumer Code.[390]

113. In addition to the industry's voluntary unlocking standards, certain wireless service providers, as discussed below, are subject to unlocking requirements as a result of rules specific to certain frequency bands or to merger commitments. Specifically, section 27.16(e) of the Commission's rules prohibits 700 MHz C Block licensees from "locking" handsets that are used in the band.[391] As one of the 700 MHz C Block licensees, Verizon is subject to these requirements.

114. In 2019, WTB granted Verizon a partial waiver of this unlocking requirement to better combat identity theft and other types of handset-related fraud.[392] The waiver allows Verizon to lock handsets that operate on the 700 MHz C Block frequencies for 60 days from the date the handsets become active on its network.[393] WTB found that allowing handsets to be locked for 60 days to combat handset fraud would not significantly interfere with the policy objective of enabling consumers to be able to migrate from one service provider to another on compatible networks.[394]

115. Prior to Verizon's acquisition of TracFone, TracFone was not subject to the 700 MHz C Block unlocking requirements.[395] In addition to Verizon's other transaction-specific commitments it made as part of the Verizon/TracFone transaction, Verizon committed to unlocking obligations aimed at extending its 60-day unlocking policy to all 700 MHz C Block devices purchased from TracFone.[396] As such, Verizon, after the expiration of the initial 60-day period, was required to automatically unlock a customer's handset regardless of whether: (1) the customer requests that the handset be unlocked; or (2) the handset has been entirely paid off.[397] T-Mobile,[398] in its acquisition of Ka'ena Corporation (Mint Mobile and Ultra Mobile brands), made voluntary handset unlocking commitments[399] that the

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[389] 47 CFR § 54.202(a)(3); *Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, Report and Order, 20 FCC Rcd 6371, 6383-84, para. 28 (2005).

[390] *See, e.g.*, *TracFone Wireless, Inc.*, File No. EB-IHD-15-00018098, Order and Consent Decree, 30 FCC Rcd 6938 (EB 2015) (resolving an investigation into Tracfone's apparent non-compliance with the CTIA Consumer Code's unlocking provisions by adoption of a compliance plan and a $400,000 per month offset to the Lifeline program).

[391] 47 CFR § 27.16(e). As the 700 MHz C Block licensee throughout the United States, Verizon is required to comply with the prohibition against device locking by licensees offering service in this band, subject to a 60-day waiver period for new customers intended to combat handset-related fraud. *Cellco Partnership d/b/a Verizon Wireless*, File No. EB-11-IH-1351, Order and Consent Decree, 27 FCC Rcd 8932 (EB 2012). In 2019, the Commission granted Verizon a partial waiver of section 27.16(e) of the Commission's rules to allow Verizon to better combat identity theft and other forms of handset-related fraud. *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, WT Docket No. 06-150, Order, 34 FCC Rcd 5134, 5134, para. 1 (WTB 2019).

[392] *Service Rules for the 698–746, 747–762 and 777–792 MHz Bands*, WT Docket No. 06-150, Order, 34 FCC Rcd 5134, para. 1 & n.1 (WTB 2019).

[393] *Id*. at 5137, para. 11.

[394] *Id*.

[395] *Verizon-TracFone Order*, 36 FCC Rcd at 17039-40, para. 122.

[396] *Id.* at 17040, para. 124.

[397] *Id*. at 16996, para. 8.

[398] As part of the *T-Mobile/Sprint* merger, the U.S. Department of Justice prohibited the Applicants from discriminating against devices that include eSIM technology or that allow for multiple profiles, and required the Applicants abide by several principles that will make it easier for subscribers to obtain unlocked devices. *T-Mobile-Sprint Order,* 34 FCC Rcd at 10592, para. 36.

[399] *See* Letter from Nancy Victory, DLA Piper LLP, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 23-171 (filed Apr. 23, 2024) (T-Mobile Handset Unlocking Commitments Letter).

Commission subsequently imposed as conditions for approval.[400] Subject to certain limitations, T-Mobile committed to implementing a 60-day unlocking period for all Mint Mobile and Ultra Mobile devices activated on T-Mobile's network and automatic unlocking for all devices that are capable of automatic unlocking.[401] In addition, T-Mobile committed to making all new Mint Mobile and Ultra Mobile devices capable of automatic unlocking within two years of the closing of this transaction.[402]

116. Several mobile service providers and consumer advocacy groups jointly submitted comments regarding handset unlocking requirements in this *Report* docket. These commenters propose that the Commission should open a rulemaking proceeding that builds a record of benefits and trade-offs associated with uniform handset unlocking requirements.[403] In their joint comments, they state that although the groups may differ in their ultimate goals for the rulemaking, they all agree that uniform handset unlocking requirements would be beneficial to consumers and would promote competition in the marketplace.[404] The comments cite to research from the United Kingdom regulator, the Office of Communications (Ofcom), who found that more than one-third of people who decided against switching providers did so due to having to get their handset unlocked.[405] On July 19, 2024, the Commission released a Notice of Proposed Rulemaking on handset unlocking requirements. In this Notice, the Commission proposed a universal 60-day handset unlocking requirement for all mobile wireless service providers.[406]

d. Advertising

117. Mobile wireless providers also compete for customers through extensive advertising and marketing. Service providers' marketing campaigns have highlighted aspects such as network quality and 5G capabilities,[407] pricing,[408] differentiating services,[409] and device promotions.[410] In 2023, AT&T spent $2.6 billion on advertising;[411] EchoStar spent $868 million;[412] T-Mobile spent $2.5 billion;[413] and Verizon

[400] *Applications of T-Mobile, US Inc. and Ka'ena Corporation for Consent to Transfer Control of International Section 214 Authorizations*, GN Docket No. 23-171, Memorandum Opinion and Order, DA 24-387, at 1, para. 1 (OIA/WTB Apr. 25, 2024).

[401] T-Mobile Handset Unlocking Commitments Letter at 1-2.

[402] *Id.* at 2.

[403] OTI, et al. *Ex Parte* at 1.

[404] *Id.* at 1, 3.

[405] Public Knowledge/OTI Reply at 5-6.

[406] *Promoting Consumer Choice and Wireless Competition Through Handset Unlocking Requirements and Policies*, WT Docket No. 24-186, Notice of Proposed Rulemaking, FCC 24-77, at 1, para. 1 (July 19, 2024).

[407] ispot.tv, *Verizon Super Bowl 2024 TV Spot, 'Beyoncé Breaks Verizon' Featuring Tony Hale*, https://www.ispot.tv/ad/6wXw/verizon-super-bowl-2024-beyonc-breaks-verizon-featuring-tony-hale (last visited May 2, 2024); ispot.tv, *AT&T Wireless TV Spot, 'Multitasking Leveled Up' Featuring Rose Zhang*, https://www.ispot.tv/ad/6Gme/at-and-t-wireless-multitasking-leveled-up-featuring-rose-zhang (last visited May 2, 2024).

[408] ispot.tv, *T-Mobile TV Spot, 'Ski Shop Polar Bear: Four for $25 + 4 iPhone 15 On Us' Featuring Zoe Saldaña*, https://www.ispot.tv/ad/6VmV/t-mobile-ski-shop-polar-bear-four-for-25-4-iphone-15-on-us-featuring-zoe-saldana (last visited May 2, 2024).

[409] ispot.tv, *T-Mobile Magenta Status TV Spot, 'VIP Treatment'*, https://www.ispot.tv/ad/6yHh/t-mobile-magenta-status-vip-treatment (last visited May 2, 2024).

[410] ispot.tv, *AT&T Wireless TV Spot, 'Extra Airlines: Eligible Trade-In'*, https://www.ispot.tv/ad/5vh6/at-and-t-wireless-extra-airlines-eligible-trade-in (last visited May 2, 2024); ispot.tv, *Verizon TV Spot, 'What's That Sound: iPhone 15 Pro'*, https://www.ispot.tv/ad/6YBp/verizon-whats-that-sound-iphone-15-pro (last visited May 2, 2024).

[411] AT&T Inc., SEC Form 10-K, at 93 (filed Feb. 23, 2024).

spent $3.8 billion.[414] By comparison, in 2021, AT&T spent $2.7 billion on advertising;[415] EchoStar spent $725 million;[416] T-Mobile spent $2.2 billion;[417] and Verizon spent $3.4 billion.[418]

e. Mobile Applications

118. The wide adoption of mobile devices in the global marketplace has contributed to the development and growth of applications (apps) that are designed for mobile operating systems.[419] In 2023, annual mobile app downloads reached 257 billion worldwide, an approximate 1% increase from the previous year.[420] The average American spent nearly 4.5 hours per day on mobile devices in 2023,[421] and as a whole, Americans spent approximately 217 billion hours using mobile apps.[422] The increasingly important role that mobile devices play in the modern economy not only directly impacts the mobile apps marketplace, but also has wider implications for e-commerce. In this section, we discuss the major mobile app platforms, revenue, and business models in the mobile app industry, and provide some download and usage statistics for mobile apps.

119. The predominant mobile operating systems worldwide are Android and iOS.[423] Globally, most mobile applications for these operating systems can be purchased in either the Google Play Store (Android) or the Apple App Store (iOS). These two app stores are the largest "native" app distribution platforms in terms of the number of applications available to download.[424] However, smaller native app

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[412] EchoStar Corporation, SEC Form 10-K, at F-32 (filed Feb. 29, 2024).

[413] T-Mobile US, Inc., SEC Form 10-K, at 69 (filed Feb. 2, 2024).

[414] Verizon Communications Inc., SEC Form 10-K, at 102 (filed Feb. 9, 2024).

[415] AT&T Inc., SEC Form 10-K, at 93 (filed Feb. 23, 2024).

[416] EchoStar Corporation, SEC Form 10-K, at F-32 (filed Feb. 29, 2024). We note that EchoStar does not separate out its advertising for mobile wireless from its other business segments.

[417] T-Mobile US, Inc., SEC Form 10-K, at 69 (filed Feb. 2, 2024).

[418] Verizon Communications Inc., SEC Form 10-K, at 102 (filed Feb. 9, 2024).

[419] BuildFire, *Mobile App Download Statistics & Usage Statistics (2024)*, https://buildfire.com/app-statistics/ (last visited May. 23, 2024) (there are 6.3 billion smartphone users and 1.14 billion tablet users worldwide).

[420] data.ai, State of Mobile 2024 at 3 (2024), https://www.data.ai/en/go/state-of-mobile-2024/ (230 billion new app downloads from "iOS, Google Play, Third-Party Android in China").

[421] Alex Kerai, Reviews.org, *Cell Phone Usage Statistics: Mornings Are for Notifications* (July 21, 2023), https://www.reviews.org/mobile/cell-phone-addiction/.

[422] Louise Wylie, Business of Apps, *US App Market Statistics (2024)* (Feb. 1, 2024), https://www.businessofapps.com/data/us-app-market/#:~:text=Users%20in%20the%20United%20States,in%20consumer%20spend%20on%20mobile.

[423] Ahmed Sherif, Statista, *Market Share of Mobile Operating Systems Worldwide from 2009 to 2024, By Quarter* (May 13, 2024), https://www.statista.com/statistics/272698/global-market-share-held-by-mobile-operating-systems-since-2009/.

[424] In this context, native app distribution platforms are app stores that are developed for use on at least one of the major mobile operating systems; i.e., Android and iOS, or on open-source operating systems. *See* Alexander S. Gillis, *Native App*, https://www.techtarget.com/searchsoftwarequality/definition/native-application-native-app (last visited May 23, 2024). For the number of apps available to download in various native app stores, *see* Laura Ceci, Statista, *Number of Apps Available in Leading App Stores as of 3rd Quarter 2022* (Dec. 8, 2023), https://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/ (for the Google Play Store, Apple App Store, and Amazon Appstore); Radu Tyrsina, Windows Report, *How Many Apps Are in the Microsoft Store?* (Oct. 4, 2023), https://windowsreport.com/state-windows-8-apps-windows-store/ (for the

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stores also exist in the marketplace, including the Amazon Appstore, the Microsoft Store, OpenStore, the PureOS Store, the Samsung Galaxy Store, and The Snap Store.[425] Non-native app distribution platforms, such as Appland, Applivery, F-Droid, and Rootpk are also present in the marketplace.[426]

120. *Revenues*. App developers employ several types of business models to generate revenue, including in-app advertisements, upfront download fees, and in-app purchases.[427] In 2023, global revenue from app store spending exceeded $171 billion, an approximate 3% increase over 2022 totals.[428] In 2023, data.ai reports that mobile games generated more revenue than any other app category.[429] Mobile games' share of app revenue is more than half of all app spending in 2023.[430]

121. The Apple App Store and Google Play Store are the two largest app platforms. Outside of China, these two platforms control more than 95% of the market.[431] In 2023, the Apple App Store generated $89.3 billion in revenue,[432] accounting for approximately 67% of global app revenue.[433] This was an approximate 3% increase over 2022 revenue.[434] Likewise, the Google Play Store generated $47 billion in revenue during 2021, an increase of approximately 11% since 2022.[435] App stores generally charge developers a percentage-based commission on both apps and in-app purchases of digital goods, services, and subscriptions in exchange for hosting apps in their stores.[436] In 2020, Apple updated its fee

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Microsoft Store). Data regarding the number of apps available to download are not readily available for OpenStore, the PureOS Store, the Samsung Galaxy Store, and The Snap Store.

[425] Amazon, *Amazon Appstore*, https://www.amazon.com/mobile-apps/b?ie=UTF8&node=2350149011 (last visited May 23, 2024); Microsoft, *Microsoft Store App*, https://apps.microsoft.com/store/apps (last visited May 23, 2024); OpenStore, *Ubuntu Touch Apps*, https://open-store.io/ (last visited May 23, 2024); Purism, *PureOS Store*, https://software.pureos.net/ (last visited May 23, 2024); Samsung, *Galaxy Store*, https://www.samsung.com/us/apps/galaxy-store/ (last visited May 23, 2024); Canonical, *The App Store for Linux*, https://snapcraft.io/ (last visited May 23, 2024) (to access The Snap Store).

[426] Appland, *App Store Platform + Content + Services*, https://www.applandinc.com/ (last visited May 23, 2024); Applivery, *Enterprise Mobility Management*, https://www.applivery.com/ (last visited May 23, 2024); F-Droid, *What is F-Droid?*, https://f-droid.org/ (last visited May 23, 2024); Rootpk, *Independent App Store,* https://rootpk.com/ (last visited May 23, 2024).

[427] Apple, *Choosing a Business Model*, https://developer.apple.com/app-store/business-models/ (last visited May 23, 2024).

[428] data.ai, State of Mobile 2024 at 3 (2024), https://www.data.ai/en/go/state-of-mobile-2024/.

[429] *Id.* at 16.

[430] *Id.*

[431] David Curry, Business of Apps, *App Store Data (2024)* (Jan. 23, 2024), https://www.businessofapps.com/data/app-stores/.

[432] David Curry, Business of Apps, *Apple App Store Statistics (2024)* (Feb. 6, 2024), https://www.businessofapps.com/data/apple-app-store-statistics/.

[433] Bigabid, *Key 2023 Apple App Store vs Google Play Store Differences for Developers and Marketers*, https://www.bigabid.com/apple-app-store-vs-google-play-store-differences/#:~:text=These%20trends%20have%20continued%2C%20and,for%20a%20better%20market%20share (last visited May 23, 2024).

[434] David Curry, Business of Apps, *Apple App Store Statistics (2024)* (Feb. 6, 2024), https://www.businessofapps.com/data/apple-app-store-statistics/.

[435] David Curry, Business of Apps, *Google Play Store Statistics (2024)* (Feb. 6, 2024), https://www.businessofapps.com/data/google-play-statistics/.

structure so that developers with annual revenues less than $1 million faced a 15% fee, while developers with revenues greater than $1 million faced a 30% fee.[437] Google has a similar fee structure in which developers face a 15% fee on their first $1 million in revenue, and a 30% fee on any revenue above $1 million.[438]

122. *Downloads*. Globally, as of 2023, the Google Play Store and the Apple App Store had approximately 2.6 million and 2.3 million applications available to download, respectively.[439] Figure II.B.25 shows that the five categories in the Apple App Store containing the largest number of apps available to download worldwide as of 2023 were Games, Business, Education, Lifestyle, and Utilities,[440] whereas Figure II.B.26 shows that the five largest categories in the Google Play Store were Games, Education, Business, Tools, and Music & Audio.[441] Moreover, global users downloaded approximately 26.9 billion and 8.1 billion applications from the Google Play Store and the Apple App Store, respectively, during the first quarter of 2023,[442] with social media and messaging apps dominating the top ten list of the most downloaded apps through the second quarter of 2022.[443] In addition, globally, as of March 2024, 97% of the applications in the Google Play Store could be downloaded for free compared with 95.1% of those in the Apple App Store.[444]

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[436] The sales of physical goods are exempt from service fees. Ian Carlos Campbell & Julia Alexander, The Verge, *A Guide to Platform Fees* (Aug. 24, 2021), https://www.theverge.com/21445923/platform-fees-apps-games-business-marketplace-apple-google.

[437] Prior to 2020, all developers were subject to a 30% service fee. Press Release, Apple, Apple announces App Store Small Business Program (Nov. 18, 2020), https://www.apple.com/newsroom/2020/11/apple-announces-app-store-small-business-program/.

[438] Google, *Service Fees*, https://support.google.com/googleplay/android-developer/answer/112622?hl=en (last visited May 23, 2024).

[439] David Curry, Business of Apps, *App Store Data (2024)* (Jan. 23, 2024), https://www.businessofapps.com/data/app-stores/. It is unclear from online sources whether the application numbers provided include non-mobile apps (i.e., applications used on tablets, laptops, etc.) in addition to mobile apps (i.e., applications used on phones).

[440] *Id.*

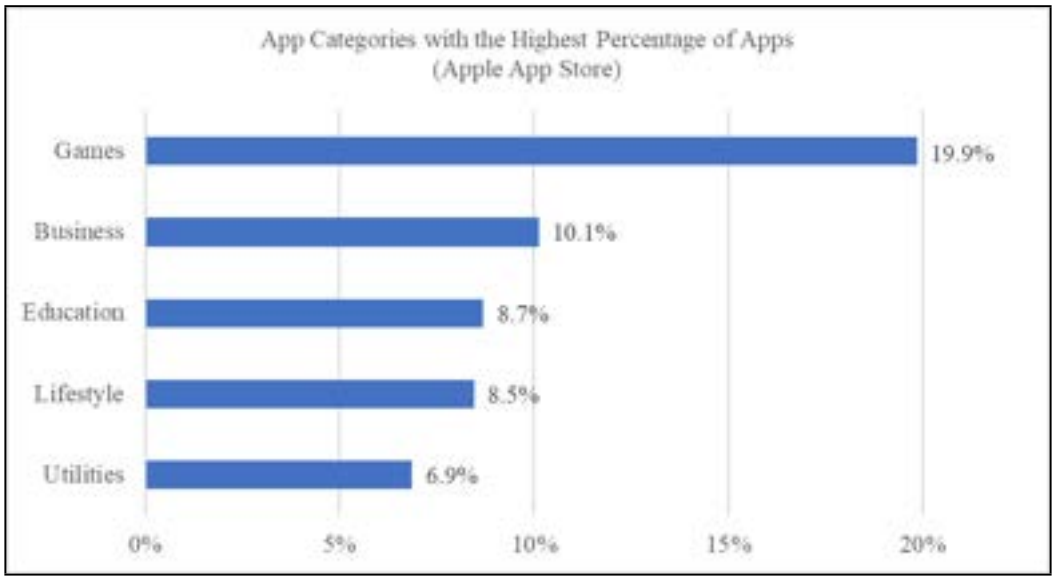
[441] *Id.*

[442] Laura Ceci, Statista, *Number of Apple App Store and Google Play Mobile App Downloads Worldwide From 3rd Quarter 2016 to 1st Quarter 2023 (*Aug. 29, 2023), https://www.statista.com/statistics/695094/quarterly-number-of-mobile-app-downloads-store/. It is unclear whether the download numbers provided include non-mobile apps (i.e., applications used on tablets, laptops, etc.) in addition to mobile apps (i.e., applications used on phones).

[443] SensorTower, *State of Mobile 2024* at 93 (2024), https://www.data.ai/en/go/state-of-mobile-2024/.

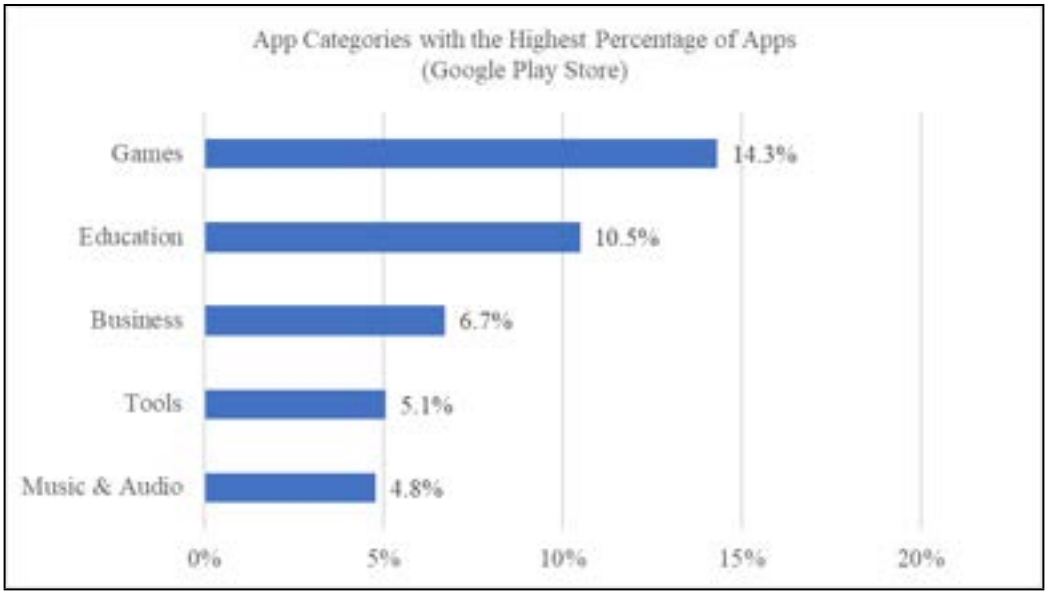
[444] Laura Ceci, Statista, *Distribution of Free and Paid Android Apps in the Google Play Store From June 2019 to March 2024* (Mar. 19, 2024), https://www.statista.com/statistics/266211/distribution-of-free-and-paid-android-apps/; Laura Ceci, Statista, *Distribution of Free and Paid iOS Apps in the Apple App Store From June 2019 to March 2024* (Mar. 19, 2024), https://www.statista.com/statistics/1020996/distribution-of-free-and-paid-ios-apps/.

Fig. II.B.25



Source: Business of Apps.

Fig. II.B.26



Source: Business of Apps.

123. *Usage*. Although there were more than 80 apps on average installed on each smartphone, the average person only used nine mobile apps per day and 30 apps per month.[445] About 25% of apps were used only once after being downloaded, and the churn rate was 71% within the first 90 days.[446] Excluding pre-installed apps, the apps with the most monthly active users in 2023 were largely comprised

[445] BuildFire, *Mobile App Download Statistics & Usage Statistics (2024)*, https://buildfire.com/app-statistics/ (last visited June 14, 2024).

[446] *Id.*

of social media and messaging apps, with Facebook, WhatsApp Messenger, and Instagram having the highest number of monthly users.[447]

f. Speed of Service

124. Network speed is a key characteristic of mobile wireless performance. As such, the Commission has long recognized the importance of accurate and timely data on wireless download and upload speeds.[448] The mobile broadband speeds that consumers experience can vary greatly with a number of factors, including the service provider's received signal quality, cell traffic loading and network capacity in different locations, as well as the capabilities of consumers' devices.[449] There are various methodologies that measure mobile network speeds. The two most prevalent methodologies rely on crowdsourced data and structured sample data. Crowdsourced data are user-generated data produced by consumers who voluntarily download speed test applications on their mobile devices, while structured sample data, by contrast, are generated from tests that control for the location and time of the tests as well as for the devices used in the test.[450] This *Report* presents speed data using Ookla Speedtest data (crowdsourced), Opensignal data (crowdsourced), and RootMetrics (structured sample).

125. Figures II.B.27 and II.B.28 present the nationwide mean and median 5G download and upload speeds by service provider based on Ookla data[451] for the second half of 2022 through the second half of 2023,[452] while Figure II.B.29 presents the increase over time for mean and median 4G LTE download speeds for all providers from the first half of 2014 through the second half of 2023.[453]

[447] SensorTower, *State of Mobile 2024* at 93 (2024), https://www.data.ai/en/go/state-of-mobile-2024/.

[448] *See, e.g.*, *2024 Section 706 Report* at 44-46, paras. 76-78; *2022 Communications Marketplace Report*, 37 FCC Rcd at 15615-16, para. 140 & n.479.

[449] *See, e.g.*, *2022 Communications Marketplace Report*, 37 FCC Rcd at 15615-16, para. 140 & n.480.

[450] Many apps that collect crowdsourced data collect these data via background or automated tests, as well as through user-initiated tests. We note that crowdsourced data have certain limitations. For example, bias may be introduced into speed test data because tests are performed only at specific times and places, potentially providing a less accurate snapshot of mobile broadband performance. Further, "the methods by which different speed test apps collect data can vary and may not use techniques that control for certain variables." *See, e.g.*, *2022 Communications Marketplace Report*, 37 FCC Rcd at 15615-16, para. 140 & n.481.

[451] Ookla gathers crowdsourced mobile speed data through the use of its Speedtest mobile app. Speedtest, *Ookla Speedtest Mobile Apps*, https://www.speedtest.net/apps/mobile (last visited Aug. 11, 2024). An in-depth discussion of the Ookla Speedtest methodology is available on the Ookla website. Ookla, *Ookla's Speedtest Methodology* (Nov. 18, 2024), https://www.ookla.com/resources/guides/speedtest-methodology. The upload and download speeds presented in this section were calculated by Ookla and provided to the Commission for use in this *Report*. The Ookla figures in this *Report* present sample count and not the total number of tests. The sample count represents the number of tests in the cleaned sample, upon which the mean and median upload and download speeds are based, while the total number of tests represents the number of tests in the uncleaned dataset.

[452] Nationwide mean and median 4G LTE download and upload speeds by service provider are presented in Appx. D-4.

[453] Note that Ookla has updated their data cleaning and aggregation rules over time; thus, the data presented in Fig. II.B.29 have not all been processed in an identical manner.

Fig. II.B.27
Ookla Speedtest–Estimated 5G Download Speeds by Service Provider, Nationwide

Service Provider	2H2022			1H2023			2H2023		
	Mean Download Speed (Mbps)	Median Download Speed (Mbps)	Sample Count (000s)	Mean Download Speed (Mbps)	Median Download Speed (Mbps)	Sample Count (000s)	Mean Download Speed (Mbps)	Median Download Speed (Mbps)	Sample Count (000s)
AT&T	109.78	83.55	384	116.3	86.48	361	173.28	113.56	418
EchoStar	111.73	102.9	0.7	143.8	124.04	1	179.64	157.89	2
T-Mobile	247.86	205.74	568	260.41	219.54	513	276.06	230.43	596
UScellular	70.72	50.85	8	62.97	46.21	8	89.61	54.26	9
Verizon	211.62	123.69	460	204.06	130.94	421	255.31	171.17	481

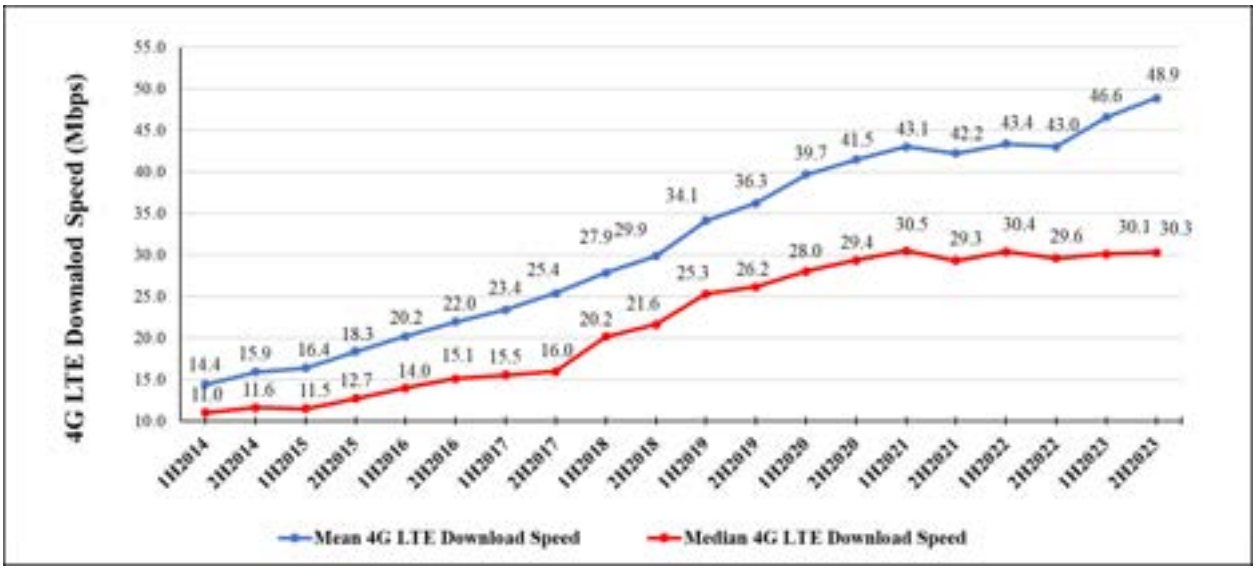
Source: Ookla SPEEDTEST intelligence data, © 2023 Ookla, LLC. All rights reserved. Published with permission of Ookla.

Fig. II.B.28
Ookla Speedtest–Estimated 5G Upload Speeds by Service Provider, Nationwide

Service Provider	2H2022			1H2023			2H2023		
	Mean Upload Speed (Mbps)	Median Upload Speed (Mbps)	Sample Count (000s)	Mean Upload Speed (Mbps)	Median Upload Speed (Mbps)	Sample Count (000s)	Mean Upload Speed (Mbps)	Median Upload Speed (Mbps)	Sample Count (000s)
AT&T	15.33	11.07	384	14.54	9.88	361	15.55	9.73	418
EchoStar	16.99	12.67	0.7	20.17	15.47	1	18.54	14.15	2
T-Mobile	22.44	16.01	568	22.58	15.75	513	21.88	14.38	596
UScellular	12.97	11.24	8	15.25	12.11	8	17.02	12.72	9
Verizon	20.76	14.24	460	21.3	14.22	421	22.55	14.4	481

Source: Ookla SPEEDTEST intelligence data, © 2023 Ookla, LLC. All rights reserved. Published with permission of Ookla.

Fig. II.B.29
Ookla Speed Test: Estimated Total 4G LTE Download Speeds, Nationwide



Source: Ookla SPEEDTEST intelligence data, © 2023 Ookla, LLC. All rights reserved. Published with permission of Ookla

126. We present nationwide average 5G download and upload speeds for the second half of 2022 through the second half of 2023 from Opensignal in Figures II.B.30 and II.B.31, respectively.[454]

[454] Opensignal collects measurements of network experience quality and speed based on user-triggered tests, and regular periodic tests, both initiated by the participant. Opensignal, *How We Approach Our Metrics and Insights*, https://www.opensignal.com/methodology-overview (last visited Mar. 7, 2024) (scroll down to find the appropriate heading). Average download and upload speeds are presented in Appx. D-4.

Fig. II.B.30
Opensignal–Estimated 5G Download Speeds, Nationwide[455]

Service Provider	2H2022	1H2023	2H2023
	Average Download Speed (Mbps)	Average Download Speed (Mbps)	Average Download Speed (Mbps)
AT&T	71.10	80.00	123.50
T-Mobile	186.30	195.50	204.90
Verizon	84.90	96.30	135.30

Source: Opensignal, © 2023 Opensignal.

Fig. II.B.31
Opensignal–Estimated 5G Upload Speeds, Nationwide[456]

Service Provider	2H2022	1H2023	2H2023
	Average Upload Speed (Mbps)	Average Upload Speed (Mbps)	Average Upload Speed (Mbps)
AT&T	12.20	12.10	14.10
T-Mobile	17.90	18.20	17.60
Verizon	16.10	18.50	19.90

Source: Opensignal, © 2023 Opensignal.

[455] Fig. II.B.30 presents Opensignal's 5G Download Speed, which shows the average download speed experienced by Opensignal users across an operator's 5G network. Robert Wyrzykowski, Opensignal, *USA Mobile Network Experience Report, January 2024* (Jan. 2024), https://www.opensignal.com/reports/2024/01/usa/mobile-network-experience (navigate to "Market Overview" subsection, click on "5G Experience" heading, and then click on "5G Download Speed" subheading); Robert Wyrzykowski, Opensignal, *USA 5G Experience Report, July 2023* (July 2023), https://www.opensignal.com/reports/2023/07/usa/mobile-network-experience-5g (navigate to "Market Overview" subsection, click on "5G Experience" heading, and then click on "5G Download Speed" subheading); Robert Wyrzykowski, Opensignal, *USA 5G Experience Report, January 2023* (Jan. 2023), https://www.opensignal.com/reports/2023/01/usa/mobile-network-experience-1 (navigate to "Market Overview" subsection, click on "5G Experience" heading, and then click on "5G Download Speed" subheading). *See* Appx. D-4 for additional Opensignal download speed estimates.

[456] Fig. II.B.31 presents Opensignal's 5G Upload Speed, which measures the average upload speeds experienced by Opensignal users across an operator's 5G network. Robert Wyrzykowski, Opensignal, *USA Mobile Network Experience Report, January 2024* (Jan. 2024), https://www.opensignal.com/reports/2024/01/usa/mobile-network-experience (navigate to "Market Overview" subsection, click on "5G Experience" heading, and then click on "5G Upload Speed" subheading); Robert Wyrzykowski, Opensignal, *USA 5G Experience Report, July 2023* (July 2023), https://www.opensignal.com/reports/2023/07/usa/mobile-network-experience-5g (navigate to "Market Overview" subsection, click on "5G Experience" heading, and then click on "5G Upload Speed" subheading); Robert Wyrzykowski, Opensignal, *USA 5G Experience Report, January 2023* (Jan. 2023), https://www.opensignal.com/reports/2023/01/usa/mobile-network-experience-1 (navigate to "Market Overview" subsection, click on "5G Experience" heading, and then click on "5G Upload Speed" subheading). *See* Appx. D-4 for additional Opensignal upload speed estimates.

127. Figure II.B.32 presents RootMetrics mobile wireless indices within the United States for the second half of 2022 through the second half of 2023.[457]

Fig. II.B.32[458]
RootMetrics–Nationwide Performance Data

	2H2022			1H2023			2H2023		
Service Provider	Speed Index	Data Index	Network Accessibility Index	Speed Index	Data Index	Network Accessibility Index	Speed Index	Data Index	Network Accessibility Index
AT&T	97.3	97.5	92.1	98.0	97.8	90.9	97.1	97.2	92.0
T-Mobile	93.7	95.0	95.0	94.7	95.8	94.8	94.5	95.7	95.6
Verizon	94.3	96.4	96.0	95.8	97.1	95.7	95.2	96.7	95.7

Source: RootMetrics Data, © 2023 RootMetrics. All rights reserved.

6. Network Coverage

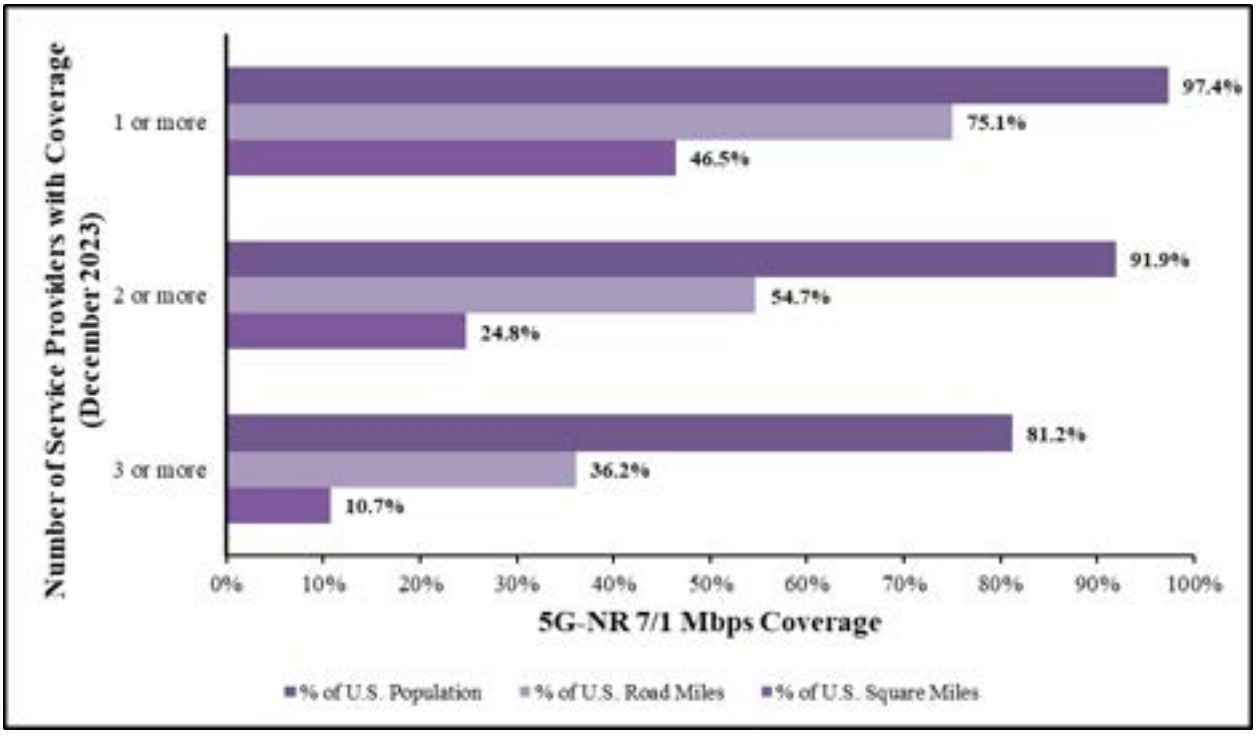
128. *5G-NR Coverage.* Figure II.B.33 presents 5G-NR mobile broadband coverage at minimum speeds of 7/1 Mbps by number of service providers.[459] Approximately 97% of the U.S. population, approximately 75% of U.S. road miles, and approximately 47% of the U.S. land area were covered by at least one 5G-NR service provider at minimum speeds of 7/1 Mbps. Approximately 92% of the population, approximately 55% of road miles, and approximately 25% of the land area were covered by at least two 5G-NR service providers at minimum speeds of 7/1 Mbps. Finally, approximately 81% of the population, approximately 36% of road miles, and approximately 11% of the land area were covered by at least three 5G-NR service providers at minimum speeds of 7/1 Mbps.

[457] RootMetrics, *A Simple Premise for a Sophisticated Methodology*, http://rootmetrics.com/en-US/methodology (last visited Mar. 7, 2024). RootMetrics performs drive tests and stationary tests in specific locations, using leading Android-based smartphones for each network. RootScores are scaled from 0 to 100.

[458] The data in this figure are sourced from RootMetrics website. *See, e.g.*, RootMetrics, *RootScore Reports*, https://www.rootmetrics.com/en-US/rootscore/map/national/united-states/2023/2H (last visited Aug. 19, 2024).

[459] *See* Appx. D-5 for coverage maps for 2023 4G LTE outdoor stationary coverage at speeds of at least 5/1 Mbps and 2023 5G-NR outdoor stationary coverage at speeds of at least 7/1 Mbps and at least 35/3 Mbps, as well as analogous maps broken out by number of providers. *See* Appx. D-6 for additional figures showing 2023 4G LTE outdoor stationary coverage at speeds of at least 5/1 Mbps and 2023 5G-NR outdoor stationary coverage at speeds of at least 7/1 Mbps and at least 35/3 Mbps broken out by demographic variable (percentage of the U.S. population, urban, rural, Tribal Areas), geographic type (percentage of U.S. square miles, percentage of U.S. road miles), provider, and number of providers.

Fig. II.B.33
Estimated 5G-NR 7/1 Mbps Outdoor Stationary Coverage (Dec. 31, 2023)

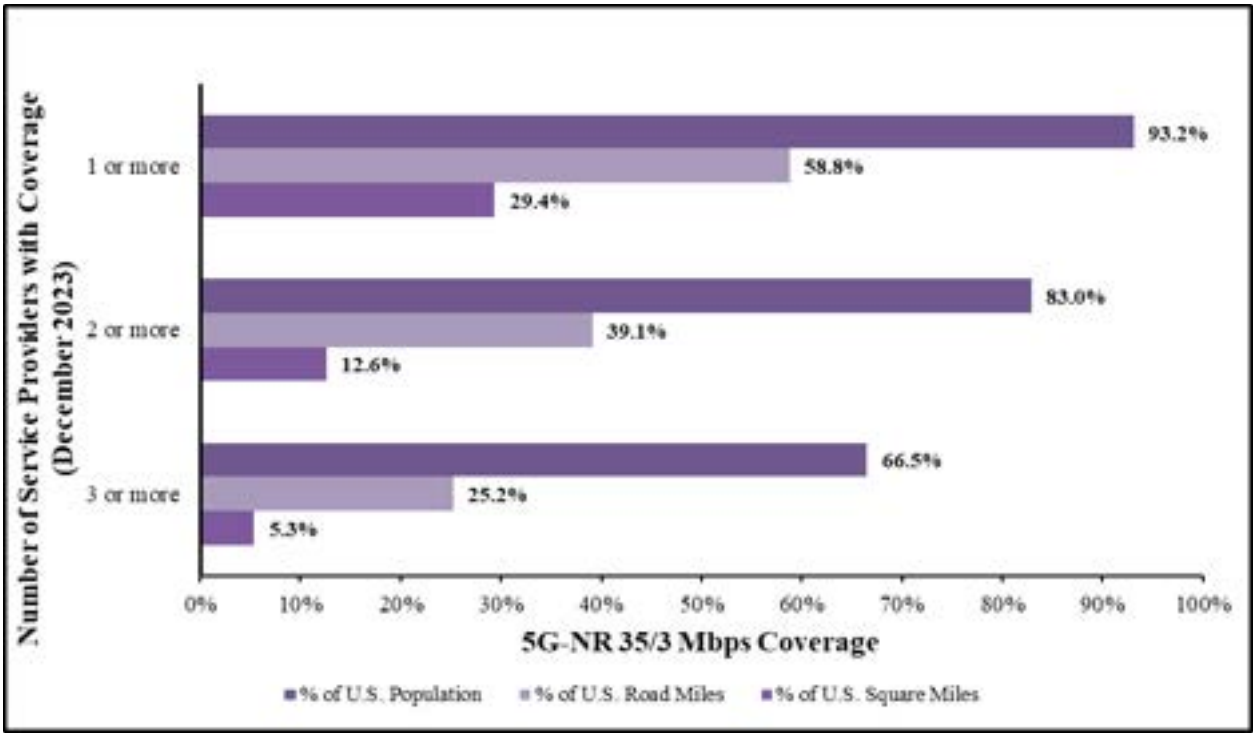


Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

129. Figure II.B.34 presents 5G-NR mobile broadband coverage at minimum speeds of 35/3 Mbps by number of service providers.[460] Approximately 93% of the U.S. population, approximately 59% of U.S. road miles, and approximately 29% of the U.S. land area were covered by at least one 5G-NR service provider at minimum speeds of 35/3 Mbps. Approximately 83% of the population, approximately 39% of road miles, and approximately 13% of the land area were covered by at least two 5G-NR service providers at minimum speeds of 35/3 Mbps. Finally, approximately 67% of the population, approximately 25% of road miles, and approximately 5% of the land area were covered by at least three 5G-NR service providers at minimum speeds of 35/3 Mbps.

[460] UScellular's 5G-NR 35/3 Mbps network covered approximately 3% of the U.S. population, approximately 2% of U.S. road miles, and approximately 1% of the U.S. land area. EchoStar's 5G-NR 35/3 Mbps network covered approximately 67% of the U.S. population, approximately 28% of U.S. road miles, and approximately 7% of the U.S. land area.

Fig. II.B.34
Estimated 5G-NR 35/3 Mbps Outdoor Stationary Coverage (Dec. 31, 2023)

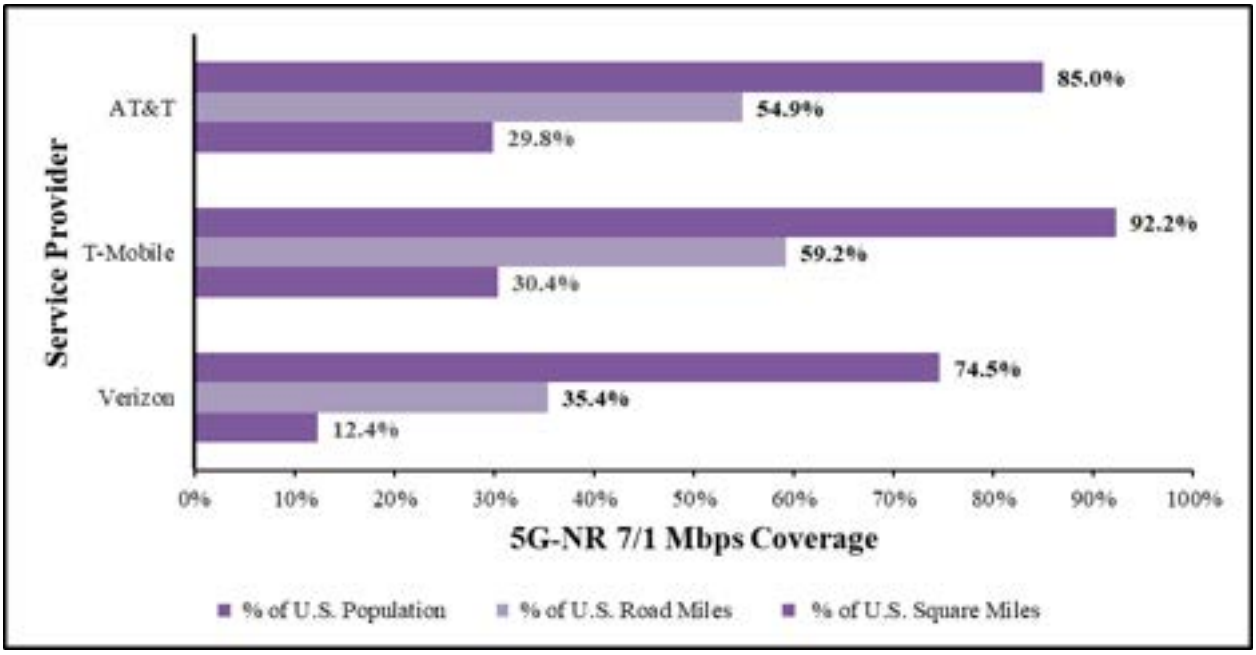


Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

130. Figure II.B.35 reports 5G-NR coverage with minimum speeds of 7/1 Mbps by individual mobile broadband service provider.[461] AT&T's 5G-NR network covered approximately 85% of the U.S. population, approximately 55% of U.S. road miles, and approximately 30% of the U.S. land area at minimum speeds of 7/1 Mbps. T-Mobile's 5G-NR network covered approximately 92% of the population, approximately 59% of road miles, and approximately 30% of the land area at minimum speeds of 7/1 Mbps. Finally, Verizon's 5G-NR network covered approximately 75% of the population, 35% of road miles, and approximately 12% of the land area at minimum speeds of 7/1 Mbps.

[461] UScellular's 5G-NR 7/1 Mbps network covered approximately 6% of the U.S. population, approximately 7% of U.S. road miles, and approximately 5% of the U.S. land area. EchoStar's 5G-NR 7/1 Mbps network covered approximately 72% of the U.S. population, approximately 30% of U.S. road miles, and approximately 8% of the U.S. land area.

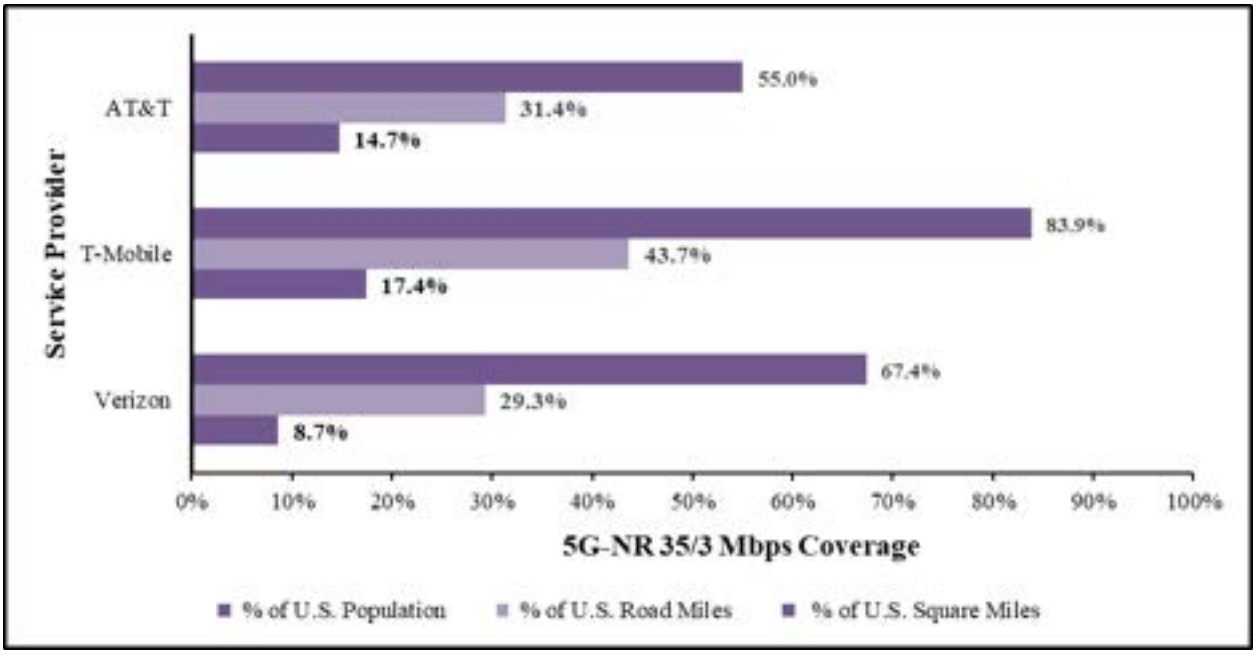
Fig. II.B.35
Estimated 5G-NR 7/1 Mbps Outdoor Stationary Coverage by Provider (Dec. 31, 2023)



Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

131. Figure II.B.36 reports 5G-NR coverage with minimum speeds of 35/3 Mbps by individual mobile broadband service provider. AT&T's 5G-NR network covered approximately 55% of the U.S. population, approximately 31% of U.S. road miles, and approximately 15% of the U.S. land area at minimum speeds of 35/3 Mbps. T-Mobile's 5G-NR network covered approximately 84% of the population, approximately 44% of road miles, and approximately 17% of the land area at minimum speeds of 35/3 Mbps. Finally, Verizon's 5G-NR network covered approximately 67% of the population, approximately 29% of road miles, and approximately 9% of square miles at minimum speeds of 35/3 Mbps.

Fig. II.B.36
Estimated 5G-NR 35/3 Mbps Outdoor Stationary Coverage by Provider (Dec. 31, 2023)



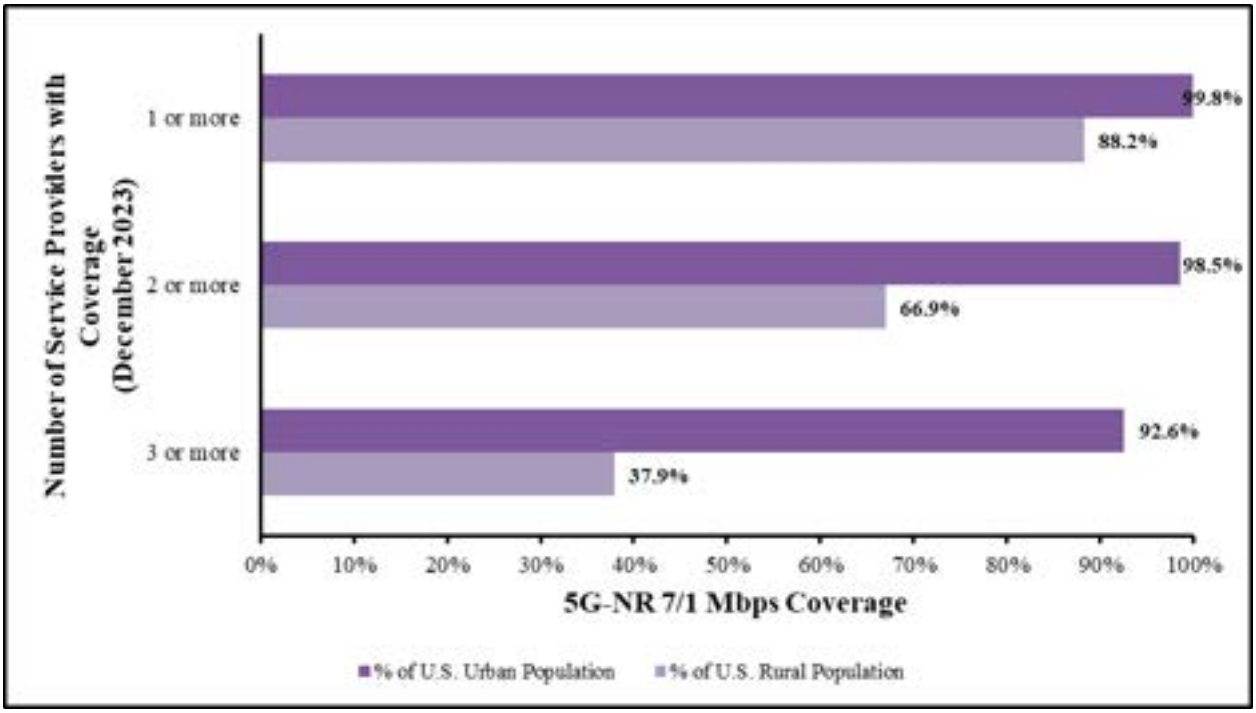
Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

132. *Rural/Urban Comparisons*. In our analysis of mobile network coverage comparing rural and urban areas, we use the urban/rural status derived from the U.S. Census Bureau's 2020 urban/rural classification.[462] Under this definition and using the 2020 U.S. Census population data, approximately 69 million people, or approximately 21% of the U.S. population, live in rural areas. These rural areas comprise approximately 3.46 million square miles, or approximately 97%, of the geographic area of the United States.

133. Figure II.B.37 reports 5G-NR population coverage at minimum speeds of 7/1 Mbps in rural and urban areas in the United States. At least one 5G-NR service provider covered nearly 100% of the U.S. urban population and approximately 88% of the U.S. rural population at minimum speeds of 7/1 Mbps. At least two 5G-NR service providers covered approximately 99% of the urban population and approximately 67% of the rural population at minimum speeds of 7/1 Mbps. Finally, at least three 5G-NR service providers covered approximately 93% of the urban population and approximately 38% of the rural population at minimum speeds of 7/1 Mbps.

[462] This approach is analogous to that used in the *2024 Section 706 Report*. *See 2024 Section 706 Report* at 30, para. 56 & n.220.

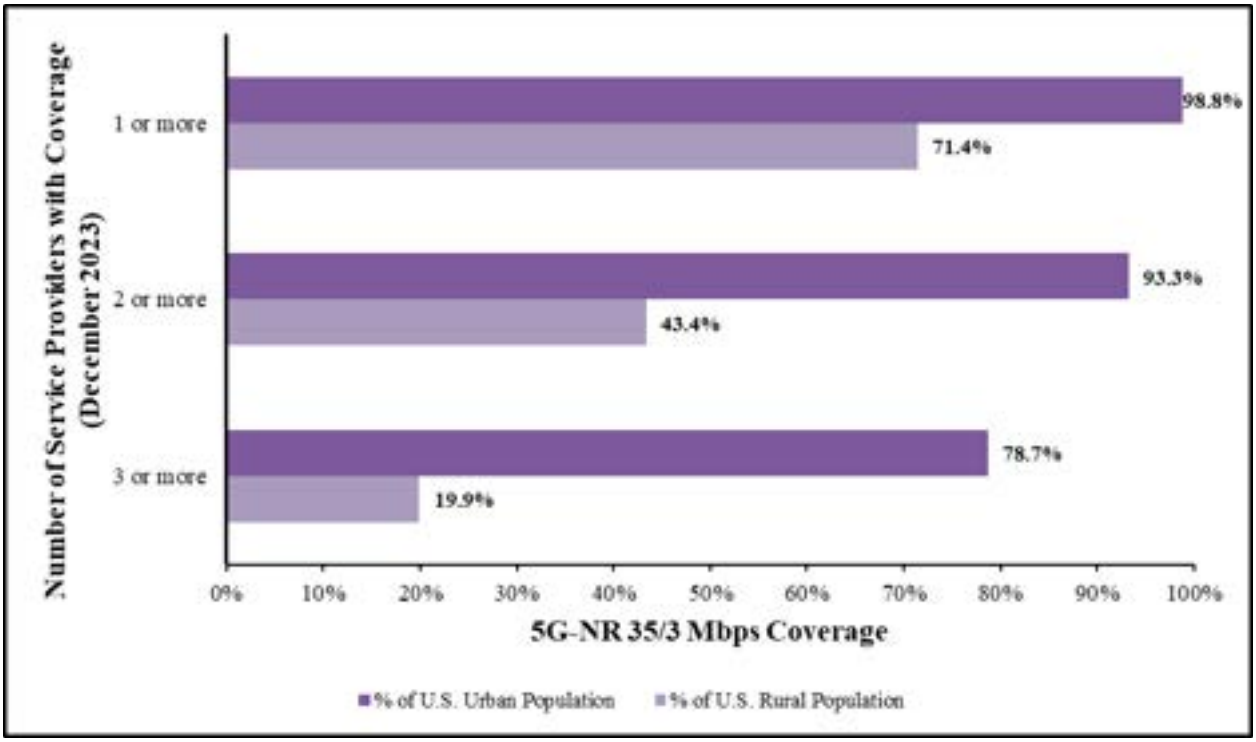
Fig. II.B.37
Estimated 5G-NR 7/1 Mbps Outdoor Stationary Coverage in Rural vs. Urban Areas (Dec. 31, 2023)



Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

134. Figure II.B.38 reports 5G-NR population coverage at minimum speeds of 35/3 Mbps in rural and urban areas in the United States. At least one 5G-NR service provider covered nearly 99% of the U.S. urban population and approximately 71% of the U.S. rural population at minimum speeds of 35/3 Mbps. At least two 5G-NR service providers covered approximately 93% of the urban population, and approximately 43% of the rural population at minimum speeds of 35/3 Mbps. Finally, at least three 5G-NR service providers covered approximately 79% of the urban population and approximately 20% of the rural population at minimum speeds of 35/3 Mbps.

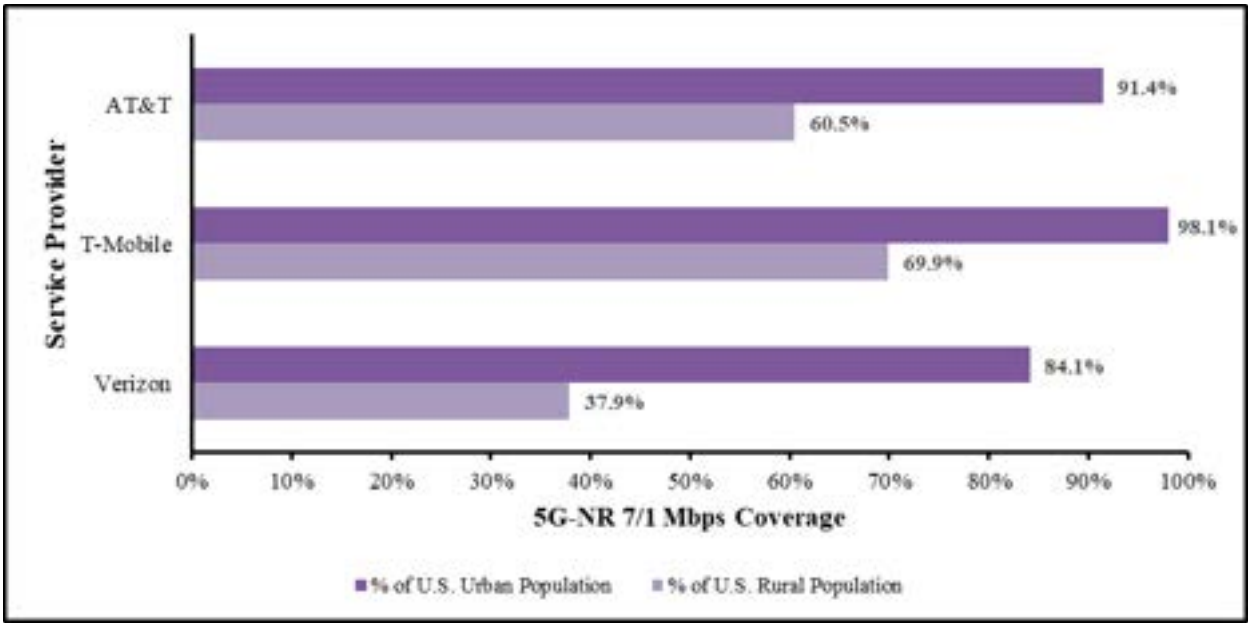
Fig. II.B.38
Estimated 5G-NR 35/3 Mbps Outdoor Stationary Coverage in Rural vs. Urban Areas (Dec. 31, 2023)



Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

135. Figure II.B.39 reports 5G-NR population coverage at minimum speeds of 7/1 Mbps in rural and urban areas by individual mobile broadband service provider. AT&T's 5G-NR network covered approximately 91% of the urban population and approximately 61% of the rural population at minimum speeds of 7/1 Mbps. T-Mobile's 5G-NR network covered approximately 98% of the urban population and approximately 70% of the rural population at minimum speeds of 7/1 Mbps. Finally, Verizon's 5G-NR network covered approximately 84% of the urban population and approximately 38% of the rural population at minimum speeds of 7/1 Mbps.

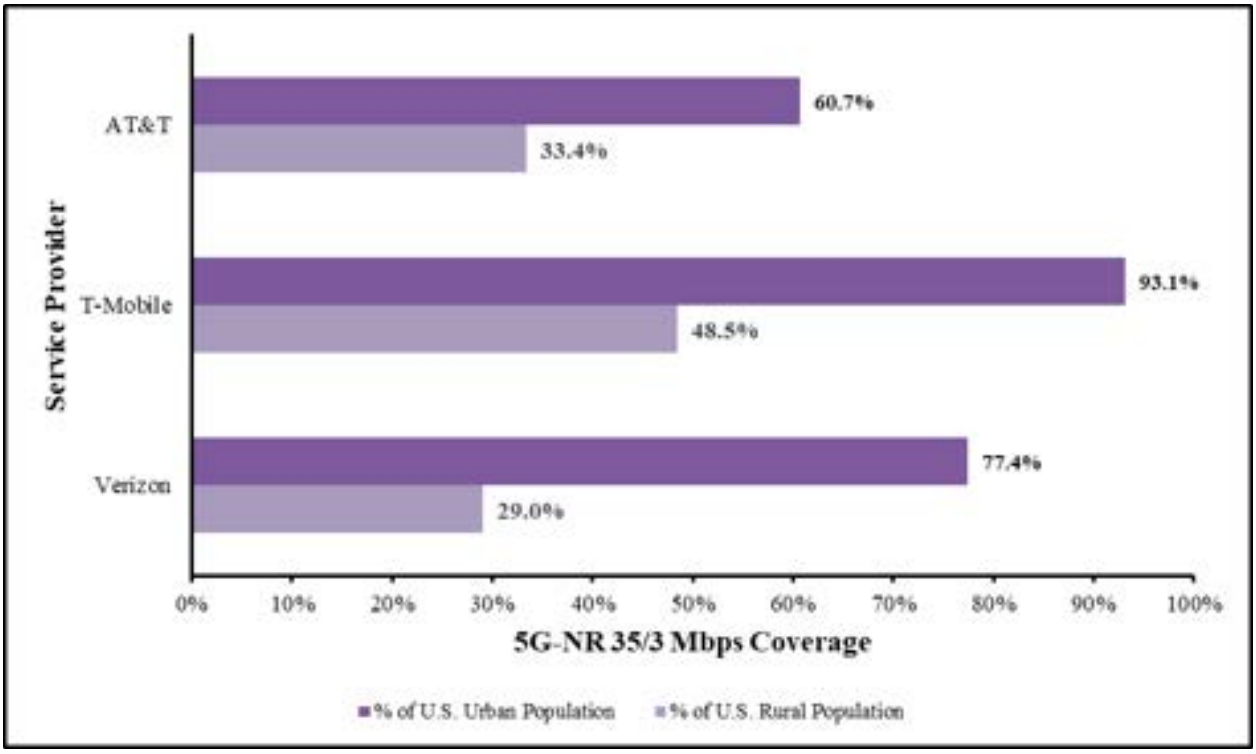
Fig. II.B.39
Estimated 5G-NR 7/1 Mbps Outdoor Stationary Coverage in Rural vs. Urban Areas by Provider (Dec. 31, 2023)



Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

136. Figure II.B.40 reports 5G-NR population coverage at minimum speeds of 35/3 Mbps in rural and urban areas by individual mobile broadband service provider. AT&T's 5G-NR network covered approximately 61% of the urban population and 33% of the rural population at minimum speeds of 35/3 Mbps. T-Mobile's 5G-NR network covered approximately 93% of the urban population and 49% of the rural population at minimum speeds of 35/3 Mbps. Finally, Verizon's 5G-NR network covered approximately 77% of the urban population and 29% of the rural population at minimum speeds of 35/3 Mbps.

Fig. II.B.40
Estimated 5G-NR 35/3 Mbps Outdoor Stationary Coverage in Rural vs. Urban Areas by Provider (Dec. 31, 2023)



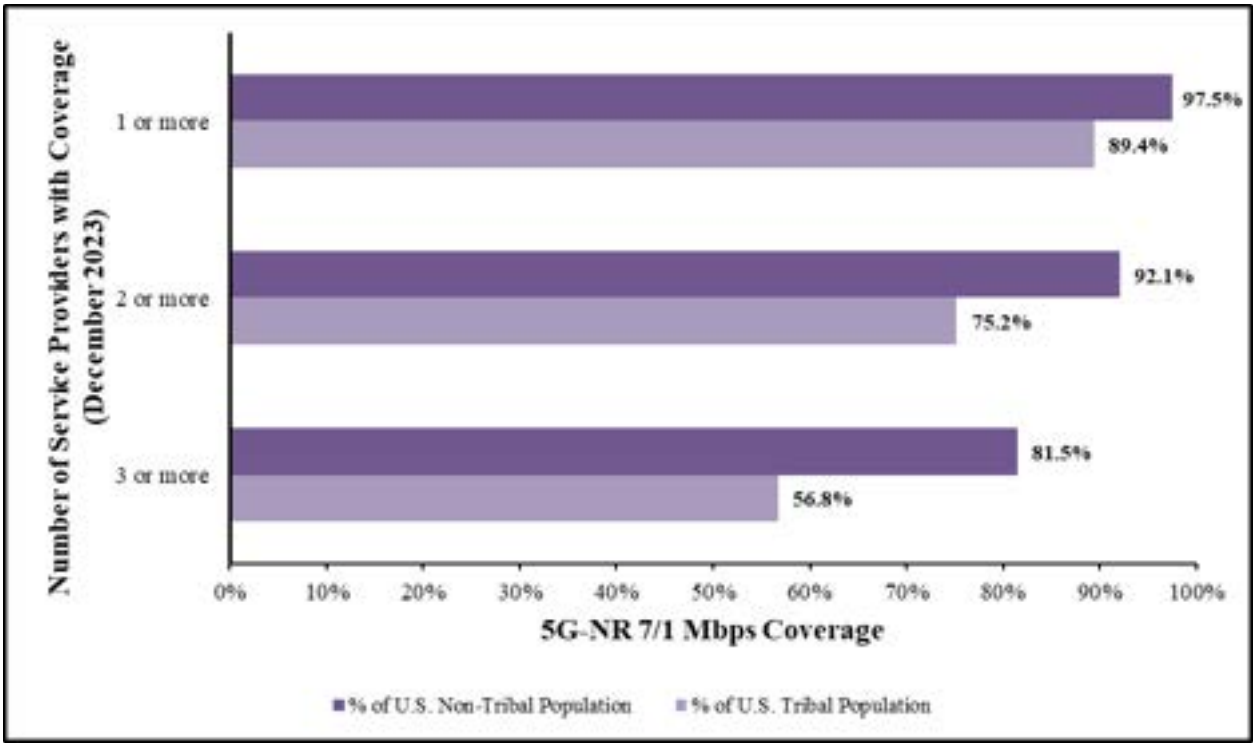
Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

137. *5G-NR Tribal/Non-Tribal Comparisons.* In our analysis of mobile network coverage in Tribal areas, we use federally recognized American Indian, Alaska Native, and Native Hawaiian Areas maintained by the U.S. Census Bureau as the source for classifying Tribal areas.[463] Using 2020 Census data, we estimate that approximately four million people live in Tribal areas, or about 1.4% of the U.S. population. Additionally, Tribal areas cover 184,858 square miles, about 5.2% of the total U.S. land area.

138. Figure II.B.41 reports 5G-NR population coverage at minimum speeds of 7/1 Mbps in Tribal and non-Tribal areas in the United States. At least one 5G-NR provider covered approximately 98% of the U.S. population in non-Tribal areas and approximately 89% of the U.S. population in Tribal areas at minimum speeds of 7/1 Mbps. Further, at least two 5G-NR service providers covered approximately 92% of the population in non-Tribal areas and approximately 75% of the population in Tribal areas at minimum speeds of 7/1 Mbps. Finally, at least three 5G-NR service providers covered approximately 82% of the population in non-Tribal areas and approximately 57% of the population in Tribal areas at minimum speeds of 7/1 Mbps.

[463] This approach is analogous to that used in the *2024 Section 706 Report*. *See 2024 Section 706 Report* at 30-31, para. 57 & n.221.

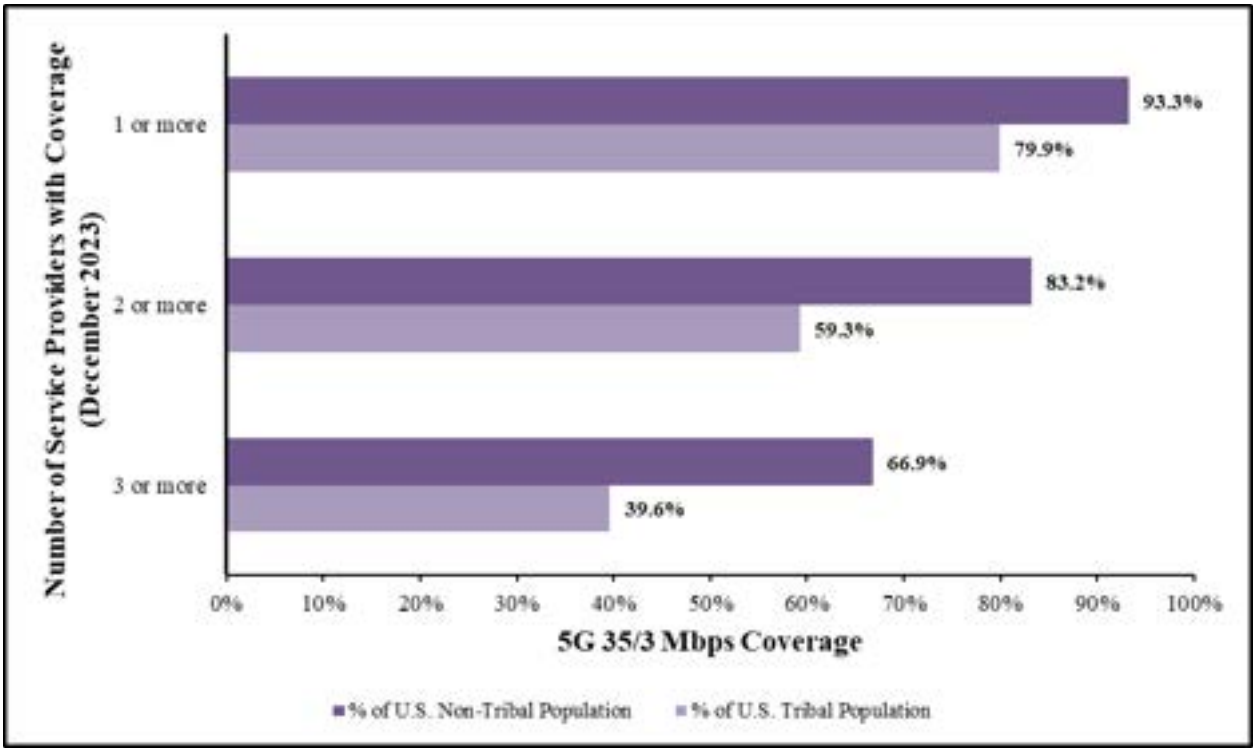
Fig. II.B.41
Estimated 5G-NR 7/1 Mbps Outdoor Stationary Coverage in Tribal vs. Non-Tribal Areas (Dec. 31, 2023)



Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

139. Figure II.B.42 reports 5G-NR population coverage at minimum speeds of 35/3 Mbps in Tribal and non-Tribal areas in the United States. At least one 5G-NR provider covered approximately 93% of the U.S. population in non-Tribal areas and approximately 80% of the U.S. population in Tribal areas at minimum speeds of 35/3 Mbps. Further, at least two 5G-NR service providers covered approximately 83% of the population in non-Tribal areas and approximately 59% of the population in Tribal areas at minimum speeds of 35/3 Mbps. Finally, at least three 5G-NR service providers covered approximately 67% of the population in non-Tribal areas and approximately 40% of the population in Tribal areas at minimum speeds of 35/3 Mbps.

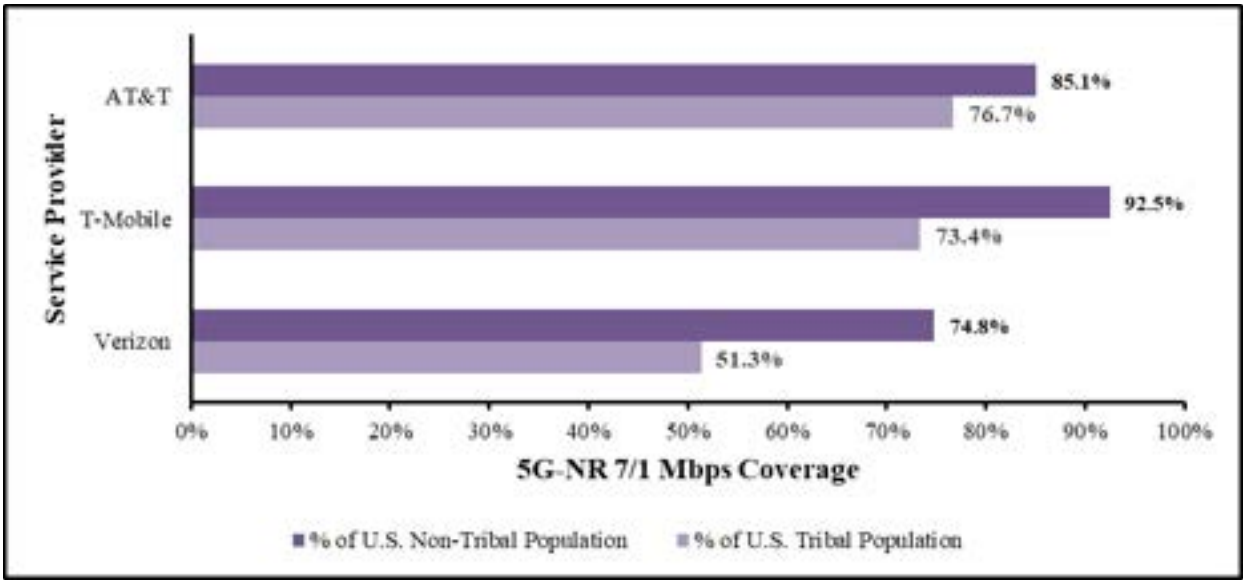
Fig. II.B.42
Estimated 5G-NR 35/3 Mbps Outdoor Stationary Coverage in Tribal vs. Non-Tribal Areas (Dec. 31, 2023)



Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

140. Figure II.B.43 reports 5G-NR coverage at speeds of 7/1 Mbps in Tribal and non-Tribal areas by individual mobile broadband service provider. AT&T's 5G-NR network covered approximately 85% of the U.S. population in non-Tribal areas and approximately 77% of the U.S. population in Tribal areas at minimum speeds of 7/1 Mbps. T-Mobile's 5G-NR network covered approximately 93% of the population in non-Tribal areas and approximately 73% of the population in Tribal areas at minimum speeds of 7/1 Mbps. Finally, Verizon's 5G-NR network covered approximately 75% of the population in non-Tribal areas and approximately 51% of the population in Tribal areas at minimum speeds of 7/1 Mbps.

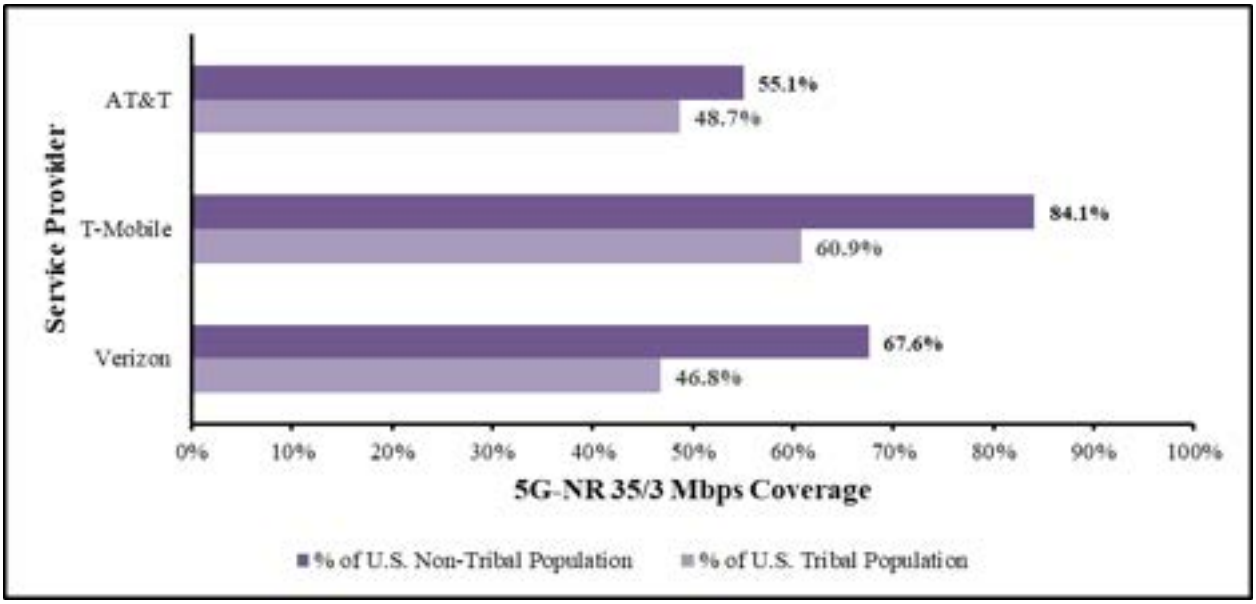
Fig. II.B.43
Estimated 5G-NR 7/1 Mbps Outdoor Stationary Coverage in Tribal vs. Non-Tribal Areas by Provider (Dec. 31, 2023)



Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

141. Figure II.B.44 reports 5G-NR coverage at speeds of 35/3 Mbps in Tribal and non-Tribal areas by individual mobile broadband service provider. AT&T's 5G-NR network covered approximately 55% of the U.S. population in non-Tribal areas and approximately 49% of the U.S. population in Tribal areas at minimum speeds of 35/3 Mbps. T-Mobile's 5G-NR network covered approximately 84% of the population in non-Tribal areas and approximately 61% of the population in Tribal areas at minimum speeds of 35/3 Mbps. Finally, Verizon's 5G-NR network covered approximately 68% of the population in non-Tribal areas and approximately 47% of the population in Tribal areas at minimum speeds of 35/3 Mbps.

Fig. II.B.44
Estimated 5G-NR 35/3 Mbps Outdoor Stationary Coverage in Tribal vs. Non-Tribal Areas by Provider (Dec. 31, 2023)



Source: FCC BDC data; 2020 Census data; Staff Block Estimates.

7. Relationship Between Fixed and Mobile Broadband Service

142. In this section, we first describe the distribution of fixed and mobile broadband subscriptions, including trends in how consumers access the Internet. We then describe differences in service attributes of fixed and mobile broadband, including plan characteristics, that could lead consumers to subscribe to both fixed and mobile broadband or only subscribe to one service. Finally, we discuss technological and strategic developments that may affect competition between fixed and mobile broadband services.

143. We begin by noting that many households continue to subscribe to both fixed and mobile broadband service,[464] suggesting that these separate services offer benefits that are either complementary or independent of each other.[465] Technological innovation in, and increased deployment of, both the

[464] U.S. Census Bureau, American Community Survey, 2023 ACS 1-Year Estimates—Public Use Microdata Sample, https://www.census.gov/programs-surveys/acs/data.html (last visited Oct. 22, 2024) (ACS 2023 Data). For this section, we define households subscribing to mobile broadband using the "BROADBND" variable and fixed broadband using the "HISPEED" variable. We do not include households who only have access to dial-up Internet, which is defined using the "DIALUP" variable, in the share of households who pay for an Internet service subscription. Access to other Internet, which is defined using the "OTHSVCEX" variable, and access to satellite Internet, which is defined using the "SATELLITE" variable, are not included in either mobile or fixed broadband, but they are included in the share of households who pay for an Internet subscription. "OTHSVCEX" includes fixed wireless, but fixed wireless cannot be isolated in the publicly available microdata.

[465] *See 2024 Section 706 Report* at 9-10, para. 18 (stating that "[b]ased on the separate use cases for fixed and mobile broadband as well as evidence that consumers tend to subscribe to both services when they can, fixed and mobile broadband services are not full substitutes"); *Id*. at 9-13, paras. 19-21 (finding that fixed and mobile broadband services have complementary use cases and consumers tend to subscribe to both if they can). INCOMPAS supports the idea that fixed and mobile broadband services are complementary, citing research from Pew Research and Leichtman Research Group. INCOMPAS Comments at 6-8; Risa Gelles-Watnick, Pew Research, *Americans' Use of Mobile Technology and Home Broadband* (Jan. 31, 2024), https://www.pewresearch.org/internet/2024/01/31/americans-use-of-mobile-technology-and-home-broadband/; LightReading, *92% of U.S. Households Get an Internet Service at Home—Leichtman Research* (Dec. 11, 2023), (continued….)

mobile and fixed broadband services marketplaces have broadened consumers' choices of how to access the Internet.

144. *Distribution of Fixed and Mobile Broadband Subscribers.* Based on one-year 2023 estimates from the U.S. Census Bureau's American Community Survey (ACS), approximately 92%[466] of households in the United States paid for at least one type of Internet service subscription.[467] Among households that pay for an Internet subscription, approximately 94% paid for mobile broadband, while approximately 17% of all households with paid Internet subscriptions relied on mobile broadband as their only means of access.[468] In comparison, approximately 83% of households with paid Internet subscriptions subscribed to fixed broadband in 2023, while approximately 5% of households with paid Internet subscriptions[469] relied on fixed broadband as their only means of access.[470]

145. As Figure II.B.45 shows, the mobile broadband-only percentage has increased somewhat from roughly 16% in 2020 to 17% in 2023,[471] whereas the fixed broadband-only percentage has decreased year over year from a peak of roughly 7% in 2020, to roughly 5% in 2023.[472] Overall, the number of households that subscribe to one Internet service decreased from approximately 24% in 2020 to approximately 22% in 2023.

(Continued from previous page)
https://www.lightreading.com/broadband/92-of-u-s-households-get-an-internet-service-at-home-leichtman-research; LightReading, *Fueled by FWA Gains, U.S. Broadband Providers Added 3.5M Subs in 2022* (Mar. 2, 2023), https://www.lightreading.com/broadband/fueled-by-fwa-gains-us-broadband-providers-added-3-5m-subs-in-2022.

[466] This statistic does not include households whose only Internet subscription is dial-up. Dial-up only households account for well under 1% of households in the United States.

[467] The ACS asks participants who indicate that they gain access to the Internet at their "house, apartment, or mobile home" by "paying a cell phone company or Internet service provider" whether they, "or any member of [their] household have access to the Internet using" a "broadband (high speed) Internet service such as cable, fiber optic, or DSL service installed in [the] household," "cellular data plan for a smartphone or other mobile device," or other means, including satellite, dial-up Internet, or some other service. *See* U.S. Census Bureau, American Community Survey, *Why We Ask Questions About Computer and Internet Use*, https://www.census.gov/acs/www/about/why-we-ask-each-question/computer/ (last visited May 9, 2024). Answers to this survey question do not necessarily correspond with the Commission's current definition of advanced telecommunications capability. We note that an additional 3.3 million households (approximately 3%) connected to the Internet without a paid subscription.

[468] Estimates based on the 2023 ACS 1-Year Estimates—Public Use Microdata Sample. ACS 2023 Data. Mobile-only households may also subscribe to dial-up Internet service, other Internet service, or satellite Internet service.

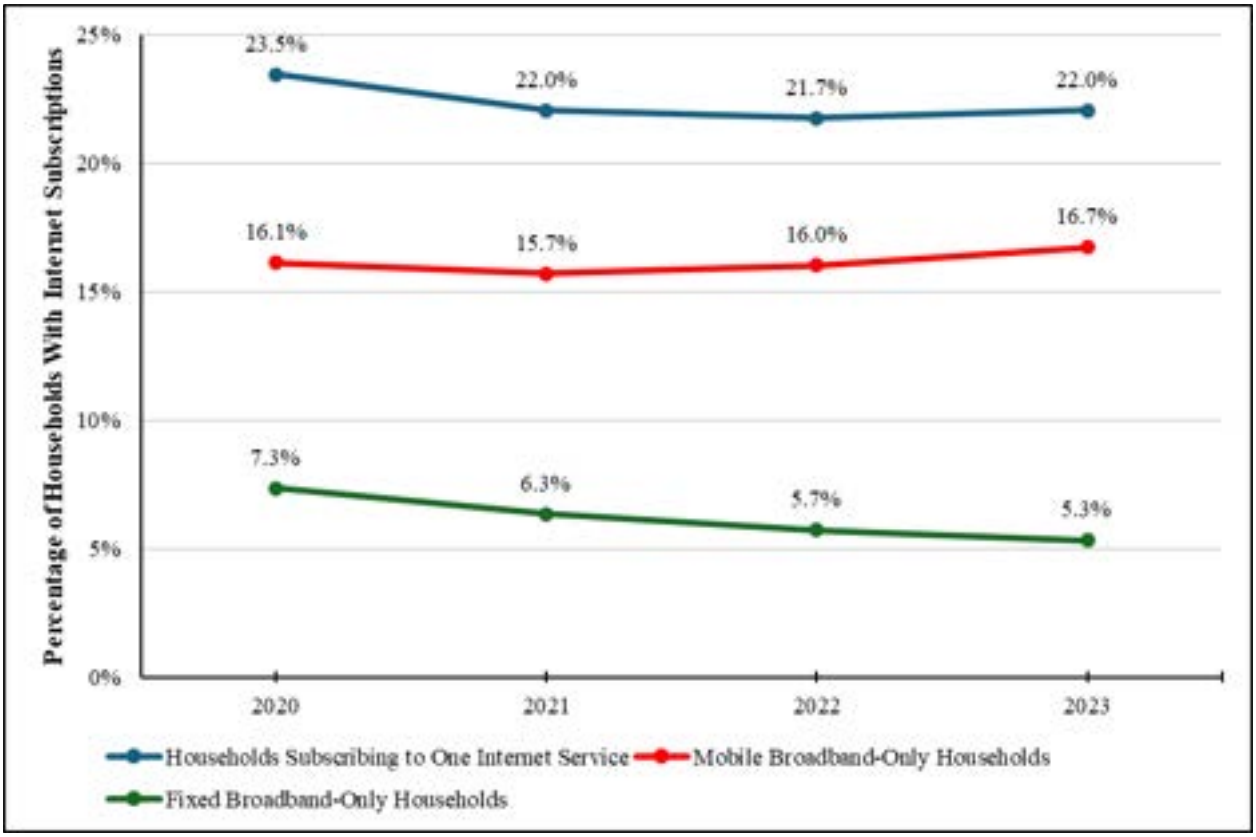
[469] Estimates based on the 2023 ACS 1-Year Estimates—Public Use Microdata Sample. *Id.* Fixed-only households may also subscribe to dial-up Internet service, other Internet service, or satellite Internet service.

[470] If we include satellite Internet with fixed broadband, the statistics change slightly. First, the share of households with paid Internet subscriptions that relied on mobile as their only means of access falls to approximately 14%. Second, the share of households with paid Internet subscriptions who subscribed to fixed broadband in 2023 rises to approximately 86%. Third, the share of households with paid Internet subscriptions relying on fixed broadband as their only means of access rises to approximately 6%. Estimates based on the 2023 ACS 1-Year Estimates—Public Use Microdata Sample. ACS 2023 Data.

[471] We note that this trend could be related to the COVID-19 pandemic when telecommuting and use of remote services became a more common practice, potentially causing additional households to subscribe to fixed services. This trend could also be related to the ACP, which began during this time period, and helped some households add an additional service by making broadband services more affordable. *See infra* section IV.B.1 for additional discussion of the impact of the ACP on the affordability of broadband services.

[472] ACS 2023 Data.

Fig. II.B.45
Percentage of Internet-Connected Households Subscribing to Only One Type of Service



Source: U.S. Census Bureau, American Community Survey, 2020-2023 ACS 1-Year Estimates—Public Use Microdata Sample.

146. Figure II.B.46 compares the number of households with mobile broadband, fixed broadband, or any type of paid Internet subscription, respectively, to households that pay for services other than mobile broadband, households that pay for services other than fixed broadband, or households that do not pay for Internet service.[473] Figure II.B.46 shows growth in the rate of mobile subscribership and a slight decrease in the rate of fixed subscribership, which helps explain the increase in mobile-only households and decrease in fixed-only households in Figure. II.B.45. Overall, paid internet access is increasing and, as evidenced by Figure II.B.45, single-subscription households are decreasing.

[473] We do not include households who only subscribe to dial-up Internet in the share of households who have paid access to the Internet.

Fig. II.B.46
Total Number and Percentage of Households Accessing the Internet by Technology[474]

		2020	2021	2022	2023
Mobile Broadband	Yes	101,319,642	107,009,390	110,816,596	113,950,014
	No	8,881,099	7,962,740	7,384,214	7,006,262
		91.9%	93.1%	93.8%	94.2%
Fixed Broadband	Yes	91,651,623	96,249,756	98,619,329	100,152,853
	No	18,549,118	18,722,374	19,581,481	20,803,423
		83.2%	83.7%	83.4%	82.8%
Paid Access to the Internet	Yes	110,200,741	114,972,130	118,200,810	120,996,359
	No	11,190,936	9,645,409	8,490,335	7,026,486
		90.8%	92.3%	93.3%	94.5%

Source: U.S. Census Bureau, American Community Survey, 2020-2023 ACS 1-Year Estimates—Public Use Microdata Sample.

147. Pew Research reported that 20% of adults surveyed indicated that they did not subscribe to home fixed broadband in 2023,[475] down from 23% in 2021.[476] Additionally, 15% of Americans are designated as smartphone-only Internet users in 2023, the same percentage as in 2021.[477] While the share of smartphone-only users has remained constant, it is still significantly higher than the 8% of U.S. adults indicated as smartphone-only users in 2013, when Pew originally began tracking such users.[478] As Figure II.B.47 shows, the percentage of smartphone-only Internet users is higher among survey participants who were younger, Black or Hispanic, less educated, or in lower income brackets.[479]

[474] The first two categories, "Mobile Broadband" and "Fixed Broadband" consist of households that paid for an Internet service. The third category, "Paid Access to the Internet," consists of either households who paid for one or more Internet subscriptions ("Yes") and those who did not have any Internet access ("No").

[475] Risa Gelles-Watnick, Pew Research, Americans' Use of Mobile Technology and Home Broadband at 5 (Jan. 2024), https://www.pewresearch.org/wp-content/uploads/sites/20/2024/01/PI_2024.01.31_Home-Broadband-Mobile-Use_FINAL.pdf (Mobile Technology and Home Broadband 2024).

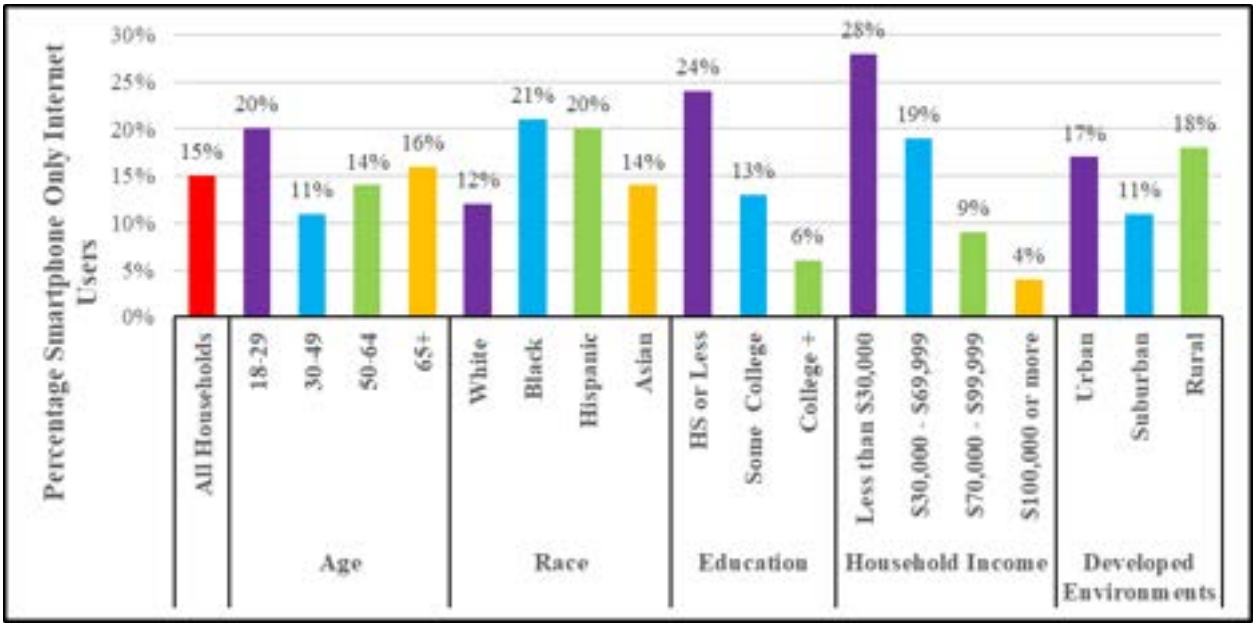
[476] Andrew Perrin, Pew Research, Mobile Technology and Home Broadband 2021 at 5 (June 2021), https://www.pewresearch.org/internet/wp-content/uploads/sites/9/2021/06/PI_2021.06.03_Mobile-Broadband_FINAL.pdf (Mobile Technology and Home Broadband 2021).

[477] Mobile Technology and Home Broadband 2024 at 7; Mobile Technology and Home Broadband 2021 at 7. In The Free State Foundation (FSF)'s reply comments, they cite to the same 2023 Pew statistic as evidence that fixed and mobile broadband are substitutes for at least some individuals. FSF Reply at 4.

[478] Pew Research Center, *Mobile Fact Sheet* (Nov. 13, 2024), https://www.pewresearch.org/internet/fact-sheet/mobile/ (showing smartphone dependency over time).

[479] Mobile Technology and Home Broadband 2024 at 5, 7. In The LGBT Technology Partnership and Institute (LGBT Tech)'s comments, they provide survey results showing 8% of LGBTQ+ adults in the United States reside in households where their only Internet access comes from data plans on mobile devices. LGBT Tech Comments at 5.

Fig. II.B.47
Smartphone-Only Internet Users by Demographic, Income, and Geographic Group



Source: Pew Research Center, Americans' Use of Mobile Technology and Home Broadband, replicated from figure entitled "15% of Americans are 'smartphone dependent,' and this share is greater among those with lower incomes."

148. *Service Attributes of Fixed and Mobile Broadband.* A majority of Internet users subscribe to both fixed and mobile service. For instance, approximately 82% of households subscribing to mobile broadband also subscribe to fixed broadband at home.[480] The decision of households to subscribe to both services may be driven by differences in quality and other plan characteristics.

149. INCOMPAS emphasized that fixed broadband (particularly fiber) delivers faster speeds and more robust broadband, whereas mobile broadband offers the convenience of Internet access outside the home.[481] In mid-2024, many mobile broadband "unlimited" plans stipulated that, during times where a cell is experiencing network congestion, those subscribers' traffic would be de-prioritized at that cell if they consumed beyond a limit that was typically set at around 50 GB per month.[482] By comparison, many

[480] ACS 2023 Data.

[481] INCOMPAS Aug. 20, 2024 *Ex Parte* at 2; INCOMPAS Aug. 12, 2024 *Ex Parte* at 1-2; INCOMPAS Comments at 7 (asserting that most fixed broadband consumers do not have to worry about hitting a cap).

[482] Eli Blumenthal, CNET, *Best Unlimited Data Plans for May 2024* (May 4, 2024), https://www.cnet.com/tech/mobile/best-unlimited-data-plans/ (navigate to the "Is unlimited data really unlimited?" section under "Wireless plan FAQ" subheading). *See, e.g.*, T-Mobile, *Why Did I Receive an SMS About Using 50GB of Data?*, https://www.t-mobile.com/offers/mydatausage (last visited May 10, 2024) (providing deprioritization practice at a congested tower under the "What happens if I do access a congested tower after I've used 50GB of data?" tab); Verizon, *Unlimited*, https://www.verizon.com/plans/unlimited/ (last visited May 10, 2024) (navigate to the "What is an unlimited data plan?" section under the "Have questions? We've got answers." subheading); AT&T, *Unlimited Data Plans*, https://www.att.com/plans/unlimited-data-plans/ (last visited May 10, 2024) (navigate to the "Is there a cap on AT&T's unlimited data plans?" section under the "Frequently asked questions" subheading).

major fixed broadband providers either do not have a data cap or cap access at or close to 1 TB, typically charging $10 for additional 50 GB increments.[483]

150. Among mobile wireless service providers, prices for unlimited plans were typically set at $50 or more for the first line among nationwide facilities-based, post-paid mobile wireless service providers, and $30 or more among nationwide prepaid providers, with a lower per-line cost for additional lines.[484] By comparison, prices among fixed wireless providers were more localized and varied with the advertised speed. Whereas fixed wireless prices typically apply to all devices at the connected premises (either through a physical connection or via Wi-Fi), mobile service plans that include the ability to use a smartphone as a mobile hotspot typically cost more, require a higher priced (premium) plan, or are limited in speed or data allowance.[485]

151. Speed tests also demonstrate that fixed broadband speeds are typically faster than mobile broadband speeds, although this gap has narrowed with more widespread adoption of 5G. In its comments, The Free State Foundation (FSF) cites to Ookla speed test data showing that median mobile broadband speeds in 2024 were similar to median fixed speeds in 2021.[486] We find above that, in the second half of 2023, mean and median 5G download speeds for the three nationwide providers ranged from 173.3 Mbps to 276.1 Mbps and 113.6 Mbps to 230.4 Mbps, respectively.[487] While such speeds are comparable to fixed broadband speeds in parts of the United States, they are well below speeds available in many locations. For example, the *Thirteenth Measuring Broadband America Fixed Broadband Report* reports that for September-October 2022, the weighted mean advertised download speed was 467 Mbps for the twelve participating ISPs, and nearly all of the ISPs' measured median download speeds met or exceeded their advertised speeds.[488] INCOMPAS asserts that higher speeds, larger data allowances, and less frequent or lack of throttling may lead subscribers to use Wi-Fi connected fixed broadband networks when available.[489]

152. *Technological and Strategic Developments*. Technological advancements and entry from non-traditional providers of mobile broadband, such as cable companies, could alter the relationship between fixed and mobile broadband services. As 5G networks become more widely available and consumers further transition to 5G-capable devices, mobile connections are expected to become faster and more reliable. Existing mobile broadband service providers are continuing to deploy 5G networks throughout the United States.[490] In some instances, traditional facilities-based mobile wireless providers

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[483] Chili Palmer, Peter Holslin, and Kevin Parrish, High Speed Internet, *Which Internet Service Providers Have Data Caps?* (Feb. 8, 2023), https://www.highspeedinternet.com/resources/which-internet-service-providers-have-data-caps.

[484] Eli Blumenthal, CNET, *Best Unlimited Data Plans for May 2024* (May 4, 2024), https://www.cnet.com/tech/mobile/best-unlimited-data-plans/. *See, e.g.*, T-Mobile, *Phone & Discount Plans*, https://www.t-mobile.com/commerce/cell-phone-plans (last visited Oct. 7, 2024); AT&T, *Learn About the AT&T Value Plus VL Plan*, https://www.att.com/support/article/wireless/KM1477695/ (last visited Oct. 7, 2024); Mint Mobile, *Plans*, https://www.mintmobile.com/plans/ (last visited Oct. 7, 2024); Cricket Wireless, *Choose Your Plan*, https://www.cricketwireless.com/cell-phone-plans (last visited Oct. 7, 2024).

[485] AT&T, *Unlimited Data Plans*, https://www.att.com/plans/unlimited-data-plans/ (last visited May 10, 2024); T-Mobile, *Plan Details*, https://www.t-mobile.com/plan-details (last visited May 10, 2024); Verizon, *Unlimited*, https://www.verizon.com/plans/unlimited/ (last visited May 10, 2024).

[486] FSF Comments at 14. Median mobile upload and download speeds were 125.14 and 9.80 Mbps, respectively, in April 2024, while median upload and download speeds for fixed service were 134.10 and 19.45 Mbps, respectively, in November 2021. *Id*.

[487] *See supra* Fig. II.B.27.

[488] *Thirteenth Measuring Broadband America Fixed Broadband Report* at 12, 15.

[489] INCOMPAS Comments at 7.

have leveraged the spectrum on their networks and are offering fixed wireless services.[491] Moreover, the Commission has taken a number of actions to spur the development and deployment of 5G networks.[492]

153. In addition, as FSF notes, major cable providers have begun offering mobile broadband services using hybrid-MVNO strategies.[493] While such providers hold a relatively small market share at this point in time, subscribership has been increasing. For instance, Comcast has increased its mobile broadband subscribers from roughly 4 million in 2021 to roughly 6.6 million in 2023, and Charter has increased its mobile subscribership from roughly 3.6 million in 2021 to roughly 7.8 million in 2023.[494] By bundling their mobile broadband services with their fixed broadband and other offerings, cable providers can provide their customers with plan options that traditional facilities-based mobile wireless providers do not offer to many of their customers.[495] At the same time, because certain cable MVNOs have only offered mobile broadband to existing residential broadband subscribers to date, their effect on nationwide mobile broadband is limited.

C. Voice Telephone Services

154. Although the public switched telephone network was once the only means to connect, there now exists a multitude of other voice service options for consumers in the United States. We focus on interconnected voice in our reporting, but acknowledge that there are many other types of telecommunications offerings, including apps running solely on data networks that are nearly indistinguishable to the consumer from the core communications functionality of the public switched telephone network, and nearly indistinguishable to providers from other network data traffic. Many of these apps combine the benefits of voice, video, and text communications into one data-based service.

(Continued from previous page)

[490] Tim Fisher, Lifewire, *Where Is 5G Available in the US? (2024)*, https://www.lifewire.com/5g-availability-us-4155914 (last visited May 7, 2024).

[491] For example, T-Mobile and Verizon ended 2023 with 4.8 million and approximately 3.1 million fixed wireless customers, respectively. Monica Alleven, Fierce Network, *T-Mobile Reports 934,000 Postpaid Phone Net Adds in Q4 2023* (Jan. 26, 2024), https://www.fierce-network.com/wireless/t-mobile-reports-934000-postpaid-phone-net-adds-q4-2023; Jeff Baumgartner, Light Reading, *Verizon's FWA Base Crosses 3M Mark* (Jan. 23, 2024), https://www.lightreading.com/fixed-wireless-access/verizon-s-fwa-base-crosses-3m-mark. Citing to Ericsson research, WISPA states that fixed wireless accounted for over 90% of the net increase in fixed broadband connections in the United States from the second quarter of 2022 to the third quarter of 2023. WISPA Comments at 4; *see also* Ericsson, Fixed Wireless Access Handbook Insights 2024, Insight 1 of 6 at 5 (2023) https://www.ericsson.com/4ade14/assets/local/reports-papers/further-insights/doc/fwa_insights_1_momentum_extracted.pdf. Various commenters suggest that this growth indicates that consumers are increasingly viewing fixed wireless as a substitute for traditional wired fixed broadband, though not as a substitute for mobile broadband. EchoStar Comments, Exh. 1 at 46; WISPA Comments at 4.

[492] *See infra* section VI of this *Report*.

[493] FSF Comments at 12-13.

[494] *See* Comcast Corporation, SEC Form 10-K, at 41 (filed Feb. 2, 2022), https://www.cmcsa.com/static-files/8887f574-dfa9-4480-8c8b-ed7771f7ce44 (for 4.0 million figure); Comcast Corporation, SEC Form 10-K, at 38 (filed Jan. 31, 2024), https://www.cmcsa.com/static-files/fabc4151-d6cd-4480-bf15-43a5dfd96290 (for 6.6 million figure); Charter Communications, Inc., SEC Form 10-K, at 5 (filed Jan. 28, 2022), https://ir.charter.com/static-files/a7341d7b-9391-48c7-83ca-280db458de42 (for 3.6 million figure); Charter Communications, Inc., SEC Form 10-K, at 5 (filed Feb. 2, 2024) https://ir.charter.com/static-files/f386360e-cd99-446e-b400-31121dc32c8c (for 7.8 million figure).

[495] *See, e.g.*, Comcast, *Xfinity Mobile*, https://www.xfinity.com/mobile/ (last visited May 10, 2024); Comcast, *NOW Mobile*, https://www.xfinity.com/now/mobile (last visited May 10, 2024); Charter, *Spectrum Mobile*, https://www.spectrum.com/mobile (last visited May 10, 2024).

155. Interconnected voice services are divided between fixed and mobile voice services. Fixed is further divided into traditional switched-access connections and interconnected VoIP.[496] VoIP is voice carried as data over an Internet Protocol (IP) network, and can be a voice service that is bundled with the underlying broadband connection or offered independent of the necessary data service (over-the-top, or OTT). Retail voice telephone service customers can also be served through mobile wireless subscriptions from a provider who operates a cellular network, or a Commercial Mobile Radio Service. Only facilities-based providers are required to submit mobile voice subscriptions through FCC Form 477. Mobile telephony (mobile voice) service is a real-time, two-way switched voice service that is interconnected with the public switched network using an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless handoff of subscriber calls.[497]

156. *Fixed Voice*. There are two fixed technologies through which retail voice subscriptions are provided: traditional switched-access and interconnected VoIP subscriptions. The December 2023 Form 477 data show that there are approximately 20.6 million end-user switched-access lines, including approximately 8.5 million residential lines.[498] In addition, there are approximately 64.2 million interconnected VoIP subscriptions, including approximately 24.1 million residential subscriptions.[499] Of the 85 million fixed retail voice telephone service subscriptions, approximately 38% were residential connections and approximately 62% were business connections.[500] The relative growth trends show that fixed switched-access continues to decline while interconnected VoIP services plateaued then had a slight decrease. The number of fixed retail switched-access lines declined over the past three years at a compound annual rate of 15.7%, while interconnected VoIP subscriptions decreased at a compound annual growth rate of 1.6%.[501] The number of fixed switched-access providers has also decreased, with 952 providers reporting fixed end-user switched-access lines in December 2020 compared to 865 in December 2023.[502] Conversely there were 1,670 providers with interconnected VoIP subscribers in December 2020, which increased to 1,843 in December 2023.[503] As of December 2023, residential fixed voice connections were approximately 26% switched-access and approximately 74% interconnected VoIP, with residential switched-access connections comprising approximately only 10% of all fixed retail voice connections.[504]

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[496] The FCC's rules state that an interconnected VoIP service is a service that: (1) enables real-time, two-way voice communications; (2) requires a broadband connection from the user's location; (3) requires Internet Protocol (IP)-compatible customer premises equipment; and (4) permits users generally to receive calls that originate on the public switched telephone network and to terminate calls to the public switched telephone network. *See* 47 CFR § 9.3.

[497] FCC, *FCC Form 477 Local Telephone Competition and Broadband Reporting Instructions* at 9 (Jan. 2, 2023), https://us-fcc.app.box.com/v/Form477Instructions.

[498] December 2023 Voice Telephone Services Report at 3, Fig. 2.

[499] *Id.*

[500] *Id.* at 2.

[501] *Id.* The compound annual growth rate is a smoothed rate of growth calculated in three steps: (1) divide the ending value by the beginning value; (2) raise the result of that division to a power equal to one divided by the number of years in the period (in this case, 3 years, so the power is 1/3); and (3) subtract 1 from the result of Step (2).

[502] *Id.* at 10-11, Tbl. 2; FCC, Office of Economics and Analytics, Voice Telephone Services: Status as of December 31, 2021 at 10-11, Tbl. 2 (Aug. 2023), https://docs.fcc.gov/public/attachments/DOC-396136A1.pdf (December 2021 Voice Telephone Services Report).

[503] December 2023 Voice Telephone Services Report at 10-11, Tbl. 2; December 2021 Voice Telephone Services Report at 10-11, Tbl. 2.

[504] December 2023 Voice Telephone Services Report at 8-9, Tbl. 1.

157. *OTT VoIP*. Fixed VoIP providers distinguish OTT VoIP, where the consumer uses an independent data service over a broadband connection, from all other types of interconnected VoIP.[505] The December 2023 FCC Form 477 data show approximately 22.9 million OTT VoIP subscriptions and approximately 41.3 million non-OTT VoIP subscriptions.[506] Mobile VoIP presents a more complicated picture given the plethora of communications apps in smartphone app ecosystems. Information on how customers use these apps for voice communication are not reported on FCC Form 477, as many of them do not permit users to make or receive calls connecting to numbers on the public switched telephone network, and therefore are not classified as interconnected VoIP.[507] The dynamic nature of this subsector makes it difficult to quantify the number of users, although U.S. consumers benefit from the ever-evolving choices available to meet their voice communication needs.

158. *Mobile Voice*. The December 2023 FCC Form 477 data indicate that there were approximately 386.1 million mobile subscriptions in the United States, representing an increase in mobile voice subscriptions at a compound annual growth rate of 3.1% over the prior three years.[508] According to preliminary data from the Centers for Disease Control and Prevention (CDC), as of December 2023, approximately 76% of adults lived in a wireless-only household in late 2023, with adults in lower age-groups more likely to live in wireless-only households.[509] For children, the CDC found that an even greater number, approximately 87%, live in wireless-only households.[510] In the 25 to 29 age group, approximately 87% of adults lived in wireless-only households, approximately 90% of those aged 30 to 34 lived in wireless-only households, approximately 87% of those aged 35 to 44 lived in wireless-only households, approximately 74% of those aged 45 to 64 lived in wireless-only households, and approximately 55% of those 65 and older lived in wireless-only households.[511] About 0.5% of households had neither wireless nor fixed voice subscriptions, as of late 2023.[512]

159. Figure II.C.1 shows the percentage of Americans living in a household with only a wireless voice connection in 2021 versus 2023 by age category. More people continue to live in wireless-only homes across all age groups. The 65 and over age category has experienced the largest change over the last two years; previously only approximately 43% of this group lived in a wireless-only home compared to approximately 55% in the most recent data.[513]

[505] *Id.* at 1 & n.3.

[506] *Id.* at 2, Fig. 3.

[507] 47 CFR § 9.3. Examples of these services are apps such as Skype, Facebook Messenger, Facetime, and WhatsApp.

[508] December 2023 Voice Telephone Services Report at 2.

[509] U.S. Department of Health and Human Services, National Center for Health Statistics, Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, July-December 2023 at 2 (June 2024), https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless202406.pdf (NCHS 2024 Wireless Substitution Report).

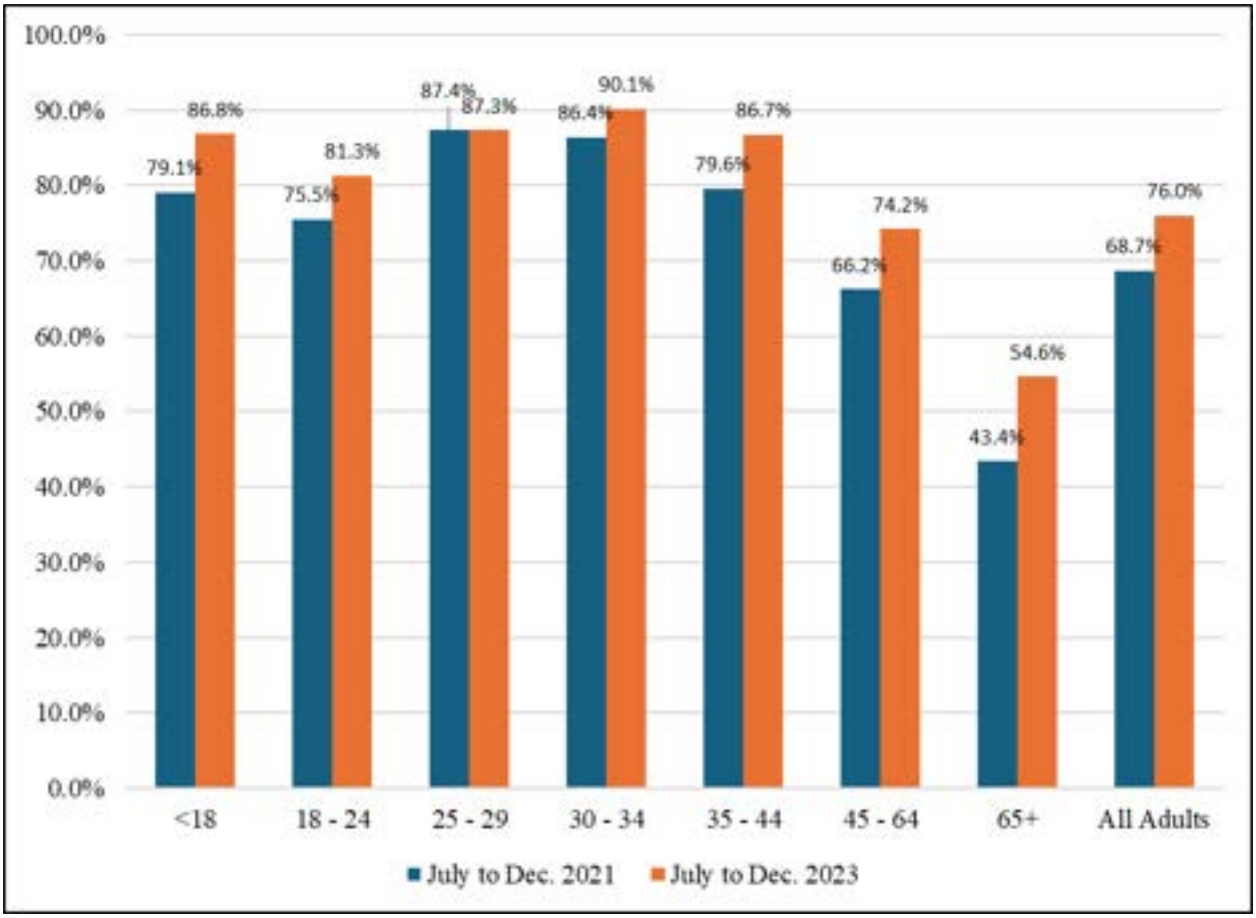
[510] NCHS 2024 Wireless Substitution Report at 2.

[511] *Id.* at 1-2.

[512] *Id.* at 4.

[513] U.S. Department of Health and Human Services, National Center for Health Statistics, Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, July-December 2021 at 1 (May 2022), https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless202205.pdf; NCHS 2024 Wireless Substitution Report at 1.

Fig. II.C.1
Percentage of Population Living in Households with Wireless Telephone Service Only by Age, 2021 vs. 2023



Source: National Center for Health Statistics, National Health Interview Survey.

D. The Satellite Marketplace

1. Overview of Commercial Satellite Services

160. In the United States and globally, satellites provide telecommunications infrastructure for communications, including voice, video, audio, and data services, as well as other services.[514] Satellites require both spectrum and orbital slots, which are licensed and authorized by the Commission for services over the United States. Commission satellite authorizations must also be coordinated internationally with the ITU. Commercial satellites serving the United States, and the earth stations in the United States that

[514] Further discussions of basic features of satellites, satellite orbits, and satellite communications systems can be found in NASA, *Basics of Space Flight, Section 1: Environment, Chapter 5: Planetary Orbits*, https://solarsystem.nasa.gov/basics/chapter5-1/ (last visited Oct. 9, 2024); European Space Agency, *Types of Orbits*, https://www.esa.int/Enabling_Support/Space_Transportation/Types_of_orbits (last visited Oct. 9, 2024); Space Foundation, The Space Briefing Book (2019), https://www.spacefoundation.org/wp-content/uploads/2019/10/SpaceFoundation_Space101.pdf; Louis J. Ippolito Jr., Satellite Communications Systems Engineering: Atmospheric Effects, Satellite Link Design and System Performance (2nd ed. 2017) (Ippolito, 2017); Howard Hausman, Fundamentals of Satellite Communications, Part 1 (2008), https://www.ieee.li/pdf/viewgraphs/fundamentals_satellite_communication_part-1.pdf (Hausman 2008 Presentation); GAO, Telecommunications: Competition, Capacity, and Costs in the Fixed Satellite Services Industry (Sept. 2011), https://www.gao.gov/products/GAO-11-777.

access them, are regulated by the Commission. This ensures that spectrum and orbital slots are safely and efficiently put to use, and eliminates or reduces the potential harm caused by spectrum interference and orbital debris.

161. Satellites differ significantly in their delivery of communications services when compared to terrestrial alternatives. Satellite services compete to a certain extent in larger terrestrial communications marketplaces, aided by the advantages of their geographically widespread (nearly ubiquitous) service, low cost of adding customers (especially for one-way service in video and audio distribution), and ability to provide disaster and redundant services when terrestrial networks are unavailable. In addition, there are a number of smaller niche marketplaces, such as maritime, aviation, and remote marketplaces, which are served primarily by satellites.[515] Satellites also conduct Earth observations, including imaging and scientific experiments. Developments in in-space servicing, assembly, and manufacturing (ISAM) could also spur the introduction of new kinds of services and activities in space.[516]

162. Communication satellites function as relay stations in space that receive signals from an earth station and then re-transmit the signal to a distant point, often located thousands of miles from the point of signal origination.[517] Satellites operate in either a geostationary satellite orbit (GSO), also referred to as a geostationary Earth orbit (GEO), or in a NGSO.[518] NGSO satellites operate at varying altitudes,[519] while GSO satellites operate on an equatorial plane with zero inclination at approximately 22,300 miles above the Earth, and rotate around the Earth at the same speed that the Earth rotates.[520] As a result, a satellite in geostationary orbit appears as a stationary point in the sky relative to a receiving and transmitting earth station. Because they effectively hover above a fixed location from a high altitude, GSO satellites cover a large fixed area of the Earth, with three satellites able to provide communications for most of the Earth.[521] NGSO satellites include a number of orbital configurations, such as highly-elliptical orbits (HEO), medium-Earth orbits (MEO), and LEO.[522]

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[515] This includes such services as voice, broadband connectivity, and entertainment programming for planes and ships and remote areas; tracking services and IoT access for equipment globally; connectivity for fishing, including real-time catch data; and IoT applications like artificial lift monitoring for offshore and energy drilling.

[516] *See Space Innovation; Facilitating Capabilities for In-space Servicing, Assembly, and Manufacturing*, IB Docket Nos. 22-271 and 22-272, Notice of Proposed Rulemaking, 39 FCC Rcd 1864, 1867-68, para. 6 (2024).

[517] An earth station (also known as a ground station or earth terminal) is a station located either on the Earth's surface or within the major portion of the Earth's atmosphere and intended for communication: (1) with one or more space stations; or (2) with one or more stations of the same kind by means of one or more reflecting satellites or other objects in space. 47 CFR § 25.103 (*Earth station*). The Commission's definition is identical to the definition established by the ITU. ITU, Radio Regulations—Articles at 13 (2016), http://search.itu.int/history/HistoryDigitalCollectionDocLibrary/1.43.48.en.101.pdf (ITU Radio Regulations).

[518] The term "geosynchronous orbits" is sometimes used interchangeably with "geostationary orbits," but more technically, "geostationary" describes the broader category of orbits at an altitude of 22,300 miles that rotate the Earth in 24 hours, but may not be in the equatorial plane (i.e., has an inclined orbit) and thus will not remain at a fixed point in the sky (such that the latitude changes over time but not the longitude). *Third Report and Analysis of Competitive Market Conditions with Respect to Domestic and International Satellite Communications Services; Report and Analysis of Competitive Market Conditions with Respect to Domestic and International Satellite Communications Services*, IB Docket Nos. 09-16 and 10-99, Third Report, 26 FCC Rcd 17284, 17288, para. 8 & n.9 (2011) (*Third Satellite Competition Report*).

[519] There are approximately 590 GSO satellites and more than 6,900 NGSO satellites in space globally as of May 1, 2023, according to one database. Union of Concerned Scientists, *UCS Satellite Database* (updated May 1, 2023), https://www.ucsusa.org/resources/satellite-database.

[520] Hausman 2008 Presentation at 17.

[521] However, latitudes above 77° get poor to no reception from GSO satellites. *Id.* at 14.

163. Satellites in geostationary orbit generally are high capacity and high bandwidth and typically have a large coverage area. However, they can be disadvantaged by their high latency (i.e., longer response time).[523] GSO satellites also often need larger antennas and handsets compared to terrestrial wireless service because of the higher power and signal detection capability needed to communicate with distant satellites compared to nearby wireless towers. Individual GSO satellites are typically large, expensive to build, and costly to launch into their high orbit.

164. Satellites in NGSOs, especially those in lower orbits, typically have lower capacity and lower bandwidth. Compared to GSO satellites, NGSO satellites are often much smaller and less expensive to build, and less costly to launch into lower orbits.[524] Because of the limited coverage area for a single satellite, particularly for those operating in LEO, a large constellation of satellites is often needed to maintain continuous coverage, sometimes comprising hundreds or thousands of satellites. However, in providing communications services, NGSO satellites typically offer the benefit of low latency service requiring smaller earth stations and handsets. Moreover, an NGSO constellation may provide more widespread coverage because GSO satellites have limited coverage in higher latitudes given their positions above the Earth's equator.

165. A constellation can allow for one satellite to "hand off" the connection to another as it moves out of range.[525] In the past, NGSO satellites' rapid movement across the sky required the use of omnidirectional antennas, leading to low throughput, increased interference concerns relative to other satellites, and reduced spectrum availability. Some of the newest generation of NGSO satellite systems, however, allow for a more efficient use of spectrum with the use of earth station electronic directional antennas which can track them, potentially increasing throughput and, more importantly, effectively eliminating interference with other users of the same spectrum, thus allowing them to use and share FSS spectrum.[526] Moreover, whereas a single FSS-based NGSO satellite may not provide the capacity of a

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[522] LEOs are defined by the National Aeronautics and Space Administration (NASA) as orbits with an altitude at or below 1,200 miles above the Earth. NASA, *Commercial Space Frequently Asked Questions*, https://www.nasa.gov/humans-in-space/leo-economy-frequently-asked-questions/#hds-sidebar-nav-1 (last visited Oct. 9, 2024) (navigate to "Low Earth Orbit FAQs" subheading). MEOs are generally defined as any orbit between LEOs and GSOs, although they typically range from about 6,200 to 12,400 miles above the Earth. HEOs are highly elliptical orbits ranging from a very low point at perigee (as low as 100 miles above the Earth) to a very high point at apogee (as high or higher than GEOs, roughly 23,000 miles above the Earth). Unlike GSOs, HEOs can cover high latitudes and polar regions, with two satellites able to provide continuous coverage. Ippolito at 25-27 (2017).

[523] Because it takes time for an electronic signal to travel from an earth station to the satellite and back to another earth station, users of high orbit satellites such as GSO satellites will experience a noticeable delay in receiving responses; i.e., about a quarter of a second for a trip up to a GSO satellite 22,300 miles above the Earth and back. Hausman at 15 (2008). For some applications, such as audio and video conversations, or gaming and two-way data interactivity, high latency reduces the quality of service for consumers. The only alternative to shortening this time and reducing latency is to use satellites in lower Earth orbits; latency is then comparable to a ground-based terrestrial network. *Id*.

[524] Hausman 2008 Presentation at 23, 29; Ippolito at 26 (2017).

[525] Satellites in lower Earth orbits do not have fixed coverage areas because they are moving relative to the ground. Connectivity is maintained for a ground customer by connecting to the nearest satellite, and then as that satellite moves out of range, handing that connection off to another satellite coming into range. Because of their lower orbits and high speed, visibility of each satellite from a ground station can be limited to a short time, so larger constellations are needed to provide continuous connectivity. Hausman 2008 Presentation at 29-30.

[526] Systems using FSS spectrum are required to use directional earth station transmission antennas to eliminate interference with other FSS users. Unlike MSS spectrum, with its use of omnidirectional antennas, which prevents others from using the same frequencies due to interference, FSS spectrum can be reused (i.e., shared) repeatedly through the use of directional antennas. *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, IB Docket No. 16-408, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 7809, 7817, 7821-22, 7826, paras. 25-26, 39, 52 & n.118 (2017) (*NGSO FSS Order*);

(continued….)

GSO satellite, the rapid growth of NGSO satellite constellations has meant that aggregate NGSO capacity growth has outpaced growth in GSO capacity.[527] By one estimate, NGSO satellites will make up 90% of in-orbit capacity in 2026.[528]

166. The provision of commercial communications satellite services requires, among other things: the manufacturing and launch of one or more satellites; ground stations and network operations center(s) providing backhaul and management service to the satellites; customer premises equipment or handsets; and customer antennas capable of communicating with the satellite(s).[529] Large communication satellites and satellite communications systems typically require several years to build and launch, and most of their investment is upfront.[530] NGSO satellites are often launched as part of a constellation, especially systems designed to provide near-global coverage, and/or continuous connectivity. GSO satellites typically can have a lifespan of 15 to 20 years or longer, while individual NGSO satellites typically have a shorter lifespan.[531] Satellite operators are required to have a plan to safely retire their satellites to prevent the satellites from becoming a source of orbital debris.[532]

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Space Exploration Holdings, LLC; Application for Approval for Orbital Deployment and Operating Authority for the SpaceX NGSO Satellite System; Application for Approval for Orbital Deployment and Operating Authority for the SpaceX NGSO Satellite System Supplement, IBFS File No. SAT-LOA-20161115-00118, Call Sign S2983, IBFS File No. SAT-LOA-20170726-00110, Call Sign S2018, Memorandum Opinion, Order and Authorization, 33 FCC Rcd 3391, 3401-02, paras. 26-27 (2018) (*SpaceX Authorization*).

[527] According to one industry report, high-throughput satellite capacity supply tripled between 2021 and 2023 to 27 terabytes per second, with NGSO operators accounting for over 90% of net supply during that period. NGSO constellations are projected to account for 97% of the increase in supply from 2023 to 2028. Press Release, Euroconsult, Non-Geostationary Orbit Constellations Redefining the High Throughput Satellites Market Landscape (Apr. 25, 2024), https://www.euroconsult-ec.com/press-release/non-geostationary-orbit-constellations-redefining-the-high-throughput-satellites-market-landscape/.

[528] Rachel Jewett, Via Satellite, *Euroconsult Projects NGSO to Make Up 90% of Capacity in 2026* (Mar. 21, 2022), https://www.satellitetoday.com/finance/2022/03/21/euroconsult-projects-ngso-to-make-up-90-of-capacity-in-2026/.

[529] GAO, Telecommunications: Competition, Capacity, and Costs in the Fixed Satellite Services Industry (Sept. 2011), https://www.gao.gov/products/GAO-11-777.

[530] For example, in mid-2020, the Commission granted, with conditions, Kuiper's application for authority to deploy a constellation of over 3,000 NGSO satellites. By mid-2024, Kuiper was in the process of testing its satellite systems in preparation for full-scale deployment. *Kuiper Systems, LLC; Application for Authority to Deploy and Operate a Ka-band Non-Geostationary Satellite Orbit System*, IBFS File No. SAT-LOA-20190704-00057, Call Sign S3051, Order and Authorization, 35 FCC Rcd 8324, 8324-25, paras. 1-4 (2020); Amazon, *Amazon Prepares to Wrap Successful Project Kuiper Prototype Mission* (May 23, 2024), https://www.aboutamazon.com/news/innovation-at-amazon/amazon-project-kuiper-deorbit-satellites.

Similarly, some GSO satellite operators announce their planned launches years in advance. *See, e.g.*, Press Release, Viasat, A Thoughtful Approach to Expanding Globally (Aug. 20, 2019), https://news.viasat.com/blog/corporate/a-thoughtful-approach-to-expanding-globally (in 2019, discussing plans to begin launching ViaSat-3 satellites starting in 2022); Viasat, *ViaSat-3 is Satellite Reimagined*, https://www.viasat.com/space-innovation/satellite-fleet/viasat-3/ (last visited Oct. 9, 2024) (confirming that the first ViaSat-3 satellite was launched in 2023).

[531] *See, e.g.*, Jeff Foust, SpaceNews, *SpaceX to Deorbit 100 Older Starlink Satellites* (Feb. 13, 2024), https://spacenews.com/spacex-to-deorbit-100-older-starlink-satellites/; Debra Werner, SpaceNews, *How Long Should a Satellite Last: Five Years, Ten Years, 15, 30?* (May 24, 2018), https://spacenews.com/how-long-should-a-satellite-last/.

[532] Orbital debris, also known as space debris, consists of any human-made object in orbit about the Earth that no longer serves any useful purpose. Examples of orbital debris include, among other things, derelict spacecraft and upper stages of launch vehicles and debris created as a result of spacecraft or upper stage explosions or collisions. NASA Orbital Debris Program Office, *Frequently Asked Questions*, https://orbitaldebris.jsc.nasa.gov/faq/ (last visited Oct. 9, 2024) (navigate to "What is orbital debris?" and "What are examples of orbital debris?" subheadings); (continued….)

2. Spectrum for Satellite Services

167. The Commission allocates spectrum for two general types of satellite services: FSS and MSS. The Commission also allocates spectrum for more specialized commercial and scientific services, including Direct Broadcast Satellite (DBS), Satellite Digital Audio Radio Service (SDARS), Earth Exploration Satellite Service (EESS), and other services. For purposes of this *Report*, we describe five major types of services provided by the commercial satellite services industry.

168. *Fixed Satellite Service (FSS)*. FSS is the transmitting and receiving of communications signals to earth stations, including customer stations, that traditionally are located at fixed points on Earth. In some cases, this service includes satellite-to-satellite links, which may also be operated in the inter-satellite service, and may also include feeder links of other space radiocommunication services.[533] The Commission has allocated specific spectrum bands for FSS, including the C-, Ku-, and Ka-bands.[534] More recently, certain NGSO FSS systems have received permission to use the E-band and V-band frequencies.[535] Examples of FSS offerings include wholesale transponder services,[536] managed services (also known as enterprise services), and retail broadband services to end users.

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NASA, *What is Orbital Debris?*, https://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-orbital-debris-58.html (last visited Oct. 9, 2024); *see also Mitigation of Orbital Debris in the New Space Age*, IB Docket No. 18-313, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 4156, 4158-59, paras. 3-4 (2020); *Space Innovation; Mitigation of Orbital Debris in the New Space Age*, IB Docket Nos. 22-271 and 18-313, Second Report and Order, 37 FCC Rcd 11818, 11818-19, para. 2 (2022); *Mitigation of Orbital Debris in the New Space Age*, IB Docket No. 18-313, Order on Reconsideration, FCC 24-6, at 1-2, paras. 1-2 (Jan. 26, 2024); *Space Bureau Seeks to Refresh the Record on Proposed Rules Pertaining to Orbital Debris Mitigation*, IB Docket Nos. 18-313 and 22-271, Public Notice, DA 24-412, at 1 (SB May 2, 2024).

[533] 47 CFR § 25.103.

[534] The conventional C-band refers to the 3700-4200 MHz (space-to-Earth) and 5925-6425 MHz (Earth-to-space) FSS frequency bands, while the extended C-band refers to the 3600-3700 MHz (space-to-Earth), 5850-5925 MHz (Earth-to-space), and 6425–6725 MHz (Earth-to-space) FSS frequency bands. The conventional Ku-band refers to the 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 (Earth-to-space) FSS frequency bands, while the extended Ku-band refers to the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), and 13.75-14.0 GHz (Earth-to-space) FSS frequency bands. The conventional Ka-band refers to the 18.3-18.8 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 28.35-28.6 GHz (Earth-to-space), and 29.25-30.0 GHz (Earth-to-space) frequency bands, which the Commission has designated as primary for GSO FSS operation. 47 CFR § 25.103. The Commission recently defined an extended Ka-band in the 17.3-18.3 GHz (space-to-Earth), 18.8-19.4 GHz (space-to-Earth), 19.6-19.7 GHz (space-to-Earth), 27.5-28.35 GHz (Earth-to-space) and 28.6-29.1 GHz (Earth-to-space) frequencies. *See* Federal Communications Commission, Enable Non-Geostationary Orbit Fixed-Satellite Service (Space-to-Earth) Operations in the 17.3-17.8 GHz Band, Report and Order and Notice of Proposed Rulemaking, 87 Fed. Reg. 64750 (Oct. 26, 2022). To facilitate the advancement of advanced wireless services, including 5G, the Commission auctioned the lower 280 megahertz of the C-band 3700-4200 MHz in the contiguous United States for flexible use in 2020, leaving satellite operators the use of the 4000-4200 MHz frequency band. *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2343, 2345, 2353, 2371 paras. 4, 20-21, 56 (2020). Therefore, there is approximately 1,175 megahertz range of spectrum in the extended C-band throughout most of the United States, 1,750 megahertz in the extended Ku-band, and 5,050 megahertz in the extended Ka-band, for a total of 7,975 megahertz range of spectrum for FSS use.

[535] The term "E-band" refers to frequencies in the 71.0-76.0 GHz and 81.0-86.0 GHz bands, while "V-band" generally refers to frequencies ranging from 37.5 GHz to 52.4 GHz. SpaceX is one NGSO FSS system authorized to use V-band and E-band frequencies for its Gen2 Starlink constellation of NGSO FSS satellites. *See Space Exploration Holdings, LLC, Request for Orbital Deployment and Operating Authority for the SpaceX Gen2 NGSO Satellite System,* ICFS File Nos.: SAT-LOA-20200526-00055, SAT-AMD-20210818-00105, SAT-AMD-20221216-00175, Order and Authorization, 39 FCC Rcd 2159, 2159-61, paras. 1, 3 (SB 2024). WorldVu has applied to use E-band frequencies. *See* SAT-MPL-20211104-00144. Boeing was authorized to use V-band frequencies, but withdrew its application shortly after the grant. *The Boeing Company; Application for Authority to Launch and Operate a Non-Geostationary Satellite Orbit System in the Fixed-Satellite Service*, IBFS File Nos. SAT-LOA-

(continued….)

169. Over the last twenty years, the Commission also has allowed the operation of Earth Stations in Motion (ESIMs) as an application of the FSS.[537] Earth Stations on Vessels, Vehicle-Mounted Earth Stations, and Earth Stations Aboard Aircraft—collectively designated as ESIMs—are mobile in nature, but nevertheless are permitted to operate in FSS spectrum because at any point in time, their emissions have the same characteristics as those of a fixed earth station transmitting from the same location, using a directional antenna focused on one satellite to avoid generating radio frequency (RF) interference with other satellites and ground-based devices. Licensees use ESIMs to deliver broadband and video programming to ships, vehicles, trains, and aircraft using the same frequency bands, hardware, satellites, transponder beams, and gateways used to serve earth stations at fixed locations.[538]

170. In 2017, the Commission revised spectrum sharing requirements among NGSO FSS systems to permit NGSO systems to gain access to FSS spectrum, provided they used directional earth station antennas and avoided interference with existing GSO and NGSO systems using the FSS spectrum.[539] This has facilitated the deployment of NGSO FSS systems capable of providing broadband services with higher speeds and lower latency than previous satellite offerings. In 2021, 2023, and 2024, the Commission revised the spectrum sharing requirements to enable multiple entrant NGSO FSS systems to enter the market and provide these services without causing interference to each other and existing GSO and NGSO systems.[540]

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20170301-00028, SAT-AMD-20170929-00137, SAT-AMD-20180131-00013, Order and Authorization, 36 FCC Rcd 16067 (2021). Besides SpaceX, a number of satellite operators are authorized to communicate in the V-band, including Hughes, WorldVu (OneWeb), O3b, Viasat, and AST.

[536] A transponder is the part of a satellite that receives signals transmitted from earth stations to the antennas onboard a satellite and then retransmits these signals to the Earth. The number of transponders onboard any given satellite may vary. *See* Dennis Roddy, Satellite Communications 199 (4th ed. 2006); U.S. Government Accountability Office, Telecommunications: Competition, Capacity, and Costs in the Fixed Satellite Services Industry at 5 (Sept. 2011), https://www.gao.gov/assets/330/322861.pdf.

[537] *See Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, IB Docket No. 02-10, Report and Order, 20 FCC Rcd 674 (2005); *see also Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed-Satellite Service*, IB Docket No. 07-101, Report and Order, 24 FCC Rcd 10414 (2009).

[538] *Amendment of Parts 2 and 25 of the Commission's Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 17-95, Report and Order and Further Notice of Proposed Rulemaking, 33 FCC Rcd 9327, 9328, para. 2 (2018) (*ESIMs Report and Order and Further Notice*).

[539] Shared access permits two or more satellite systems to use the same spectrum band as long as they avoid interference with each other. *NGSO FSS Order*, 32 FCC Rcd at 7821-22, 7826, paras. 39, 52 & n.118; *see also SpaceX Authorization*, 33 FCC Rcd at 3401-02, paras. 26-27 (". . . [W]e recently adopted changes to the Commission's rules that will apply a spectrum sharing mechanism to all NGSO FSS systems that have sharing capabilities (e.g., directional earth station antennas), regardless of the frequency bands used.").

[540] *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems; Revision of Section 25.261 of the Commission's Rules to Increase Certainty in Spectrum Sharing Obligations Among Non-Geostationary Orbit Fixed-Satellite Service Systems*, IB Docket No. 21-456, RM-11855, Order and Notice of Proposed Rulemaking, 36 FCC Rcd 17871 (2021); *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems*, IB Docket No. 21-456, Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 3699 (2023); *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems*, IB Docket No. 21-456, Second Report and Order and Order on Reconsideration, FCC 24-117, at 1-2, para. 1 (Nov. 15, 2024).

171. *Mobile Satellite Service (MSS)*.[541] MSS generally involves transmitting and receiving communications signals from mobile earth stations located on land, on sea, or on airplanes.[542] MSS operates in a 70 megahertz range of spectrum allocated in the L-band, in a 40 megahertz range in the 2 GHz MSS band, in a 33 megahertz range in the Big LEO band, and in a four megahertz range in the Little LEO band.[543] Voice and data services are conducted in the L-band, Big LEO band, and 2 GHz bands, while the Little LEO band is limited to non-voice services.[544] Examples of MSS applications include voice, low-speed data, and tracking services for aircraft and ships, as well as handsets operating in remote locations on land.[545]

172. In recent years there has been significant interest in developing Satellite D2D services, which allow direct communications between satellites and consumer mobile phones.[546] Some D2D providers are using or plan to use satellite MSS spectrum to provide these services, whereas others are focused on using terrestrial mobile spectrum, which has posed technical and regulatory challenges.[547] As discussed above, in 2024, the Commission developed a new regulatory framework for SCS, which established conditions for the use of terrestrial spectrum for communications between mobile phones and satellites.[548]

173. *Earth Exploration Satellite Service (EESS)*. The EESS is a radiocommunication service in specified spectrum bands between earth stations and one or more space stations that collects information relating to the characteristics of the Earth from active or passive sensors on EESS satellites and distributes that information to earth stations.[549] Many different frequency bands are allocated for the provision of EESS, including, for example, 1215-1300 MHz, 1400-1427 MHz, 2025-2110 MHz, 2200-2290 MHz, and 8025-8400 MHz.[550] The frequency band allocations for EESS include frequency bands used for sensing purposes and for communicating with earth stations, including downlinking data. EESS satellites can be used for observations of the Earth, e.g., for observing disaster sites, crop growth, and local weather almost anywhere on Earth.

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[541] MSS generally refers to services provided to mobile earth stations using MSS frequency bands. The newer ESIMs, discussed above, refer to services provided to ESIMs using FSS frequency bands and following FSS spectrum sharing rules.

[542] 47 CFR § 25.103.

[543] There are MSS allocations in the 1525-1559 MHz (space-to-Earth) band and the 1626.5-1660.5 MHz (Earth-to-space) band of the L-band, and in the 2000-2020 MHz and 2180-2200 MHz bands of the 2 GHz band. Other frequency bands with MSS allocations have been given specific labels in the Commission rules: the Big LEO bands (1610-1626.5 MHz and 2483.5-2500 MHz) and the Little LEO bands (137-138 MHz, 400.15-401 MHz, and 148-150.5 MHz). 47 CFR § 25.103. Therefore, there is approximately 145 megahertz range of spectrum for MSS use, which must be divided among all users. Due to encumbrances, not all of the allocated spectrum is available for use by MSS providers.

[544] *See, e.g.*, *Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks; Amendments to Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems*, IB Docket No. 13-213, RM-11685, Report and Order, 31 FCC Rcd 13801, 13802, para. 1 & n.2 (2016) (noting a distinction between Big LEO systems that operate with voice and higher data-rate capabilities, and Little LEO systems, which do not provide voice service and generally operate with lower data-rate capabilities).

[545] *See, e.g.*, Iridium Comments at 3; EchoStar Comments at 26-27; MSSA Comments at 2-5.

[546] *See generally* MSSA Comments; *see also* EchoStar Comments at 26-27; SIA Reply at 12-13.

[547] *See supra* section II.B.5.b (discussion of *SCS*).

[548] *Supplemental Coverage from Space Report and Order*, 39 FCC Rcd at 2623, para. 4.

[549] *See* ITU Radio Regulations at 12 (Article 1, 1.51); 47 CFR § 2.1.

[550] 47 CFR § 2.106 (*Table of Frequency Allocations*).

174. *Satellite Digital Audio Radio Service (SDARS)*. SDARS is a radiocommunication service in the 2.3 GHz band in which audio programming is digitally transmitted by one or more space stations directly to fixed, mobile, and/or portable customer stations.[551] Satellite-delivered radio programming is supplied nationwide by SiriusXM, presently the only SDARS operator in the nation.[552]

175. *Direct Broadcast Satellite (DBS) Service*. DBS service is a radiocommunication service in which signals transmitted or retransmitted by Broadcasting Satellite Service (BSS) space stations in the 12.2–12.7 GHz band are intended for direct reception by subscribers or the general public.[553] DBS satellite operators provide nationwide video programming directly to customers. Currently, there are two DBS satellite operators offering video programming to consumers: DISH Network and DIRECTV. AT&T spun off DIRECTV into a separate entity on August 2, 2021.[554]

3. Satellite Industry Current Status and Participants

a. Satellite Industry Revenues

176. Figure II.D.1 below provides aggregated U.S. satellite services revenues provided by the SIA for 2015 to 2023 with respect to consumer services, fixed, mobile, and remote sensing satellite services.[555]

Fig. II.D.1
U.S. Satellite Services Revenue (2015-2023)

Service	Total Revenue (Billions, U.S.$)								
	2015	2016	2017	2018	2019	2020	2021	2022	2023
Consumer	48.0	46.4	45.5	43.5	42.8	40.2	39.5	38.2	36.9
Satellite TV (DBS/DTH)[556]	41.7	39.7	38.3	35.5	34.0	31.4	30.1	28.4	25.7
Satellite Radio (SDARS)	4.6	5.0	5.4	5.8	6.2	6.3	6.6	6.9	6.8

[551] *Id.* § 25.103 (*Satellite Digital Audio Radio Service* (*SDARS*)).

[552] In 2023, SiriusXM's total revenue was $8.95 billion, which represents a decrease of approximately 1% from total revenue in 2022 and an increase of approximately 3% from total revenue in 2021. Sirius XM Holdings Inc., SEC Form 10-K, at 41 (filed Feb. 1, 2024); Sirius XM Holdings Inc., SEC Form 10-K, at 38 (filed Feb. 2, 2023).

[553] 47 CFR § 25.103 (*Direct Broadcast Satellite (DBS) Service*).

[554] Catie Keck, The Verge, *AT&T has Officially Spun Off DirecTV, Which is Now Its Own Business* (Aug. 3, 2021), https://www.theverge.com/2021/8/3/22608577/att-directv-tpg-deal-u-verse-att-tv-new-company.

[555] SIA Reply at 20. SIA estimates that the U.S. share of the global satellite services revenue of $110.2 billion in 2023 was approximately 40%, or $44.5 billion. The data include only U.S. satellite services providers' revenues and does not include foreign providers to the U.S. market. SIA's estimate of global satellite services revenue includes revenue derived from D2C retail services (e.g., satellite TV, radio, and broadband), fixed and mobile satellite services, and Earth observation services. The estimate does not include revenue associated with ground equipment, satellite manufacturing or launch services, space sustainability activities, commercial human spaceflight, or government space spending. *Id.* at 18-20; *see also* OECD, OECD Handbook on Measuring the Space Economy at 20 (2d ed. 2022), https://doi.org/10.1787/8bfef437-en.

[556] DTH refers to television service provided in the FSS, rather than the BSS, allocation. *See Policies and Rules for the Direct Broadcast Satellite Service*, IB Docket No. 98-21, Report and Order, 17 FCC Rcd 11331, 11333, para. 3 (2002).

Satellite Broadband	1.7	1.7	1.8	2.2	2.4	2.5	2.8	2.9	4.4
Fixed	**4.1**	**4.4**	**5.0**	**5.2**	**5.3**	**4.1**	**3.6**	**3.6**	**3.8**
Managed Services[557]	3.8	4.1	4.7	4.9	5.1	4.1	3.6	3.6	3.8
Transponder Agreements[558]	0.3	0.3	0.3	0.3	0.2	0.0	0.0	0.0	0.0
Mobile[559]	**0.5**	**0.5**	**0.6**	**0.7**	**0.7**	**0.7**	**0.8**	**0.9**	**2.3**
Remote Sensing	0.7	0.8	1.0	1.0	1.2	1.3	1.3	1.5	1.5
Total	53.3	52.1	52.1	50.3	49.7	46.3	45.2	44.2	44.5

Source: 2022-2023 data based on SIA Reply at 20; 2015-2021 data based on *2022 Communications Marketplace Report*, 37 FCC Rcd at 15643, Figure II.D.1.

177. While total U.S. satellite services revenues declined between 2015 and 2021, total revenues remained relatively flat in 2022 and 2023. Although satellite TV revenues continued to decline in 2022 and 2023, total satellite service industry revenue losses have been offset primarily by gains in satellite broadband and mobile voice and data services provided via MSS. From 2021 to 2023, annual satellite TV revenues dropped by $4.4 billion from $30.1 billion to $25.7 billion, or 15%. Conversely, annual satellite broadband revenues increased by $1.6 billion, or approximately 57%, from 2021 to 2023, and mobile services revenues increased by $1.5 billion, or 188%. Revenues also increased from 2021 to 2023 in satellite radio, managed services, and remote sensing, with increases of approximately 3%, 6%, and 15%, respectively.[560] These changes are due in part to investments in new satellites and new technologies for accessing them to take advantage of satellites' natural advantages in providing wide geographic coverage and serving as a unique observational platform.[561] They also reflect changes in competing terrestrial facilities marketplaces, especially the buildout of domestic wireline and wireless networks and increases in capacity of submarine cables, as well as changes in consumer demand, such as cord-cutting reducing demand for MVPD services, including DBS, and a shift to streaming and interactive broadband services.[562]

178. *Facilities-based Operators and Resellers*. The satellite services marketplace is served by satellite operators and resellers. Satellite operators build, launch, and manage their own fleet of satellites. They provide a combination of wholesale services, involving the sale of raw transponder capacity on their satellites, retail services directly to consumers and businesses, and basic communications and observation services to other wholesalers and resellers and businesses.[563] Some operators provide transponders for

[557] The revenue represented for "Managed Services" includes fixed and mobility VSAT/private-network services, as well as maritime and in-flight broadband connectivity over FSS bands. SIA Reply at 20.

[558] The revenue represented for "Transponder Agreements" includes leased transponder capacity to industry verticals including media and broadcasting, telecom, and governments. *Id.*

[559] The revenue represented for "Mobile" includes end-to-end mobile voice and data (including IoT) services over MSS frequency bands. *Id.*

[560] The percentage changes in annual revenue from 2015 to 2023, which are calculated based on revenues presented in Fig. II.D.1, are approximate, due to rounding of the source numbers.

[561] *See, e.g.*, MSSA Comments at 2-5; Public Knowledge/OTI Reply at 20; SIA Reply at 8-15.

[562] DIRECTV Comments at 2; EchoStar Comments at 15; Benjamin Mullin, NY Times, *Satellite TV is in Trouble. DirecTV's Dispute with Disney Shows Why* (Sept. 12, 2024), https://www.nytimes.com/2024/09/12/business/media/directv-disney-dispute.html.

[563] *See, e.g.*, Viasat, Inc., SEC Form 10-K, at 4-7 (filed May 29, 2024); SES, Consolidated Financial Statements: As at and for the Year Ended 31 December 2023 at 145-147, 194 (Feb. 2024),

(continued….)

lease through arrangements that are tailored for specific applications required by the customer, such as video distribution.[564] Operators may also supply a complete, end-to-end communications solution to customers, referred to as managed services.[565] Consumer retail services provided by operators include satellite broadband service, SDARS, and satellite television (e.g., DBS).[566] Customers of enterprise services include terrestrial telecommunications companies, television networks, and resellers of satellite transponder capacity. Satellite resellers purchase satellite services and resell them to businesses and consumers. They often combine resold satellite services with their own arrangements for network management and integration, equipment, customer support, and terrestrial communications.[567]

b. Satellite Marketplaces

179. In this section, we discuss: mobile marketplaces for customers lacking a fixed location or requiring low latency services from NGSO satellites; fixed location marketplaces for customers with fixed locations; and Earth observation services. According to SIA, satellite marketplaces are going through major changes due to technological innovation, increased demand for broadband services and mobile use, and the introduction of new products and services.[568] Formerly, markets were divided into fixed location applications and mobile applications. Fixed location services were typically characterized by high bandwidth service but limited by high latency and the need for large fixed ground antennas, while mobile applications were typically characterized by low latency, mobility, and small ground antennas but limited by low bandwidth availability. ESIMs and NGSO FSS-based services, which the Commission has supported and enabled with revised regulations, have blurred the traditional distinctions between mobile and fixed satellite services by combining the best features of both types of services.[569] ESIMs allow mobile users to access the full bandwidth of FSS satellites, while NGSO FSS-based services lower latency to non-noticeable levels for fixed location and ESIM broadband users, allowing the use of inexpensive low power ground stations. Bandwidth, latency, mobility, and convenience are improving for several classes of customers, thus strengthening satellites' positions in markets less well served by

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https://www.ses.com/sites/default/files/2024-05/SES-AR2023-CFS_0.pdf. Intelsat, SES, Hughes, Viasat, Iridium, Eutelsat, and Telesat are examples of facilities-based satellite operators. Facilities-based operators may also lease some excess capacity from each other to expand their geographic coverage or meet the unique transmission requirements of specific customers. Viasat, Inc., SEC Form 10-K, at 4 (filed May 29, 2024).

[564] *See, e.g.*, Intelsat, *Flexible Leasing of Satellite Bandwidth*, https://www.intelsat.com/isps-mnos-telcos/products/leased-wholesale-capacity/ (last visited Oct. 9, 2024); *see also* SIA Reply at 13-14.

[565] *See, e.g.*, Eutelsat America Corp., Eutelsat Group, *Eutelsat Advance*, https://eutelsatamerica.com/advance/ (last visited Oct. 9, 2024); Viasat, *Viasat Managed Communication Services, Connecting Your Operations End-to-End*, https://www.viasat.com/enterprise-and-mobility/solutions/energy-services-solutions/managed-communications/ (last visited Oct. 9, 2024).

[566] SIA Reply at 7, 20.

[567] Some satellite resellers, often called integrators, combine leased satellite capacity with other value-added services for their customers. GAO, Telecommunications: Competition, Capacity, and Costs in the Fixed Satellite Services Industry at 9 (Sept. 2011), https://www.gao.gov/products/GAO-11-777. Examples of resellers include Speedcast International Ltd and Artel, LLC. Speedcast, *VSAT Satellite Network*, https://www.speedcast.com/our-solution/product/vsat-satellite/ (last visited Oct. 9, 2024); Artel, LLC, *Company*, https://www.artelllc.com/company/ (last visited Oct. 9, 2024).

[568] *See, e.g.*, SIA Reply at 8-13.

[569] *Amendment of Parts 2 and 25 of the Commission's Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed Satellite Service; Facilitating the Communications of Earth Stations in Motion with Non-Geostationary Orbit Space Stations*, IB Docket Nos. 17-95 and 18-315, Second Report and Order in IB Docket No. 17-95 and Report and Order in IB Docket No. 18-315 and Further Notice of Proposed Rulemaking, 35 FCC Rcd 5137, 5138, paras. 1-2 (2020).

terrestrial communications networks, and allowing satellite operators to both compete with and supplement services offered by terrestrial networks.[570]

180. *Mobile Satellite Customer Marketplaces.* Satellites traditionally have served mobile marketplaces—marketplaces where customers lack a fixed location or need low latency service—using MSS spectrum. This includes maritime, aviation, IoT, satellite telephony, and D2D services such as SOS messaging.[571] Omnidirectional low power antennas are typically used for such MSS services.[572] The spectrum allocated for each MSS customer is generally very limited because much less spectrum has been allocated for MSS purposes than for other purposes, and it is shared globally with other MSS customers. Nevertheless, in 2023, mobile marketplaces using MSS spectrum generated approximately $2.3 billion in U.S. revenues—more than double those of the previous year.[573] Satellite operators that provide service using MSS in the United States include Globalstar, Iridium, Ligado, Myriota, ORBCOMM, Swarm (subsidiary of SpaceX), and Viasat.[574] Additionally, several operators are developing or deploying D2D systems, some using MSS spectrum.[575]

181. Services to mobile satellite customers vary significantly in characteristics, such as cost, geographic availability, required customer equipment, data bandwidth and allowances, two-way capabilities, latency, and network reliability.[576] Viasat, which in 2023 acquired Inmarsat,[577] provides voice, video, and data communications services to mobile satellite customers using GSO satellites that rely on the L-, Ka-, and S-bands.[578] Ligado provides a variety of mobile satellite services, including communications and satellite-based IoT, using the SkyTerra 1 GSO satellite in the L-band.[579]

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[570] *Id*. at 5146-47, para. 27.

[571] SIA Reply at 9, 12-13.

[572] *O3b Limited*; *Request for Modification of U.S. Market Access for O3b Limited's Non-Geostationary Satellite Orbit System in the Fixed-Satellite Service and in the Mobile-Satellite Service*, IBFS File Nos. SAT-MOD-20160624-00060, SAT-AMD-20161115-00116, SAT-AMD-20170301-00026, and SAT-AMD-20171109-00154, Call Sign S2935, Order and Declaratory Ruling, 33 FCC Rcd 5508, 5516, para. 21 & n.59 (2018) (*O3b Modification Order*).

[573] In 2023, mobile satellite revenues were approximately 5% of total U.S. satellite services revenue. *See* SIA Reply at 20.

[574] FCC, *Approved Space Station List*, https://www.fcc.gov/approved-space-station-list (last visited Oct. 9, 2024); *see also* Globalstar, Inc., SEC Form 10-K, at 3 (filed Feb. 29, 2024); Iridium Communications, Inc., SEC Form 10-K, at 3 (filed Feb. 15, 2024); Ligado Networks, *Stronger Connections*, https://ligado.com/ (last visited Oct. 9, 2024); Myriota, *The Telco for Global Field Intelligence*, https://myriota.com (last visited Oct. 9, 2024); ORBCOMM, *Extending the Reach of IoT*, https://www.orbcomm.com/en/partners/connectivity/satellite (last visited Oct. 9, 2024); Wayback Machine, Swarm, *Global Affordable Connectivity* (captured Aug. 6, 2024), https://web.archive.org/web/20240806211115/https:/swarm.space/; Viasat, Inc., SEC Form 10-K, at 5 (filed May 29, 2024).

[575] MSSA Comments at 3-5; SIA Reply 12-13.

[576] These differences stem from, among other things, differences in spectrum being used, the satellite's orbit, the number, locations, and technology of satellites in an operator's constellation (which help determine an operator's coverage map and bandwidth offered), and the specific product or service being sold. *See e.g.*, *Applications of Viasat, Inc. and Connect Topco Limited For Consent To Transfer Control of Authorizations*, IB Docket No. 22-153, ICFS File No. SES-T/C-20220201-00145, Memorandum Opinion and Order and Declaratory Ruling, 38 FCC Rcd 4776, 4788, 4791, 4795, paras. 26, 33, 43 (SB/OIA 2023).

[577] *Id.* at 4777, para. 2.

[578] FCC, *Approved Space Station List*, https://www.fcc.gov/approved-space-station-list (last visited Oct. 9, 2024); Viasat, Inc., SEC Form 10-K, at 4-5 (filed May 29, 2024).

182. NGSO LEO systems offer much lower latency due to their low Earth orbits compared to GSO systems, which is useful for satellite voice telephony and interactive data applications, and requires smaller antennas.[580] The Big LEO systems of Iridium and Globalstar provide low-latency voice and data services to portable handsets and other devices. Iridium, with its constellation of 66 operational satellites, provides low-latency mobile voice, data, and IoT communications services with fully global coverage.[581] Globalstar uses its approximately 30 operational first and second generation satellites to provide two-way voice and data and one-way IoT low-latency services in North America, Europe, Central and South America, Africa, Australia, and Asia.[582] ORBCOMM's Little LEO system provides data services for transportation, maritime, remote monitoring, government, and other applications.[583] Little LEO systems are restricted to non-voice low data rate services because of the relatively small uplink bandwidth and the fact that they must operate in spectrum shared with terrestrial mobile operations.[584] Until mid-2023, when it halted new device sales, SpaceX-owned Swarm offered inexpensive global IoT service with its constellation of small satellites.[585] Similarly, Myriota is in the process of expanding an inexpensive global IoT service as it launches its constellation of small satellites.[586]

183. Whereas mobile vessels like ships and planes were traditionally served by MSS operators providing low-capacity service, the development of ESIM services has allowed these vessels to access the services of FSS satellites. ESIMs use directional antennas that enhance throughput and enable them to transmit and receive very high data-rate broadband communications with satellites while in motion.[587]

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[579] Ligado Networks, Covering North America: What Ligado's Satellite Network Can Do for You at 2, 5 (2018), https://ligado.com/wp-content/uploads/LS_Satellite_2018_CNA-Brch.pdf. Ligado has filed a $175 million insurance claim against the SkyTerra 1 satellite due to degraded performance following an April 2023 anomaly. Dan Swinhoe, Data Center Dynamics, *Ligado Networks Files $175 Million Insurance Claim Against SkyTerra 1 Mobile Communications Satellite* (May 17, 2024), https://www.datacenterdynamics.com/en/news/ligado-networks-files-175-million-insurance-claim-against-skyterra-1-mobile-communications-satellite/.

[580] Ippolito at 25 (2017).

[581] Iridium Communications, Inc., SEC Form 10-K, at 2-5 (filed Feb. 15, 2024). Iridium provides services to industries such as emergency services, maritime, aviation, government, utilities, oil and gas, mining, recreation, forestry, heavy equipment, construction, railways and other transportation. *Id.* at 2.

[582] Jonathan's Space Pages, *Globalstar Statistics*, https://planet4589.org/space/con/gbl/stats.html (last visited Aug. 12, 2024); Globalstar, Inc., SEC Form 10-K, at 6, 9, 19, 27 (filed Feb. 29, 2024).

[583] ORBCOMM, *Solutions*, https://www.orbcomm.com/ (last visited Oct. 9, 2024) (navigate to "Solutions" subheading).

[584] *Third Satellite Competition Report*, 26 FCC Rcd at 17314-15, para. 71.

[585] Wayback Machine, Swarm, *Frequently Asked Questions* (captured Aug. 6, 2024), https://web.archive.org/web/20240806224839/https:/swarm.space/frequently-asked-questions/; Aria Alamalhodaei, TechCrunch, *SpaceX's Swarm Technologies is Halting New Device Sales* (July 20, 2023), https://techcrunch.com/2023/07/20/spacexs-swarm-technologies-is-halting-new-device-sales/; Darrell Etherington, TechCrunch, *Here's What Swarm Has Been Up To in the 10 Months Since Being Acquired by SpaceX* (July 29, 2022), https://techcrunch.com/2022/07/29/heres-what-swarm-has-been-up-to-in-the-10-months-since-being-acquired-by-spacex/.

[586] Myriota Developer, *Coverage Map*, https://support.myriota.com/hc/en-us/articles/6983447280911-Coverage-Map (last visited Oct. 9, 2024); *see also Myriota Pty. Ltd.; Petition for Declaratory Ruling Granting Access to the U.S. Market for Non-Voice, Non-Geostationary Satellite Service*, IBFS File No. SAT-PDR-20190328-00020, Call Sign S3047, Order and Declaratory Ruling, 35 FCC Rcd 5475, 5475, para. 1 (IB 2020).

[587] ESIMs enable the provision of very high data rate broadband communications, navigational, situational awareness, and other services to mobile platforms that often cannot be served using other communications technologies. *See ESIMs Report and Order and Further Notice*, 33 FCC Rcd at 9328, para. 2. The Commission continues to distinguish ESIMs, which operate in FSS spectrum, from mobile earth stations, which operate in MSS spectrum. *ESIMs Report and Order and Further Notice,* 33 FCC Rcd at 9328-30, paras. 3-4, 10 (defining ESIMs to

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FSS operators provide broadband services to aircraft and maritime vessels, the owners of which include government organizations, commercial entities, and individual clients.[588] For example, Hughes/EchoStar offers FSS-based broadband services on commercial airlines while Intelsat, SES, Telesat, SpaceX, and Viasat serve both aircraft and maritime vessels.[589]

184. *Fixed Satellite Customer Marketplaces.* Satellites traditionally served fixed locations using GSO satellites and FSS spectrum.[590] While GSO satellite operators continue to launch and improve GSO satellites, multiple operators have launched or plan to launch constellations of hundreds or thousands of NGSO satellites to offer low-latency, high speed fixed satellite broadband services.[591] Eutelsat/OneWeb,[592] Hughes/EchoStar,[593] Intelsat, SES,[594] SpaceX/Starlink, Telesat, and Viasat are the major providers of FSS in the United States using FSS-based spectrum.[595] Hughes/EchoStar, Intelsat,

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collectively designate the three types of FSS earth stations that the Commission authorizes to transmit while in motion: Earth Stations on Vessels, Vehicle-Mounted Earth Stations, and Earth Stations Aboard Aircraft); 47 CFR § 25.103 (*Mobile Earth Station*) (defining mobile earth station as "[a]n earth station in the Mobile-Satellite Service intended to be used while in motion or during halts at unspecified points").

[588] "[T]he aeronautical and maritime industry are deploying an ever-increasing number of Earth Stations in Motion (ESIM), which communicate with GSO and NGSO satellites, to fill in a critical gap in terrestrial mobile networks to deliver high throughput Internet services to passengers from gate-to-gate and port-to-port." *See* SIA Reply at 10.

[589] Hughes, *Fast, Reliable and Flexible In-Flight Connectivity,* https://www.hughes.com/what-we-offer/mobile-connectivity/in-flight (last visited Oct. 9, 2024); Intelsat, *Elevate Your Airline's Inflight Experience with Multi-Orbit Connectivity*, https://www.intelsat.com/commercial-aviation/ (last visited Oct. 9, 2024); Intelsat, *Leading Provider of Satellite Connectivity to the Maritime Industry*, https://www.intelsat.com/maritime/ (last visited Oct. 9, 2024); SES, *Commercial Aviation*, https://www.ses.com/find-service/commercial-aviation (last visited Oct. 9, 2024); SES, *Commercial Maritime*, https://www.ses.com/find-service/commercial-maritime (last visited Oct. 9, 2024); Telesat Canada, SEC Form 20-F, at 66-67 (filed Mar. 28, 2024); Viasat, Inc., SEC Form 10-K, at 4, 6-7 (filed May 29, 2024).

[590] Before the development of ESIMs, only earth stations with fixed locations were permitted to access GSO satellites with FSS spectrum, because directional antennas focused on a single satellite were required for the earth station to avoid RF interference with other satellites' operations. *O3b Modification Order*, 33 FCC Rcd at 5516, para. 21 & n.59.

[591] Public Knowledge/OTI Reply at 20; SIA Reply at 11-12.

[592] In 2023, GSO satellite operator Eutelsat completed its acquisition of NGSO satellite operator OneWeb. Press Release, Eutelsat Group, Eutelsat and OneWeb Combination Heralds New Era in Space Connectivity as World's First GEO-LEO Operator (Sept. 28, 2023), https://www.eutelsat.com/en/news/press.html#/pressreleases/eutelsat-and-oneweb-combination-heralds-new-era-in-space-connectivity-as-worlds-first-geo-leo-operator-3276261.

[593] EchoStar provides its consumer broadband and managed services through its wholly-owned subsidiary, Hughes Network Services. Press Release, EchoStar, EchoStar Corporation Completes Hughes Communications, Inc. Acquisition (June 8, 2011), *https://ir.echostar.com/news-releases/news-release-details/echostar-corporation-completes-hughes-communications-inc*. In 2024, EchoStar completed its acquisition of DISH Network Corporation. Press Release, EchoStar, EchoStar Corporation Completes Merger with DISH Network Corporation (Jan. 2, 2024), https://ir.echostar.com/news-releases/news-release-details/echostar-corporation-completes-merger-dish-network-corporation.

[594] SES and Intelsat have announced an agreement for SES to acquire Intelsat. Press Release, SES, SES to Acquire Intelsat in Compelling Transaction Focused on the Future (Apr. 30, 2024), https://www.ses.com/press-release/ses-acquire-intelsat-compelling-transaction-focused-future.

[595] FCC, *Approved Space Station List*, https://www.fcc.gov/approved-space-station-list (last visited Oct. 9, 2024); Press Release, Eutelsat Group, OneWeb Expands Services, Launches Commercial Service Across Large Parts of Europe and the US (June 28, 2023), https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://oneweb.net/resources/oneweb-expands-services-launches-commercial-service-across-large-parts-europe-and-us&ved=2ahUKEwi8y6-

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SES, Telesat, and Viasat each rely on GSO high-throughput satellites (HTS) over North America.[596] GSO satellite operators rely on a combination of fixed narrow spot beams to deliver high speed services along with steerable beams for additional capacity that can be delivered as needed.[597] Eutelsat/OneWeb and SES offer service using both GSO and NGSO satellites, whereas SpaceX/Starlink relies on its NGSO constellation.[598]

185. Satellite broadband providers such as Hughes/EchoStar, SpaceX/Starlink, and Viasat play a role in closing the connectivity gap across the United States, especially in the most rural and remote areas of the country, where it may be uneconomical to build terrestrial networks.[599] As of 2023, Hughes and Starlink each served over one million subscribers in the United States.[600] Satellites are also providing backhaul Internet connectivity to local ISPs and community institutions.[601]

186. In addition to providing consumer retail broadband services, some satellite operators,[602] as well as third-party integrators purchasing the use of satellite facilities,[603] supply managed network services, which are complete, end-to-end communications systems that include leased satellite bandwidth, ground facilities, terrestrial transmission links, and management of the end-to-end communications

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wsa2KAxWvK1kFHXQHG1EQFnoECCAQAw&usg=AOvVaw0TrbBvB0rq7QIn8PPQaCoh; Hughes, *Powering a Connected Future*, https://www.hughes.com/who-we-are/about-hughes (last visited Oct. 9, 2024); EchoStar Comments at 24; Intelsat, *Expand Your Reach, Build Your Viewership*, https://www.intelsat.com/media/ (last visited Oct. 9, 2024); SES, Consolidated Financial Statements: As at and for the Year Ended 31 December 2023 at 155 (Feb. 2024), https://www.ses.com/sites/default/files/2024-05/SES-AR2023-CFS_0.pdf; Michael Kan, PCMag, *SpaceX: Starlink Now Has 1.3 Million Customers in the US* (Dec. 13, 2023), https://www.pcmag.com/news/spacex-starlink-now-has-13-million-customers-in-the-us (citing Letter from Christopher Cardaci, Vice President, Legal, Space Exploration Technologies, to Marlene H. Dortch, Secretary, FCC, WC Docket No. 19-126, at 2 (filed Dec. 12, 2023)); Telesat Canada, SEC Form 20-F, at 58-59 (filed Mar. 28, 2024); Viasat, Inc., SEC Form 10-K, at 4 (filed May 29, 2024).

[596] Hughes, *Jupiter GEO Satellites*, https://www.hughes.com/what-we-offer/satellite-services/jupiter-geo-satellites (last visited Oct. 9, 2024); Intelsat, *Satellite Network – Unrivaled Power and Flexibility*, https://www.intelsat.com/global-network/satellite-network/ (last visited Oct. 9, 2024); SES, *GEO HTS*, https://www.ses.com/our-coverage/geo-hts (last visited Oct. 9, 2024); Telesat, *GEO Satellites*, https://www.telesat.com/geo-satellites/ (last visited Oct. 9, 2024); Viasat, *ViaSat-1 Satellite*, https://www.viasat.com/space-innovation/satellite-fleet/viasat-1/ (last visited Oct. 9, 2024).

[597] SIA Reply at 11.

[598] Eutelsat OneWeb, Eutelsat Group, *Delivering LEO Connectivity for New Network Solutions*, https://oneweb.net/ (last visited Oct. 9, 2024); SES, *O3b mPOWER*, https://www.ses.com/o3b-mpower (last visited Oct. 9, 2024); Starlink, *Satellite Technology*, https://www.starlink.com/us/technology (last visited Oct. 9, 2024).

[599] SIA Reply at 2.

[600] SIA Reply at 9; EchoStar Comments at 24; Michael Kan, PCMag, *SpaceX: Starlink Now Has 1.3 Million Customers in the US* (Dec. 13, 2023), https://www.pcmag.com/news/spacex-starlink-now-has-13-million-customers-in-the-us.

[601] SIA Reply at 10.

[602] *See, e.g.*, Hughes, *Create a Smarter Network with Hughes Managed Network Services*, https://www.hughes.com/what-we-offer/managed-network-services (last visited Oct. 9, 2024); Intelsat, *Solutions,* https://www.intelsat.com/solutions/ (last visited Oct. 9, 2024) (navigate to "Managed Services" subheading); SES, *Find a Service,* https://www.ses.com/find-service (last visited Oct. 9, 2024).

[603] Examples of third-party providers of managed services include Artel, LLC and Speedcast International Limited. *See* Artel, *Company*, https://www.artelllc.com/company/ (last visited Oct. 9, 2024); Speedcast, *Network Management for Your Satellite Connection*, https://www.speedcast.com/our-solution/product/network-management/ (last visited Oct. 9, 2024).

service. Customers of managed satellite services include U.S. and foreign government agencies, government contractors, media companies, and commercial entities.[604]

187. FSS operators in the United States provide transponder capacity for lease through contracts for variable quantities of bandwidth, frequency, orbital location, geographic coverage, power, and length of service of the transponders required by the customer.[605] Many wholesale customers of FSS operators lease transponder capacity only and self-supply their own earth stations and terrestrial links. Applications of leased transponder capacity include point-to-point transponder capacity for use by providers of media services, point-to-multipoint transmission of video programming to multichannel cable programming distributors, and the transport of point-to-point telecommunications transmissions to terrestrial telecommunications operators and corporate users.[606] Also, satellite provision of backhaul services[607] is growing and projected to continue doing so.[608]

188. *Earth Observation Services.* EESS satellites are increasingly used to gather Earth observation information for commercial purposes, including information to observe the weather, measure factors important to climate change, assess needs in disaster recovery, monitor strategic assets, and observe crop growth. Several companies operate or plan to operate Earth observation satellites that the Commission authorized as EESS.[609] Some of these companies operate or plan to operate large numbers of

[604] *See, e.g.*, *Third Satellite Competition Report*, 26 FCC Rcd at 17304, paras. 41-42 (noting that value-added resellers provide managed services to government and corporate clients—e.g., U.S. Army, Federal Bureau of Investigation, commercial shipping—that need communications in "thin markets" or need to extend the reach of their corporate networks); *see also* SES, Consolidated Financial Statements: As at and for the Year Ended 31 December 2023 at 139, 152 (Feb. 2024), https://www.ses.com/sites/default/files/2024-05/SES-AR2023-CFS_0.pdf; Viasat, Inc., SEC Form 10-K, at 5 (filed May 29, 2024); GAO, Telecommunications: Competition, Capacity, and Costs in the Fixed Satellite Services Industry at 9 (Sept. 2011), https://www.gao.gov/products/GAO-11-777.

[605] *See Third Satellite Competition Report*, 26 FCC Rcd at 17292-99, paras. 15-35 (discussing complexities of output produced by commercial satellite operators). The pricing of transponder services and the specific attributes of the service to be supplied to the customer are bilaterally negotiated between the customer and the satellite operator. *Id.* at 17291-92, para. 14; *see also* GAO, Telecommunications: Competition, Capacity, and Costs in the Fixed Satellite Services Industry at 9-10 (Sept. 2011), https://www.gao.gov/products/GAO-11-777.

[606] *See Third Satellite Competition Report*, 26 FCC Rcd at 17296-97, paras. 26-28.

[607] Backhaul is used to route terrestrial mobile wireless voice and data traffic from base stations to mobile switching centers. *See supra* section II.B.2.

[608] Jiachen Zhang & Lluc Palerm, Analysys Mason, Wireless Backhaul and Trunking Via Satellite, 18th Edition (Apr. 25, 2024), https://www.analysysmason.com/research/content/reports/wireless-backhaul-trunking-nsi039/; Industry ARC, *Satellite Backhaul/Satellite Based Cellular Backhaul Market–Forecast* (2024-2030), https://www.industryarc.com/Report/19396/satellite-backhaul-satellite-based-cellular-backhaul-market.html (last visited Oct. 9, 2024); *see also* Eutelsat Group, *Telecommunication Networks*, https://www.eutelsat.com/en/satellite-communication-services/telecom-networks-backhaul.html (last visited Oct. 9, 2024); Hughes, *Cellular Satellite Backhaul for Mobile Network Operators (MNOs)*, https://www.hughes.com/what-we-offer/digital-divide-solutions/cellular-backhaul (last visited Oct. 9, 2024).

[609] The FCC has authorized EESS to Astro Digital U.S. Inc; BlackSky Global LLC; Capella Space Corp; HawkEye 360, Inc.; ICEYE US, Inc.; Kinéis; Loft Orbital Solutions, Inc.; Maxar License, Inc. (formerly DigitalGlobe and DG Consents Sub, Inc./GeoEye); MethaneSAT LLC; Metrea (formerly Meta Aerospace, Orbital Effects, and R2 Space, LLC); Muon Space, Inc.; Orbital Sidekick, Inc.; Planet Labs PBC (aka dMY Technology Group, Inc.); Space Sciences & Engineering LLC (dba PlantiQ); Spire Global, Inc; Theia Holdings A, Inc; and Umbra Lab, Inc. FCC, *Approved Space Station List*, https://www.fcc.gov/approved-space-station-list (last visited Oct. 9, 2024); Maxar, *History*, https://www.maxar.com/maxar-intelligence/history (last visited Oct. 9, 2024); DigitalGlobe, Inc., SEC Form 10-K, Exhibit 21.1 (filed Feb. 26, 2014), https://www.sec.gov/Archives/edgar/data/1208208/000110465914013405/a13-24405_1ex21d1.htm (listing DG Consents Sub, Inc. and GeoEye as subsidiaries); Warren Ferster, SpaceNews, *DigitalGlobe Closes GeoEye Acquisition* (Jan. 31, 2013), https://spacenews.com/digitalglobe-closes-geoeye-acquisition/; Press Release, PR

(continued….)

satellites. For example, Spire Global reported that it had launched more than 170 satellites as of year-end 2023,[610] and Planet Labs PBC had over 150 satellites in orbit as of August 2024.[611]

189. EESS providers generally operate satellites in low Earth orbit to provide Earth observations either by capturing optical images of the Earth, using Synthetic Aperture Radar (SAR),[612] or using radio location and RF signal detection and measurements for various purposes. Many combine their image data with other datasets and provide analytics for modeling and analysis. For example, Planet Labs captures frequent high-resolution optical images of the Earth for purposes that include agriculture and disaster management.[613] Spire Global satellites collect radio and Global Navigation Satellite System Reflectometry data for weather measurement.[614] Using four satellites in LEO, Maxar provides optical high-resolution high-accuracy imaging, geospatial information, and data analytics to the U.S. government and other customers.[615] BlackSky uses small satellites in LEO that capture Earth observation data that BlackSky combines with its AI software platform for analysis.[616] ICEYE, which specializes in flood monitoring and other disaster assistance, uses its SAR satellites to monitor daily ground conditions.[617] Capella uses its SAR satellites to provide all-weather Earth observation.[618] HawkEye 360 provides precise mapping of RF emissions and space-based RF analytics.[619]

4. Satellite Industry Characteristics

190. In many communications marketplaces, satellite services compete directly with terrestrial services. However, because of technological and organizational differences, satellite services are often able to provide a differentiated and, in certain aspects, a complementary service to terrestrial communications services. Here we discuss both the strengths and limitations of satellite services. We briefly describe the key features of satellite services that differentiate them from terrestrial alternatives in the areas of coverage and reach, cost, capacity, quality, customer convenience, and the time and risk involved in building and launching satellites.

(Continued from previous page)
Newswire, Meta Aerospace is Now Metrea (Oct. 11, 2022), https://www.prnewswire.com/news-releases/meta-aerospace-is-now-metrea-301646469.html; Press Release, Communications Daily, Meta Aerospace Seeks FCC Deal OK After Buying Orbital Effects (Apr. 27, 2021), https://communicationsdaily.com/news/2021/04/27/Meta-Aerospace-Seeks-FCC-Deal-OK-After-Buying-Orbital-Effects-2104260006; Press Release, dMY Technology Group, Planet Announces Closing of Business Combination with dMY Technology Group, Inc. IV (Dec. 7, 2021), https://www.dmytechnology.com/dmy-technology-group-inc-iv/.

[610] Spire Global, Inc., SEC Form 10-K, at 11 (filed Mar. 6, 2024).

[611] Planet, *Our Constellation*, https://www.planet.com/our-constellations/ (last visited Aug. 12, 2024). Planet also claims to have launched and deployed more than 450 satellites. *Id.*

[612] NASA Earthdata, *What is Synthetic Aperture Radar?*, https://www.earthdata.nasa.gov/learn/backgrounders/what-is-sar (last visited Oct. 9, 2024); Capella Space, *Technology*, https://www.capellaspace.com/technology (last visited Oct. 9, 2024).

[613] Planet Labs PBC, SEC Form 10-K, at 3 (filed Mar. 29, 2024). Planet Labs claims to "image the Earth every day at medium- and high-resolution" and "have collected over 2,700 images on average for every point on Earth's landmass, creating a non-replicable historical archive for analytics, machine learning, and insights." *Id.* at 2.

[614] Spire Global, Inc., SEC Form 10-K, at 10 (filed Mar. 6, 2024).

[615] Maxar Technologies Inc., SEC Form 10-K, at 3-7 (filed Feb. 22, 2023).

[616] BlackSky Technology Inc., SEC Form 10-K, at 5 (filed Mar. 20, 2024).

[617] ICEYE, *Trusted Mission Partner*, https://www.iceye.com/ (last visited Oct. 9, 2024).

[618] Capella Space, *Capella Space Open Data Gallery*, https://www.capellaspace.com/gallery/ (last visited Oct. 9, 2024).

[619] HawkEye 360, *About–Revolutionizing RF Analytics*, https://www.he360.com/about-us-rf-analytics/ (last visited Oct. 9, 2024).

191. *Coverage and Reach as a Space Platform*. As a space platform, satellites have some unique capabilities and challenges. Satellites can have very long range and provide near ubiquitous coverage, especially satellites in geostationary orbit. Satellites can reach remote regions, so long as there is line of sight to the satellite for FSS service, and provide relatively inexpensive long-distance service.[620] Satellites are thus able to provide service to remote and rural locations that are too difficult and expensive for terrestrial networks to reach.[621]

192. Another advantage of being a space platform is that a satellite can easily observe the Earth, enabling weather and ground monitoring and photography. A satellite is also unaffected by terrestrial developments and disasters, making it useful for providing redundant (backup) service to terrestrial systems, especially following a disaster. However, satellites are susceptible to challenges specific to space, including orbital debris and solar flares, and communications may be affected by cloudy and wet weather on Earth for some services. In addition, being in space means that maintenance and repairs are very difficult or impossible to provide, although there is a nascent ISAM industry that seeks to address some of these challenges.

193. *Cost*. The cost of building small satellites, such as cube satellites, has fallen.[622] Moreover, the proliferation of launch options, including SpaceX and Rocket Lab, has significantly decreased the cost of deploying individual satellites.[623] Nevertheless, it remains generally true that there is a high fixed cost to designing, manufacturing, and launching a large satellite or a constellation of smaller satellites. The provision of communications services using satellites requires either one or more large GSO satellites or large constellations of smaller NGSO satellites. The manufacturing-to-launch process for large satellites can take years, and an individual satellite can cost up to $500 million.[624] A constellation of small satellites capable of handling communications with multiple ground stations would also be expensive because of the large number of satellites needed in LEO or MEO orbit.[625] Thus, there is a high cost to providing satellite communications services, which poses a significant barrier to entry. Conversely, because satellite systems have inherently wide- area coverage, they can easily reach distant

[620] For satellite service from GSOs, the cost is mostly independent of the distance involved, unlike many terrestrial ground-based networks that require middle and last mile build-out or submarine cable.

[621] SIA Reply at 8-10; EchoStar Comments at 23; PDI Comments at 2-3. For instance, Starlink offers its LEO service to remote and recreational vehicle communities. Starlink, *Starlink For Homes*, https://www.starlink.com/residential (last visited Oct. 9, 2024); Starlink, *Roam With Starlink*, https://www.starlink.com/us/roam (last visited Oct. 9, 2024). Eutelsat-OneWeb's LEO network also seeks to serve difficult-to-reach communities. Eutelsat OneWeb, *Delivering LEO Connectivity for New Network Solutions*, https://oneweb.net/ (last visited Oct. 9, 2024).

[622] Christopher Barclay, American University, *Small Satellites and International Security* (Feb. 14, 2024), https://www.american.edu/sis/centers/security-technology/small-satellites-and-international-security.cfm.

[623] Denise Chow, NBC News, *To Cheaply Go: How Falling Launch Costs Fueled a Thriving Economy in Orbit* (Apr. 8, 2022), https://www.nbcnews.com/science/space/space-launch-costs-growing-business-industry-rcna23488.

[624] SIA Reply at 12; GAO, Telecommunications: Competition, Capacity, and Costs in the Fixed Satellite Services Industry at 30 (Sept. 2011), https://www.gao.gov/products/GAO-11-777.

[625] For example, in 2018, SpaceX projected that it would cost about $10 billion to deploy it's then planned satellite constellation. Michael Baylor, NasaSpaceFlight.com, *With Block 5, SpaceX to Increase Launch Cadence and Lower Prices* (May 17, 2018), https://www.nasaspaceflight.com/2018/05/block-5-spacex-increase-launch-cadence-lower-prices/. Recent estimates indicate that the individual cost of SpaceX's first generation satellites was $200,000 each, but that its latest V2 mini version costs $800,000 per satellite to produce, reflecting an increase in size and capabilities. Sandra Erwin, SpaceNews, *Starlink Soars: SpaceX's Satellite Internet Surprises Analysts with $6.6 Billion Revenue Projection* (May 9, 2024), https://spacenews.com/starlink-soars-spacexs-satellite-internet-surprises-analysts-with-6-6-billion-revenue-projection/.

and rural customers.[626] This also means that the cost of adding additional customers can be very low once the satellite or constellation is operational in space.[627]

194. *Capacity*. The satellite industry is investing heavily to increase capacity. One form of capacity-enhancing investment is innovation, as new satellites are providing broadband download speeds exceeding 100 Mbps, with GSO and NGSO satellites that expect to offer fiber-like speeds under construction.[628] A specific innovation, the software-defined satellite, can customize its spectral power, shape and steer its beams, and adapt its geographic footprints from orbit, thereby augmenting capability, coverage, and capacity.[629] Beam-forming enhancements, including narrow spot beams, broad regional beams, and steerable beams, are being deployed to extend broadband availability to terrestrial, aviation, and maritime subscribers.[630] New launches constitute another type of capacity-enhancing investment, with 2,116 new satellites launched during 2023.[631] Many of these launches are small satellites, with more than 8,000 small satellites deployed since 2020.[632] Starlink, OneWeb, and Amazon Kuiper have large LEO constellations of small satellites planned, approved, or under development.[633] As of August 2024, Starlink had more than 6,000 working LEO satellites deployed,[634] followed by OneWeb with more than 630.[635] Deployment of these constellations of small satellites has dramatically increased FSS LEO satellite capacity.[636]

195. *Quality*. High latency and jitter[637] can negatively impact the quality of satellite services, especially for higher Earth orbits. High latency, which slows down response time, can negatively impact

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[626] SIA Reply at 10.

[627] EchoStar Comments at 25; SIA Reply at 10.

[628] SIA Reply at 11.

[629] Marisa Torrieri, Via Satellite, *How Software-Defined Satellites Will Shape Communications* (Apr. 2021), https://interactive.satellitetoday.com/via/april-2021/how-software-defined-satellites-will-shape-communications/; *see also* Press Release, Euroconsult, Software Defined Satellites Create New Space Market Opportunities (Apr. 15, 2024), https://www.euroconsult-ec.com/press-release/software-defined-satellites-create-new-space-market-opportunities/.

[630] SIA Reply at 11.

[631] *Id*. at 11-12.

[632] *Id.*

[633] Tom Butash, Aerospace America, *Low-Earth Orbit Megaconstellations Reach Record Capacity* (Dec. 2021), https://aerospaceamerica.aiaa.org/year-in-review/low-earth-orbit-megaconstellations-reach-record-capacity/.

[634] Jonathan's Space Pages, *Starlink Statistics*, https://planet4589.org/space/con/star/stats.html (last visited July 26, 2024); *see also* Public Knowledge/OTI Reply at 20.

[635] Jonathan's Space Pages, *OneWeb Statistics*, https://planet4589.org/space/con/ow/stats.html (last visited Aug. 12, 2024); Eutelsat OneWeb, Eutelsat Group, *Connect With Confidence*, https://oneweb.net/our-network (last visited Oct. 9, 2024) (navigate to "High Throughput Low Latency" subheading).

[636] Press Release, Euroconsult, Non-Geostationary Orbit Constellations Redefining the High Throughput Satellites Market Landscape (Apr. 25, 2024), https://www.euroconsult-ec.com/press-release/non-geostationary-orbit-constellations-redefining-the-high-throughput-satellites-market-landscape/; Rachel Jewett, Via Satellite, *Euroconsult Projects NGSO to Make Up 90% of Capacity in 2026* (Mar. 21, 2022), https://www.satellitetoday.com/finance/2022/03/21/euroconsult-projects-ngso-to-make-up-90-of-capacity-in-2026/.

[637] In video applications and network transmission, jitter is the loss or delay of transmitted data between network devices. *See* Haivision, *Jitter*, https://www.haivision.com/glossary/jitter/ (last visited Oct. 9, 2024); RingCentral, *What is Jitter? How to Test and Reduce Internet Jitter*, https://www.ringcentral.com/us/en/blog/what-is-jitter/ (last visited Oct. 9, 2024); IR, *Network Jitter – Common Causes and Best Solutions*, https://www.ir.com/guides/what-is-network-jitter (last visited Dec. 17, 2024).

customer experiences with certain communications applications, especially two-way communications. LEO satellites have much lower latency, enabling voice communication, data transmission, and other low-latency functions.[638] Another quality impediment is local ground weather, which can adversely affect the reception of certain satellite services, depending on the frequency bands used.[639]

196. *Customer Convenience*. Customer convenience can be a significant factor in determining the usefulness and uptake of satellite services. Customers of satellite services may find the location flexibility of satellite services convenient, allowing them to take service anywhere in the United States, with limited hand-off problems and loss of reception,[640] even in remote areas.[641] However, current customer terminals and handsets, which may require a large power source for some satellite services, can be inconvenient, especially when compared with the smaller pocket-sized handsets available for terrestrial mobile wireless service.

197. *Time and Risk Involved in Satellite Launches.* The time needed to build and launch satellites, and the risk involved, can be a significant issue for satellite operators considering market entry or expansion. It can take years to build and launch a satellite; relative concentration in the launch market constrains operators' launch options; and there is a risk that the satellite launch will not be successful, or that the satellite will be damaged or will malfunction at some point.[642] Space weather, space dust, incorrect orbit, internal malfunction, and collisions with other satellites or orbiting debris can damage or disable satellites.[643] For example, Viasat filed a $421 million insurance claim for its partially disabled satellite ViaSat-3 F1, and a $349 million claim for the total loss of Inmarsat-6 (I-6) F2.[644] The possibility of loss substantially raises the costs and market risks of entering the satellite services marketplace and of expanding service.

E. The Video Marketplace

1. Overview of the Video Programming Marketplace

198. In the United States, consumers can access video programming content from multiple sources: some video providers, like broadcast television stations, have been in the marketplace for over 80 years,[645] whereas other providers, like online video providers, have entered the marketplace more

[638] Tori Kimball, SKYTRAC, *SKYTRAC #Satcomseries: The Differences, Strengths, and Weaknesses of LEO and GEO Satellites* (Apr. 26, 2022), https://www.skytrac.ca/resources/magazine/skytrac-satcomseries-the-differences-strengths-and-weaknesses-of-leo-and-geo-satellites/.

[639] Rain on the transmission path can degrade and attenuate signals for spectrum above 3 GHz, including C-band, Ku-band, Ka-band, and V-band. Ippolito at 101-05 (2017).

[640] Reception may be lost in areas without clear line of sight to satellites, such as in mountainous areas.

[641] SDARs, for example, allows cars to receive the same audio service anywhere in the United States.

[642] SpaceX launches the bulk of US-based satellites. Although highly successful, SpaceX's Falcon 9 rocket is not invulnerable to launch failure, which remains a risk. *See* Mike Wall, Space.com, *SpaceX Rocket Failure Highlights Need for Multiple Launch Options: 'Falcon 9 is Not Invulnerable'* (July 25, 2024), https://www.space.com/spacex-falcon-9-launch-failure-lessons; *see also* Public Knowledge and OTI Reply at 21 ("Additional actors in th[e launch] arena could help drive prices down particularly in the nation's most rural and tribal communities").

[643] Capitology Blog, Capitol Technology University, *Hazards of Space: How Satellite Missions Can Go Wrong* (Sept. 25, 2018), https://www.captechu.edu/blog/hazards-of-space-how-satellite-missions-can-go-wrong.

[644] Jason Rainbow, SpaceNews, *Viasat Preparing to Start Services from Hobbled Viasat-3 Satellite* (Feb. 6, 2024), https://spacenews.com/viasat-preparing-to-start-services-from-hobbled-viasat-3-satellite/. Typically, insurance proceeds help defray out-of-pocket losses, but not all costs. Lost revenues and growth opportunities are among the latter.

recently. There are three primary categories of participants in the video marketplace: MVPDs, OVDs, and broadcast television stations.

199. MVPDs use wireline or satellite technologies to deliver video programming to consumers. MVPDs sell channel packages, which typically include linear channels from cable networks and retransmitted broadcast television stations,[646] as well as video-on-demand (VOD) content.[647] Traditional MVPDs include cable providers like Charter and Comcast, telephone company providers like Verizon, two DBS providers—DISH and DIRECTV—as well as numerous smaller cable and telephone company MVPDs. Continuing a downward trend that began in 2012, MVPDs lost 7.8 million video subscribers between 2022 and 2023, ending 2023 with 54.1 million video subscribers.[648] As many MVPDs also provide broadband Internet, voice, and mobile wireless services, MVPDs continue to compete by offering discounted services to consumers who purchase video services as part of a bundle that includes some combination of other service offerings.[649]

200. OVDs deliver video content to consumers via the Internet.[650] They use a variety of business models, including advertising-supported video offerings; a subscription model for access to an entire video library; and a transactional approach in which consumers pay to view a movie or television episode on a per-program basis. While OVDs often provide access to programming from third-party producers, major OVDs are increasing the amount of original and owned content they provide as a means of differentiating themselves from competitors. Additionally, many large video content owners have elected to use their own OVD services, instead of third-party platforms, to make their content available online. OVDs include Netflix, Hulu, Amazon Prime Video, Disney+, and YouTube TV, as well as numerous other providers tending to focus on niche audiences. Moreover, social media sites such as Facebook and Instagram are increasingly distributing video, including user-created video and AI-generated video.[651]

(Continued from previous page)

[645] Commercial television began in the late 1940s. *See* Cornell University, *The History of Television (or, How Did This Get So Big?)*, https://www.cs.cornell.edu/~pjs54/Teaching/AutomaticLifestyle-S02/Projects/Vlku/history.html (last visited Dec. 16, 2024).

[646] A linear channel is a traditional television channel that delivers content on a predetermined schedule.

[647] VOD is a service that allows users to access and watch video content whenever they choose.

[648] Mau Rodriguez and John Fletcher, S&P Global, *Multichannel Trends: Q1 2024 Video Market Share: Everyone Loses* (May 22, 2024) (last accessed May 28, 2024). We do not provide URLs for S&P Global articles and data throughout this section because it is a paid subscription service that cannot be publicly accessed.

[649] *See infra* section II.E.2.b.

[650] For purposes of this section, we define an OVD as "an entity that distributes video programming (1) by means of the Internet or other IP-based transmission path; (2) not as a component of an MVPD subscription or other managed video service; and (3) not solely to customers of a broadband Internet access service owned or operated by the entity or its affiliates." *2022 Communications Marketplace Report*, 37 FCC Rcd at 15653, para. 214 & n.657.

[651] Generative AI is now able to generate, at relatively low cost, short videos from text descriptions. *See*, *e.g.*, OpenAI, *Creating Video from Text*, https://openai.com/index/sora/ (last visited July 18, 2024); Google Research, *VideoPoet: A Large Language Model for Zero-Shot Video Generation*, https://sites.research.google/videopoet/ (last visited July 18, 2024); and Meta Research Blog, *Introducing Make-A-Video: An AI System that Generates Videos from Text* (Sept. 29, 2022), https://web.archive.org/web/20230720175217/https://ai.meta.com/blog/generative-ai-text-to-video/. For commercial case studies, *see* Synthesia, *Discover AI Video Success Stories*, https://www.synthesia.io/case-studies (last visited July 18, 2024). Videos widely viewed on social media are typically quite short (TikTok originally limited video length to 15 seconds). Successful social-media videos are thus relatively easy to generate using AI.

201. Broadcast television stations offer linear video programming channels over-the-air (OTA) to households using a television set connected to an antenna. Although many broadcast television stations are affiliated with commercial broadcast networks (e.g., ABC, CBS, FOX, and NBC), participants in this category also include independent commercial stations and Noncommercial Educational (NCE) stations.[652] Programming aired on broadcast television stations includes local programming produced by stations, network programming, and syndicated programming. Stations derive their revenue from the sale of advertisements during the programming and from fees paid by MVPDs for the carriage of the station's signal, called retransmission consent fees. Advertising revenue accounts for approximately 50% of revenue earned by all stations, while retransmission consent revenue accounts for approximately 41%, and digital and online services account for the remaining 9%.[653]

2. Multichannel Video Programming Distributors

a. Providers and Subscribers

202. At the end of 2023, seven MVPDs each had over one million video subscribers. These MVPDs include four cable companies (Charter, Comcast, Altice, and Cox),[654] DISH (a DBS MVPD),[655] DIRECTV (a combined DBS and telephone company MVPD),[656] and Verizon Fios (a telephone company MVPD).[657] Six other cable MVPDs and two telephone company MVPDs each had between 100,000 and 1 million video subscribers.[658] In addition, many small cable and telephone company MVPDs served smaller numbers of customers.[659]

203. Cable MVPDs generally serve non-overlapping franchise areas; consequently, most consumers have access to one cable MVPD only, and cable MVPDs do not generally compete directly with one another for the same subscribers.[660] DIRECTV and DISH have national footprints and almost all consumers have access to both DBS MVPDs.[661] Telephone company MVPDs rarely compete with one another for the same subscribers; however, they almost always overbuild areas already served by at least one cable company.[662] As such, most consumers have access to one cable MVPD and two DBS MVPDs, and some consumers additionally have access to a telephone company MVPD.

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[652] Examples of major independent stations include WGN-TV in Chicago, KCAL-TV in Los Angeles, and WHDH-TV in Boston.

[653] *See infra* section II.E.4.d.

[654] S&P Global, *Top Cable MSOs* (last accessed May 28, 2024) (*Top Cable MSOs*).

[655] EchoStar Corporation, SEC Form 10-K, at 66 (filed Feb. 29, 2024).

[656] S&P Global, *US DBS Subscribers, 2015-2024 YTD* (last accessed May 28, 2024).

[657] Verizon Communications Inc., SEC Form 10-K, at 30 (filed Feb. 9, 2024).

[658] The six cable MVPDs were Mediacom, Astound Broadband, Breezeline, Cable One, Midcontinent Communications, and Armstrong Utilities. *See Top Cable MSOs*. The telephone company MVPDs were Frontier Communications and Cincinnati Bell. *See* Frontier Communications Parent, Inc., SEC Form 10-K, at 30-31 (filed Feb. 23, 2024); Cincinnati Bell Inc., SEC Form 10-K, at 37-38 (filed Mar. 25, 2024).

[659] *See Top Cable MSOs*.

[660] Where cable overbuilders exist (e.g., Astound Broadband), consumers have access to more than one cable MVPD. The available data, however, do not permit us to calculate how many homes have access to two cable MVPDs.

[661] We recognize that physical features (e.g., tall buildings, terrain, and trees) prevent some housing units from receiving DBS signals. *See 2022 Communications Marketplace Report*, 37 FCC Rcd at 15654, para. 217 & n.665.

[662] Mau Rodriguez, S&P Global, *Multichannel Trends: Cable's Hold on Broadband Subs Wavers in Telco ZIP Codes* (Mar. 13, 2024) (last accessed May 28, 2024). Although we distinguish telco MVPDs from cable MVPDs for descriptive purposes for this *Report*, we note that telco MVPDs are cable operators for regulatory purposes. *See* (continued….)

204. Traditional MVPD subscribership has been declining since 2012, when it reached 101.6 million subscribers.[663] Figure II.E.1 shows that collectively, the number of traditional MVPD subscribers fell from 61.9 million at the end of 2022 to 54.1 million at the end of 2023, which represents a loss of 7.8 million video subscribers.[664] Between 2022 and 2023, cable MVPDs lost 4.0 million subscribers, DBS MVPDs lost 3.0 million subscribers, and telephone company MVPDs lost 0.8 million subscribers.[665] Over the past decade, cable MVPDs lost about 17.3 million subscribers and DBS and telephone company MVPDs lost about 23.2 million subscribers.[666] NCTA estimates that the percentage of households subscribing to a traditional MVPD has fallen from a peak of approximately 88% in 2009 to approximately 41% as of December 2023.[667]

Fig. II.E.1
MVPD Video Subscribers (in millions)

	2022	2023	Net Change	Percentage Change
Cable	39.3	35.3	-4.0	-10.1%
DBS	16.7	13.7	-3.0	-18.0%
Telephone Company	5.9	5.1	-0.8	-13.5%
Total	**61.9**	**54.1**	**-7.8**	**-12.6%**

Source: Mau Rodriguez and John Fletcher, S&P Global, *Multichannel Trends: Q1 2024 Video Market Share: Everyone Loses* (May 22, 2024) (last accessed May 28, 2024).

205. Figure II.E.2 shows the relative shares of MVPD subscribers for cable, DBS, and telephone companies. In 2023, 65.3% of MVPD subscribers subscribed to cable while 25.3% subscribed to DBS and 9.4% subscribed to telephone companies. While the total number of MVPD subscribers declined from 61.9 million in 2022, to 54.1 million in 2023, the market shares for cable MVPDs increased, while those of DBS and telephone company MVPDs declined.

Fig. II.E.2
Percentage of MVPD Subscribers

Year	Cable	DBS	Telephone
2022	63.5%	26.9%	9.5%
2023	65.3%	25.3%	9.4%

Source: Mau Rodriguez and John Fletcher, S&P Global, *Multichannel Trends: Q1 2024 Video Market Share: Everyone Loses* (May 22, 2024) (last accessed May 28, 2024).

206. Figure II.E.3 shows the number of subscribers and market shares for the largest traditional MVPDs at the end of 2023. These MVPDs served approximately 92% of all traditional MVPD subscribers.

(Continued from previous page)
Promoting Innovation and Competition in the Provision of Multichannel Video Programming Distribution Services, MB Docket No. 14-261, Notice of Proposed Rulemaking, 29 FCC Rcd 15995, 16026-29, paras. 71-77 (2014).

[663] S&P Global, *U.S. Multichannel Industry Benchmarks* (last accessed May 24, 2024) (*Multichannel Benchmarks*).

[664] Mau Rodriguez and John Fletcher, S&P Global, *Multichannel Trends: Q1 2024 Video Market Share: Everyone Loses* (May 22, 2024) (last accessed May 28, 2024).

[665] *Id.*

[666] Leichtman Research Group, *Research Notes 1Q 2024* at 3, https://leichtmanresearch.com/wp-content/uploads/2024/03/LRG-Research-Notes-1Q-2024.pdf (last visited May 22, 2024).

[667] NCTA Comments at 28-29.

Fig. II.E.3
Largest Traditional MVPDs

	2023 Subscribers (in Millions)	2023 Market Share
Charter (Cable)	14.1	26.1%
Comcast (Cable)	14.1	26.1%
DIRECTV (DBS)	7.2	13.3%
DISH (DBS)	6.5	12.0%
Verizon Fios (Telephone)	3.0	5.6%
Altice (Cable)	2.3	4.2%
Cox (Cable)	2.1	3.9%
Mediacom (Cable)	0.5	0.9%

Source: *Top Cable MSOs*; S&P Global, *US DBS Subscribers, 2015-2024 YTD* (last accessed May 28, 2024); S&P Global, *US Telco Video Subscribers, Q1 2023 – Q1 2024* (last accessed May 28, 2024).

207. Some cable companies have decided to phase out their MVPD service. For example, Cable One explains that they continue to have an MVPD service, but it is not being marketed to new customers.[668] WideOpenWest is transitioning away from its traditional MVPD service and now bundles YouTube TV with its broadband service.[669] DIRECTV no longer accepts new customers for its legacy AT&T U-verse video service and Frontier stopped promotions for Frontier TV.[670] S&P Global notes that the largest cable MVPDs (Charter, Comcast, Altice, and Cox) may continue to offer traditional MVPD service but declining MVPD subscriptions could lead smaller MVPDs to abandon the service and focus on broadband.[671] ACA Connects maintains that smaller cable operators are strongly considering exiting the cable video business over the coming decade as the landscape becomes more challenging.[672]

b. Channel Packages and Bundling

208. MVPDs typically offer a variety of channel packages at different prices. For example, in mid-2024, Comcast offered three packages with channel counts ranging from 10 to more than 185, which were priced from $25 to $80 per month.[673] Similarly, DISH offered three packages with channel counts ranging from 190 to more than 290, which were priced from $84.99 to $114.99 per month.[674] Although no two channel packages are exactly alike, there is substantial overlap in the packages offered by competing MVPDs. Traditional MVPDs tend to offer the major cable and broadcast networks and similar

[668] John Fletcher, S&P Global, *Multichannel Trends: Broadband-First Economics* at 1 (Dec. 4, 2023) (last accessed May 28, 2024).

[669] *Id.* at 2.

[670] John Fletcher, Scott Robson, Seth Shafer, Justin Nielson, and Peter Leitzinger, S&P Global, *Multichannel Trends: US Video Home Forecast Through 2026* at 3 (July 14, 2022) (last accessed May 28, 2024).

[671] *Id.* at 4.

[672] ACA Connects Comments at 22.

[673] Comcast, *Build Your Plan with Xfinity for Internet, TV, Mobile and Security*, https://www.xfinity.com/digital/offers/plan-builder (last visited May 27, 2024).

[674] DISH, *Satellite TV Packages—Compare Packages & Prices*, https://www.dish.com/programming/packages (last visited May 27, 2024).

premium channels. Mainly because of their programming similarities, households typically subscribe to only one MVPD.

209. Some MVPDs maintain that the bargaining power of large programmers hinders their ability to offer TV packages that might better match consumer preferences. For example, ACA Connects complains that large programmers impose bundling, tiering, and penetration requirements that inflate costs and restrict the ability to offer customized video packages.[675] DIRECTV argues that vertically integrated programmers and OVDs force MVPDs to carry bloated and expensive bundles of programming that prevent MVPDs from offering smaller TV packages and specialty tiers that consumers want.[676] EchoStar also claims that an ever-increasing shift of power from distributors to a handful of programming conglomerates, which are vertically integrated with their own distribution conduits, handicaps independent distributors.[677]

210. MVPDs generally offer access to some channels and VOD programs over the Internet for viewing on devices both inside and outside the home.[678] Some MVPDs also offer their own virtual Multichannel Video Programming Distributor (vMVPD).[679] For example, DIRECTV offers DIRECTV Stream and DISH offers Sling TV.[680] Some MVPDs bundle vMVPDs from third parties with their broadband service. For example, Frontier offers a discount on YouTube TV when bundled with its broadband service.[681] These online channel packages are examined more fully in our discussion of OVDs below.

211. MVPDs offer discounted rates to consumers who purchase video services as part of a bundle that may include some combination of video, Internet, voice, and mobile wireless services.[682] Although bundling traditional channel packages with other services has been a dominant marketing strategy for MVPDs for a long time, today cable and telephone company MVPDs tend to market broadband service first.[683] Bundles that include traditional channel packages are less prominent.[684] For cable MVPDs, broadband has generated more revenue than video since 2020.[685] At the end of 2023,

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[675] ACA Connects Comments at 19-20.

[676] DIRECTV Comments at 13-14.

[677] EchoStar Comments at 14.

[678] For viewing over the Internet, MVPDs use an authentication process to ensure that users subscribe to an MVPD.

[679] The term "vMVPD" refers to a provider that delivers subscription packages of streaming linear video channels via the Internet.

[680] DIRECTV STREAM, *DIRECTV STREAM—Live Stream TV on Mobile & Streaming Devices*, https://streamtv.directv.com/ (last visited May 27, 2024); Sling TV, *Sling TV: Stream Live TV Channels, Sports, & News Online*, https://www.sling.com/ (last visited May 27, 2024).

[681] Frontier, *Save Up to $120 on Your First Year of YouTube TV*, https://frontier.com/shop/tv (last visited May 27, 2024).

[682] Briley Kenney, Digital Trends, *The 9 Best Internet and TV Bundles in March 2024* (Mar. 25, 2024), https://www.digitaltrends.com/home-theater/best-internet-and-tv-bundles/.

[683] *See*, *e.g.*, Comcast, *Internet, TV, Phone, Smart Home and Security*, https://www.xfinity.com/overview (last visited June 24, 2024); Charter, *Spectrum: Internet, Mobile, Cable TV and Home Phone*, https://www.spectrum.com/ (last visited June 24, 2024); Verizon, *Verizon: Wireless, Internet, TV and Phone Services*, https://www.verizon.com/ (last visited June 24, 2024). Note that the home websites of each of these companies focus on Internet service before video service.

[684] Roger Cheng, Cord Cutters News, *The 'Triple Play' Bundle For Phone, Cable-TV, and Internet is Slowing Dying* (Dec. 13, 2023), https://cordcuttersnews.com/the-triple-play-bundle-for-phone-cable-tv-and-internet-is-slowly-dying/.

broadband accounted for approximately 44% of revenue, while video accounted for approximately 32% of revenue.[686]

c. Pricing

212. During the period covered by this report, the prices displayed to consumers on MVPD websites, in mailings, or in television advertisements typically target new subscribers, and are often only available for a limited time, with prices increasing once the promotional period ends.[687] For example, in May 2024, DIRECTV offered new subscribers price discounts for 24 months[688] and Charter offered discounts for 12 months.[689] In addition to the prominently displayed advertised prices, MVPDs explain that the monthly bill may include additional fees for programming from local broadcast television stations or regional sports networks or for equipment rental. For example, in May 2024, DIRECTV showed two prices for each channel package. Below the more prominently displayed advertised price, a higher price was shown, which explained that the package included a $15 Advanced Receiver Service Fee and a $15.99 Regional Sports fee for packages with sports programming.[690] Any fees over-and-above prominently displayed advertised prices are typically included in the advertisements and listed on a subscriber's monthly billing statement.[691]

213. In addition, the fees for programming from local broadcast television stations continue to increase.[692] S&P Global explains that six of the nine legacy MVPDs they track have raised their broadcast fees from the first quarter of 2023 to January 2024, resulting in a nearly 13% increase in the group's weighted national average to about $21.48 a month.[693] Broadcast fees vary significantly by company with Mediacom charging subscribers the most ($28.28/month) and Verizon Fios charging subscribers the least ($11.49/month).[694] S&P Global notes that DBS and telephone company MVPDs

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[685] John Fletcher, S&P Global, *Multichannel Trends: US Cable Revenue Trends: 2016-2023* at 1-2 (Dec. 20, 2023) (last accessed May 28, 2024).

[686] *Id.* at 2.

[687] This practice is common in subscription and other repeat purchase markets, in which firms exercise market power over consumers who face switching costs, while also seeking to attract existing customers of rival firms. Consumer switching costs could include transaction costs, learning costs, or contractual costs. *See, e.g.*, Paul Klemperer, *Markets with Consumer Switching Costs*, 102 The Quarterly Journal of Economics 375-94 (1987); Curtis R. Taylor, *Supplier Surfing: Competition and Consumer Behavior in Subscription Markets*, 34 RAND Journal of Economics 223-46 (2003).

[688] DIRECTV, *Satellite TV Deals*, https://www.directv.com/satellite/ (last visited May 27, 2024).

[689] Charter, *Spectrum TV—Digital Cable Service Provider*, https://www.spectrum.com/cable-tv (last visited May 27, 2024).

[690] DIRECTV, *DIRECTV Packages Via Satellite or Internet*, https://www.directv.com/packages/ (last visited May 27, 2024).

[691] Section 1004(a) of the Viewer Protection Act of 2019 (TVPA) amended the Act to require MVPDs to "give consumers a breakdown of all charges related to the MVPD's video service" before contracting with a consumer for service and also provides consumers 24 hours in which to cancel such service without penalty. H.R. Rep. No. 116-329, 116th Cong., 1st Sess. 2019 at 4. Section 642(a)(1) of the Act, as added by the TVPA, specifically requires that MVPDs provide "the total monthly charge for the [service] . . . including any related administrative fees, equipment fees, or other charges . . . ." 47 U.S.C. § 562(a)(1) (as added by section 1004(a) of the TVPA, Pub. L. No. 116-94, 133 Stat. 2534 (2019)).

[692] *See, e.g.*, Mau Rodriguez, S&P Global, *Multichannel Trends: Broadcast TV Surcharges Persistently Rise in 2023* at 1 (Jan. 20, 2023) (last accessed May 28, 2024); ACA Connects Comments at 20; DIRECTV Comments at 10; EchoStar Comments at 14, 20.

[693] Mau Rodriguez, S&P Global, *Multichannel Trends: Broadcast TV Fees Burden Monthly Consumer Bills in 2024* at 1 (Jan 30, 2024) (last accessed May 28, 2024).

tended to charge lower broadcast fees to subscribers than cable MVPDs.[695] DISH has not raised its broadcast fee since 2021.[696] Further, MVPDs commonly offer plans that charge fees for ending service before the end of the contract term, i.e., early termination fees (ETFs). DIRECTV, DISH, Cox, and Charter, as examples, all offered plans with ETFs.[697]

214. In December 2023, the Commission initiated a proceeding to examine certain junk fee billing practices that may prevent subscribers from choosing the video services they want or result in consumers paying fees for video services they do not choose to receive.[698] Specifically, the Commission proposed to adopt customer service protections that prohibit cable operators and DBS service providers from imposing ETFs and billing cycle fees (BCFs).[699] On March 14, 2024, the Commission adopted new rules requiring cable MVPDs and DBS providers to specify the "all-in" price clearly and prominently for video programming service in their promotional materials and on subscribers' bills.[700] The new rules require providers to state the total cost of video programming service clearly and prominently, including broadcast retransmission consent fees, regional sports programming fees, and other programming-related fees, as a prominent single line item on subscribers' bills and in promotional materials.[701] If "part or all of the aggregate price is limited in time, then the provider must state the post-promotion rate, as calculated at that time, and the duration of each rate that will be charged."[702] These proceedings are discussed more fully in section VI of this *Report.*

d. Video Revenue

215. Video revenue for traditional MVPD service has declined from $83.2 billion in 2022 to $74.1 billion in 2023.[703] Video revenues for some of the largest MVPDs are shown in Figure II.E.4. Although the bulk of MVPD video revenue comes from subscriptions, MVPDs also earn revenue by selling advertising. S&P Global reports that cable MVPDs earned net local advertising revenue of $4.4 billion in 2022 and $4.0 billion in 2023.[704] S&P Global reports that video revenue declines were modest

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[694] *See id.*

[695] *See id.*

[696] *See id.*

[697] DIRECTV, *DIRECTV Packages Via Satellite or Internet*, https://www.directv.com/packages/ (last visited Dec 5, 2024); DISH, *Satellite TV Packages—Compare Packages & Prices*, https://www.dish.com/programming/packages (last visited Dec. 5, 2024); Cox Communications, *Top Cox Packages—Cox Cable Bundles—TV & Internet Deals,* https://www.cox.com/residential/special-offers/bundles.html (last visited Dec. 5, 2024); *Charter*, *Spectrum TV—Digital Cable Service Provider*, https://www.spectrum.com/ (last visited Dec. 5, 2024).

[698] *Promoting Competition in the American Economy: Cable Operator and DBS Provider Billing Practices*, MB Docket No. 23-405, Notice of Proposed Rulemaking, 38 FCC Rcd 12219, 12219, para. 1 (2023).

[699] *Id.* at 12219-20, para. 1.

[700] *All-In Pricing for Cable and Satellite Television Service*, MB Docket No. 23-203, Report and Order, FCC 24-29, at 9-10, paras. 12-13 (Mar. 19, 2024) (*All-In Pricing Report and Order*).

[701] *See id*. at 9-10, paras. 12-13.; *see also* MHCRC Comments at 2 (supports requiring cable and DBS providers to disclose the all-in price on bills and advertising materials).

[702] *See All-In Pricing Report and Order* at 43, Appx. B.

[703] Seth Shafer and Wade Holden, S&P Global, *Media Trends, 2023* at 1 (Feb. 16, 2024) (last accessed May 28, 2024); S&P Global, *USA | Global Forecast Table* (last accessed June 5, 2024).

[704] *See Multichannel Benchmarks*.

as operators managed to charge remaining subscribers more to keep up with increasing programming expenses.[705]

Fig. II.E.4
MVPD Video Revenue (in billions)

	2022	2023	Percentage Change
Comcast[706]	$30.5	$28.8	-5.6%
Charter	$17.5	$16.4	-6.4%
DISH[707]	$12.5	$11.6	-7.5%
Altice	$3.3	$3.1	-6.4%
Verizon Fios	$3.2	$3.0	-8.8%

Source: Comcast Corporation, SEC Form 10-K, at 39 (filed Jan. 31, 2024); Charter Communications, Inc., SEC Form 10-K, at 37 (filed Feb. 2, 2024); EchoStar Corporation, SEC Form 10-K, at 61 (filed Feb. 29, 2024); Altice USA, Inc., SEC Form 10-K, at 52 (filed Feb. 15, 2024); Verizon Communications Inc., SEC Form 10-K, at 30 (filed Feb. 9, 2024).

e. Content Ownership

216. Some traditional MVPDs have ownership interests in cable, broadcast, and regional sports networks that allow them to vertically integrate their ownership of a distribution network with ownership of video programming. At the end of 2023, Comcast was the only large MVPD with substantial programming assets.[708] Common ownership of entities that *deliver* video programming to consumers and entities that *produce and supply* video programming for delivery may have implications for competition and programming diversity in the MVPD marketplace. Thus, Congress enacted various provisions related to vertical integration between cable operators and programming networks (e.g., program access, program carriage, channel occupancy limit provisions).[709] The Commission reviews some vertical mergers between MVPDs and owners of video content (or vertical aspects of mergers that

[705] John Fletcher, S&P Global, *Multichannel Trends: US Cable Revenue Trends: 2016-2023* at 4 (Dec. 20, 2023) (last accessed May 28, 2024).

[706] Comcast video revenue includes video operations in the UK and Italy. *See* Comcast Corporation, SEC Form 10-K, at 1 (filed Jan. 31, 2024).

[707] DISH video revenue includes Sling TV. *See* EchoStar Corporation, SEC Form 10-K, at 58 (filed Feb. 29, 2024).

[708] Comcast owns cable networks USA, Syfy, E!, MSNBC, Bravo, CNBC, Oxygen, Golf Channel, Universal Kids, Universo, and CNBC World; regional sports networks in Boston, Chicago, Philadelphia, Sacramento, and San Francisco; the NBC and Telemundo broadcast networks; international television networks under the Sky Sports brand; the Peacock streaming service; 11 owned NBC local broadcast stations, 30 owned Telemundo local broadcast stations; and film studios including the brands Universal Pictures, Illumination, DreamWorks Animation, Focus Features, and Working Title. *See* Comcast Corporation, SEC Form 10-K, at 7-10 (filed Jan. 31, 2024).

[709] 47 U.S.C. §§ 533, 536, 548. In 1992, many of the most popular cable programming networks were owned by cable operators. Congress was concerned that cable operators had the ability and incentive to thwart the competitive development of additional programming networks by refusing to carry unaffiliated networks or by insisting on an ownership stake in return for carriage. *See id*. § 536. Congress was also concerned that cable operators had the ability and incentive to thwart competition in the video distribution market by withholding their most popular programming networks from rival MVPDs. *See id*. § 548.

are otherwise primarily horizontal), and evaluates potential harms and benefits to ensure the merger serves the public interest.[710]

f. Commercial Availability of Equipment Used to Access MVPD Programming and Services

217. In addition to their monthly subscription fee, MVPDs sometimes have also charged subscribers an additional fee to lease a set-top box to access MVPD programming and services. The primary function of a set-top box is to deliver MVPD programming to a television. In 2017, the Commission committed to gather data, solicit comments, and analyze issues relevant to whether there is a need for further regulations to ensure the commercial availability of devices to access MVPD programming,[711] consistent with section 629 of the Telecommunications Act of 1996,[712] and in response to a 2017 report from the Government Accountability Office (GAO).[713]

218. Accordingly, the *2024 CMR Public Notice* sought data and comment to "help the Commission analyze how the ongoing evolution of the video programming marketplace affects competition in the related marketplace for set-top boxes and devices, including the extent to which consumer choice for devices to access MVPD content remains relevant."[714] In the years since the set-top box docket was opened, data and comments in that proceeding reflect a decline in MVPD subscriptions

[710] *See*, *e.g.*, *Applications of Charter Communications, Inc., Time Warner Cable Inc., and Advance/Newhouse Partnership For Consent to Assign or Transfer Control of Licenses and Authorizations*, MB Docket No. 15-149, Memorandum Opinion and Order, 31 FCC Rcd 6327 (2016); *Applications of AT&T Inc. and DIRECTV for Consent to Assign or Transfer Control of Licenses and Authorizations*, MB Docket No. 14-90, Memorandum Opinion and Order, 30 FCC Rcd 9131 (2015); *Applications of Comcast Corporation, General Electric Company and NBC Universal, Inc. For Consent to Assign Licenses and Transfer Control of Licensees*, MB Docket No. 10-56, Memorandum Opinion and Order, 26 FCC Rcd 4238 (2011); *Applications of General Motors Corporation, Hughes Electronics Corporation and The News Corporation LTD*, MB Docket No. 03-124, Memorandum Opinion and Order, 19 FCC Rcd 473 (2004); *Applications for Consent to the Transfer of Control of Licenses and Section 214 Authorizations by Time Warner Inc., and America Online, Inc., et al.*, CS Docket No. 00-30, Memorandum Opinion and Order, 16 FCC Rcd 6547 (2001).

[711] At the end of 2023, there were 54.1 million MVPD subscribers. *See supra* Fig. II.E.1.

[712] This provision requires the Commission to "adopt regulations to assure the commercial availability—to consumers of multichannel video programming and other services offered over multichannel video programming systems—of converter boxes, interactive communications equipment, and other equipment used by consumers to access multichannel video programming and other services offered over multichannel video programming systems, from manufacturers, retailers, and other vendors not affiliated with any multichannel video programming distributor." 47 U.S.C. § 549(a).

[713] In 2016, the Commission proposed regulations for navigation devices (i.e., set-top boxes) that consumers use to access MVPD video services. *Expanding Consumers' Video Navigation Choices; Commercial Availability of Navigation Devices*, MB Docket No. 16-42, CS Docket No. 97-80, Notice of Proposed Rulemaking and Memorandum Opinion and Order, 31 FCC Rcd 1544 (2016). In 2017, the GAO concluded that the Commission's proposed regulations did not sufficiently analyze "the extent to which Internet-based providers affect consumer choice for video programming and what that change means for the importance of consumer choice for devices in the context of the Act." U.S. Government Accountability Office, GAO-17-785, FCC Should Conduct Additional Analysis to Evaluate Need for Set-Top Box Regulation, at 22 (2017) (2017 GAO Report). Following the 2017 GAO Report, the Commission indicated that it would use future *Communications Marketplace Reports* to gather data, solicit comments, and perform analysis on issues relevant to whether there is a need for further regulations to ensure the commercial availability of devices to access MVPD programming. Letter from Michelle Carey, Chief, Media Bureau, FCC, to Mark Goldstein, Director, Physical Infrastructure Issues, Government Accountability Office (filed Sept. 21, 2017). The 2016 Notice of Proposed Rulemaking was terminated in 2020. *See Expanding Consumers' Video Navigation Choices; Commercial Availability of Navigation Devices*, MB Docket No. 16-42, CS Docket No. 97-80, Report and Order, 35 FCC Rcd 10209 (2020).

[714] *See 2024 CMR Public Notice* at 7, para. 15.

and the number of leased set-top-boxes, due to: a decline in customers overall, development of alternatives like apps to access MVPD programming, and increased availability of vMVPDs that provide programming similar to traditional MVPDs but do not require leased set-top boxes. Industry and consumer reports now share information on ways to access MVPD programming without set-top boxes, including through apps on smart TVs (Internet-connected, flexible-use TVs) and phones. These sources indicate that while set-top boxes provide convenience for subscribers, they are no longer the necessity they once were.[715] S&P Global notes that the "relevance of traditional multichannel set-top boxes is waning with the confluence of falling subscribers and rising alternative devices."[716]

219. For example, Charter and Comcast provide apps that allow MVPD subscribers to stream MVPD programming to both smartphones and streaming devices that connect to a television.[717] DISH and DIRECTV provide apps that allow MVPD subscribers to stream MVPD programming to smartphones and to certain streaming devices such as Apple TV, Android TV, and Amazon Fire TV that connect to a television.[718] Also, vMVPDs enable subscribers to view programming substantially like traditional MVPD programming on a television or smartphone without the need to lease any equipment.[719]

220. Comcast and Charter have begun to phase out set-top boxes in favor of streaming devices.[720] The shift is aimed at retaining television customers in response to "rapidly declining cable subscriptions and the fragmented media environment" in which television customers utilize several services to watch their favorite content.[721] Nevertheless, while set-top boxes are in decline, there are still many households that retain them. Even for companies that are phasing out set-top boxes, set-top boxes will not disappear completely in the near term due to existing boxes used by subscribers[722] On the whole, however, even as MVPD subscribers still lease set-top boxes, consumers now have additional options for viewing MVPD programming and other video content on a television or on other devices without a set-top box.

221. In comments in this proceeding, NCTA states that there is a robust marketplace for devices to access MVPD programming as well as other video content.[723] Arguing that the primary objective of Section 629 was to give consumers the option "to buy from retail stores a device that could take the place of the device they otherwise rented from their incumbent cable operator," [724] NCTA points

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[715] *See e.g.,* Nathaniel, Meyershon, CNN, *Cable Companies Are Replacing Ancient Cable Boxes with These Tiny New Gadgets* (Jan. 18, 2024), https://www.cnn.com/2024/01/18/tech/cable-box-xumo/index.html; Matthew Lynch, The Tech Edvocate, *Do Cable Subscribers Always Need a Cable Box?* (Sept. 7, 2023) https://www.thetechedvocate.org/do-cable-subscribers-always-need-a-cable-box/; Willie Howard, Tech You Like, *Does Each TV Need a Cable Box?* (Aug. 13, 2024) https://techyoulike.com/does-each-tv-need-a-cable-box/.

[716] Ian Olgeirson, S&P Global, *US Cable, Telco, DBS Set-Tops Lose Traction in 2021 Forecast* (July 14, 2021) (last accessed May 28, 2024).

[717] *See* Charter, *Spectrum TV App: Stream TV Live or On-Demand*, https://www.spectrum.com/cable-tv/spectrum-tv-app (last visited July 22, 2024); *see also* Comcast, *Xfinity Stream App on Xfinity TV Partner Devices FAQs*, https://www.xfinity.com/support/articles/xfinity-stream-app-faqs (last visited July 22, 2024).

[718] *See* DISH, *DISH Anywhere FAQs*, https://www.dishanywhere.com/faqs (last visited July 22, 2024); *see also* DIRECTV, *DIRECTV App—Watch Live TV on Your Mobile Phone or Tablet*, https://www.directv.com/satellite/technology/app/ (last visited July 22, 2024).

[719] *See infra* section II.E.3.a.

[720] Nathaniel Meyersohn, CNN, *Cable Companies are Replacing Ancient Cable Boxes with These Tiny New Gadgets* (Jan. 18, 2024), https://www.cnn.com/2024/01/18/tech/cable-box-xumo/index.html.

[721] *Id.*

[722] *Id.*

[723] NCTA Comments at 36-37.

out that consumers now have many more options to access video content.[725] Likewise, FSF briefly notes that consumers today purchase a range of devices for accessing MVPD and other video content that far exceeds what the lawmakers who passed Section 629 could have imagined.[726] NCTA cites 2022 data from a D&R International audit report that consumers used apps to access MVPD video services on more than 50.9 million smart TVs, tablets, streaming devices, smartphones, gaming consoles, and personal computers.[727] Citing the same report, NCTA notes that only 35% of U.S. televisions are connected to an MVPD set-top box in 2022, down from 58% in 2016.[728] NCTA provides further data showing that 88% of U.S. television households had at least one Internet-connected TV device (i.e., a smart TV, streaming device, or gaming console) in 2023, compared to 44% in 2013.[729] NCTA also notes that, with all of the television alternatives for accessing Internet-delivered video services, 57% of adults watch video regularly on devices other than televisions.[730] Given the overall marketplace for video programming and video devices, NCTA urges the Commission to find irrelevant any concerns that consumers are still forced to rent set-top boxes from MVPDs to access video content.[731] Similarly, in its comments to this proceeding, FSF advocates for the Commission to find that the sunset provision set forth in Section 629(e) of the 1996 Telecommunications Act has been satisfied and states that another attempt to create a retail marketplace for set-top boxes would waste agency resources.[732]

3. Online Video Distributors

222. OVDs are entities that distribute video programming to consumers over the Internet, rather than as a component of an MVPD subscription, and at least partially, if not completely, over distribution facilities that the OVD does not own.[733] Because OVDs use existing broadband infrastructure, they have a large universe of potential customers for whom they can compete. OVD content typically is available to U.S. consumers on a nationwide basis, although in some cases,

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[724] *Id.* at 36.

[725] *Id*.

[726] FSF Comments at 28.

[727] NCTA Comments at 37 (citing D&R International, 2022 Annual Report Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Set-Top Boxes at 18 (Aug. 2023), https://energy-efficiency.us/wp-content/uploads/2024/09/US-STB_2022_Report.pdf (D&R International Report)).

[728] *Id.* at 37 (citing D&R International Report at 18).

[729] *Id.* at 37 (citing Press Release, Leichtman Research Group, 49% of Adults Watch Video via a Connected TV Device Daily (June 2, 2023), https://s3.amazonaws.com/media.mediapost.com/uploads/LRG-Press-Release-06-02-2023.pdf); *see also* Tom Butts, TV Tech, *Despite Smart TV's Dominance, Most Connected TV Viewing is on Streaming Devices* (June 2, 2023), https://www.tvtechnology.com/news/despite-smart-tvs-dominance-most-connected-tv-viewing-is-on-streaming-devices.

[730] NCTA Comments at 37 (citing Leichtman Research Group, *83% of U.S. Households Have an SVOD Service* (Aug. 9, 2023), https://web.archive.org/web/20240517095003/https://leichtmanresearch.com/83-of-u-s-households-have-an-svod-service/); *see also* Erik Gruenwedel, Media Play News, *Leichtman: 2023 U.S. Household SVOD Subscription Growth Flat* (Aug. 14, 2023), https://www.mediaplaynews.com/leichtman-2023-us-household-svod-subscription-growth-flat/.

[731] NCTA Comments at 38.

[732] FSF Comments at 28. Section 629(e) of the Telecommunications Act of 1996 provides that the rules adopted under section 629 shall cease to apply when the Commission determines that (1) the market for MVPDs is fully competitive; (2) the market for converter boxes, and interactive communications equipment, used in conjunction with MVPD service is fully competitive; and (3) elimination of the rules would promote competition and the public interest. 47 U.S.C. § 549.

[733] Although online video includes both professional and amateur content, our focus is on content similar to the programming offered by cable and broadcast networks.

geographic availability of OVD content can be limited (e.g., OVDs that offer cable and broadcast channels).[734]

a. OVD Service Offerings

223. OVDs employ a variety of business models and strategies. We discuss four types of service provided by OVDs: Advertising-based Video On Demand (AVOD); Subscription Video On Demand (SVOD); Transactional Video On Demand (TVOD); and vMVPD service.[735]

224. *Advertising-based Video On Demand (AVOD).* AVOD providers allow consumers to access video programming online free of charge and generate revenue from advertisements included with their content.[736] Some AVOD services are owned by large media or technology companies. For example, Google's YouTube offers a wide variety of content, including user-created videos, professionally produced video content, music videos, and clips from TV shows and movies.[737] TikTok allows users to share and watch short videos.[738] Instagram Reels and YouTube shorts are similar services.[739] Several AVOD providers offer movies and TV shows, including NBCUniversal's Fandango at Home,[740] Amazon's Prime Video,[741] Fox's Tubi,[742] and Crackle.[743] Paramount Global's ad-supported Pluto TV

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[734] For example, geographic availability may depend on contractual arrangements with cable networks, broadcast stations, and other content owners. *See 2022 Communications Marketplace Report*, 37 FCC Rcd at 15662, para. 236. Availability may also require building, or contracting with, content distribution networks to enhance the speed and quality of video content delivered to consumers. *Id.*

[735] The term "vMVPD" refers to a provider that delivers subscription packages of streaming linear video channels via the Internet. Some providers offer both streaming and vMVPD services, while some also stream some live events. Nonetheless, the categories AVOD, SVOD, and vMVPD remain in common use and are economically significant. EchoStar Comments at 18 ("these distinctions have become increasingly blurred and less meaningful in recent years"). The information in this section is current as of June 2024. We note that OVD offerings and prices continue to change.

[736] *See* Seth Shafer and Kirt Raynes, S&P Global, *Economics of Internet: US Free, Ad-Supported TV Sector Update, Year-End 2023* (Mar. 28, 2024) (last accessed May 28, 2024) (*Free, Ad-Supported TV*); Imagen, *What are SVOD, TVOD, AVOD?*, https://imagen.io/resources/what-are-svod-tvod-avod/ (last visited May 9, 2024) (*What are SVOD, TVOD, AVOD?*); Uscreen, *SVOD, AVOD, TVOD + SVOD Pricing Calculator for Creators,* https://www.uscreen.tv/video-business-school/svod-tvod-avod-monetization-models/ (last visited May 9, 2024) (*Uscreen SVOD, AVOD, TVOD*).

[737] YouTube, *YouTube*, https://www.youtube.com/ (last visited May 9, 2024); *see also Free, Ad-Supported TV*. YouTube's AVOD service is separate from its vMVPD service, YouTube TV.

[738] *See* TikTok, *TikTok*, https://tiktok.com (last visited June 12, 2024); *see also* Zheping Huang, Bloomberg, *TikTok Turns On the Money Machine* (June 23, 2022), https://www.bloomberg.com/news/features/2022-06-23/tiktok-becomes-cash-machine-with-revenue-tripling-to-12-billion.

[739] *See* Instagram, *Instagram Reels*, https://about.instagram.com/features/reels (last visited June 10, 2024); *see also* Chris Jaffe, YouTube Official Blog, *Building YouTube Shorts, A New Way to Watch & Create on YouTube* (Sept. 14, 2020), https://blog.youtube/news-and-events/building-youtube-shorts/.

[740] *See* Fandango at Home, *Watch for Free*, https://www.vudu.com (last visited May 9, 2024). Fandango at Home, formerly called Vudu, is part of NBCUniversal's Fandango Media subsidiary. Warner Brothers Entertainment holds a minority stake in Fandango Media. *See* Fandango, *Corporate Ownership,* https://www.fandango.com/info/corporate-ownership (last visited May 9, 2024). NBCUniversal is itself owned by Comcast. *See* Comcast Corporation, SEC Form 10-K, at 1 (filed Jan. 31, 2024).

[741] Amazon, *Prime Video*, https://www.amazon.com/gp/video/storefront/?contentType=subscription&contentId=freewithads&benefitId=freewithads (last visited May 9, 2024).

[742] Tubi TV, *tubi*, https://tubitv.com/home (last visited May 10, 2024).

service provides multi-device access to about 200 linear channels of content, including movies, TV shows, news, and sports, as well as on-demand movies.[744] In addition, broadcast networks have branded AVOD services, including NBC News Now, CBS News Streaming Network, and CBS Sports HQ, which feature live news programming and sports video clips.[745] NBCUniversal's Peacock service, which provides access to live and on-demand programming, including some original content, stopped offering its free tier to new customers in 2023, but still offers a lower-cost subscription that includes advertisements.[746] Roku, which provides digital media hardware that also allows access to third party services, has been expanding its ad-supported service, The Roku Channel.[747] Beginning in November 2022, Netflix began offering programming on an advertisement-supported basis by partnering with Microsoft to launch an advertisement-supported VOD service.[748] Within six months Netflix had acquired about 5 million subscribers to its lower-priced, ad-supported, tier.[749] As of May 2024, globally Netflix had 40 million subscribers to its ad-supported tier.[750]

225. *Subscription Video On Demand (SVOD).* SVOD providers charge customers a recurring subscription fee for on-demand access to the provider's library of video content.[751] While it is not possible to list all SVOD providers in this report, large SVOD services include Netflix and Amazon Prime Video. Both of these services provide access to large libraries of video content such as TV shows, movies, documentaries, and original content.[752] Netflix's ad-free plans cost from $15.49 (Standard plan) and $22.99 (Premium plan) per month.[753] Consumers can subscribe to Amazon Prime Video as a standalone service for $8.99 per month or as part of an Amazon Prime membership, which costs $14.99

(Continued from previous page)

[743] Crackle, *Crackle*, https://www.crackle.com/ (last visited May 10, 2024).

[744] *See* Pluto TV, *Drop In. Watch Free.*, https://pluto.tv/welcome (last visited May 10, 2024); Editorial Teams, Pluto TV, *Pluto TV Channels List | Complete*! (Aug. 28, 2024), https://plutotvreview.com/pluto-tv-channels-list-complete/.

[745] *See e.g.*, NBC, *NBC News Now*, https://www.nbcnews.com/now (last visited May 10, 2024); CBS, *CBS News Streaming Network*, https://www.cbsnews.com/live/ (last visited May 10, 2024); CBS, *CBS Sports HQ*, https://www.cbssports.com/cbs-sports-hq/ (last visited May 10, 2024).

[746] Peacock, *Pick a Plan. Cancel Anytime,* https://www.peacocktv.com/plans/all-monthly (last visited Sept. 11, 2024). *See* Jess Weatherbed, The Verge, *Peacock Drops Free Membership Tier for New Customers* (Feb. 1, 2023), https://www.theverge.com/2023/2/1/23581014/peacock-free-membership-new-customers-nbcuniversal-comcast; Blair Marnell, Digital Trends, *What is Peacock?* (Feb. 3, 2021), https://www.digitaltrends.com/movies/what-is-peacock/.

[747] The Roku Channel, *The Roku Channel*, https://therokuchannel.roku.com/ (last visited May 10, 2024).

[748] Ahna Flood et al., Microsoft Advertising, *How Microsoft is Innovating in Video Advertising* (Dec. 14, 2023), https://about.ads.microsoft.com/en/blog/post/december-2023/how-microsoft-is-innovating-in-video-advertising.

[749] *See* Jess Weatherbed, The Verge, *Almost 5 Million People are Using Netflix's Ad Tier* (May 18, 2023), https://www.theverge.com/2023/5/18/23728253/netflix-ad-supported-tier-5-million-users-growth.

[750] *See* Sarah Whitten et al., CNBC, *Netflix Ad-Supported Tier Has 40 Million Monthly Users, Nearly Double Previous Count* (May 15, 2024), https://www.cnbc.com/2024/05/15/netflix-ad-tier-has-40-million-users.html.

[751] *See What are SVOD, TVOD, AVOD*?; *Uscreen SVOD, AVOD, TVOD*.

[752] Netflix's U.S. streaming catalog in January 2023, consisted of 3,700 movies and 3,600 TV shows. Amazon Prime Video's U.S. streaming catalog, in contrast, was 5,200 movies and 2,300 TV shows. *See* Statista, *Content Available on Major Subscription Video Streaming Platforms in the United States as of January 2023, By Service*, https://www.statista.com/statistics/1110424/svod-content-catalog-size-by-type-us/#:~:text=In%20the%20United%20States%2C%20Amazon,movies%20and%20783%20TV%20shows (last accessed May 13, 2024).

[753] Plans offer lower prices for extra member slots, as well as a lower-price ad-supported plan. *See* Netflix, *Plans and Pricing*, https://help.netflix.com/en/node/24926 (last visited May 10, 2024).

per month or $139 per year.[754] Amazon Prime Video also provides its members with access to some live events, including Thursday night NFL games.[755]

226. Disney controls three SVOD services: Hulu, ESPN+, and Disney+. Like Netflix and Amazon Prime Video, Hulu provides access to a library of movies, TV shows, and other video content, including original programming.[756] A Hulu subscription costs $7.99 per month with ads or $17.99 per month without ads.[757] ESPN+ provides access to live sporting events and sports-related programing for $10.99 per month or $109.99 per year.[758] Disney+, which launched in November 2019, offers original programming, TV shows and movies from Disney, and programming that Disney acquired from 20th Century Fox. Disney+ costs $7.99 per month (with ads) or $13.99 (without ads).[759]

227. Other major media companies operate SVOD services as well. NBCUniversal's Peacock also offers movies and TV shows from NBCUniversal studios as well as additional third-party video. Peacock currently has two main subscription options: a library of video entertainment for $5.99 per month with ads or the same library for $11.99 per month without ads.[760] Paramount Global's Paramount+ provides access to a library of CBS shows and original content. It also includes live channels such as local CBS stations, CBS News Streaming Network, and NFL on CBS. Subscribers pay $5.99 per month for the ad-supported Paramount+ service and $11.99 monthly for an ad-free plan that includes SHOWTIME and additional live sports such as the PGA Tour.[761] Warner Bros. Discovery's Max, formerly known as HBO Max, offers original content from HBO and other Warner Bros. Discovery libraries, including series, documentaries, specials, and movies. It includes shows such as *Friend*s and

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[754] Amazon, *The Amazon Prime Membership Fee*, https://us.amazon.com/gp/help/customer/display.html?nodeId=G34EUPKVMYFW8N2U (last visited May 13, 2024). Amazon Prime members also receive other benefits such as free shipping on eligible items. *See* Amazon, *Amazon Prime Benefits*, https://www.amazon.com/gp/help/customer/display.html?ref_=hp_left_v4_sib&nodeId=GD4TCHHFTXXX328Y (last visited May 13, 2024).

[755] *See* Amazon, *Prime Video*, https://www.amazon.com/gp/video/offers/ (last visited May 13, 2024); Amazon, *Live Events Help: Frequently Asked Questions*, https://www.amazon.com/b?ie=UTF8&node=19343854011 (last visited May 13, 2024).

[756] In May 2019, Comcast ceded full operational control of Hulu to Disney, with Disney originally committing to purchase Comcast's minority stake in Hulu in 2024. *See* Alex Sherman, CNBC, *Hulu is Facing an Existential Crisis as Disney Approaches a 2024 Deadline to Buy Comcast's 33% Stake* (July 6, 2022), https://www.cnbc.com/2022/07/06/hulu-faces-existential-crisis-as-disney-decides-how-to-move-forward.html. Disney, however, sped up the acquisition and acquired Comcast's minority stake in Hulu in November 2023. *See* Todd Spangler, Variety, *Disney Expects to Pay Comcast at Least $8.6 Billion to Buy Out Hulu Stake, Final Price Tag Could Be Higher* (Nov. 1, 2023), https://variety.com/2023/digital/news/disney-buys-hulu-stake-comcast-1235776557/.

[757] Hulu, *Choose Your Plan*, https://signup.hulu.com/plans (last visited May 13, 2024).

[758] ESPN+, *Stream Live Sports plus ESPN+ Originals*, https://plus.espn.com/ (last visited May 13, 2024); ESPN+, *Frequently Asked Questions, How Much Does ESPN+ Cost?*, https://plus.espn.com/#faqs (last visited May 13, 2024).

[759] *See* Disney+, *Endless Entertainment for All*, https://www.disneyplus.com/ (last visited Sept. 11, 2024); Joan E. Solsman and Mike Sorrentino, CNET, *Disney Plus: Price Hikes, the New Ad Tier and Everything Else to Know* (Dec. 10, 2022), https://www.cnet.com/tech/services-and-software/disney-plus-hike-prices-the-ad-tier-and-everything-else-to-know/.

[760] *See* Peacock, *Choose a Plan*, https://www.peacocktv.com/plans/all-monthly (last visited May 13, 2024).

[761] Paramount+, *Pick Your Plan*, https://www.paramountplus.com/account/signup/pickplan/ (last visited Sept. 11, 2024). CBS All Access became Paramount+ on March 4, 2021. Paramount+ fully integrated SHOWTIME into its premium plan early in 2024.

The Big Bang Theory, and also movies from Studio Ghibli.[762] Max costs $9.99 (with ads) or $15.99 per month (without ads). It also offers a 4K Ultra HD streaming plan for $19.99 per month.[763]

228. In addition, certain technology companies operate SVOD services. Apple offers Apple TV+, which costs $9.99 per month.[764] Apple bundles three months of free subscription to Apple TV+ with the purchase of a variety of Apple devices.[765] Google's YouTube Premium provides ad-free access to YouTube, YouTube Music (YouTube's music streaming service), and some original content for $13.99 per month.[766] Certain SVOD services focus on niche content. For example, BritBox provides access to British television shows from ITV and the BBC for $8.99 per month or $89.99 per year.[767] In addition, SVOD services from sports leagues and organizations such as the NBA and MLB provide online access to live and archived events and programs.[768] Some sports teams such as the NBA's Utah Jazz offer a team-specific streaming service.[769]

229. *Transactional Video On Demand (TVOD)*. Unlike subscription models that offer access to a catalog of programs for a set monthly price, TVOD providers allow consumers to purchase specific video content (movies, TV shows, or live events) on a transactional or per-program basis.[770] Electronic-sell-through transactions provide consumers with permanent access to video content, while download-to-rent transactions give consumers access to video content for a limited period of time.[771] Examples include Amazon's Video Store,[772] Apple's TV app,[773] and Google Play.[774]

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[762] Max, *Max*, https://www.max.com/ (last visited June 12, 2024).

[763] *Id.*

[764] Apple, *Apple TV+*, https://www.apple.com/apple-tv-plus/ (last visited May 13, 2024).

[765] *Id.*

[766] YouTube, *YouTube Premium*, https://www.youtube.com/premium (last visited May 13, 2024); YouTube, *Watch YouTube Originals*, https://www.youtube.com/@youtubeoriginals (last visited May 13, 2024); YouTube, *Using YouTube Premium Benefits*, https://support.google.com/youtube/answer/6308116 (last visited May 13, 2024). YouTube Premium subscribers can also download videos to watch offline and play videos on a mobile device while using other apps or when the screen is off. *See* YouTube, *Using YouTube Premium Benefits*, https://support.google.com/youtube/answer/6308116 (last visited May 13, 2024).

[767] BritBox, *Welcome to BritBox*, https://www.britbox.com/us/ (last visited May 13, 2024).

[768] *See*, *e.g.*, NBA, *Watch the NBA On Demand*, https://www.nba.com/watch/pricing (last visited May 13, 2024); MLB.TV, *The Home of Streaming Baseball,* https://www.mlb.com/live-stream-games/ (last visited May 13, 2024). NHL streaming video is available from a variety of video providers. NHL, *How to Watch & Steam NHL Games*, https://www.nhl.com/info/how-to-watch-and-stream-nhl-games (last visited May 13, 2024). WWE streaming video is now available from Peacock. Peacock, *WWE*, https://www.peacocktv.com/sports/wwe (last visited May 13, 2024).

[769] *See, e.g.*, NBA, *Jazz+*, https://www.nba.com/jazz/jazzplus (last visited June 11, 2024). On this development more generally, FSF Comments at 24.

[770] *See What are SVOD, TVOD, AVOD?*; *Uscreen, SVOD, AVOD, TVOD*.

[771] *See What are SVOD, TVOD, AVOD?*.

[772] Amazon, *Prime Video: Store*, https://www.amazon.com/b/?_encoding=UTF8&filterId=OFFER_FILTER%3DTVOD&node=2858778011&ref=insider_ar_video_pvqa (last visited May 13, 2024).

[773] Apple, *Buy Movies and TV Shows from the Apple TV App*, https://support.apple.com/en-us/HT203375 (last visited May 13, 2024).

[774] Google Play Help, *Watch Google Play Movies & TV Shows*, https://support.google.com/googleplay/answer/2851683?co=GENIE.Platform%3DiOS&hl=en (last visited May 13, 2024).

230. *Virtual Multichannel Video Programming Distributor (vMVPD).* Like traditional MVPDs, vMVPDs offer consumers access to a package of streaming linear channels. While MVPDs make use of cable, fiber, or satellite infrastructure to deliver their pay television products, vMVPDs, like other OVDs, deliver programming to consumers via the Internet.[775] In 2015, these services launched in select metropolitan markets with comparatively limited access to local broadcast stations, sports, and news.[776] Today, however, vMVPDs often include local broadcast channels and a wide variety of cable networks. vMVPDs tend to market themselves to consumers who wish to "cut the cord" and no longer subscribe to a traditional MVPD.[777] In general, vMVPDs are available to consumers on a wide variety of devices.[778]

231. vMVPD prices vary according to many factors, including the number and types of channels offered, and the availability of local broadcast stations. Some vMVPDs provide fewer channels for a lower cost. For example, Philo subscribers pay $25 per month for VOD content and many live (linear, time-programmed) TV channels, but the service does not include sports or broadcast channels.[779] DISH's Sling TV offers three channel packages. Two differentiated channel sets are $40 per month each.[780] In addition, a variety of add-on channel packages are available with prices ranging from $6 to $11 per month.[781] These packages include some non-local news and sports content, as well as local broadcast channels.[782]

232. More expansive vMVPD offerings include Hulu + Live TV. This service combines access to Hulu's SVOD library with live and on-demand TV channels for $76.99 per month.[783] It includes news and sports programming and local broadcast stations. In addition, regional sports networks are available in select markets. For $72.99 per month, YouTube TV offers access to more than 100 channels, including sports and news programming. YouTube TV also offers a Spanish-language package for $34.99 per month.[784] DIRECTV offers DIRECTV Stream channel packages ranging in price from $69.99 per month to $149.99 per month.[785] This service includes local channels and regional sports

[775] For example, YouTube TV, Hulu Live TV, Fubo TV, and DIRECTV Stream.

[776] *See* Seth Shafer, S&P Global, *Economics of Internet: State of US Online Video: Virtual Multichannel* (Oct. 22, 2019) (last accessed May 28, 2024). Sony's PlayStation Vue launched in March 2015 and was one of the first vMVPDs, but the service ceased operations in January 2020. Sarah Perez, TechCrunch, *Why Sony's PlayStation Vue Failed* (Jan. 30, 2020), https://techcrunch.com/2020/01/30/why-sonys-playstation-vue-failed/.

[777] *See*, *e.g.*, Brad Adgate, Forbes, *Virtual MVPD Subscriber Growth Is Slowing* (Dec. 9, 2019), https://www.forbes.com/sites/bradadgate/2019/12/09/virtual-mvpd-subscriber-growth-is-slowing/#6f65a8bb7016 ("virtual MVPDs . . . have been marketed as replacement cable/satellite systems"); Sling TV, *The Best Cable TV Alternative—Stop Paying Too Much for TV*, https://www.sling.com/value/cable-tv-alternatives (last visited Sept. 11, 2024) ("Between the low monthly cost, versatile lineup options and wide variety of supported streaming devices, it's no wonder that Sling is often called the best alternative to cable").

[778] *See* Kym Nator, S&P Global, *Economics of Internet: State of US Online Video: Virtual Multichannel 2021* (Nov. 24, 2021) (last accessed May 28, 2024) (*Virtual Multichannel 2021*).

[779] *See* Philo, *Live and On Demand TV*, https://try.philo.com/ (last visited May 13, 2024). Users can add premium channels from Epix and STARZ at additional cost. *Id.*

[780] Sling TV, *Personalize Your Channel Lineup*, https://www.sling.com/service (last visited May 13, 2024).

[781] *Id.*

[782] Sling TV, *New to Sling? Let's Talk About Local Channels*, https://www.sling.com/programming/local-channels (last visited May 13, 2024).

[783] Hulu, *Watch Thousands of TV Shows and Movies on Hulu*, http://hulu.com/content (last visited May 13, 2024). Subscribers also receive unlimited cloud DVR storage for a storage period of up to nine months. *Id.*

[784] YouTube, *YouTube TV*, https://tv.youtube.com/welcome/ (last visited May 13, 2024). YouTube TV subscribers can record programming with unlimited storage space. *Id*.

networks.[786] FuboTV offers four plans: Pro (183 channels for $79.99 per month), Elite (251 channels for $79.99 per month), Premier (260 channels, Paramount+ with SHOWTIME and 4K resolution for $99.99 per month), and Latino (63 channels for $32.99 per month).[787] FuboTV also offers local ABC, CBS, Fox, and NBC stations in many markets.[788] Many vMVPD offerings now look similar to traditional MVPD offerings, but vMVPDs typically pay more per subscriber to acquire programming than do traditional MVPDs.[789]

233. *Bundles and Combinations*. Some OVDs are offered in bundles or in combination with other services.[790] For example, consumers can bundle all three Disney OVD products—Hulu, ESPN+, and Disney+—for $14.99 per month (with ads) or $24.99 (no ads on Hulu and Disney+).[791] DIRECTV Premier Stream subscribers get a bundle including Paramount+ with SHOWTIME, STARZ, and Cinemax.[792] Amazon Prime members also can add on-demand or live programming from providers like SHOWTIME, STARZ, Paramount+, PBS, Major League Baseball, and many other channels for an additional $4.99 to $14.99 per month.[793] Amazon's Twitch, a platform for live video streaming, includes a "Watch Parties" feature that allows streamers with subscriptions to Prime Video to watch movies together as part of a social online experience.[794]

b. Original Content and Content Ownership

234. While estimates vary, OVD spending on original content has generally increased over the past five years. Figure II.E.5 shows original content spending for select OVDs. Among OVDs, Netflix is the leader by a wide margin in original content spending. As of March 2022, Netflix's catalog of video programming was 51% original or exclusive content, compared to original-exclusive shares of 9% and 4% for Amazon Prime Video and Hulu, respectively.[795]

(Continued from previous page)

[785] DIRECTV, *The Supreme TV Experience*, https://www.directv.com/stream/ (last visited May 13, 2024).

[786] DIRECTV, *DIRECTV Stream Channel Lineup*, https://www.directv.com/stream/channel-lineup/ (last visited May 13, 2024).

[787] FuboTV, *Live Sports and TV Without Cable*, https://www.fubo.tv/welcome (last visited May 13, 2024). Plans also provide 1000 hours of Cloud DVR and the ability to watch on multiple screens simultaneously. *Id*.

[788] FuboTV, *What Local ABC, CBS, FOX, NBC, and CW Stations Does fuboTV Carry?*, https://support.fubo.tv/hc/en-us/articles/115005151127-What-local-ABC-CBS-FOX-NBC-and-CW-stations-does-fuboTV-carry- (last visited May 13, 2024).

[789] *See Virtual Multichannel 2021*.

[790] EchoStar Comments at 17.

[791] Disney+, *Hulu Disney+ ESPN+*, https://www.disneyplus.com/ (last visited May 13, 2024). This bundle does not include Hulu + Live TV. *Id*.

[792] DIRECTV, *The Supreme TV Experience*, https://www.directv.com/stream/ (last visited May 13, 2024).

[793] Amazon, *Prime Membership Benefits*, https://www.amazon.com/b/node=23945845011 (last visited May 14, 2024); *see also* David Katzmaier, CNET, *Amazon Prime Video Channels: All the TV Channels You Can Add to Your Prime Account* (Sept. 17, 2021), https://www.cnet.com/tech/services-and-software/amazon-prime-video-channels-all-the-tv-channels-you-can-add-to-your-prime-account/.

[794] *See* Joseph Yaden, DigitalTrends, *What Is Twitch* (Oct. 25, 2020), https://www.digitaltrends.com/gaming/what-is-twitch/; Twitch, *Watch Parties*, https://blog.twitch.tv/en/2020/09/02/watch-parties-are-now-available-to-creators-around-the-world/ (last visited May 14, 2024).

[795] Joe Hall, Ampere|Analysis, *Netflix Originals and Exclusives Now the Majority of its US Catalogue* (May 31, 2022), https://www.ampereanalysis.com/insight/netflix-originals-and-exclusives-now-the-majority-of-its-us-catalogue.

Fig. II.E.5
Original Content Spending, Select OVD Providers (in $ millions)

Provider	2022	2023	Percentage Change	2024	Percentage Change
Netflix	$6,045	$6,902	14.2%	$7,682	11.3%
Amazon Prime Video	$1,372	$1,670	21.7%	$2,183	30.7%
Disney+	$2,256	$3,863	71.2%	$5,334	38.1%
Apple TV+	$1,157	$1,365	18.0%	$1,672	22.5%
Max	$889	$996	12.1%	$1,160	16.4%
Paramount+	$818	$1,447	76.9%	$2,156	49.0%
Hulu	$688	$762	10.7%	$804	5.6%
Peacock	$525	$837	59.5%	$1,091	30.3%

Source: Deana Myers, S&P Global, *Streamer Success May Come With Huge Content Expense* (Apr. 28, 2022) (last accessed May 28, 2024) (excluding Paramount+ and Peacock). Note: Data compiled mid-2023, except for Paramount+ and Peacock, which are estimates and projections as of April 2022.

235. Spending by Amazon and Netflix on original content as a percentage of overall content spending has been increasing. Figure II.E.6 shows that Amazon's spending on original content has increased from approximately 14% of its overall content spending in 2016 to a projected 25% in 2024. Similarly, Netflix spent approximately 17% on original content in 2016, but was budgeted to spend 46% on original content in 2024.

236. The number of new releases on streaming services has recently decreased. Most large streaming services released fewer original TV seasons in the first quarter of 2023 than in the first quarter of 2022.[796] The overall size of the streaming catalog for STARZ, Discovery, and HBO Max (now known as Max) actually decreased from late 2022 to early 2023.[797] The seven largest streaming services released 367 new TV seasons in the first half of 2024, down from 452 new releases in the first half of 2023.[798] As Figure II.E.5 indicates, while content spending continues to increase, the growth in content spending was lower in 2024 than in 2023 for many OVD providers. Overall, the largest streamers appear to be seeking to become profitable rather than incurring losses in pursuit of more subscribers.[799]

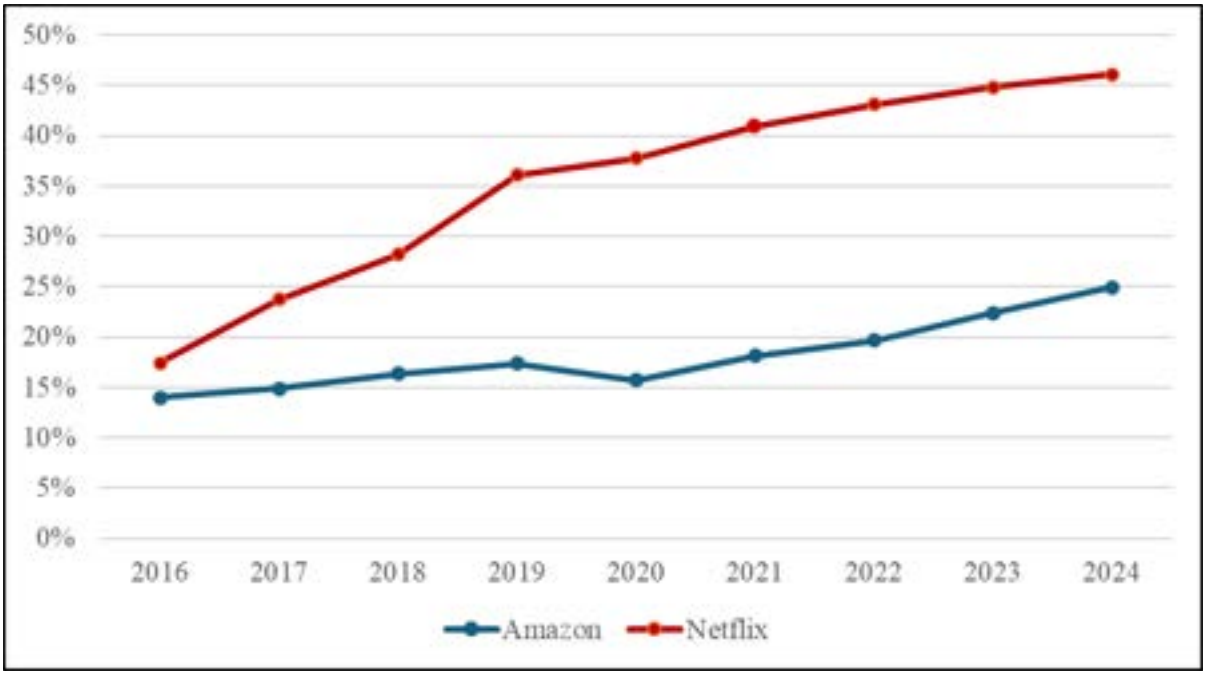
[796] Tyler Aquilina, Variety, *How Austerity Is Shaping the New Streaming Content Strategy* (May 30, 2023), https://variety.com/vip/streaming-content-strategy-austerity-1235619458/; *see also* MPA Comments at 3 ("industry labor strikes contributed to a decrease in production of filmed entertainment in 2023").

[797] Tyler Aquilina, Variety, *How Austerity Is Shaping the New Streaming Content Strategy* (May 30, 2023), https://variety.com/vip/streaming-content-strategy-austerity-1235619458/.

[798] David Satin, The Streamable, *Output of Streaming Originals Dips Nearly 20% in 2024 as the Market Settles into a New Normal* (June 24, 2024), https://thestreamable.com/news/output-of-streaming-originals-dips-nearly-20-percent-in-2024-as-the-market-settles-into-a-new-normal.

[799] *Id.*

Fig. II.E.6
Share of Content Spending on Original Content: Amazon and Netflix



Source: S&P Global, *Amazon Prime Video Estimated Streaming Programming Costs, 2014–2027* (Sept. 2023) (last accessed May 28, 2024); S&P Global, *Netflix Content Spending Projections Through 2027* (June 2023) (last accessed May 28, 2024).

237. Recently OVDs have invested significantly in live sports coverage. Such coverage includes Amazon Prime's Thursday Night Football (NFL), YouTube TV's NFL Sunday Ticket, and Apple TV+ offerings of Major League Baseball and Major League Soccer.[800] OVDs have also purchased exclusive rights to stream particular events, such as particular football games and boxing bouts.[801]

c. OVD Usage, Subscribers, and Revenue

238. OVDs are now well-established video services that large corporations provide to a large number of customers. Amazon, Apple, and Google are companies with high market capitalization relative to broadcasters and traditional MVPDs.[802] Over a typical 30-day period, about 80% of U.S. adults watch streaming video.[803] In March 2024, OVDs accounted for 38.5% of total U.S. TV viewing.[804] Netflix and Amazon Prime Video each have about 70 million active users in the United States.[805] OVD

[800] DIRECTV Comments at 8-9; NAB Comments at 8-10; NCTA Comments at 32-33.

[801] DIRECTV Comments at 8-9.

[802] NAB Comments at 21.

[803] DirectTV Comments at 4 ("99% of U.S. households now subscribe to at least one or more streaming services") (citing Adtaxi's 2024 Streaming TV Survey); INCOMPAS Comments at 37 (citing Forbes Home survey).

[804] Daniel Frankel, NextTV, *YouTube Now Controls 9.7% of U.S. Television Usage, Nielsen Says* (Apr. 17, 2024), https://www.nexttv.com/news/youtube-now-controls-97-of-us-television-usage-nielsen-says (reporting results from Nielsen, The Gauge); *see also* NAB Comments at 7-8.

[805] S&P Global, *US Subscribers for Select US Video Subscription Services, Q1 2015 to Q3 2023* (Nov. 29, 2023) (last accessed May 28, 2024) (reporting Netflix subscribers); Bevin Fletcher, StreamTV Insider, *Amazon's Prime Video Aims to Be One-Stop Video Entertainment Hub* (Mar. 6, 2024), https://www.streamtvinsider.com/video/amazons-prime-video-aims-be-one-stop-video-entertainment-hub (reporting (continued….)

revenue, not counting revenue generated from video on social media such as Facebook and Instagram, amounts to 42% of total video service revenue in the United States in 2024.[806] OVD revenue is projected to exceed traditional MVPD revenue in 2025.[807]

239. Customers can access OVDs on a wide variety of Internet-connected devices. As of December 2023, the most-used device for accessing digital video was smartphones, used by 69% of consumers, and smart TVs (Internet-connected, flexible-use TVs), used by 62% of consumers.[808] U.S. household ownership of smart TVs has risen from 66% in 2020 to 79% in 2024.[809] Because they are associated with longer viewing sessions, big screen devices account for 77% of streaming video viewing.[810] From the first quarter of 2021 to the first quarter of 2022, viewing of OVD services on smart TVs grew 34%, while desktop computer and gaming console video viewing declined 15%.[811] Other devices, however, remain significant for video viewing. In the United States, in 2023, 57% of adults watched video on non-TV devices, and 81% of persons ages 18 to 34 did so daily.[812]

240. *Advertising-based Video On Demand (AVOD)*. Figure II.E.7 shows widespread usage of AVOD services among U.S. consumers. In 2021, about 80% of U.S. households were consuming AVOD, excluding video served on social-media sites.[813] Among individual websites and services, YouTube dominates AVOD. A variety of other companies, however, are moving into this service with niche offerings.

241. Video-sharing is now ubiquitous on social media. Video contributes to time spent on the social-media sites, generates data on user interests, and thus indirectly supports advertising around video (out of stream advertising).[814] TikTok, a video-focused social media site, has decreased in popularity

(Continued from previous page)
Amazon Prime Video active users). MoffettNathanson forecasts that YouTube TV will have 12.4 million subscribers by the end of 2026. Brad Adgate, Forbes, *YouTube TV Is Forecasted To Be The Largest Pay-TV Distributor In 2026* (Apr. 7, 2024), https://www.forbes.com/sites/bradadgate/2024/04/07/youtube-tv-is-forecast-to-be-the-largest-pay-tv-distributor-in-2026/.

[806] S&P Global, *US Streaming Video Outlook, 2024* (Jan. 2024) (last accessed May 28, 2024) (calculated from sector revenue table).

[807] DIRECTV Comments at 5.

[808] *See* Statista, *Most Used Devices for Digital Videos in the U.S. as of December 2023*, https://www.statista.com/forecasts/997109/most-used-devices-for-digital-videos-in-the-us (last accessed May 24, 2024).

[809] *See* Zharmer Hardimon, The Current, *79% of U.S. Households Now Own a Smart TV* (May 22, 2024), https://www.thecurrent.com/americans-smart-tv-data-streaming-marketing. Another source states, "88 percent of TV households having at least one Internet-connected TV device in 2023." NAB Comments at 6.

[810] *See* Jon Lafayette, Broadcasting & Cable, *Streaming Rises, With Viewing Shifting to Big Screens From Connected Devices* (May 19, 2022), https://www.nexttv.com/news/streaming-rises-with-viewing-shifting-to-big-screens-from-connected-devices.

[811] *Id*.

[812] Leichtman Research Group, *83% of U.S. Households Have an SVOD Service* (Aug. 9, 2023), https://web.archive.org/web/20240517095003/https:/leichtmanresearch.com/83-of-u-s-households-have-an-svod-service/ (cited in NCTA Comments at 37).

[813] Seth Shafer, S&P Global, *Economics of Internet: State of US Online Video: AVOD 2021* (Nov. 30, 2021) (last accessed May 28, 2024) (estimating 104.3 AVOD U.S. households in 2021); U.S. Census Bureau, *Table HH-1* (Nov. 2021) https://www2.census.gov/programs-surveys/demo/tables/families/time-series/households/hh1.xls (estimating 129.9 million households in the United States in 2021).

[814] *See, e.g.*, Jamia Kenan, Sprout Social, *7 Steps to a Successful Social Media Video Marketing Strategy* (Nov. 8, 2022), https://sproutsocial.com/insights/video-marketing-strategy/.

recently. TikTok fell from 29% U.S. usage in the third quarter of 2022 to 22% usage in the first quarter of 2024.[815] On April 24, 2024, President Biden signed into law a bill requiring ByteDance, as foreign adversary controlled, to divest its ownership of TikTok within nine months or distribution and support of TikTok within the United States will be banned.[816] On May 7, 2024, ByteDance filed an appeal contesting the constitutionality of this law.[817]

Fig. II.E.7
U.S. Usage of Leading AVOD Services, March 2024

AVOD Service	Percentage of Internet-Using Adults Using Service
YouTube	68%
Facebook	43%
Instagram	30%
Tubi TV	28%
FreeVee	25%
Pluto TV	23%
The Roku Channel	23%
TikTok	22%
Twitter	19%
Peacock	17%
Snapchat Discover	15%
Samsung TV Plus	9%
Crackle	9%
Twitch	9%
Watch Free with Plex	5%
Crunchy Roll	5%

Source: S&P Global, *Q1 2024 US Digital Entertainment Trends* (May 13, 2024) (last accessed May 28, 2024).

242. Revenue for AVOD providers continues to increase, although more slowly than prior to 2022. Figure II.E.8 shows AVOD revenue figures for instream advertisements (advertisements shown within video content) as well as AVOD-viewing household penetration. Instream AVOD advertisement revenue grew from an estimated $31.4 billion in 2022 to an estimated $38.6 billion in 2024.[818]

[815] S&P Global, *Q1 2024 US Digital Entertainment Trends*, tbl. 8 (May 13, 2024) (last accessed May 28, 2024).

[816] Pub. L. No. 118-50, Division H—Protecting Americans from Foreign Adversary Controlled Applications Act (2024) (making emergency supplemental appropriations for the fiscal year ending September 30, 2024, and for other purposes).

[817] *TikTok Inc. v. Garland*, Petition for Review of Constitutionality of the Protecting Americans from Foreign Adversary Controlled Applications Act, No. 24-1113 (filed D.C. Cir. May 7, 2024).

[818] This revenue doesn't include revenue for out of stream advertisements (advertisements not connected to a content video stream; e.g., video ads in social media feeds/streams, and pause, menu, and lock screens). YouTube's ad revenue from all sources was $31.5 billion in 2023. *See* Alphabet Inc., SEC Form 10-K, at 63 (filed Jan. 31, 2024). Excluding revenue from banner ads shown around videos, Meta and TikTok will collect an estimated $13.7 billion

(continued….)

Fig. II.E.8
U.S. AVOD Advertising Revenue (in $ billions) and Household Penetration (%)

	2022	2023	Percentage Change	2024	Percentage Change
Instream Advertising Revenue	$31.4	$35.2	12.0%	$38.6	9.8%
AVOD Household Penetration	86%	88%	2.3%	88%	0.0%

Source: S&P Global, *US Streaming Video Outlook, 2024* (Jan. 2024) (last accessed May 28, 2024); S&P Global, *Q1 2024 US Digital Entertainment Trends*, tbl. 7 (May 13, 2024) (last accessed May 28, 2024).

243. *Subscription Video On Demand (SVOD)*. Figure II.E.9 shows that SVOD subscribership is increasing, but growth is slowing. SVOD subscriptions jumped 27% from 2020 to 2021, probably spurred by pandemic restrictions. Subscription growth has slowed to 4% from 2023 to 2024. Netflix, the largest SVOD provider, experienced a decline in total U.S. subscribers across the first nine months of 2022. Netflix's subscriber total has subsequently resumed growing, at least in part from Netflix's introduction of a lower-cost subscription with advertisements.[819]

Fig. II.E.9
U.S. SVOD Subscriptions (in millions)

	2020	2021	2022	2023	2024
Subscriptions	322	409	448	469	488
Growth Relative to Previous Year		27.0%	9.5%	4.7%	4.1%

Source: Seth Shafer, S&P Global, *US SVOD projections through 2028* (Apr. 14, 2024) (last accessed May 28, 2024).

244. Households commonly subscribe to more than one SVOD service. Approximately 70% of respondents to the Kagan Consumer Insights First Quarter 2024 Survey indicated that they subscribed to two or more SVOD services and 45% indicated that they subscribed to four or more.[820] As of March, 2024, adult Internet users average 3.8 SVOD subscriptions.[821] SVOD is now a mainstream service. A majority of U.S. consumers (66%) view content from an online video subscription service at least once a week.[822] Moreover, 34% of consumers report watching more on-demand video than linear, time-programmed (channel-based) video.[823] SVOD revenue is also increasing. SVOD revenue was $38.3 billion in 2023, an increase of 7.0% from $35.8 billion in 2022.[824] Projected SVOD revenue for 2024 is $40.2 billion, an increase of 4.8% from the previous year.[825]

(Continued from previous page)
and $9.0 billion, respectively, in advertising revenue in 2024. *See* Mike Reynolds, S&P Global, *What a US Sale or Shuttering of TikTok Would Mean for Advertisers* (July 11, 2024) (last accessed July 25, 2024).

[819] Julia Stoll, Statista, *Number of Netflix Paying Streaming Subscribers in the United States and Canada From 1st Quarter 2013 to 1st Quarter 2024* (Apr. 22, 2024), https://www.statista.com/statistics/250937/quarterly-number-of-netflix-streaming-subscribers-in-the-us/ (last accessed May 28, 2024).

[820] Brian Bacon, S&P Global, *US SVOD User Trends and Demographics, Q1 2024* (July 15, 2024) (last accessed May 28, 2024) (*SVOD Trends Q1 2024*).

[821] S&P Global, *Q1 2024 US Digital Entertainment Trends*, tbl. 5 (May 13, 2024) (last accessed May 28, 2024).

[822] *SVOD Trends Q1 2024* (adjusted for non-responses).

[823] *SVOD Trends Q1 2024.*

[824] S&P Global, *US Streaming Video Outlook, 2024* (Jan. 2024) (last accessed May 28, 2024).

245. *Transactional Video On Demand (TVOD)*. Revenue from online rental and purchase of video content by U.S. consumers is small relative to video streaming revenue. In 2022, U.S. online video rentals and purchases totaled an estimated $2.3 billion and $2.4 billion, respectively.[826] Both video rental and purchases amount to only 5.8% of $81.7 billion total video streaming revenue in 2022.[827] Data for online video rentals and sales are no longer readily available for years after 2022.

246. Online video rentals and purchases are likely becoming economically insignificant relative to video spending overall. The share of U.S. Internet-using adults that purchased or rented online video at least once per week fell from 24% in early 2022 to 18% in early 2024.[828] Other evidence indicates the growing importance of streaming. Total U.S. retail spending on purchase and rental of physical video media (DVD and Blu-ray disks) fell from $11.8 billion in 2012 to $1.5 billion in 2023.[829] Netflix ended its DVD subscription service in 2023, and the mass-market retailer Best Buy phased out selling DVDs and Blu-ray disks in 2024.[830] Online video streaming has therefore largely replaced the sale of physical video media.

247. Online rental and purchase of video is likely to follow the trend of online purchase of music. Online music purchases (downloaded albums and singles) reached a high of 43% of total U.S. recorded music revenues in 2012.[831] However, online music purchases amounted to only $396 million in 2023, accounting for approximately 3% of total U.S. recorded music revenues.[832] Online rental and purchase of video is surely declining in dollar value and probably now amounts to only about 3% of the estimated $99.8 billion in total video streaming revenue in 2024.[833]

248. *Virtual Multichannel Video Programming Distributor (vMVPD)*. Figure II.E.10 shows that both subscribers and revenues for vMVPD providers have been increasing rapidly. Growth in vMVPDs has benefitted from the relatively low base of subscribers and revenue, as well as an overall video industry trend toward bundling.

(Continued from previous page)

[825] *Id.*

[826] Deana Myers, S&P Global, *Economics of Internet: State of Transactional Online Video: Rental, Electronic Sell-Through* (Nov. 22, 2021) (last accessed May 28, 2024).

[827] S&P Global, *US Streaming Video Outlook, 2024* (Jan. 2024) (last accessed May 28, 2024).

[828] S&P Global, *Q1 2024 US Digital Entertainment Trends*, tbl. 14 (May 13, 2024) (last accessed May 28, 2024).

[829] Wade Holden, S&P Global, *Retail DVD, Blu-ray Revenue Extends Long-Term Decline With 19.5% Drop in 2022* (Oct. 30, 2023) (last accessed May 28, 2024).

[830] *See* Todd Spangler, Variety, *Best Buy to End DVD, Blu-ray Disc Sales* (Oct. 13, 2023); Wade Holden, S&P Global, *Retail DVD, Blu-ray Revenue Extends Long-Term Decline With 19.5% Drop in 2022* (Oct. 30, 2023).

[831] Matthew Bass, RIAA, *Year-End 2023 RIAA Revenue Statistics* (Mar. 2024), https://www.riaa.com/wp-content/uploads/2024/03/2023-Year-End-Revenue-Statistics.pdf.

[832] *Id.*

[833] S&P Global, *US Streaming Video Outlook, 2024* (Jan. 2024) (last accessed May 28, 2024) (estimating total streaming video revenue in 2024).

Fig. II.E.10
U.S. vMVPD Subscribers and Revenue

	2022	2023	Percentage Change	2024	Percentage Change
Subscribers (in Millions)	15.3	18.5	20.7%	21.4	15.5%
Revenue (in $ Billions)	$14.5	$18.1	25.5%	$21.0	15.7%

Source: Mau Rodriguez and John Fletcher, S&P Global, *Multichannel Trends: Q1 2024 Video Market Share: Everyone Loses* (May 22, 2024) (last accessed May 28, 2024); S&P Global, *US Streaming Video Outlook, 2024* (Jan. 2024) (last accessed May 28, 2024). Subscribers are for the first quarter of each year.

249. For a broad view of OVD providers, we provide subscriber figures for select SVOD and vMVPD providers in Figure II.E.11. Provider size and growth percentages vary widely. Amazon Prime Video, which offers a wider range of video options than a typical SVOD, had 90 million U.S. Amazon Prime members and an estimated 70 million U.S. active users as of January 2024.[834] Disney company streaming subscribers (Hulu, Disney+, and ESPN+) worldwide surpassed Netflix subscribers worldwide in mid-2022.[835] Warner Bros. Discovery, formed from the merger of WarnerMedia and Discovery in 2022 and providing the video streaming services Max (HBO Max) and Discovery+, had a decline from 55.3 million to 52.7 million in total U.S. subscribers from first quarter of 2023 to the first quarter of 2024.[836] More generally, as the rightmost column of Figure II.E.11 indicates, changes in streaming video provider subscribership typically happen more quickly than changes in the sizes of MVPD and broadcast video providers.

[834] Bevin Fletcher, StreamTV Insider, *Amazon's Prime Video Aims to Be One-Stop Video Entertainment Hub* (Mar. 6, 2024), https://www.streamtvinsider.com/video/amazons-prime-video-aims-be-one-stop-video-entertainment-hub.

[835] Sara Fisher, Axios, *Disney Surpasses Netflix in Global Paid Streaming Subscribers* (Aug. 10, 2022), https://www.axios.com/2022/08/10/disney-surpasses-netflix-global-paid-subscribers.

[836] *See* Statista, *Combined Number of Subscribers to Max, HBO Max, HBO, and Discovery Plus Worldwide From 2nd Quarter 2021 to 1st Quarter 2024 (In Millions)*, https://www.statista.com/statistics/1251687/d2c-video-subscribers-warner-bros-discovery/ (last accessed May 31, 2024); Paige Hagy, Yahoo Finance, *Warner Bros. Discovery Lost 2.5 Million Streaming Subscribers In the Last 6 Months While its Rivals Grew—And Sports Are Partly to Blame* (Nov. 10, 2023), https://finance.yahoo.com/news/warner-bros-discovery-lost-2-220653503.html.

Fig. II.E.11
Total Subscribers, Select SVOD and vMVPD Providers (in millions)

OVD	Q3 2022	Q3 2023	Percentage Change
Netflix	66.0	69.5	5.4%
Hulu	47.2	48.5	2.8%
Disney+	41.7	41.7	0.1%
Paramount+	20.9	30.7	47.2%
HBO/HBO Max/Max	23.1	27.4	18.6%
ESPN+	24.3	26.0	7.0%
Peacock Premium	16.0	28.4	77.3%
Apple TV+	11.7	14.2	21.2%
Showtime OTT	13.6	6.0	-55.8%
Starz OTT	12.3	12.0	-1.9%
Discovery+	10.3	7.5	-26.8%
YouTube TV	4.9	6.3	29.0%
DIRECTV Stream	2.0	3.1	51.7%
Sling TV	2.4	2.1	-12.07%
Cinemax OTT	1.7	1.5	-16.19%
FuboTV	1.1	1.3	17%

Source: S&P Global, *US Subscribers for Select US Video Subscription Services, Q1 2015 to Q3 2023* (Nov. 29, 2023) (last accessed May 28, 2024). Hulu includes Hulu + Live TV subscribers.

4. Broadcast Television Stations

250. Broadcast television stations offer linear video programming channels OTA to households for free to consumers. In addition, households may also receive broadcast television station programming channels from MVPDs and, in some cases, OVDs. Many commercial stations air programming they produce themselves, such as local news; syndicated programming; and licensed broadcasts of other programming, such as movies. Television stations affiliated with broadcast networks also run programs from their affiliated network.[837] Commercial broadcast television stations generate revenue from two main sources: advertising sales and payments negotiated with MVPDs and OVDs for the right to retransmit station signals.

a. Station Licensing and Ownership

251. The Commission licenses broadcast television stations consistent with the Communications Act.[838] Licenses were formerly granted pursuant to comparative hearings among interested applicants.[839] Today, the Commission awards commercial broadcast television licenses by

[837] Ken Basin, The Business of Television 12 (2018) (Basin, 2018).

[838] 47 U.S.C. § 151 *et seq.*; *see also* 47 CFR §§ 73.601-73.699, 73.1001-73.4280. In this section, we focus on full-power broadcast television stations. In addition to these stations, the Commission licenses Class A and low-power television (LPTV) stations, as well as television translator and satellite stations, which are used to increase the geographic reach of the associated main station.

auction. The most recent auction, Auction 112, concluded in June 2022. It raised $33 million in net bids, with seven bidders winning a total of 18 construction permits for full power television (FPTV) stations.[840] Non-commercial stations are awarded by a comparative system.[841] Figure II.E.12 shows that the number of licensed broadcast television stations has remained stable in recent years.

Fig. II.E.12
Number of Licensed Broadcast Television Stations[842]

	2020	2021	2022	2023	2024
Commercial UHF	1,001	996	999	1,010	1,015
Commercial VHF	371	378	374	365	367
Non-Commercial	387	384	384	383	383
Total Stations	1,759	1,758	1,757	1,758	1,765

Source: FCC Broadcast Totals as of Mar. 31, 2020; Mar. 31, 2021; Mar. 31, 2022; Mar. 31, 2023; Mar. 31, 2024.

252. Whereas Figure II.E.12 shows the number of television stations in the United States, viewers can only access the stations in their markets. Figure II.E.13 is a scatterplot of the number of stations per market by market size (measured in TV households), in which each point represents a market.[843] The data generally show that the number of television stations available increases with market size. While the median market has five stations, because the population is concentrated in the largest markets, the majority of TV households have access to at least nine stations. In addition, many television broadcast stations use digital transmission technologies to offer multiple programming streams (digital multicast channels) to viewers.[844] This suggests that the number of stations shown in Figure II.E.13 is a lower bound for the number of broadcast channels available in each market.

(Continued from previous page)

[839] KPMG, History of the Broadcast License Application Process at 4 (Nov. 2000), https://transition.fcc.gov/opportunity/meb_study/broadcast_lic_study_pt1.pdf.

[840] *Auction of Construction Permits for Full Power Television Stations Closes; Winning Bidders Announced for Auction 112*, AU Docket No. 21-449, Public Notice, 37 FCC Rcd 7461, 7461 (MB/OEA 2022).

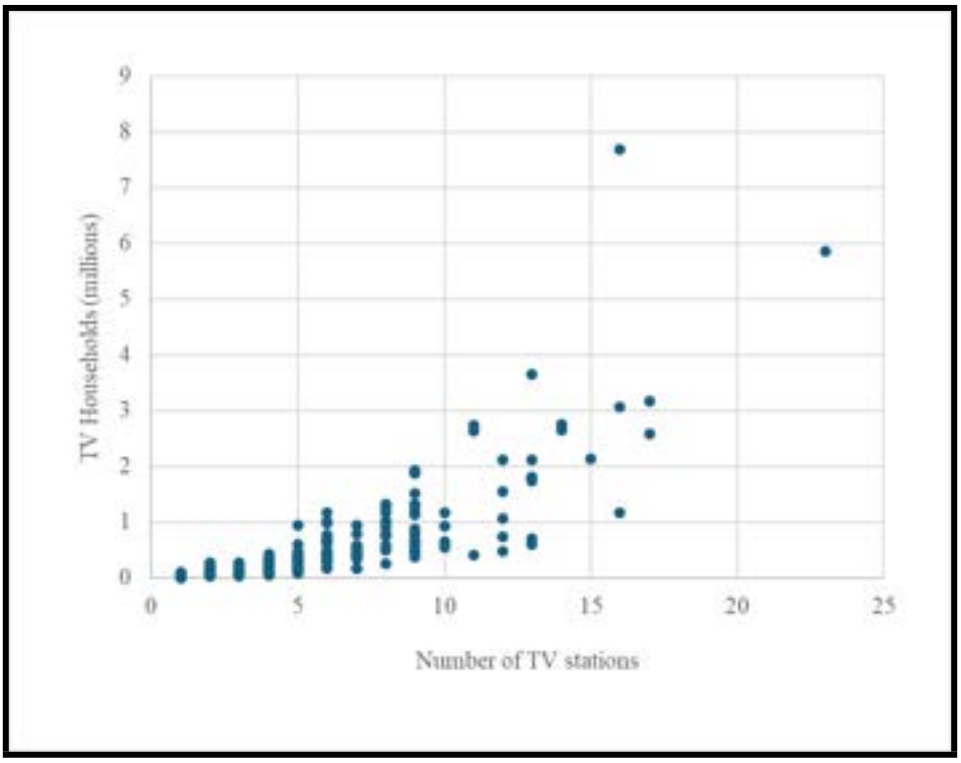
[841] *See Reexamination of the Comparative Standards for Noncommercial Educational Applicants*, MM Docket No. 95-31, Report and Order, 15 FCC Rcd 7386, 7393-7420, paras. 16-79 (2000) (*NCE Comparative Standards Report and Order*).

[842] *Broadcast Station Totals as of March 31, 2024*, Public Notice, DA 24-323 (MB Apr. 4, 2024), https://docs.fcc.gov/public/attachments/DA-24-323A1.pdf; *Broadcast Station Totals as of March 31, 2023*, Public Notice, 38 FCC Rcd 2507, 2507 (MB 2023), https://docs.fcc.gov/public/attachments/DA-23-300A1_Rcd.pdf; *Broadcast Station Totals as of March 31, 2022*, Public Notice, 37 FCC Rcd 4661, 4661 (MB 2022), https://docs.fcc.gov/public/attachments/DA-22-365A1_Rcd.pdf; Press Release, FCC, Broadcast Station Totals as of March 31, 2021 (Apr. 5, 2021), https://docs.fcc.gov/public/attachments/DOC-371337A1.pdf; Press Release, FCC, Broadcast Station Totals as of March 31, 2020 (Apr. 6, 2020), https://docs.fcc.gov/public/attachments/DOC-363515A1.pdf.

[843] Fig. II.E.13 defines broadcast television markets using Nielsen's designated market area (DMA) definitions. Each DMA is a group of counties that form an exclusive geographic area in which the home market television stations capture a dominance of total hours viewed. There are 210 DMAs, covering the entire continental United States, Hawaii, and parts of Alaska. The DMA boundaries and DMA data are owned solely and exclusively by Nielsen. Nielsen, *DMA Regions*, https://markets.nielsen.com/us/en/contact-us/intl-campaigns/dma-maps/ (last visited Oct. 6, 2024).

[844] Brad Adgate, Forbes, *TV Stations are Launching Multicast Networks as an Opportunity to Reach Cord Cutters* (June 10, 2021), https://www.forbes.com/sites/bradadgate/2021/06/10/tv-stations-are-launching-multicast-networks-as-an-opportunity-to-reach-cord-cutters/?sh=475adc6e7136.

Fig. II.E.13
Television Stations by Market Size



Source: BIA/Kelsey, *MEDIA Access Pro Online Television Analyzer Database* (last accessed May 31, 2024).

253. Most television stations are owned by companies that own multiple stations, called station groups. Figure II.E.14 shows information about the 10 largest station groups in the United States by share of TV households reached. The table lists the number of full power stations owned by each group and the number of markets in which the station group owns at least one station. The share of TV households reached by the station group is the total number of TV households living in markets where the station group owns at least one station divided by the total number of TV households in the United States.

Fig. II.E.14
Largest U.S. Broadcast Television Station Groups by TV Households Reached

Station Group	Stations	Markets	Share of TV Households Reached
The E.W. Scripps Company	91	76	71.1%
Nexstar Media Group, Inc.	144	115	62.4%
Univision Communications Inc.	49	31	44.9%
TEGNA Inc.	63	51	39.3%
Fox Corporation	29	18	38.6%
Comcast Corporation	30	21	38.1%
Paramount Global	27	23	37.4%
Sinclair Broadcast Group, Inc.	104	82	36.2%
Gray Television, Inc.	145	113	36.2%
Weigel Broadcasting Co.	19	13	27.5%

Source: S&P Global, *Top 50 TV Station Groups Update* (Dec. 14, 2023) (last accessed May 28, 2024); BIA/Kelsey, *MEDIA Access Pro Online Television Analyzer Database* (last accessed May 30, 2024).

b. Distribution and Delivery

254. Broadcast television stations reach viewers by broadcasting signals directly OTA to homes, as well as through carriage agreements with MVPDs and OVDs, which retransmit the signals of stations to households subscribing to their services. The OTA reach of a broadcast television station is determined largely by the height of its transmission tower and the power of its transmitter. Buildings, hills, and other objects, however, may interfere with OTA signals.[845] When a broadcast station negotiates with MVPDs and OVDs for carriage of its programming, it is in the business of content distribution—similar to a cable network. When a broadcast station delivers programming OTA, it is in the business of content delivery—similar to facilities-based MVPDs.

255. MVPDs offering service within a Designated Market Area (DMA) typically carry the local broadcast television stations assigned to the DMA, and each MVPD rebroadcasts the stations' signals to its subscribers in the DMA. This is because broadcast stations typically hold exclusive rights to broadcast network programming in a DMA. Thus, unlike cable networks that are available nationwide, most broadcast television stations' signals are retransmitted by MVPDs only within the station's assigned DMA. Rebroadcast of television stations' signals by vMVPDs follows a similar pattern—subscribers located in a DMA receive signals of local broadcast television stations from the same DMA.[846] Some advertising-based OVDs like Pluto TV and Tubi and streaming apps like Local Now and NewsOn repackage and stream the local portion of broadcast stations' programming, sometimes from DMAs other than where the viewer is located, at no cost and without a subscription.[847]

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[845] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15677, para. 266.

[846] *Id*. at 15677, para. 267.

[847] *See* "Watch Pluto-TV Free," https://www.pluto.tv/welcome (last visited Sept. 16, 2024); "Tubi Help Center," https://tubitv.com/help-center/Content/articles/24898743777435 (last visited Sept. 16, 2024); "LocalNow," https://localnow.com (last visited Sept. 16, 2024); "NewsOn," https://newson.us/whatson, (last visited Sept. 16, 2024).

c. Programming and Content Ownership

256. *Programming.* Broadcast television stations air network programming, programming produced by the station, and syndicated programming.[848] The major broadcast television networks (ABC, CBS, FOX, and NBC) brand and market a slate of programming, usually acquired from in-house studios, network-affiliated studios, and third-party studios.[849] The major Spanish-language broadcast television network are Telemundo and Univision. To obtain network programming, broadcast stations enter into affiliation agreements with broadcast networks. In many affiliation agreements, the network sells most of the advertising time during the programming it provides to the station.[850] Further, a station may pay a fee to the broadcast network. The fee the station pays the network is commonly known as reverse compensation or a reverse retransmission fee as it is usually tied to the retransmission consent payments the station receives from MVPDs.[851]

257. In 2023, 1,109 television stations aired local news, a decrease of 11 stations from 2022.[852] About 700 of these stations produced local news while the other stations aired local news produced by another station.[853] Large television station groups like Gray and E.W. Scripps have news bureaus in Washington, D.C. that link national news to local concerns; Nexstar's national news bureau is located in Chicago.[854] According to a survey by the Knight and Gallup Foundation taken in July 2022, 26% of Americans have a favorable opinion of the news media, one component of what broadcast stations offer, and 53% have an unfavorable view.[855] For national news, 72% of Americans say national news media are capable of reporting news fairly and accurately, but only 35% say national news media can be relied upon to deliver the information viewers need.[856] For local news, 65% of those surveyed say local news media have the resources and opportunity to report news accurately and fairly, and 52% say local news media can be relied upon to deliver the information viewers need.[857]

258. Syndicated programming is the third type of content carried by broadcast stations. Syndicated programming includes reruns of programming previously broadcast by a network, sometimes known as "second-run syndication," and first-run original content produced by third-party studios or production companies.[858] First-run syndication agreements are similar to network affiliation agreements.

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[848] Basin at 12 (2018).

[849] *Id.*

[850] *Id.* at 9.

[851] *Id.* at 13; Jon Lafayette, Broadcasting & Cable, *Affiliates Seek to Change How They Pay Networks for Programming* (Mar. 1, 2024), https://www.nexttv.com/news/affiliates-seek-to-change-how-they-pay-networks-for-programming.

[852] Bob Papper and Keren Henderson, RTDNA, Another Record Year For Local TV News at 3 (July 2023), https://web.archive.org/web/20230731190228/https://assets-002.noviams.com/novi-file-uploads/rtdna/Research/Local_TV_News.pdf.

[853] *Id.* at 2.

[854] Gray Television, *Gray News Washington Bureau*, https://www.localnewslive.com/news/national/ (last visited May 17, 2024); Scripps, *Scripps Washington Bureau*, https://scripps.com/scripps-washington-bureau/ (last visited May 17, 2024).

[855] Knight Foundation, *American Views 2022: Part 2, Trust, Media, and Democracy* (Feb. 15, 2023), https://knightfoundation.org/reports/american-views-2023-part-2/.

[856] *Id.*

[857] *Id.*

[858] Basin at 12 (2018).

Stations pay studios a combination of cash licensee fees and "bartered" advertising time. The studio that produces show has the opportunity to benefit from selling "bartered" advertising time.[859]

259. *Ownership of Content*. In addition to owning broadcast stations and other properties, Disney, Paramount Global, Fox, Comcast, and Univision each have an interest in at least one broadcast network (ABC, CBS and the CW, FOX, NBC and Telemundo, and Univision, respectively).[860] All of these companies also own movie or television production studios.[861] In addition, several other broadcast groups also produce and own programming.[862] Owning video content allows its owner to generate revenue from fees to license the content internationally or domestically.

d. Broadcast Television Revenue

260. *Advertising Revenue.* Broadcast television stations air advertising spots during breaks in programming. Network affiliation agreements specify the number of advertising minutes allocated to the network and to the local station. The station controls most of the advertising presented alongside its own programming or licensed syndicated programming. The network controls most of the advertising presented alongside network programming.[863] Another source of revenue is product integration or product placement, which generally refers to the paid use, depiction, or mention of a product within a television show. Unlike traditional advertising, product placement is not separately demarcated from the show, but integrated into the program itself.[864]

261. The price of an advertising spot is generally determined by the size and demographic composition of the program's audience.[865] Local broadcast stations particularly rely on revenue from election years when political advertisers buy quantities of advertising time targeted at specific geographic markets. Local news programming, and the advertising presented alongside it, are vital to broadcast stations.[866] In 2023, Nexstar reported that it earned 71% of its core and political advertising revenue from spots aired during local programming.[867]

262. Both local and national businesses buy advertising spots from broadcast television stations. Advertising spots are sold to local advertisers directly through a station's local sales staff while national advertisers generally work with national advertising sales representative firms to buy advertising time.[868] Figure II.E.15 shows annual gross revenues for broadcast stations for the period 2019-2023. Total advertising revenue was about $18.7 billion in 2023. As seen in Figure II.E.15, local advertising revenue has remained relatively flat over the past five years, but its share of total gross revenue has fallen from 58% in 2019 to about 51% in 2023.

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[859] *Id.* at 15.

[860] *See* The Walt Disney Company, SEC Form 10-K, at 3 (filed Nov. 21, 2023); Paramount Global, SEC Form 10-K, at I-1 (filed Feb. 28, 2024); Fox Corporation, SEC Form 10-K, at 1 (filed Aug. 8, 2024); Comcast Corporation, SEC Form 10-K, at 1 (filed Jan. 31, 2024); Grupo Televisa, S.A.B., SEC Form 20-F, at 63 (filed Apr. 30, 2024).

[861] *See* The Walt Disney Company, SEC Form 10-K, at 3 (filed Nov. 21, 2023); Paramount Global, SEC Form 10-K, at I-1 (filed Feb. 28, 2024); Fox Corporation, SEC Form 10-K, at 1 (filed Aug. 8, 2024); Comcast Corporation, SEC Form 10-K, at 1 (filed Jan. 31, 2024), Grupo Televisa, S.A.B., SEC Form 20-F, at 46 (filed Apr. 30, 2024).

[862] *See, e.g.*, Gray Television, Inc., SEC Form 10-K, at 4 (filed Feb. 23, 2024); The E.W. Scripps Company, SEC Form 10-K, at 4 (filed Feb. 23, 2024); TEGNA Inc., SEC Form 10-K, at 3 (filed Feb. 29, 2024).

[863] Basin at 15 (2018).

[864] *Id.* at 14-18.

[865] *Id.* at xxii, 9.

[866] *Id.* at 15.

[867] *See* Nexstar Media Group, Inc., SEC Form 10-K, at 4 (filed Feb. 28, 2024).

[868] Basin at 14-18 (2018).

263. *Retransmission Consent Revenue.* Many broadcast television stations generate revenue by granting MVPDs the right to carry their signals.[869] Pursuant to section 325 of the Communications Act, MVPDs may not retransmit a broadcast television station's signal without the station's express permission.[870] If a station elects transmission consent, the station and MVPD negotiate a carriage agreement, which often includes monetary or other types of compensation for the television station.[871] If a carriage agreement cannot be negotiated, the MVPD must stop retransmitting the station's broadcast signal and viewers lose access to the station through the MVPD, in what is known as a blackout. Figure II.E.15 also shows retransmission consent revenue over the period 2019-2023. Retransmission consent revenue increased by 31%, from $11.5 billion to $15.1 billion, from 2019 to 2023.[872] Retransmission consent revenue growth is moderating compared to years past in part due to the decline in MPVD subscribers.[873] Also, stations often pay a portion of retransmission consent fees to the station's affiliated broadcast network in what is called reverse compensation or reverse retransmission fees.[874] Industry estimates that about one-half of retransmission revenues are paid by stations to their affiliated networks as reverse retransmission fee. Now that networks are moving content once exclusively carried by stations to network-owned streaming platforms, reverse retransmission agreements may be affected.[875]

Fig. II.E.15
Broadcast Television Station Industry Gross Revenue Trends (millions)

	2019	2020	2021	2022	2023
Total advertising	19,224	18,312	17,605	21,084	18,702
National	5,921	4,855	5,341	5,555	5,388
Local	12,342	9,874	11,355	12,036	12,277
Political	960	3,583	910	3,493	1,037
Retransmission Consent	11,522	12,730	14,072	14,908	15,092
Digital/online revenue	2,666	2,733	2,952	3,070	3,162
Total	**33,412**	**33,775**	**34,629**	**39,061**	**36,956**

Source: S&P Global, *US TV Station Industry Total Revenue Projections, 2019-2023* (Oct. 2023) (last accessed May 28, 2024).

[869] Although not covered by the Commission's retransmission consent rules, many broadcast television stations also generate revenue, directly or indirectly, through carriage agreements with OVDs.

[870] 47 U.S.C. § 325(b). Every three years, commercial television stations must elect either the right to grant consent for the MVPDs in the DMA to retransmit the station's signal or the right to receive mandatory carriage by those MVPDs. *Id.* § 325(b)(3)(B); 47 CFR §§ 76.56(b), 76.64.

[871] Basin at 11 (2018).

[872] S&P Global, *US TV Station Industry Total Revenue Projections, 2009-2018* (Oct. 2023) (last accessed May 28, 2024).

[873] Jon Lafayette, Broadcasting & Cable, *Affiliates Seek to Change How They Pay Networks for Programming* (Mar. 1, 2024), https://www.nexttv.com/news/affiliates-seek-to-change-how-they-pay-networks-for-programming.

[874] Basin at 13 (2018); Jon Lafayette, Broadcasting & Cable, *Affiliates Seek to Change How They Pay Networks for Programming* (Mar. 1, 2024), https://www.nexttv.com/news/affiliates-seek-to-change-how-they-pay-networks-for-programming.

[875] Jon Lafayette, Broadcasting & Cable, *Affiliates Seek to Change How They Pay Networks for Programming* (Mar. 1, 2024), https://www.nexttv.com/news/affiliates-seek-to-change-how-they-pay-networks-for-programming.

5. Competition in Video

264. This section of this report describes various aspects of competition among MVPDs, OVDs, and broadcast television stations. It includes data on household subscriptions to, and use of, multiple video services, as well as total subscription figures for the top video services. Finally, the section examines competition in advertising by presenting advertising revenue estimates by sector.

265. *Time, Location, and Device Flexibility.* Many consumers value the ability to watch video programming at any time and in any place. In response to consumer preferences, MVPDs, which traditionally offered linear video programming channels to view on a television set in the home, today also offer VOD content and DVR services, as discussed above. In addition, many MVPDs allow subscribers to watch programming on devices other than a television set and at any location that has an Internet connection. Among OVDs, vMVPDs also offer linear programming channels with some VOD programming and DVR capabilities, while AVOD, SVOD, and TVOD services are built around VOD programming. OVDs also offer location and device flexibility, as noted above, as OVDs are available via an Internet connection and many are available on multiple devices. In general, broadcast stations offer linear video programming channels OTA and therefore cannot provide time, location, or device flexibility. However, consumers who view these stations through an MVPD, OVD, or other online access may have additional flexibility. Some cable companies may exit the cable video business to focus on broadband. As noted above, some cable companies such as Cable One, DIRECTV's AT&T U-verse, and Frontier are taking steps to phase out their MVPD service.[876]

266. *Programming*. As discussed above, to draw customers to their services, OVDs such as Netflix, Amazon Prime Video, Max, and Disney+ offer exclusive programming—both new TV shows and movies and already released video programming—on their services. When video programming owners, like Disney, Comcast, and AT&T, developed their own online video services, they pulled back popular video programming licensed to competitive OVDs to offer it exclusively on their own services.[877] In addition, many OVDs develop exclusive original programming. In 2023, as shown in Figure II.E.5 above, Netflix spent an estimated $6.9 billion on original content, Disney+ spent $3.9 billion, Amazon Prime Video spent $1.7 billion, and Paramount + spent $1.5 billion.

267. *Pricing and Contracts.* As discussed above, MVPD subscriptions are declining. Many subscribers who cancel their MVPD subscriptions cite rising prices as a cause.[878] As noted above, in addition to the subscription price advertised by MVPDs, subscribers may be charged fees for installation, equipment, regional sports networks, broadcast stations, and other services. In contrast, OVDs generally do not charge additional fees.[879] Further, OVDs generally offer flexible cancellation[880] and some OVDs offer free service trials.[881] Many MVPDs, on the other hand, offer service under long-term contracts, and

[876] John Fletcher et al., S&P Global, *Multichannel Trends: US Video Home Forecast Through 2026* at 4 (July 14, 2022) (last accessed May 28, 2024).

[877] Tali Arbel, AP News, *AT&T Pulls 'Friends' from Netflix for Its Streaming Service* (July 9, 2019), https://apnews.com/557110226d10440c905f9563e70c4bc2.

[878] Keith Nissen, S&P Global, *US, Europe Video Cord Cutting: Same Trend, Different Reasons* (Oct. 18, 2021) (last accessed May 28, 2024).

[879] Nick Cole, Clark, *Cable vs. Streaming: Does Cutting the Cord Really Save You Money?* (May 22, 2023), https://clark.com/technology/tvsatellite-cable/cable-streaming-price-comparison/.

[880] *Id.*

[881] *See, e.g.*, Max, *Watch Free Episodes on Max*, https://www.hbomax.com/collections/watch-free/ (last visited Sept. 16, 2024); Hulu, *Free Trials on Hulu*, https://help.hulu.com/s/article/free-trials (last visited July 8, 2024).

consumers often pay a fee to terminate the contract before its end date.[882] A Commission Notice of Proposed Rulemaking to eliminate these termination fees is underway.[883]

268. *Consumer Access.* Consumer access to video providers depends on the geographic market and type of service. For OTA television, the number of available stations depends both on the number of stations allocated to the consumer's DMA and the consumer's ability to receive a useable OTA signal from the station.[884] In addition, most households have access to at least one cable provider and two DBS providers, and some also have access to a telephone company MVPD. To obtain service from an OVD, a consumer must have Internet access at sufficient speed and reliability to stream video content.

269. *Video Use Data.* Nielsen reports "The Media Distributor Gauge," a cross-platform view of total TV consumption across distributors—broadcast, cable and streaming. TV usage is calculated by adding together the total minutes viewed on a TV screen for each network's services and aggregating those amounts based on the distribution technology.[885] For May 2024, a daily snapshot of total TV usage minutes reports that streaming represents 39% of all minutes viewed; cable was 28%, and broadcast was 22%.[886] For December 2023, a daily snapshot of total TV usage minutes reports 36% was streaming, 28% was cable, and 24% was broadcast.[887]

270. Figure II.E.16 shows year-end subscribers for the period 2019-2023 for selected video providers including major MVPDs and OVDs. MVPDs (Comcast, Charter, DIRECTV, and DISH) saw subscriber declines from 2019 to 2023, while OVDs (Netflix, Hulu, and Disney+) saw subscriber increases over the same period.

[882] Chantel Buchi, Reviews.org, *How to Avoid TV Cancellation Fees* (May 28, 2024), https://www.reviews.org/tv-service/television-cancellation-fees/.

[883] *Promoting Competition in the American Economy: Cable Operator and DBS Provider Billing Practices*, MB Docket No. 23-405, Notice of Proposed Rulemaking, FCC 23-106, at 1, para. 1 (Dec. 14, 2023).

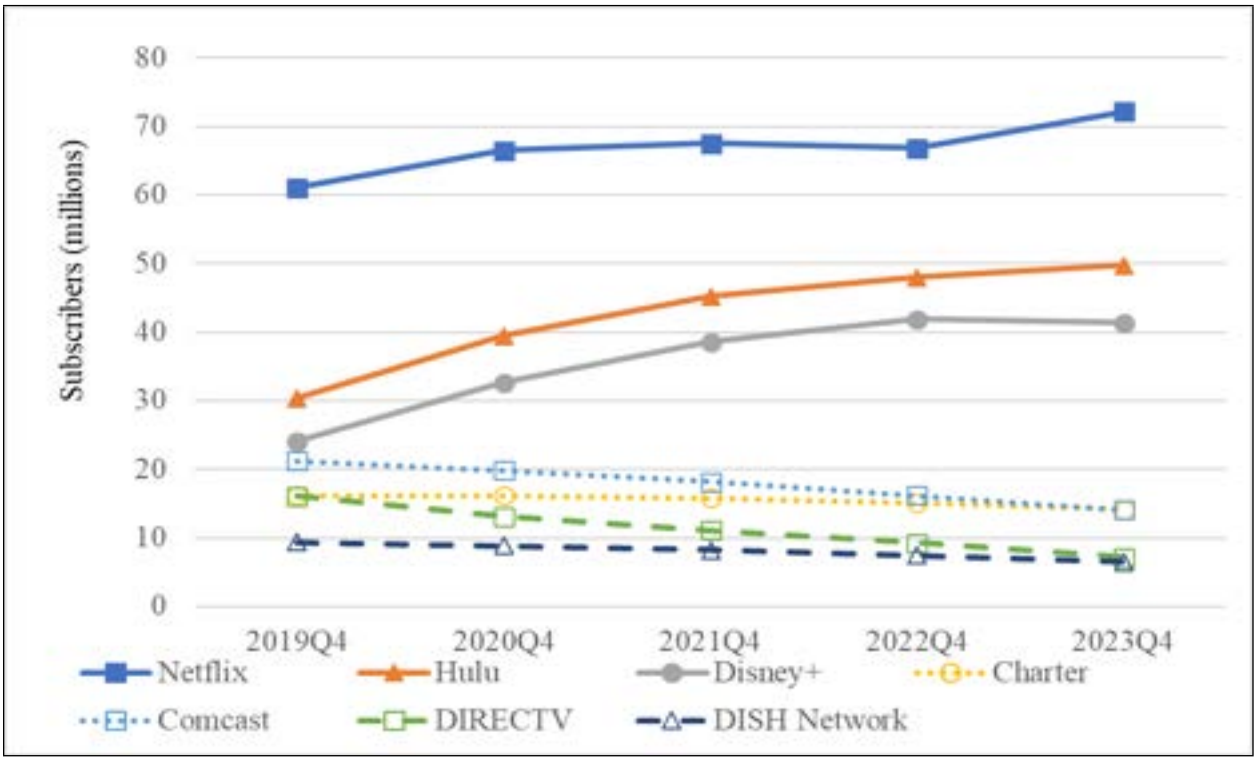
[884] FCC, *DTV Reception Maps*, https://www.fcc.gov/media/engineering/dtvmaps (last visited July 8, 2024).

[885] Nielsen, *Nielsen Launches the Media Distributor Gauge, First Convergent TV Comparison of its Kind* (May 2024), https://www.nielsen.com/news-center/2024/nielsen-launches-the-media-distributor-gauge-first-convergent-tv-comparison-of-its-kind/#:~:text=The%20Gauge%E2%84%A2%20is%20Nielsen's,media%20distributor%20across%20these%20categories.

[886] Nielsen, *Nielsen's May 2024 Report of the Gauge: Young Sheldon Creates a Big Bang Across Platforms* (June 2024), https://www.nielsen.com/news-center/2024/the-gauge-may-2024-young-sheldon-covergent-tv-win/. The remaining percentage of television use involves other unmeasured uses, such as gaming.

[887] Nielsen, *TV Usage Rises in December; Video Gaming Drives Big Gains* (Jan. 2024), https://www.nielsen.com/insights/2024/tv-usage-rises-in-december-video-gaming-drives-big-gains/. The remaining percentage of television use involves other unmeasured uses, such as gaming.

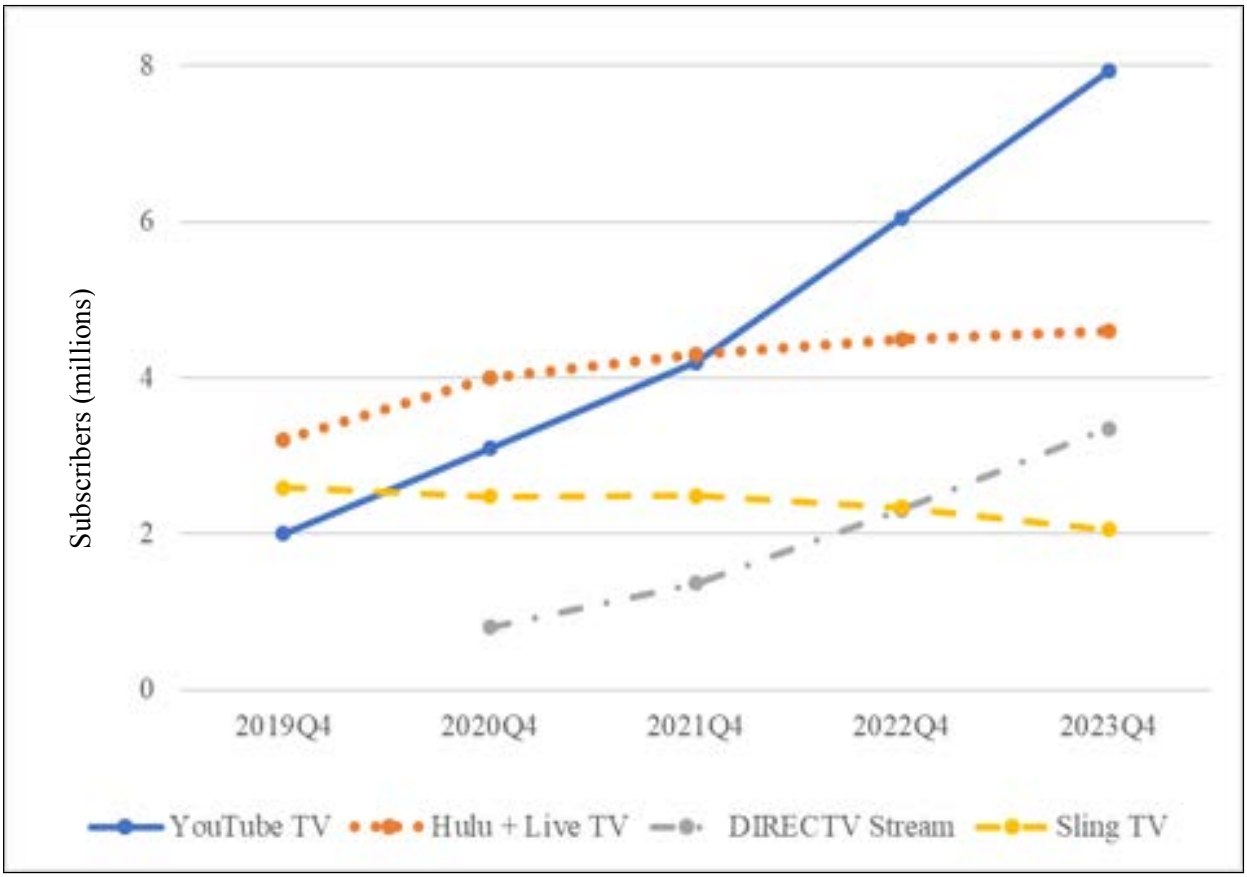
Fig. II.E.16
Video Subscribers, 2019-2023



Source: S&P Global, *Top Select US Video Subscription Services* (Mar. 2024) (last accessed May 28, 2024). Note: Amazon Prime Video is not included because Amazon subscribers includes all Prime members, including those who do not use Prime video.

271. Similarly, Figure II.E.17 shows vMVPD subscribers over the period 2019-2023. Over this period, subscribers to YouTube TV quadrupled, subscribers to DIRECTV Stream tripled, and subscribers to Hulu+Live TV grew by 40%. SlingTV subscribers declined between 2021 and 2023.

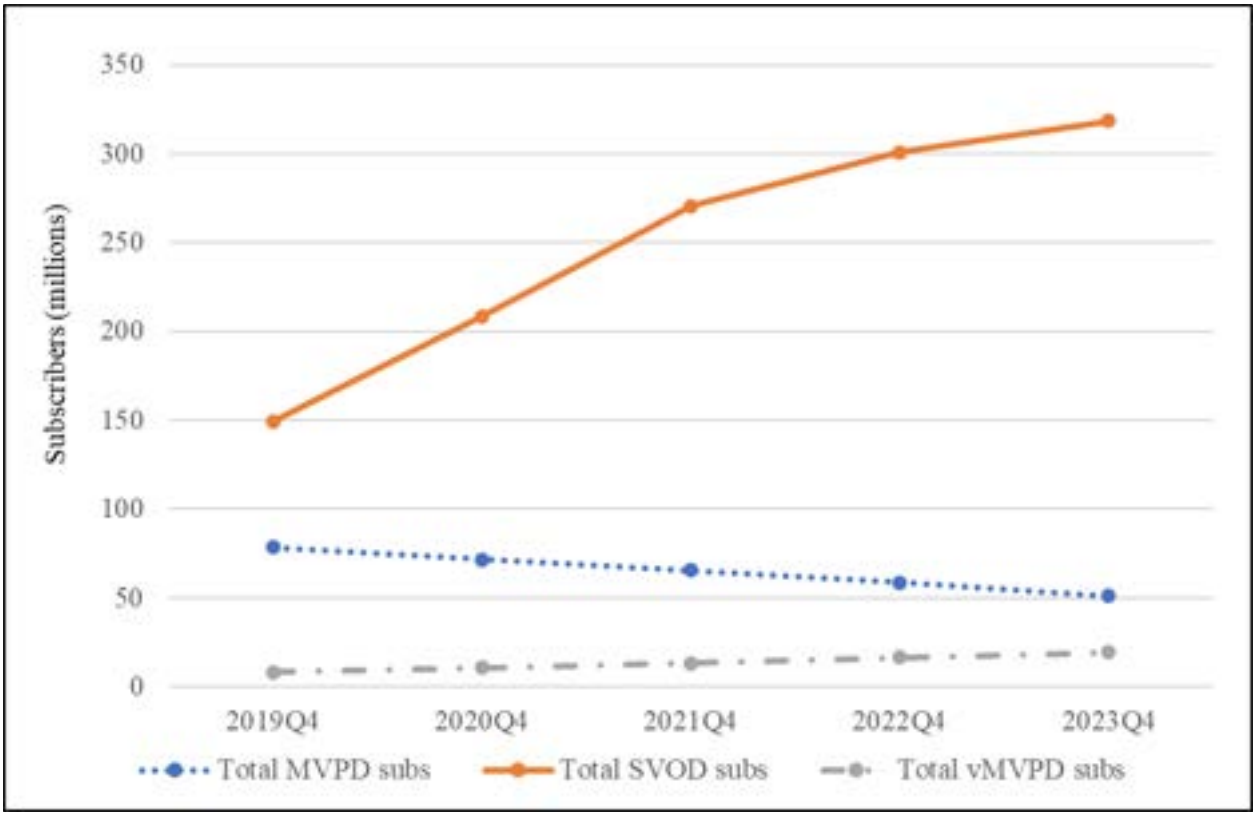
Fig. II.E.17
vMVPD Subscribers, 2019-2023



Source: S&P Global, *Top Select US Video Subscription Services* (Mar. 2024) (last accessed May 28, 2024).

272. Figure II.E.18 aggregates the information in Figures II.E.16 and II.E.17 to show total video subscriptions by service type. As discussed in previous sections, MVPD subscriptions have declined over the past five years while OVD (SVOD and vMVPD) subscriptions have doubled in this period. In the fourth quarter of 2023, there were 51 million MVPD subscriptions, 19 million vMVPD subscriptions, and 318 million SVOD subscriptions.

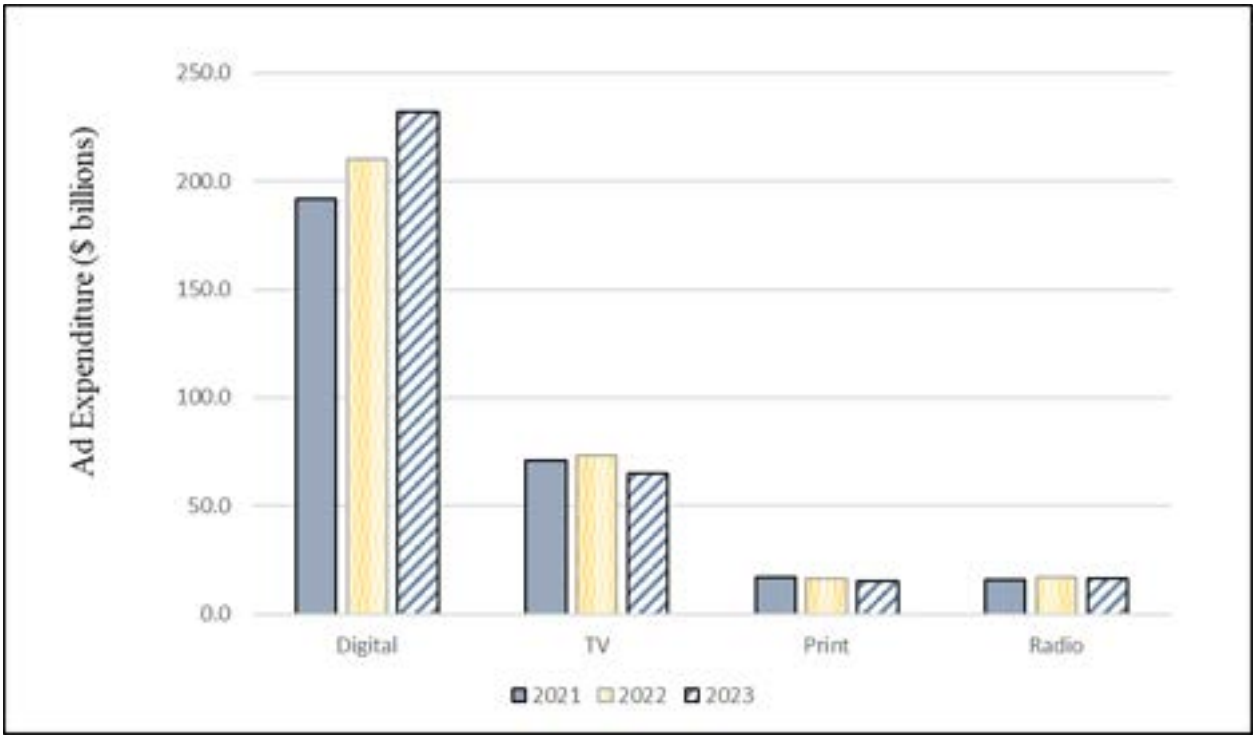
Fig. II.E.18
Video Subscriptions by Service Type



Source: S&P Global, *Top Select US Video Subscription Services* (Mar. 2024) (last accessed May 28, 2024).

273. *Advertising Expenditure.* Figure II.E.19 provides a breakdown of advertising expenditure by sector over the period 2021 to 2023. Over this time period, digital advertising spending increased by 21%, television advertising spending decreased by 8%, print advertising spending decreased by 10%, and radio advertising spending increased by 1%.

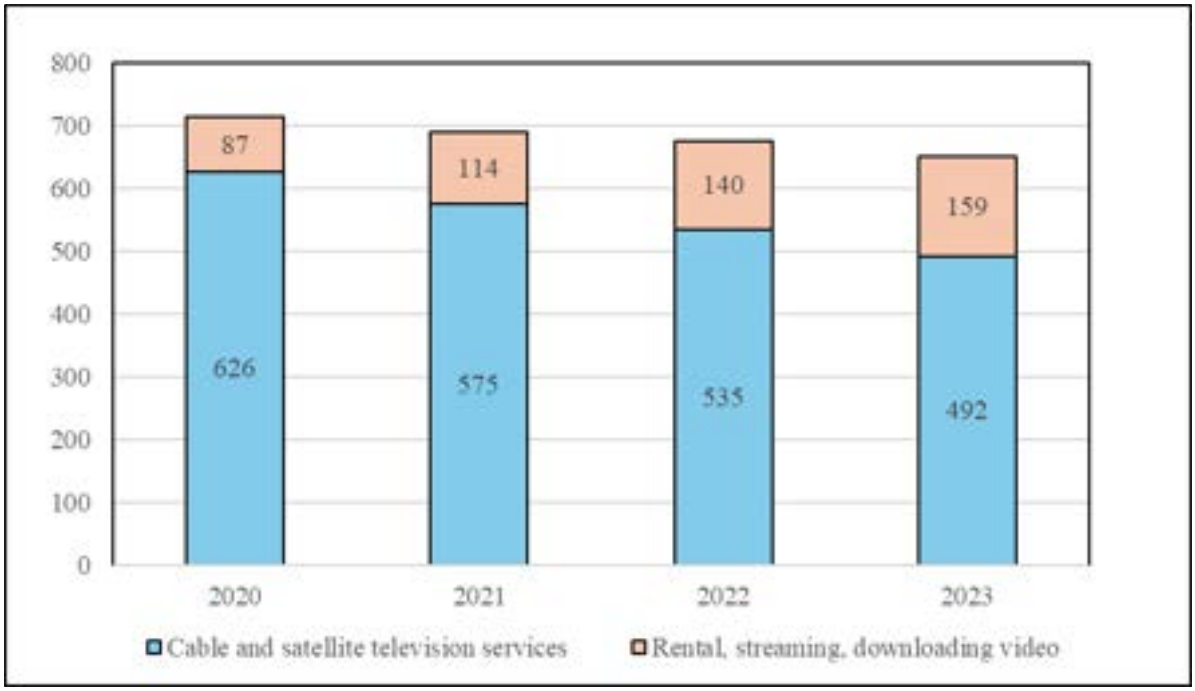
Fig. II.E.19
U.S. Advertising Expenditure, 2021-2023



Source: S&P Global, *Advertising Expenditure Forecast* (June 2024) (last accessed May 28, 2024).

274. *Household expenditure.* The U.S. Bureau of Labor Statistics (BLS) reports household spending, including on (1) cable and satellite television services and (2) rental, streaming, and downloading video. Figure II.E.20 shows overall annual spending on these two items declining from $713 in 2020 to $651 in 2023 with a decline of 21% for cable and satellite television services and a gain of 83% for rental, streaming, and downloading video during this time period.

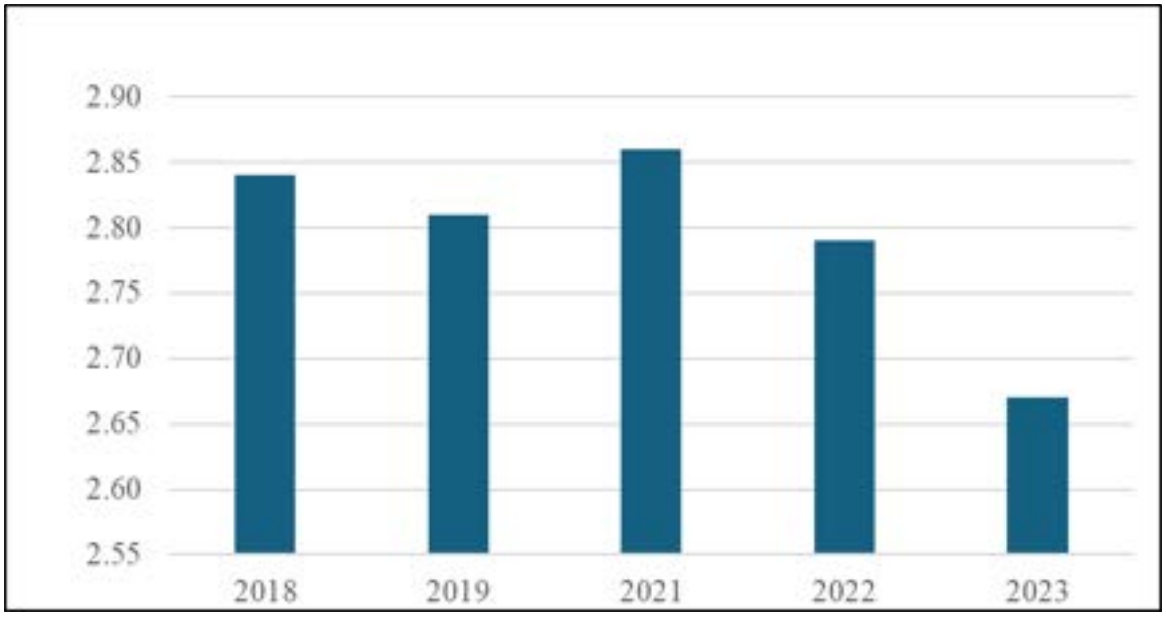
Fig. II.E.20
U.S. Household Annual Expenditure (in $) on Video and Television Services, 2020-2023



Source: U.S. Bureau of Labor Statistics, *Table R-1, All Consumer Units: Annual Detailed Expenditure Means, Standard Errors, Relative Standard Errors, and Weekly (D) or Quarterly (I) Percents Reporting, Consumer Expenditure Surveys, 2023*, https://www.bls.gov/cex/tables/top-line-means.htm (last visited Oct. 9, 2024); U.S. Bureau of Labor Statistics, *Table R-1, All Consumer Units: Annual Detailed Expenditure Means, Standard Errors, Relative Standard Errors, and Weekly (D) or Quarterly (I) Percents Reporting, Consumer Expenditure Surveys, 2022*, https://www.bls.gov/cex/tables/calendar-year/mean/cu-all-detail-2022.pdf (last visited Oct. 9, 2024); U.S. Bureau of Labor Statistics, Consumer Expenditure Surveys, *Table R-1, All Consumer Units: Annual Detailed Expenditure Means, Standard Errors, Coefficients of Variation, and Weekly (D) or Quarterly (I) Percents Reporting, Consumer Expenditure Surveys, 2021*, https://www.bls.gov/cex/tables/calendar-year/mean/cu-all-detail-2021.pdf (last visited Oct. 9, 2024); U.S. Bureau of Labor Statistics, Consumer Expenditure Surveys, *Table R-1, All Consumer Units: Annual Detailed Expenditure Means, Standard Errors, Coefficients of Variation, and Weekly (D) or Quarterly (I) Percents Reporting, Consumer Expenditure Surveys, 2020*, https://www.bls.gov/cex/tables/calendar-year/mean/cu-all-detail-2020.pdf (last visited Oct. 9, 2024).

275. BLS also reports the average hours of television watched per day by Americans, as shown in Figure II.E.21. While the COVID-19 pandemic interrupted the survey in 2020, average hours per day fluctuated between 2.67 hours in 2023 and 2.86 hours in 2021.

Fig. II.E.21
Watching Television, Average Hours Per Day



Source: U.S. Bureau of Labor Statistics, *American Time Use, 2018-2023,* https://beta.bls.gov/dataViewer/view/timeseries/TUU10101AA01014236 (last visited Sept. 16, 2024).
Note: 2020 data collection interrupted by COVID-19.

6. Report on Cable Industry Prices

276. We report herein on the average rates charged by cable operators for basic cable service and other cable programming, as well as cable equipment to access such programming,[888] as required by section 623(k) of the Communications Act of 1934, as amended by the Cable Television Consumer Protection Act of 1992 (Cable Act)[889] and the RAY BAUM's Act of 2018.[890] Consistent with the statute, the Commission is required to compare the rates of operators subject to effective competition to the rates of operators not subject to effective competition under a statutorily defined standard (hereinafter referred to as "effective competition").[891] In addition, section 110 of the STELA Reauthorization Act of 2014

[888] A "cable operator" (or operator) refers to an entity that operates a wireline system and is an MVPD that makes available for purchase, by subscribers or customers, multiple channels of video programming. 47 U.S.C. § 522(5). "Service tier" (or service) refers to a cable service for which a separate rate applies. *Id.* § 522(l7). Regarding the statutory provision for regulation of rates, operators must provide a separately available "basic cable service" (or basic service) to which customers must subscribe before accessing any other tier of service. *Id.* § 543(b)(7)(A). "Other cable programming" service means any video programming other than programming offered with the basic service or programming offered on a per channel or per program basis. *Id.* § 543(l)(2).

[889] Section 623(k), adopted as section 3(k) of the Cable Act, Pub. L. No. 102-385, 106 Stat. 1460, codified at 47 U.S.C. § 543(k).

[890] RAY BAUM'S Act of 2018, Pub. L. No. 115-141, div. P, § 402(e), 132 Stat. 1080, 1089 (amending 47 U.S.C. § 543(k)).

[891] Commission findings of effective competition generally are made in reference to a cable community identified by a cable community unit identifier (CUID). The Commission assigns a unique CUID to each community served by an operator. If two unaffiliated cable operators serve an overlapping area, the Commission assigns two CUIDs. 47 CFR § 76.1801. As discussed in Appx. E, the Commission recently changed its process and presumption for determining effective competition. In 2015, the Commission adopted a rebuttable presumption that cable operators in all cable communities are subject to effective competition. *See generally Amendment to the Commission's Rules Concerning Effective Competition, Implementation of Section 111 of the STELA Reauthorization Act*, MB Docket
(continued….)

requires the Commission to report on retransmission consent fees paid by cable systems to broadcast stations or groups.[892] The following presents an overview of the Commission's findings as of January 1, 2024, and fulfills these statutory directives. The Commission's full *Report on Cable Industry Prices*, containing additional data and information, can be found in Appendix E.

277. *Average price over all communities.* Cable prices increased over the twelve months ending January 1, 2024, at a lower rate compared to the average annual increases over the past five years. The monthly price for cable subscribers who take basic service only grew by 7.7%, to $47.06, over the year ending January 1, 2024. Over the five years ending January 1, 2024, basic prices rose by an average of 13.4% per year. Prices for expanded basic service increased by 5.9%, to $108.41 over the year ending January 1, 2024. This is similar to the average annual increase of 7.6% over the last five years. To account for growth in the number of channels offered with cable services, we also report price per channel (service and equipment lease price divided by number of channels).[893] Over the year ending January 1, 2024, price per channel for basic and expanded basic service grew by 5.5% and 5.2% to $1.21 and 89 cents per channel, respectively. In comparison to cable prices, the rate of general inflation measured by the CPI rose by 3.1% over the twelve months ending January 1, 2024, and at an average annual rate of 4.5% over the last five years.[894]

278. *Average price in communities with a finding of effective competition compared to average price in communities without a finding.* This year, there is only one community, the same community reported in the *2022 Communications Marketplace Report*,[895] without a finding of effective competition, and that community serves less than 0.1% of U.S. cable subscribers.[896] Therefore, we no longer compare prices in effective competition communities to prices in non-effective competition communities. As noted in section II.E.2.a, most households are served by at least three MVPDs.[897] Since

(Continued from previous page)
No. 15-53, Report and Order, 30 FCC Rcd 6574 (2015). As a result of this change, operators in nearly all communities became subject to effective competition. In addition, in October 2019, the Commission found, for the first time, that a cable operator was subject to effective competition from a LEC-affiliated OVD under the LEC effective competition test. *See Petition for Determination of Effective Competition in 32 Massachusetts Communities and Kauai, HI (HI0011)*, MB Docket No. 18-283, Memorandum Opinion and Order, 34 FCC Rcd 10229 (2019), *petition for review denied in Massachusetts Department of Telecommunications and Cable v. FCC*, 983 F.3d 28 (1st Cir. 2020). Rates of an operator subject to effective competition are not subject to regulation by a local franchising authority (LFA). 47 U.S.C. § 543(a)(2); 47 CFR § 76.905(a). An LFA may elect to regulate the rate of basic service of an operator not subject to effective competition. *Id.*

[892] *See* section 110 of the STELA Reauthorization Act of 2014 (STELAR). *See* Pub. L. No. 113-200, 128 Stat. 2059 (2014) enacted December 4, 2014 (H.R. 5728, 113th Cong.). Specifically, STELAR instructs the Commission to include in its now-biennial *Report on Cable Industry Prices*, "the aggregate average total amount paid by cable systems in compensation under section 325 [of the Communications Act of 1934, as amended,]" and to report such information "in a manner substantially similar to the way other comparable information is published" in the report. 47 U.S.C. § 543(k)(2).

[893] Beginning in 2022, the survey modified the question that asks for the number of channels to include only high definition channels, whereas previous surveys also included standard definition channels.

[894] U.S. Bureau of Labor Statistics, *Consumer Price Index for All Urban Consumers: All Items in U.S. City Average (CPIAUCNS)*, https://fred.stlouisfed.org/series/CPIAUCNS (last visited July 6, 2024).

[895] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15688-89, para. 293 & n.868.

[896] *See infra* Appx. E, Fig. 1.

[897] Most households are served by at least one cable operator and two DBS operators. *See supra* section II.E.2.a.

operators in all communities except one are subject to effective competition, this price comparison no longer provides any useful information.[898]

279. *Broadcast retransmission consent compensation fees*. From 2022 to 2023,[899] annual retransmission consent fees paid per subscriber increased, on average, by 16.2%, rising from $231.52 to $268.99. Average monthly retransmission consent fees per subscriber per broadcast station increased by 19%, increasing from $2.27 to $2.70 over the same period. Over the period 2013- 2023, the compound average annual increase in fees per subscriber was 27.3%.[900]

F. The Audio Marketplace

1. Overview of the Audio Programming Marketplace

280. Consumers can access audio programming from multiple sources—from terrestrial broadcast radio stations, which have existed in the marketplace for over a century, to more recent marketplace entrants, such as entities that use the Internet to deliver audio content to consumers. Distinguishing features of audio providers include the method of delivery (including access using various consumer devices), the ability to download programming rather than solely stream programming or listen live, and the type and quantity of content offered. The major participants in today's marketplace for the delivery of audio programming can be divided into three categories: terrestrial radio broadcasters, satellite radio providers, and online audio providers.[901]

281. Terrestrial radio broadcasters use terrestrial radio stations licensed by the Commission to broadcast audio programming OTA that is free to consumers, who primarily use radios to receive the stations' programming. Participants in this category include AM, FM, and Low Power FM (LPFM) radio stations. There are thousands of terrestrial radio stations in the United States, providing linear channels of music, news, sports, entertainment, educational programming, and other content.[902] As discussed below, some terrestrial radio programming is also available online via computers, smartphones, smart speakers, and other devices with access to the Internet. Terrestrial radio revenue depends primarily on advertising and has generally remained steady, except for a sharp dip in 2020 associated with the COVID-19 pandemic.[903]

282. SiriusXM is the only provider of satellite radio in the United States today and depends on both advertising and subscription revenue. The company uses satellite technology to offer subscription-

[898] Further, we cannot make a statistically valid comparison between prices in the effective competition group and prices in the noncompetitive group. When comparing average values between two groups, it is necessary to account for sampling error and this cannot be done if one of the groups has only one sampling unit.

[899] The data for retransmission consent fees are collected somewhat differently than the rest of the data in the *Report on Cable Industry Prices*. Retransmission consent fee data are collected for complete years, whereas all other data are collected as of a certain date (January 1) of the survey year and the previous year. As a result, the retransmission consent fee data are for the complete years 2022 and 2023 (the latest two years for which annual retransmission consent data were available at the time of the 2024 survey), whereas the other data in the survey are snapshots as of January 1, 2023 or January 1, 2024.

[900] The compound average annual increase is calculated by applying the following steps: (1) divide the value at the end of the period by its value at the beginning of that period; (2) raise the result to an exponent of one divided by the number of years; and (3) subtract one from the subsequent result. *See* Jason Fernando, Investopedia, *Compound Annual Growth Rate (CAGR) Formula and Calculation* (Aug. 9, 2024), https://www.investopedia.com/terms/c/cagr.asp.

[901] These three categories do not include music channels on cable and satellite TV or recorded music, such as CDs.

[902] Linear channels provide specific audio content or programs at a specific time of day. By contrast, podcasts and downloaded audio programming can be listened to at any time.

[903] S&P Global, *US TV and Radio Station Ad Projections 2023-33* (Sept. 14, 2023) (last accessed July 10, 2024).

based audio programming to consumers. Most subscribers access satellite radio programming in cars using specially designed receivers that either come standard or can be installed by the factory/dealer. Consumers can also use computers, smartphones, and other devices to access this content over the Internet. SiriusXM provides multiple linear channels of programming, including exclusive content and features.[904]

283. Online audio providers use the Internet to deliver audio programming to consumers. Consumers, in turn, access this programming using computers, smartphones, smart speakers, and other devices. Certain online audio providers offer linear audio channels similar to those offered by terrestrial radio stations. Others, such as Pandora, allow listeners to search by artist or music genre and to avoid advertisements by paying subscription fees. Certain providers also allow users to access and download audio content and listen to it at any time (e.g., podcasts). Online audio providers include larger, well-known entities, such as Apple Music and Spotify, as well as numerous other providers, some of which focus on specialty content for niche audiences. Online audio providers rely on both paid subscriptions and advertising for revenue; however, in recent years there has been a shift toward greater reliance on paid subscriptions. According to a recent report, revenue from paid subscriptions accounts for 77% of streaming music revenue.[905]

2. Terrestrial Radio Broadcasters

284. Terrestrial radio broadcasters, which include full power AM and FM radio stations and LPFM stations,[906] have long been the mainstay of the audio programming marketplace. Most radio stations broadcast analog signals OTA to consumers, with some stations also transmitting high-quality digital audio to consumers.[907] FM stations that broadcast digital signals are able to provide multiple streams of programming to consumers as well as other data, such as song information, weather updates, traffic reports, and other news. Consumers, however, must have a receiver with both an analog tuner and a digital tuner to receive all broadcast signals.[908]

285. Terrestrial radio stations must receive authorization from the Commission before they construct and operate in the United States and are subject to both the Communications Act of 1934, as amended, and regulations promulgated by the Commission thereunder.[909] In allocating and authorizing

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[904] SiriusXM, *SiriusXM*, https://www.siriusxm.com (last visited July 9, 2024).

[905] S&P Global, *Economics of Digital Music and Radio 2023* (July 13, 2023) (last accessed July 10, 2024) (*Economics of Digital Music and Radio*).

[906] The Commission created the LPFM radio service in January 2000. LPFM stations operate at a much lower power, and serve a much smaller area, than full power FM stations. FCC, *Low Power FM (LPFM) Broadcast Radio Stations*, https://www.fcc.gov/media/radio/lpfm (last visited June 3, 2024). LPFM stations are authorized for NCE broadcasting only and must be licensed to government or non-profit educational institutions; non-profit organizations, associations, or entities with an educational purpose; or government or nonprofit entities providing local public safety or transportation service. LPFM license applicants must be based in the community in which they intend to broadcast. *See* 47 CFR § 73.853; FCC, *Low Power FM Radio*, https://www.fcc.gov/consumers/guides/low-power-fm-lpfm-radio (last visited June 6, 2024). LPFM stations typically provide opportunities for local and niche programming. *See* Isha Trivedi, *Pirate Cat Radio Returns to Los Gatos—This Time With FCC Approval* (Aug. 5, 2024), https://www.siliconvalley.com/2024/08/04/pirate-cat-radio-returns-to-los-gatos-this-time-with-fcc-approval/.

[907] Digital audio transmission and reception are more resistant to interference and eliminate many imperfections of analog radio transmission and reception, while offering better sound quality than analog. FM digital radio can provide clear sound comparable in quality to CDs, and AM digital radio can provide sound quality equivalent to that of standard analog FM. FCC, *Digital Radio* (Jan. 26, 2021), https://www.fcc.gov/consumers/guides/digital-radio.

[908] *Id.*

[909] In accordance with its statutory authority, the Commission licenses broadcast spectrum to applicants and acts on applications to assign or transfer control of broadcast licenses. *See* 47 U.S.C. §§ 301, 303(c), 307(c), 308(a), 309(a), (continued….)

terrestrial radio stations, the Commission is charged with ensuring that its decisions result in a "fair, efficient, and equitable distribution" of service among states and communities.[910] In addition, licensees of terrestrial broadcast stations must comply with certain obligations and rules to ensure that the licensed spectrum is used to serve the public interest. Licenses for broadcast radio stations have an eight-year term, but licenses may be renewed by the Commission upon application by the licensee.[911]

286. As Figure II.F.1 shows, the number of AM, FM, and LPFM radio stations in the United States has remained relatively steady in recent years. New stations are possible only through new allocations and award of licenses, either through the competitive bidding process, in the case of commercial stations,[912] or a comparative system, for non-commercial stations.[913]

(Continued from previous page)
310(d). In addition, the Commission has adopted rules to ensure that the licensed spectrum is used to serve the public interest during each license term. *See generally* 47 CFR Pt. 73 Subpts. A-D, G-H; *id.* Pt. 74, Subpt. L; *see also* FCC, *The Public and Broadcasting* (Sept. 13, 2022), https://www.fcc.gov/media/radio/public-and-broadcasting; FCC, *Broadcast Radio Links* (July 17, 2024), https://www.fcc.gov/media/radio/broadcast-radio-links.

[910] 47 U.S.C. § 307(b).

[911] *Id.* §§ 307(c), 309(k); 47 CFR § 73.1020, 73.3539.

[912] *See NCE Comparative Standards Report and Order*, 15 FCC Rcd at 7427-33, paras. 101-11. The Balanced Budget Act of 1997 amended section 309(j) of the Communications Act "to require the Commission to use competitive bidding to resolve application conflicts, but exempted NCE stations from this process." *Reexamination of the Comparative Standards for Noncommercial Educational Applicants*, MM Docket No. 95-31, Memorandum Opinion and Third Order on Reconsideration, 23 FCC Rcd 17423, 17424, para. 3 (2008) (citing Balanced Budget Act of 1997, Pub. L. No. 105-33, Title III, 111 Stat. 251 (1997), amending 47 U.S.C. §§ 307(j)). With two specified exceptions not relevant here, the Commission's authority to grant licenses or permits through systems of competitive bidding expired on March 9, 2023. 47 U.S.C. § 309(j)(11).

[913] *See NCE Comparative Standards Report and Order*, 15 FCC Rcd at 7393-7420, paras. 16-79. The Commission recently adopted changes to its rules and procedures for considering competing applications for new and major modifications to NCE FM radio stations. *Reexamination of the Comparative Standards and Procedures for Licensing Noncommercial Educational Broadcast Stations and Low Power FM Stations*, MB Docket No. 19-3, Report and Order, 34 FCC Rcd 12519 (2019); *Reexamination of the Comparative Standards and Procedures for Licensing Noncommercial Educational Broadcast Stations and Low Power FM Stations*, MB Docket No. 19-3, Order on Reconsideration, 35 FCC Rcd 10180 (2020); *see also Media Bureau Announces NCE FM New Station Filing Procedures and Requirements for November 2-9, 2021, Window*, MB Docket No. 20-343, Public Notice, DA 21-885 (MB July 23, 2021).

Fig. II.F.1
Number of Licensed Broadcast Radio Stations[914]

	2020	2021	2022	2023	2024
AM	4,580	4,546	4,508	4,472	4,427
FM Commercial	6,726	6,682	6,763	6,681	6,663
FM Non-Commercial	4,172	4,213	4,119	4,219	4,320
LPFM	2,159	2,114	2,049	1,999	1,960
Total Stations	17,637	17,555	17,439	17,371	17,370

287. *Revenue*. The primary source of revenue for commercial terrestrial radio stations is advertising. To secure the highest rates and to compete for advertising market share, stations strive to gain the largest audience of listeners possible. Broadcast stations receive advertising revenue from entities seeking to reach consumers listening to programming OTA, as well as those listening on online platforms. Figure II.F.2 shows the top 10 largest radio station owners, ranked by revenue. These owners control stations that are not confined to particular geographic regions; rather, their stations are spread across various geographical markets in the United States. The numbers in Figure II.F.2 also indicate that some large owners control a number of stations within the same market, perhaps in some cases at the maximum allowable number for a market according to the Commission's rules.[915] Some commenters have noted that consolidation within markets has increased the difficulty for small or independent stations to compete for advertising dollars.[916]

[914] *Broadcast Station Totals as of March 31, 2024*, Public Notice, DA 24-323 (MB Apr. 4, 2024); *Broadcast Station Totals as of March 31, 2023*, Public Notice, 38 FCC Rcd 2507, 2507 (MB 2023); *Broadcast Station Totals as of March 31, 2022*, Public Notice, 37 FCC Rcd 4661, 4661 (MB 2022); Press Release, FCC, Broadcast Station Totals as of March 31, 2021 (Apr. 5, 2021), https://docs.fcc.gov/public/attachments/DOC-371337A1.pdf; Press Release, FCC, Broadcast Station Totals as of March 31, 2020 (Apr. 6, 2020), https://docs.fcc.gov/public/attachments/DOC-363515A1.pdf.

[915] For example, in a radio market with 45 or more stations, an entity may own up to eight radio stations, and no more than five in the same (AM or FM) service. In a radio market with between 30 and 44 radio stations, an entity may own up to seven radio stations, and no more than four of these can be in the same service. Markets with 29 or fewer stations face adjusted restrictions on the number of stations an entity can own. *See* FCC, *FCC Broadcast Ownership Rules* (Jan. 17, 2020), https://www.fcc.gov/sites/default/files/fcc_broadcast_ownership_rules.pdf; 47 CFR § 73.3555(a)(1).

[916] musicFirst/FMC Comments at 2-4.

Fig. II.F.2
Top 10 Radio Station Owners

Ultimate Parent	Stations	Markets	Total Ad Revenue (in $ millions)
iHeartMedia, Inc.	745	149	$2,422
Audacy, Inc.	211	46	$1,172
Cumulus Media Inc.	353	84	$550
Beasley Broadcast, Inc.	54	12	$233
Urban One, Inc.	49	13	$217
Hubbard Broadcasting, Inc.	33	8	$193
Townsquare Media, Inc.	225	52	$191
CMG Media Corporation	38	8	$182
TelevisaUnivision, Inc.	33	12	$148
Spanish Broadcasting, Inc.	18	7	$132

Source: S&P Global, *Top Radio Station Owners* (last accessed May 22, 2024).

288. Figure II.F.3 shows total U.S. broadcast radio revenue from 2005 to 2023. Total broadcast radio revenue was virtually flat between 2010 and 2019, going from $17.3 billion in 2010 to $17.8 billion in 2019, for an average annual growth rate of approximately 0.32%.[917] However, total broadcast radio revenue dropped to $13.7 billion in 2020, and then rose to $14.8 billion in 2021, resulting in a net decline of approximately 17% from 2019 to 2021, due largely to the drop in demand for advertising because of the COVID-19 pandemic. Revenues for more recent years, 2022 and 2023, were $15.4 billion and $15.2 billion, respectively. On the other hand, Pew Research Center has reported recent improvement in revenues since 2020 for Spanish news radio stations.[918]

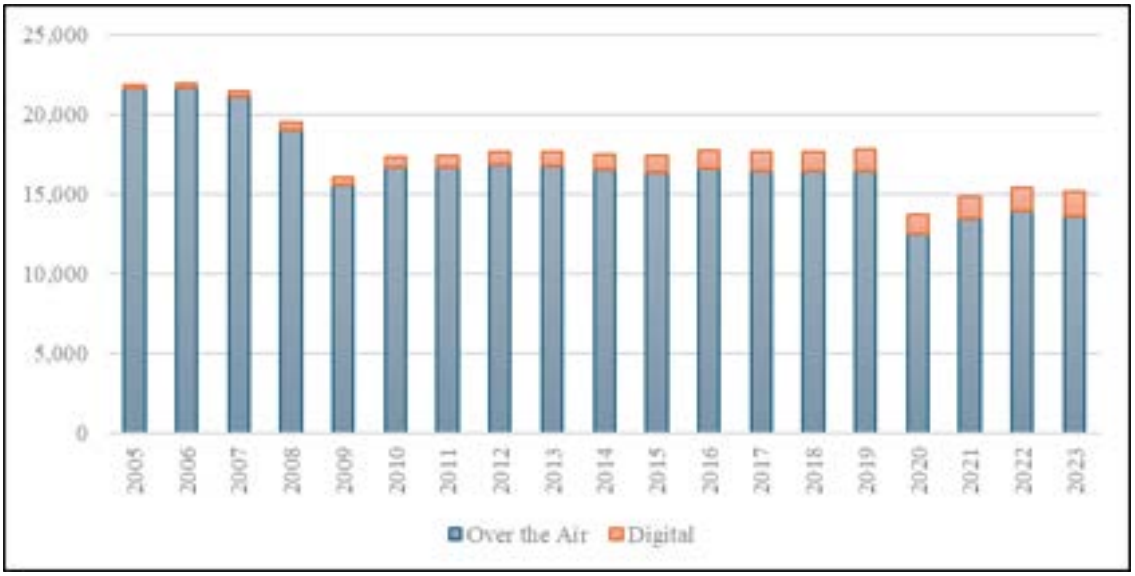
289. Further, Figure II.F.3 breaks down radio revenues between OTA radio (which includes network, national spot, and local spot advertising) and digital radio (online versions of radio broadcasts). Online broadcast radio has had more substantial revenue growth than OTA radio, i.e., an average annual growth rate of 13.1% between 2010 and 2019. The share of revenue from online advertising grew from 3.6% in 2010 to 10.0% in 2023. Online radio is an important area of growth for radio advertising revenue, especially given various new devices for accessing online radio that include smartphones, tablets, and smart speakers. A recent report indicates that iHeart media has the largest monthly audience for podcasts and the highest number of active podcast shows.[919]

[917] Total U.S. radio revenues include network, national spot, local spot, digital/online, and off-air radio advertising. Revenue for off-air advertising includes event sponsorship (e.g., concerts and contests).

[918] Pew Research Center, *Hispanic and Black News Media Fact Sheet* (Aug. 1, 2023), https://www.pewresearch.org/journalism/fact-sheet/hispanic-and-black-news-media/.

[919] *See Economics of Digital Music and Radio.*

Fig. II.F.3
U.S. Terrestrial Radio Revenue 2005-2023 (billions)



Source: S&P Global, *US TV and Radio Ad Projections, 1970-2033* (last accessed May 17, 2024).

290. *Programming.* Types of radio programming include categories of music and talk. In addition, programming may be live or recorded. Further, because terrestrial stations are located in specific geographic markets, programming may target local listeners in those markets.[920] Alternatively, some stations may choose to broadcast non-local programming that is not specifically targeted to listeners living in a particular market. Since producing a show for one market is likely more costly (per listener) than distributing the same show across stations in many markets, cost considerations may favor non-local programming.[921] On the other hand, promoting a local on-air personality as the "face" of a station may be an important way for a station to distinguish itself from other stations in its market. Some stakeholders have argued that stations that are part of a group of stations whose owner is not local to that market broadcast less programming produced in that market and may be less sensitive to the needs and interests of that market.[922]

291. Multiple radio stations are generally available to listeners within each geographic market.[923] Figure II.F.4 shows a scatterplot of the number of stations within a market against the market

[920] Because stations have a duty to serve the needs of their local communities, localism has been a cornerstone of broadcast regulations for decades. *See Broadcast Localism,* MB Docket No. 04-233, Report on Broadcast Localism and Notice of Proposed Rulemaking, 23 FCC Rcd 1324, 1328, para. 5 (2008).

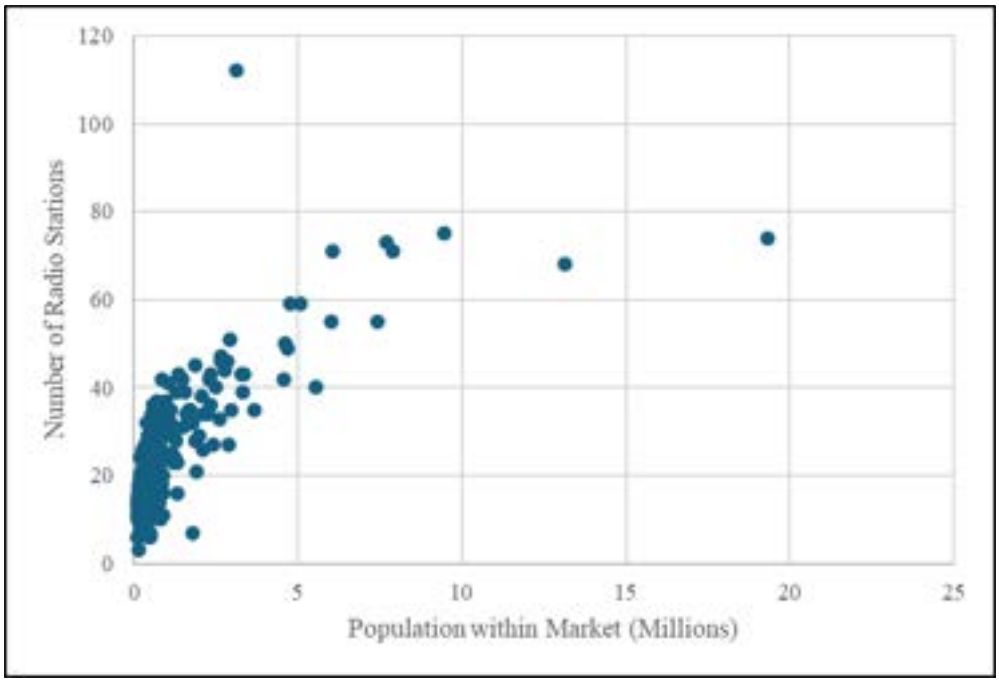
[921] This reasoning also applies to podcasting and other types of online programming. Podcasting and other online programming may offer new sources of revenue, but they are unlikely to provide additional local programming for communities.

[922] The musicFirst Coalition (musicFirst) and Future of Music Coalition (FMC) described how "listeners of commercial radio in [local] markets lose opportunities to hear locally-oriented programming reflecting diverse voices and viewpoints as a result of the cost cutting measures that have followed ownership consolidation." musicFirst/FMC Comments at 2; *see also* musicFIRST/FMC Reply at 5, 9.

[923] Terrestrial radio markets are generally named for the largest city within the geographic region, which includes areas outside the city. Such geographical markets for terrestrial radio are identified by The Nielsen Company. Nielsen, Radio Market Survey Population, Rankings & Information (2024), https://www.nielsen.com/wp-content/uploads/sites/2/2024/04/Populations_Rankings.pdf.

size, measured by population. The number of radio stations available generally increases as the market size increases, suggesting more choices in markets with higher populations.[924]

Fig. II.F.4
Number of Terrestrial Radio Stations by Market Size



Source: BIA/Kelsey, *MEDIA Access Pro Online Radio Analyzer Database* (last accessed June 3, 2024).

292. We have noted in various proceedings that AM broadcasting services face persistent interference issues.[925] Such interference may have an effect on station format choice. AM stations favor talk formats relative to music formats, which are more common on FM stations, due to the superior sound quality of the FM service. This is illustrated in Figure II.F.5, which presents the distribution of programming formats across AM, FM, and LPFM stations. More than 60% of FM stations have a music format, while only approximately 35% of AM stations have a music format. However, as Figure II.F.5 shows, AM stations favor Spanish and Ethnic, News, Sports, and Talk formats relative to FM stations. More stations with a Public and Education format use FM frequencies as opposed to AM frequencies, reflecting the fact that most NCE stations are FM stations.[926] 126 FM stations are designated Public and Education format (approximately 1.2% of all FM stations), while there are only three AM stations within that format.

[924] Not shown in the table, however, are additional choices that listeners have, including satellite and online radio, as discussed below.

[925] *See, e.g.*, *All-Digital AM Broadcasting*, Notice of Proposed Rulemaking, 34 FCC Rcd 11560, 11560-61, para. 2 (2019); *Revitalization of the AM Service*, MB Docket No. 13-249, First Report and Order, Further Notice of Proposed Rulemaking, and Notice of Inquiry, 30 FCC Rcd 12145 (2015).

[926] FCC, *The Public and Broadcasting* (Sept. 13, 2022), https://www.fcc.gov/media/radio/public-and-broadcasting#NCECOMM.

293. Figure II.F.5 also presents the distribution of programming formats for LPFM stations, which have much smaller geographic reach than conventional FM stations.[927] Because LPFM stations are authorized for NCE (including cultural) broadcasting only and serve smaller areas than full-power stations, they may provide programming of interest to listeners and community stakeholders that other FM or AM stations do not. As Figure II.F.5 shows, nearly half of LPFM stations are classified as Music stations. However, LPFM Music stations are predominantly classified in the Miscellaneous format, as opposed to music formats such as Rock and Country.[928] Further, about one-third of LPFM stations provide religious community programming (considerably more, in percentage terms, than AM or FM stations), reflecting local churches' or local religious organizations' use of the medium. Additionally, about 5% of LPFM stations are classified as Public and Education format.

Fig. II.F.5
Programming Formats for Terrestrial Radio

Format	AM	FM	LPFM
Music	35.4%	61.1%	45.8%
Spanish and Ethnic	13.9%	5.8%	11.6%
Religion	15.9%	22.9%	37.0%
Public and Education	0.1%	1.2%	4.6%
News	17.7%	6.8%	0.5%
Sports	11.3%	1.4%	0.1%
Talk	5.7%	0.8%	0.4%

Source: BIA/Kelsey, *MEDIA Access Pro Online Radio Analyzer Database* (last accessed June 3, 2024).
Notes: These data include 4,305 AM stations, 10,805 FM stations, and 1912 LPFM stations. The Music category is constructed by combining the following BIA music format categories: Adult Contemporary, Album Oriented Rock/Classic Rock, Alternative, Classical, Contemporary Hit Radio/Top 40, Country, Easy Listening/Beautiful Music, Jazz/New Age, Middle of the Road, Miscellaneous, Nostalgia/Big Band, Oldies, Rock, and Urban.

3. Satellite Radio

294. In 1995, the Commission allocated spectrum in the 2310–2360 MHz band for SDARS.[929] In 1997, the Commission established rules for the service.[930] SDARS provides nationally distributed subscription radio service and requires a significant investment of capital for operation.[931] Two SDARS

[927] LPFM stations are authorized to operate with an effective radiated power no more than 100 watts. The approximate service range of a 100 watt LPFM station is a 3.5 mile radius. *See* FCC, *Low Power FM (LPFM) Broadcast Radio Stations*, https://www.fcc.gov/media/radio/lpfm (last visited June 27, 2024).

[928] Approximately 75% of music LFPM stations are classified in the Miscellaneous music format. These stations play a wider range of music than what might fall into a particular category, such as Country, Rock, or Adult Contemporary. Thus, programming decisions on these stations likely are not restricted by a particular format or marketing strategy.

[929] *Amendment of the Commission's Rules with Regard to the Establishment and Regulation of New Digital Audio Radio Services*, GN Docket No. 90-357, Report and Order, 10 FCC Rcd 2310, 2310, para. 1 (1995).

[930] *See Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, GN Docket No. 90-357, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 12 FCC Rcd 5754 (1997).

licensees—Sirius and XM—purchased their licenses at auction, successfully launched their satellite systems, and commenced commercial service to the public.[932] In 2008, Sirius and XM merged and formed SiriusXM,[933] which is currently the only provider of SDARS in the audio marketplace. SiriusXM acquired Pandora Media, a streaming service, on February 1, 2019.[934] SiriusXM reports that it had 33.9 million U.S. subscribers and 6.0 million Pandora self-pay subscribers at the end of 2023.[935]

295. *Revenue*. Both subscription fees and advertising contribute to SiriusXM's revenues. Specifically, For 2023, Sirius XM reported approximately $6.8 billion in revenue, which included both subscriber and advertising revenue, a slight decrease from the approximately $6.9 billion SiriusXM reported in 2022.[936] Pandora's subscriber and advertising revenue for 2023 was approximately $524 million and $1.6 billion, respectively.[937] In 2023, Sirius XM reports that its total consolidated revenue, including Pandora, was approximately $9.0 billion for 2023.[938]

296. *Programming and Subscription Plans*. SiriusXM offers over 150 channels via satellite and online streaming, as well as over 250 additional channels that are available only through online streaming.[939] These channels provide content and features not available from other sources. SiriusXM offers consumers three principal subscription packages: Music & Entertainment ($23.05/month), Platinum ($29.12 per month), and Music Showcase ($16.98 per month).[940] All three packages offer access to all of SiriusXM's music channels, while the Platinum and Music and Entertainment packages also offer exclusive artist-dedicated channels, comedy channels, news channels, college sports, and traffic and weather.[941] These channels are available online and in vehicles and follow a linear format so that, like terrestrial stations, programs are scheduled to play at specific times.[942] And while such linear

(Continued from previous page)

[931] *See Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, IB Docket No. 95-91, Second Further Notice of Proposed Rulemaking, 22 FCC Rcd 22123, 22150, Appx. B (2007) (*Digital Audio Radio Satellite Service Second Further Notice*).

[932] XM began nationwide commercial service on Nov. 12, 2001; Sirius began commercial service on Feb. 14, 2002. *Digital Audio Radio Satellite Service Second Further Notice*, 22 FCC Rcd at 22123, para. 1 & n.4.

[933] *Applications for Consent to the Transfer of Control of Licenses from XM Satellite Radio Holdings Inc. to Sirius Satellite Radio Inc.*, MB Docket No. 07-57, Memorandum Opinion and Order and Report and Order, 23 FCC Rcd 12348, 12349, para. 1 (2008).

[934] Press Release, SiriusXM, SiriusXM Completes Acquisition of Pandora (Feb. 1, 2019), https://investor.siriusxm.com/news-events/press-releases/detail/1084/siriusxm-completes-acquisition-of-pandora. As a streaming service, Pandora will be discussed in the following section on online audio providers. *See infra* section II.F.4.

[935] SiriusXM Holdings, Inc., SEC Form 10-K, at 5-6 (filed Feb. 1, 2024). Self-pay subscribers are distinct from users who do not pay but instead listen to advertising.

[936] *Id.* at 41.

[937] *Id.* SiriusXM Holdings, Inc. reported that Pandora's subscriber and advertising revenue for 2022 was approximately $522 million and $1.6 billion, respectively. *Id.*

[938] *Id.*

[939] *See* SiriusXM, *Music & Entertainment,* https://www.siriusxm.com/plans/music-entertainment (last visited July 1, 2024).

[940] SiriusXM, *Popular Plans*, https://www.siriusxm.com/plans (last visited July 1, 2024).

[941] *Id.*

[942] Online channels can be accessed on multiple devices, which include smartphones, smart speakers, smart TVs, and other streaming devices. *See* SiriusXM, *Music & Entertainment*, https://www.siriusxm.com/plans/music-entertainment (last visited July 1, 2024) (navigate to "All the Ways to Listen" subheading).

programming does not include interactive features, the acquisition of Pandora has allowed SiriusXM to also offer customized music stations online.

4. Online Audio Providers

297. In addition to terrestrial broadcast radio stations and satellite-delivered radio service, audio programming delivered via the Internet has emerged as a third category in the audio marketplace. Generally, online audio providers may be classified as non-interactive or interactive, with the latter involving user choice, such as choosing specific songs and downloading content. In addition, as discussed above, both terrestrial radio broadcasters and SiriusXM have supplemented their traditional offerings with online audio services. Thus, both on-demand services (which include podcasts and music streaming) and the more traditional linear format of programming are accessible using online platforms. Edison Research recently reported that the time spent listening to on-demand services has recently surpassed time spent listening to linear programmed formats.[943]

298. *Service Offerings.* Online audio providers generally offer various service options including paid services without ads and free services with ads. In general, these providers make their content available on various mobile applications and smart speakers.[944] Spotify offers free service with advertising and several Premium packages that offer ad-free listening and the ability to download music and programming for offline playback. Spotify's Premium packages are Individual ($11.99 per month), Duo ($16.99 per month), Family ($19.99 per month), and Student ($5.99 per month).[945] Apple Music offers similar plans, including Individual ($10.99 per month) and Family ($16.99 per month).[946] SiriusXM also offers a standalone non-satellite (i.e., online audio) streaming plan called All Access ($9.99 per month).[947] Pandora continues to offer plans for listening to music and podcasts online. Pandora offers a free, ad-supported service with music and podcasts, as well as ad-free programming with Pandora Plus ($4.99 per month), and the ability to create and share playlists with Pandora Premium ($10.99 per month).[948]

299. *Revenue, Subscribers, and Usage.* Online audio providers' sources of revenue include both paid subscriptions and ad-supported options that are free to consumers. However, in recent years, a shift toward paid subscriptions has led to less reliance on advertising. This trend demonstrates a willingness by consumers to pay for monthly subscriptions to such popular streaming services as Apple Music, Spotify, Amazon Music, and Pandora. In 2022 streaming music contributed to 84% of total U.S. music industry revenue, an increase of 1 percentage point from 83% in 2021, according to the Recording Industry Association of America (RIAA).[949] RIAA also reports that paid subscriptions grew by 8% year

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[943] Edison Research has reported that, as of the second quarter of 2023, 50.3% of all daily audio time consumed by those in the United States aged 13+ was on on-demand platforms and 49.7% was on linear platforms. Edison Research, *Weekly Insights 8.23.2023 On-Demand Audio Passes Linear Audio* (Aug. 23, 2023), https://www.edisonresearch.com/weekly-insights-8-23-2023-on-demand-audio-passes-linear-audio/.

[944] Edison's Infinite Dial 2024 report found that 93% of the U.S. population aged 12 years and older owned a smartphone, smart tv, or smart speaker and 34% specifically owned a smart speaker. Edison Research, The Infinite Dial 2024 at 8, 11 (Mar. 2024), http://www.edisonresearch.com/wp-content/uploads/2024/06/Infinite-Dial-2024-Presentation.pdf (Infinite Dial 2024).

[945] Spotify, *Affordable Plans for Any Situation*, https://www.spotify.com/us/premium/#plans (last visited July 1, 2024).

[946] Apple Music, *Choose the Plan That's Right for You*, https://www.apple.com/apple-music/#plans (last visited July 1, 2024).

[947] SiriusXM, *Popular Plans*, https://www.siriusxm.com/plans (last visited July 1, 2024) (navigate to "App Only" subheading).

[948] Pandora, *Choose How You Want to Listen*, https://www.pandora.com/plans (last visited July 1, 2024).

[949] *See Economics of Digital Music and Radio.*

over year to $10.2 billion and accounted for 77% of streaming music revenues and almost two-thirds of total industry revenue.[950] On the other hand, music revenue from ad-supported, on-demand services such as YouTube, Spotify, Pandora, and others grew 6% to $1.8 billion.[951] A recent report found that the online audio brands used most often in the United States by persons aged 12 years and older include Spotify (35%), YouTube Music (19%), Pandora (13%), Apple Music (14%), Amazon Music (9%), and iHeart Radio (5%).[952]

300. *Programming*. Online audio providers allow listeners to access a wide range of music. Two of the most popular streaming services, Spotify and Apple Music, provide listeners with access to music libraries of over 100 million songs.[953] Further, the interactive nature of streaming services, where platforms gather data on users choices and music preferences, has led to the use of AI algorithms that analyze users' listening patterns to create personalized playlists that introduce listeners to new artists and genres aligned with their preferences.[954] Users of premium plans may create their own playlists or genre stations, where they may discover new music within a small preference niche. Because major competing online audio providers generally all offer a wide range of music and related programming, subscribers tend to use only a single streaming service.[955]

301. *Podcasting*. Podcasting, which offers a large variety of spoken word programming, has provided an important avenue for differentiation among online audio providers. Podcasts can be streamed at any time, in contrast to audio programs on linear channels. Podcasts feature a wide range of content and personalities, with subjects that include scientific research, slice of life journalism, self-help, fringe topics, comedy, stories, and many others. Broadcast radio station owners, SiriusXM, and pure online audio providers have been expanding into this growing audio platform.[956] Recent advances in AI technology have enhanced personalization and content creation for listeners and creators.[957] The Interactive Advertising Bureau and PwC reported that ad revenue from podcasts reached $1.9 billion in 2023 in the United States.[958] According to Edison's recent Infinite Dial report, the number of people who have listened to a podcast reached 192 million in 2024, i.e., approximately 67% of the U.S. population aged 12 years and older.[959] The same report also shows that the share of the U.S. population who have

[950] *Id.*

[951] *Id.*

[952] Infinite Dial 2024 at 34.

[953] Lexy Savvides & Vanessa Hand Orellana, CNET, *Apple Music vs. Spotify: What's the Best Music Streaming Service for You in 2024?* (Apr. 16, 2024), https://www.cnet.com/tech/services-and-software/apple-music-vs-spotify-whats-the-best-music-streaming-service-for-you/.

[954] David Henkin, Forbes, *Orchestrating the Future—AI in the Music Industry* (Dec. 5, 2023), https://www.forbes.com/sites/davidhenkin/2023/12/05/orchestrating-the-future-ai-in-the-music-industry/.

[955] A survey from S&P Global suggests that, unlike listeners consuming radio from a variety of terrestrial broadcast stations, most users of online music services tend to use just one service, especially those who use a pay music service. The survey found that of those that subscribed to a pay music service, 74% subscribed to one service only. S&P Global, *Online Music User Profile*s (July 12, 2018) (last accessed May 28, 2024).

[956] Meaghan Yuen, Emarketer, *Guide to the Podcast Industry: Top Platforms, Key Audience Stats, and Ad Trends* (July 12, 2024), https://www.emarketer.com/insights/the-podcast-industry-report-statistics/.

[957] Ashwoni Shoda, Doola, *The Future of Podcasting: Trends and Technologies to Watch* (Aug. 6, 2024), https://www.doola.com/blog/the-future-of-podcasting-trends-and-technologies-to-watch/.

[958] Interactive Advertising Bureau & PwC, U.S. Podcasting Advertising Revenue Study at 3 (May 2024), https://www.iab.com/wp-content/uploads/2024/05/IAB_US_Podcast_Advertising_Revenue_Study_FY2023_May_2024.pdf.

[959] Infinite Dial 2024 at 19.

listened to a podcast in the last month grew from 17% in 2015 to 47% in 2024.[960] According to the 2023 Infinite Dial report, 38% of US adults aged 18 years and older who have ridden in a car in the last month said they listened to podcasts in the car in 2023, up from 32% in 2022.[961]

5. Competition in Audio Programming

302. Although providers in these three main categories of audio services all deliver audio programming to consumers, there are significant differences in the availability, reach, consumer engagement, and cost of the services. In recent years, the popularity of terrestrial broadcast radio has decreased somewhat while certain online audio programming sources have become more popular. Edison Research's 2023 Share of Ear report indicated that the total share of time spent listening to AM/FM radio for Americans aged 13 years and older was 36%, while 20% of their time went to streaming music, 14% went to YouTube, 11% went to podcasts, 8% went to SiriusXM satellite radio, 4% went to owned music, 3% went to TV music channels, 3% went to audiobooks, and 1% went to "Other."[962] Commenters representing radio broadcasters have argued that the share of listeners for AM/FM radio has been declining due to increased competition from other platforms.[963]

303. *Music as Input*. As noted above, the ubiquity of music creates a challenge for music providers seeking to differentiate themselves. Streaming services allow their subscribers access to a much larger range and quantity of music than listeners can expect to hear on a terrestrial broadcast station, which is constrained to a linear format. The large range and quantity of music provided by online audio providers likely also exceeds what listeners can experience with satellite radio when the latter is confined to a linear format, despite the relatively large number of channels offered. In addition to their large libraries, online audio providers offer their subscribers the flexibility to choose particular songs anytime, create playlists, or listen to stations with song lists chosen by algorithms.

304. *Regulations*. Different audio marketplace participants are subject to different regulatory regimes. For example, because they use the public airwaves, both terrestrial broadcast radio and SDARS must comply with certain Commission regulations. These obligations are not identical and so do not impose identical regulatory costs on these licensees. Online audio providers, in contrast, do not hold Commission licenses for their services and thus do not incur the same Commission regulatory compliance costs.

305. *Music Licensing*. Different marketplace participants are subject to different music licensing conditions under law, which means they face different costs of gaining access to the music they distribute. For example, terrestrial broadcast radio stations—as non-subscription, non-interactive audio transmission—do not pay royalties to performers or sound recording copyright owners for the use of sound recordings OTA.[964] In contrast, SiriusXM pays a copyright royalty for the use of sound recordings,

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[960] *Id.* at 20.

[961] Edison Research, 25th Anniversary—The Infinite Dial at 46 (Mar. 2023), https://www.edisonresearch.com/wp-content/uploads/2023/03/The-Infinite-Dial-2023.pdf (Infinite Dial 2023).

[962] Edison Research, *The Q4 2023 Share of Ear Audio Dial* (Feb. 7, 2024), https://www.edisonresearch.com/the-q4-2023-share-of-ear-audio-dial.

[963] NAB argues that the Commission should rethink its regulatory framework in order to ensure that terrestrial radio remains viable. *See* NAB Comments at 10-13, 50-54; *see also* musicFIRST, et al. *Ex Parte* at 2 ("The Commission has an opportunity . . . to encourage smaller participants in intragroup local competition to report about their competitive struggles against larger local clusters that wield comparatively much larger market share."); musicFIRST/FMC Nov. 15, 2024 *Ex Parte* at 1-2 ("[The Commission should] publish a 2024 Communications Marketplace Report . . . and use that report to identify changes that are taking place in audio services from the perspective of users . . . as well as content providers and industry stakeholders."); musicFIRST/FMC May 15, 2024 *Ex Parte* at 2 ("[The Commission should] publish a 2024 Communications Marketplace Report that identifies transformational changes that are taking place in audio services from the perspective of users, i.e., listeners and fans of music as well as news and information, as well as providers.").

but the Digital Millennium Copyright Act granted pre-existing services such as SiriusXM a compulsory copyright license for sound recordings, the rate for which is set by the Copyright Royalty Board through a rate determination proceeding.[965] Interactive subscription services like Spotify must reach commercial agreements with music labels. Despite its higher licensing costs, Spotify's licensing cost as a percentage of its total revenue for its Premium service has declined from 73% in 2018 to 71% in 2023.[966]

306. *In Car Listening*. Before the advent of satellite radio and various streaming platforms, in-vehicle listeners of audio programming only had access to AM or FM radio. Easy access to AM/FM radio inside vehicles presented terrestrial radio with an advantage over other forms of media such as television and newspapers. However, new technology has allowed other sources of audio programming, specifically satellite radio and online audio providers, to gain a foothold, not just on new devices such as tablets and smartphones, but also within vehicles. SiriusXM radios are currently installed in approximately 160 million operating vehicles.[967] Further, listening to online audio in cars has been facilitated through mobile devices, either through integration with cellular technology or through connection with customers' smartphones.[968] Edison Research reported that, as of the second quarter of 2023, online demand audio content, which includes paid streaming, podcasts, and owned music, surpassed linear audio, which includes OTA radio, Pandora's free radio service, and satellite radio, for the first time in terms of the percentage of time spent listening to audio services for those in the United States aged 13 years and older.[969]

307. Another recent Edison survey reports the breakdown of different audio sources ever used in cars for U.S. individuals aged 18 years and older as follows: 70% have used AM/FM radio, 55% have used online audio, 32% have used podcasts, 25% have used CDs, 22% have used SiriusXM, 16% have used MP3/digital files, 16% have used Apple CarPlay, and 10% have used Android Auto.[970] Despite the dominance of AM/FM radio, the survey results show that the percentage of respondents who have ever listened to AM/FM radio in the car fell from 84% in 2013 to 73% in 2023, while the share that had ever listened to online audio (excluding podcasts) in the car had increased from 12% in 2013 to 37% in 2023.[971]

308. *Mobile Devices*. Audio streaming services such as Spotify, Pandora, and Apple Music provide their diverse music libraries and podcasts through online applications. As noted above, some terrestrial broadcast stations also provide online access to their stations, and SiriusXM makes its satellite radio service available online. Further, iHeartMedia repurposes its broadcasts as podcasts, resulting in low-cost programming that contributes additional advertising revenue.[972] iHeartMedia has also released

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[964] musicFIRST/FMC Comments at 27-28.

[965] Dana A. Scherer, Congressional Research Service, Money for Something: Music Licensing in the 21st Century at 22-23 (Feb. 2021), https://crsreports.congress.gov/product/pdf/R/R43984.

[966] Spotify Technology S.A., SEC Form 20-F, at 47 (filed Feb. 8, 2024); Spotify Technology S.A., SEC Form 20-F, at 49 (filed Feb. 12, 2019).

[967] SiriusXM Holdings, Inc., SEC Form 10-K, at 5 (filed Feb. 1, 2024).

[968] S&P Global, *Connected Car Projections through 2024: Connectivity Growing as Cars Get Smarter* (July 11, 2019) (last accessed Aug. 21, 2024).

[969] Edison Research, *Weekly Insights 8.23.2023 On-Demand Audio Passes Linear Audio* (Aug. 23, 2023), https://www.edisonresearch.com/weekly-insights-8-23-2023-on-demand-audio-passes-linear-audio/. Connoisseur Media, LLC (Connoisseur Media) highlighted this fact to underline the recent strong growth of digital audio relative to OTA audio. Connoisseur Media Reply at 3.

[970] Infinite Dial 2024 at 15.

[971] Infinite Dial 2023 at 47. Edison reported that the share of the population who had ever listened to podcasts in a car was 38% in 2023; however, this survey question was not asked in 2013.

an application for discovering new podcasts using ML inputs such as music preferences, favorite stations, and liked songs.[973]

309. Some online audio providers have even stronger relationships (in some cases through direct ownership) with the most popular device manufacturers. A recent report noted that Apple's more than 1.5 billion mobile devices globally facilitated such offerings as Apple Music.[974] Spotify, in turn, has partnered with electronics manufacturer Samsung to integrate Spotify into a range of devices that includes smartphones, tablets, watches, and smart speakers.[975]

310. *Smart Speakers*. Smart speakers have emerged as important devices for accessing audio programming in the home or office, and enhance many aspects of the daily lives of consumers, including those with disabilities. These devices are voice activated and are able to connect with smartphones, tablets, smart switches, smart thermostats, smart doorbells, smart TVs, and other smart entertainment devices, or computers via Wi-Fi and Bluetooth. Smart speakers are used for a variety of purposes, which include playing music, getting the news, listening to a podcast, setting a timer/alarm, operating other smart devices within the home, making announcements, being used as a house intercom system, and requesting miscellaneous information such as recipes. For music, consumers can choose to listen to a particular AM or FM station or a streaming service such as Spotify or Amazon music. According to Edison, the top three smart speakers in the United States are: Amazon Alexa (owned by 28% of the population), Google Nest (owned by 12% of the population), and Apple HomePod (owned by 2% of the population).[976] Edison also reported that 34% of the U.S. population aged 12 years and older, or approximately 98 million people, own a smart speaker while 60%, or approximately 172 million people, owned a radio set.[977] Another study reported that, for the U.S. population aged 13 and older, the share of time spent listening to audio programming through a smart speaker increased 400% from 2017 to 2022, and the share of time spent listening to podcasts through a smart speaker increased 200% over the same time period.[978] This study also reported that the share of smart speaker owners who have listened to news on their smart speaker increased from 55% in spring 2019 to 66% in spring 2022.[979]

311. We note that smart speakers are produced by companies that also own major audio streaming service platforms. For example, Amazon produces and sells its Echo smart speaker; Google and Apple manufacture and distribute the Google Nest and Apple HomePod smart speakers, respectively. This connection is relevant, given that, as noted above, paid subscribers of streaming music or podcasting are likely to subscribe to just one service. Figure II.F.6 shows the share of different online services used most often according to which smart speaker they own (Amazon Alexa or Google Nest). The chart indicates that Alexa owners are more likely to subscribe to Amazon Music, and Google Nest owners are more likely to subscribe to YouTube Music (which is owned by Google). However, the differences are modest. Further, Spotify has the highest share of online subscribers but does not manufacture a smart speaker. The differences in subscriptions between the other online services and among different smart

(Continued from previous page)

[972] John Fletcher, Rob Parungo & Theodore Vincent Calaor, S&P Global, *Economics of Mobile Music, 2020* (July 2, 2020) (last accessed Aug. 21, 2024).

[973] *See id.*

[974] *Id.*

[975] Spotify, *Spotify and Samsung's Partnership Gives Users More Ways To Listen* (Aug. 16, 2022), https://newsroom.spotify.com/2022-08-16/spotify-and-samsungs-partnership-gives-users-more-ways-to-listen/.

[976] Infinite Dial 2023 at 11. The percentages in the text are of the U.S. population, ages 12 and older.

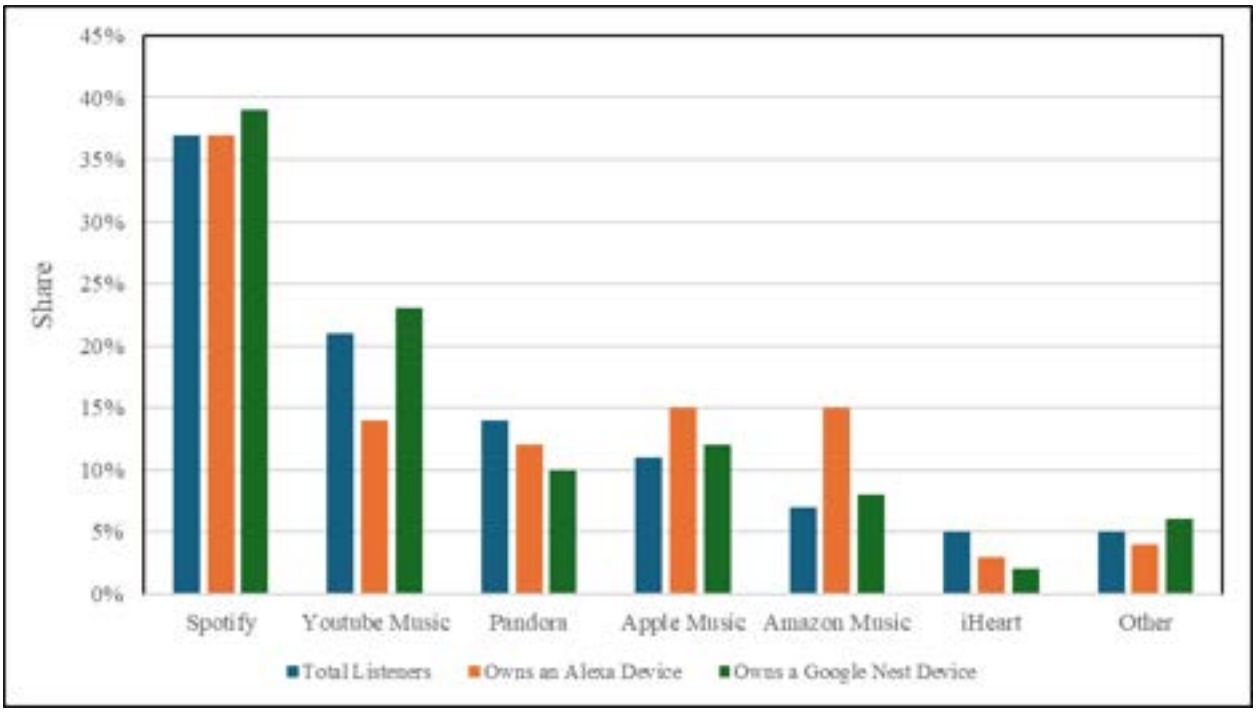
[977] Infinite Dial 2024 at 14.

[978] Edison Research and National Public Radio, The Smart Audio Report at 23 (June 2022), https://www.nationalpublicmedia.com/insights/reports/smart-audio-report/.

[979] *Id.* at 31.

speaker owners appear slight. Overall, it appears that manufacturing a smart speaker provides only a modest advantage in the marketplace for audio services.

Fig. II.F.6
Online Audio Services Used Most Often



Source: Infinite Dial 2023 at 42.

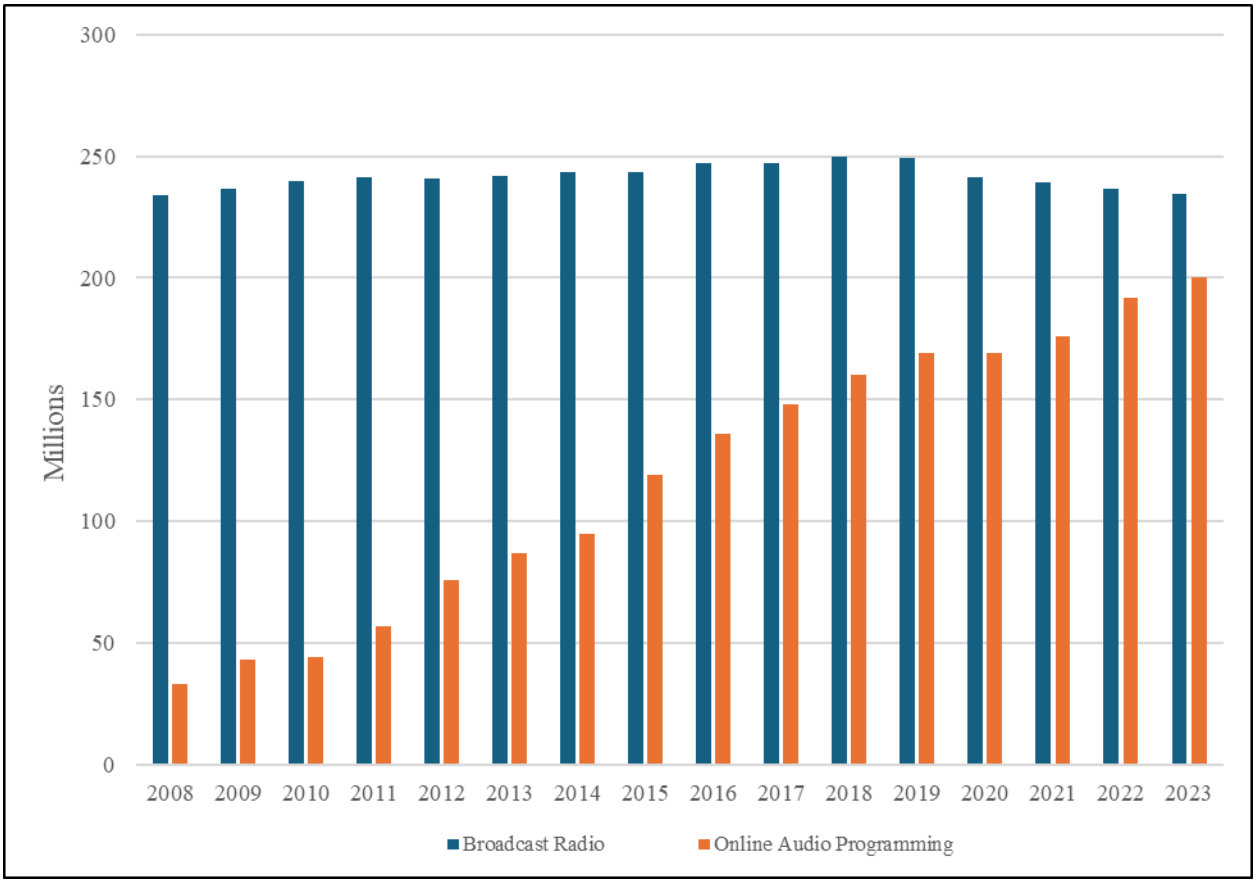
312. *Overall Listenership.* While terrestrial broadcast radio remains dominant in some respects, as Figure II.F.7 illustrates, the gap in usage between broadcast and online audio programming has declined over time.[980] Figure II.F.7 shows that the number of weekly listeners to broadcast radio in the United States remained relatively stable, while the audience for online audio programming grew steadily. According to this figure, over the past decade, the number of listeners of terrestrial broadcast radio fell slightly, by approximately 0.3% on average, while the annual growth in online audio listeners was approximately 13%.[981] However, since 2019, the number of weekly listeners of broadcast radio has fallen by approximately 1.4% on average. The COVID-19 pandemic likely played a role here. However, one report has suggested that more remote work and less commute time has impacted in-car radio time; the report also noted that that new cars, especially hybrids and EVs, deprioritize radio in the dashboard and in some cases lack AM antennas.[982] Such factors could impede a recovery of AM/FM listenership to pre-pandemic levels.

[980] *Economics of Digital Music and Radio.*

[981] It is important to note that online audio programming includes AM or FM broadcasts accessed online.

[982] S&P Global, *Radio/TV Station Annual Outlook* at 2 (Sept. 14, 2023) (last accessed July 10, 2024).

Fig. II.F.7
U.S. Terrestrial Radio and Online Audio Programming Weekly Audience (millions), 2008-2023



Source: S&P Global, *Economics of Digital Music and Radio 2023* (July 13, 2023) (last accessed July 10, 2024).

III. ASSESSMENT OF BROADBAND SERVICE AVAILABILITY

313. We assess in this section the availability of communications capabilities as required by RAY BAUM'S Act of 2018.[983] We also provide comparative international data on broadband services, and, where possible, a year-to-year measure of the extent of broadband service capability, including speeds and prices, in the United States and select communities and countries abroad.[984] Finally, this section provides a summary of regulatory developments in select communities and countries abroad.

A. Access to Advanced Telecommunications Capability

314. In Figures III.A.1 through III.A.7 below, we provide estimates of broadband service availability[985] for fixed and mobile services from 2020 to 2023.[986] Our analysis relies on FCC Form 477

[983] 47 U.S.C. § 163(b)(2). This assessment is not intended to fulfill the Commission's statutory responsibility under section 706 of the Telecommunications Act of 1996 to "determine whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion." *Id.* § 1302(b).

[984] *Id.* § 1303(b). The Broadband Data Improvement Act, Pub. L. No. 110-385, 122 Stat. 4096 (2008), is codified in Title 47, Chapter 12 of the United States Code. *Id.* § 1301, et seq.

[985] Unless otherwise noted, the service availability percentage estimate for fixed terrestrial services and mobile service is the population with coverage for the service divided by the total population in the area being considered (e.g., United States, all rural areas, all urban areas, and Tribal areas).

deployment data for year-end 2020 and 2021 and FCC BDC service availability data for year-end 2022 and 2023. We consider service availability in all 50 states, the District of Columbia, and U.S. Territories.[987]

315. *Speed Tiers*. In this *Report*, we provide service availability estimates for fixed terrestrial services at speeds of 100/20 Mbps and 940/500 Mbps.[988] The analysis of mobile services focuses on the availability of 5G-NR with minimum speeds of 35/3 Mbps, which is the highest mobile speed currently collected by the BDC.[989] Specifically, we will analyze the provider-reported 5G-NR outdoor stationary coverage based on the FCC BDC data from December 31, 2022, and December 31, 2023, where service providers claim to provide 5G-NR mobile broadband service at speeds of at least 35/3 Mbps.[990]

316. *Satellite Services*. We find that the FCC Form 477 deployment data and FCC BDC service availability data for satellite broadband services may overstate the extent to which satellite broadband is available. The December 2023 FCC BDC availability data indicate that satellite service offering 100/20 Mbps speeds is available to almost 100% of the U.S. population. However, FCC Form 477 data indicate that satellite services have a relatively low subscription rate despite their apparent widespread availability, and satellite capacity limits the number of subscribers that can be served without service degradation.[991] Given this, and unless stated otherwise, our analysis in this section is based on all fixed terrestrial services and does not include satellite services.

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[986] We present additional service availability data for fixed terrestrial and/or mobile broadband services in Appx. F. *See infra* Appx. F-1 (reporting Service Availability of Fixed Services (includes Satellite) at Different Speed Tiers in the United States); Appx. F-2 (reporting Service Availability of Fixed Broadband by State, County, and County Equivalent, Segmented by Rural and Urban Areas); Appx. F-3 (reporting Service Availability of Mobile Broadband by State); Appx. F-4 (reporting Service Availability of Mobile Broadband by State, County, and County Equivalent Segmented by Rural and Urban Areas); Appx. F-5 (reporting Service Availability of Fixed Terrestrial Broadband and Mobile 5G-NR with a Minimum Advertised Speed of 7/1 Mbps by State); Appx. F-6 (reporting Service Availability of Fixed Terrestrial Broadband and Mobile 5G-NR with a Minimum Advertised Speed of 35/3 Mbps by State); Appx. F-7 (reporting Service Availability of Fixed Terrestrial Broadband at 100/20 Mbps and Mobile 5G-NR with a Minimum Speed of 35/3 Mbps By State and County); and Appx. F-8 (reporting Service Availability of Fixed Terrestrial Broadband at 100/20 Mbps and Mobile 5G-NR with a Minimum Speed of 35/3 Mbps By State and County Segmented by Urban and Rural Areas).

[987] Estimates for 2020 and 2021 may differ from those presented in prior *Reports* as these figures now include U.S. territories. *2022 Communications Marketplace Report*, 37 FCC Rcd at 15712-13, para. 343 & n.989.

[988] *2024 Section 706 Report* at 13, 26, paras. 22, 47. For purposes of this *Report*, we use a download speed of 940 Mbps rather than 1 Gbps because that is the maximum advertised download speed reported in the FCC BDC availability data by two of the largest providers of fixed terrestrial broadband service. This is also what the Commission reported in the *2022 Communications Marketplace Report*. *2022 Communications Marketplace Report*, 37 FCC Rcd at 15533, para. 31 & n.64. As noted above, 100/20 Mbps is the Commission's fixed speed benchmark for advanced telecommunications capability under section 706 of the Telecommunications Act of 1996, and 1000/500 Mbps is the Commission's long-term fixed broadband speed goal.

[989] *2024 Section 706 Report* at 41-42, para. 71.

[990] While we focus our analysis in the main body of the Report on the 5G-NR outdoor stationary coverage at speeds of 35/3 Mbps, we also analyze other deployed provider-reported FCC BDC coverage data for mobile broadband (e.g., 5G-NR 35/3 Mbps in-vehicle, 5G-NR 7/1 Mbps outdoor stationary and in-vehicle; 4G LTE 5/1 Mbps outdoor stationary and in-vehicle) in Appx. F.

[991] FCC Form 477 subscription data indicate that between December 2022 and December 2023, consumer subscriptions for satellite services at any speed increased slightly from approximately 1.9 million to approximately 2.0 million. The adoption rate for satellite services is just over 1.6%. *See supra* Fig. II.A.5. While satellite coverage may enable operators to offer services to wide swaths of the country, overall satellite capacity may limit the number of consumers that can actually subscribe to satellite service at any one time. *2022 Communications Marketplace Report,* 37 FCC Rcd at 15704, para. 332 & n.963.

317. *Census Geography Changes.* In this *Report*, we use both 2010 census-based geographies (year-end data for 2020) and 2020 census-based geographies (year-end data for 2021, 2022, and 2023). For year-end 2020 and 2021, we use FCC Form 477 data and service availability is determined at the census block level; thus, deployment based on the aggregation of block-level data does not represent identical geographies compared to service availability in 2022 and 2023.[992] Further, the block relationship between a 2010 census block and a 2020 census block can be one-to-one,[993] one-to-many,[994] or many-to-one.[995] Therefore, some of any change in service availability between 2020 and 2021 could be the result of a change in the block configuration. Moreover, because of differences between the 2020 census blocks and the 2010 census blocks,[996] there can be anomalous results at the block level that are not apparent at a more aggregated level.

1. Service Availability of Fixed Advanced Telecommunications Capability

318. Figure III.A.1 presents estimates of fixed broadband service availability for speed thresholds of 100/20 Mbps and 940/500 Mbps for the United States as a whole, as well as in urban areas, rural areas, and Tribal areas. As explained above, because of the change in census geographies during our data collection period, caution should be exercised when interpreting the change in service availability between 2020 and 2021 for urban and rural areas. In addition, due to the different natures of the two underlying data collections, the results for 2022 and 2023 should not be directly compared with previous years. Figure III.A.1 shows service availability at speeds of 100/20 Mbps has increased in the United States from approximately 93% in 2022 to approximately 95% in 2023. Further, service availability at these speeds has increased considerably both in rural areas and in Tribal areas between 2022 and 2023. In considering speeds of 940/500 Mbps, approximately 47% of the population of the United States had that

[992] The centroid methodology was employed to evaluate service availability of mobile broadband. If the geometric center point, or centroid, of the relevant geographic area is within the coverage boundary of a coverage map, then we consider that area to be "served." The methodology estimates coverage of population by aggregating the population totals for "served" areas. *2022 Communications Marketplace Report*, 37 FCC Rcd at 15621-22, para. 145 & n.495. For the years 2020 and 2021, the relevant area is the census block. *Id.* at 15705, para. 335 & n.966. For years 2022 and beyond, the relevant area is the hexagon. *2024 Section 706 Report* at 124-26, Appx. A, paras. 1-4.

[993] *See* 2020 Census Block Relationship Files Record Layouts for a description of the crosswalk between the 2010 and the 2020 census blocks. U.S. Census Bureau, *2020 Census Block Relationship Files Record Layouts*, https://www.census.gov/programs-surveys/geography/technical-documentation/records-layout/2020-census-block-record-layout.html (last visited July 19, 2024). The 2020 Census crosswalk data contain block assignment information for 11,155,486 2010 census blocks for the states, the District of Columbia, and Puerto Rico. In a one-to-one relationship, a 2010 census block is entirely coextensive with a 2020 census block. An analysis of the 2010 census block part flag variable and the 2020 census block part flag variable reveals that 5,026,787 of the 2010 census blocks have a one-to-one relationship to a 2020 census block. Measured in 2010 population, these 2010 blocks included 156.1 million residents of urban areas and 24.7 million residents of rural areas. Staff analysis.

[994] In a many-to-one relationship, multiple 2010 census blocks may intersect a single 2020 census block. An analysis of the 2010 block part flag variable and the 2020 block part flag variable reveals that 5,101,864 of the 2010 census blocks have this type of mapping. Measured in 2010 population, these 2010 blocks included 54.9 million residents of urban areas and 20.6 million residents of rural areas. Staff analysis.

[995] In a one-to-many relationship, a single 2010 census block may intersect multiple 2020 census blocks. Staff analysis of the 2020 crosswalk indicates that 1,026,835 of the 2010 census blocks have a one-to-many relationship with a 2020 census block. Measured in 2010 population, these 2010 blocks included 41.7 million residents of urban areas and 15.3 million residents of rural areas. Staff analysis.

[996] For the United States, the 2010 Census identifies 11.155 million census blocks which have an average land area of 0.317 square miles. In contrast, the 2020 Census identified 8.175 million census blocks with an average land area of 0.433 square miles. Similarly, the 2010 Census identified 74,002 census tracts with an average land area of 47.773 square miles in the United States. In contrast, the 2020 Census identified 85,395 census tracts with an average land area of 41.412 square miles. Staff analysis.

service available to them. Service availability at these speeds has increased in urban, rural, and Tribal areas between 2022 and 2023.

Fig. III.A.1
Service Availability (Millions) of Fixed Terrestrial Services at Different Speed Tiers (2020-2023)

	2020		2021		2022		2023	
	Pop.	%	Pop.	%	Pop.	%	Pop.	%
100/20 Mbps								
United States	304.924	91.6%	316.061	94.2%	314.290	93.3%	322.559	95.3%
Rural Areas	44.876	67.9%	51.874	76.9%	49.615	72.7%	55.136	80.0%
Urban Areas	260.049	97.4%	264.187	98.5%	264.675	98.5%	267.423	99.2%
Tribal Areas	2.487	60.9%	2.998	74.0%	3.103	76.2%	3.394	82.6%
940/500 Mbps								
United States	119.577	35.9%	149.650	44.6%	135.728	40.3%	158.800	46.9%
Rural Areas	11.971	18.1%	16.153	24.0%	16.445	24.1%	22.402	32.5%
Urban Areas	107.606	40.3%	133.497	49.8%	119.283	44.4%	136.398	50.6%
Tribal Areas	0.820	20.1%	1.096	27.1%	1.118	27.5%	1.432	34.9%
Pop. Evaluated	333.018	100.0%	335.530	100.0%	336.881	100.0%	338.491	100.0%

Source: FCC BDC data, Dec. 2023; FCC BDC data, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020; Staff Block Estimates.

2. Service Availability of Mobile Broadband

319. Figure III.A.2 reports coverage for mobile 5G-NR with minimum speeds of 35/3 Mbps.[997] As explained above, because of the change in census geographies during our data collection period, we must be cautious in how we interpret the change in service availability between 2020 and 2021 for urban and rural areas. In addition, due to the different parameters of the underlying data collections, the results for 2022 and 2023 should not be directly compared with previous years. Figure III.A.2 shows that service availability for the United States as a whole increased from approximately 91% to approximately 94% between 2022 and 2023. Service availability at minimum speeds of 35/3 Mbps also increased in urban, rural, and Tribal areas.

[997] We will analyze the provider-reported 5G-NR outdoor stationary coverage based on the Commission's BDC data from December 31, 2022, and December 31, 2023, where service providers claim to provide 5G-NR mobile broadband service at speeds of at least 35/3 Mbps. While we focus our analysis in the main body of the *Report* on the 5G-NR outdoor stationary coverage at speeds of 35/3 Mbps, we also analyze other deployed provider-reported FCC BDC coverage data for mobile broadband (e.g., 5G-NR 35/3 Mbps in-vehicle, 5G-NR 7/1 Mbps outdoor stationary and in-vehicle; 4G LTE 5/1 Mbps outdoor stationary and in-vehicle) in Appx. F.

Fig. III.A.2
Service Availability (Millions) of Mobile 5G-NR with Minimum Speeds of 35/3 Mbps (2020-2023)

	2020		2021		2022		2023	
	Pop.	%	Pop.	%	Pop.	%	Pop.	%
United States	237.485	71.3%	325.149	96.9%	306.596	91.0%	317.369	93.8%
Rural Areas	28.467	43.1%	59.010	87.5%	43.855	64.3%	50.716	73.6%
Urban Areas	209.019	78.3%	266.139	99.3%	262.741	97.8%	266.653	98.9%
Tribal Areas	2.308	56.5%	3.603	88.9%	3.147	77.3%	3.335	81.2%
Pop. Evaluated	333.018	100.0%	335.530	100.0%	336.881	100.0%	338.491	100.0%

Source: FCC BDC data, Dec. 2023; FCC BDC data, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020; Staff Block Estimates.

3. Service Availability of Fixed and Mobile Broadband

320. Figure III.A.3 shows service availability across all geographic areas for fixed terrestrial services with speeds of at least 100/20 Mbps and 940/500 Mbps *and* 5G-NR mobile broadband with minimum speeds of 35/3 Mbps. In considering service availability at speeds of 100/20 Mbps fixed and 35/3 Mbps mobile, the percentage of the U.S. population with access to these speeds increased from approximately 87% to approximately 91% between 2022 and 2023. In addition, the percentage has increased in urban, rural, and Tribal areas, with the biggest increase in rural areas. In considering service availability at speeds of 940/500Mbps fixed and 35/3 Mbps mobile, the percentage of the U.S. population with access to these speeds has increased from approximately 38% to approximately 45% between 2022 and 2023. In addition, the percentage has increased in urban, rural, and Tribal areas, with the biggest increase in rural areas.

Fig. III.A.3
Service Availability (Millions) of Fixed Terrestrial and Mobile 5G-NR Services (2020-2023)

	2020		2021		2022		2023	
	Pop.	%	Pop.	%	Pop.	%	Pop.	%
100/20 Mbps Fixed and 5G-NR 35/3 Mbps Mobile								
United States	224.645	67.5%	308.660	92.0%	293.348	87.1%	307.226	90.8%
Rural Areas	20.181	30.6%	46.362	68.8%	34.331	50.3%	42.660	61.9%
Urban Areas	204.464	76.6%	262.298	97.8%	259.017	96.4%	264.567	98.1%
Tribal Areas	1.685	41.3%	2.842	70.1%	2.671	65.6%	2.997	72.9%
940/500 Mbps Fixed and 5G-NR 35/3 Mbps Mobile								
United States	93.759	28.2%	146.994	43.8%	127.590	37.9%	151.231	44.7%
Rural Areas	5.319	8.1%	14.199	21.1%	10.526	15.4%	16.229	23.5%
Urban Areas	88.440	33.1%	132.795	49.5%	117.064	43.6%	135.002	50.1%
Tribal Areas	0.562	13.8%	1.043	25.8%	0.937	23.0%	1.257	30.6%
Pop. Evaluated	333.018	100.0%	335.530	100.0%	336.881	100.0%	338.491	100.0%

Source: FCC BDC data, Dec. 2023; FCC BDC data, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020; Staff Block Estimates.

4. Additional Estimates of Fixed Service Availability

321. We provide alternative estimates based on criteria that attempt to lessen the effect of factors that could result in either understating availability in areas where satellite services are purchased by households or overstating service availability in the FCC BDC data. In Figure III.A.4, we present alternative estimates of coverage for 100/20 Mbps and 940/500 Mbps based on three scenarios that include *all* fixed technologies.[998] These alternative estimates include satellite service to the extent that the service meets the speed threshold and the scenario criteria. For comparison purposes, Scenario I presents fixed broadband coverage for all reported technologies, and takes the filer's data as released by the Commission. The two remaining scenarios include the filer's block-level data only if the filer's residential connections data meet the minimum adoption rate for the scenario. We note that our assessment of service availability requires at least one filer to satisfy the scenario criteria. Scenario II compares each filer's BDC availability data to its residential connections data and excludes the filer's availability data from the Census tract if the filer does not attain a 1% adoption rate (the filer's total number of residential connections in the tract divided by the filer's number of served households meeting the speed threshold in the census tract). Scenario III increases the adoption rate in Scenario II from 1% to 5%. Scenarios II and III analyze penetration without regard to subscription speed to account for consumers opting to subscribe to services at slower speeds than the maximum advertised speed offered by a provider.[999]

322. Figure III.A.4 presents alternative service availability estimates for three scenarios for the entire United States while also presenting estimates for urban areas, rural areas, and Tribal areas.[1000] The first column of Figure III.A.4 reports the results from the *last column* of Figure III.A.1 (availability of fixed terrestrial services for 2023). Comparing the results of the first column of Figure III.A.4 to Scenario I shows the impact of including satellite services in the service availability data, i.e., including all fixed services in the service availability estimates.

323. Comparing the results for Scenario I to Scenario II and Scenario III shows the impact on the availability estimates when the analysis excludes a filer's service availability data if the filer's connections data do not meet the adoption rate criteria for the scenario. The criteria for inclusion of a filer's service availability data becomes more stringent in Scenario III compared to Scenario II. Comparing the results for Scenario II to Scenario I suggests that our availability estimates for 100/20 Mbps would fall from 100% to approximately 98% in urban areas, from approximately 100% to approximately 73% in rural areas, and from approximately 100% to approximately 77% in Tribal areas. Imposing a 5% adoption rate test results in more significant effects on our availability estimates. Comparing the results for Scenario III to Scenario I suggests that our service availability estimates for 100/20 Mbps would fall from 100% to 98% in urban areas, from approximately 100% to approximately 69% in rural areas, and from approximately 100% to approximately 72% in Tribal areas. Hence, the impact of these criteria on our availability estimates is greater in rural areas and Tribal areas than in urban areas. Urban areas are more likely to have more providers and to have higher adoption rates, and thus are more likely to have providers that satisfy these adoption rate criteria.

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[998] These estimates include FSS. The estimates for Scenarios II and III rely on confidential FCC Form 477 residential connections (subscriber) data.

[999] As noted above, in Scenarios II and III, our decision to exclude a filer's FCC BDC availability data does not mean that such service is not available in particular location, only that the filer failed to attain the relevant adoption rate for purposes of these alternate estimates.

[1000] We also present figures showing the impact of these scenarios on the number of provider options. *See supra* Fig. II.A.29. The results in Fig. II.A.29 are measured in percentage of deployed households, while the results in Fig. III.A.4 are measured in percentage of the population.

Fig. III.A.4
Service Availability (Millions) by Scenario for Fixed Services Meeting 100/20 Mbps and 940/500 Mbps (Dec. 31, 2023)

	From Fig. III.A.1: (Excludes Satellite)		Scenario I: All Technologies		Scenario II: All Technologies, 1% Adoption Rate		Scenario III: All Technologies, 5% Adoption Rate	
	Pop.	%	Pop.	%	Pop.	%	Pop.	%
100/20 Mbps								
United States	322.559	95.3%	338.401	100.0%	315.328	93.2%	312.035	92.2%
Rural Areas	55.136	80.0%	68.849	99.9%	50.091	72.7%	47.854	69.4%
Urban Areas	267.423	99.2%	269.552	100.0%	265.237	98.4%	264.181	98.0%
Tribal Areas	3.394	82.6%	4.103	99.9%	3.173	77.2%	2.955	71.9%
940/500 Mbps								
United States	158.800	46.9%	158.800	46.9%	140.770	41.6%	128.688	38.0%
Rural Areas	22.402	32.5%	22.402	32.5%	17.009	24.7%	13.940	20.2%
Urban Areas	136.398	50.6%	136.398	50.6%	123.761	45.9%	114.748	42.6%
Tribal Areas	1.432	34.9%	1.432	34.9%	1.302	31.7%	1.167	28.4%

Source: FCC BDC data, Dec. 2023; FCC Form 477, Dec. 2023; Staff Block Population Estimates.

5. Service Availability in Tribal Areas

324. We report broadband availability estimates for federally recognized Tribal areas as identified by the 2010 Census and the 2020 Census. As we have done in prior *Reports,* we aggregate federally recognized Tribal areas into four Tribal areas categories (Alaska Native Village Statistical Areas, Federal Reservations,[1001] Hawaiian Home Lands,[1002] and Tribal Statistical Areas),[1003] and we report availability estimates for these categories separately and jointly. Figure III.A.5 shows fixed broadband availability estimates for services of 100/20 Mbps and 940/500 Mbps in Tribal areas, by rural and urban areas and by major Tribal areas category. These data suggest that while the gap in service availability between urban areas and rural areas in Tribal areas has narrowed, service availability on rural Tribal areas continues to lag behind service availability in urban Tribal areas.

[1001] These areas include: (1) Joint Use Areas; (2) legal, federally recognized American Indian Area consisting of reservation and associated off-reservation trust land; (3) legal, federally recognized American Indian Area consisting of reservation only; and (4) legal, federally recognized American Indian Area consisting of off-reservation trust land only.

[1002] Hawaiian Home Lands were established by the Hawaiian Homes Commission Act of 1921.

[1003] Tribal Statistical Areas are statistical American Indian Areas defined for a federally recognized Tribe that does not have reservation or off-reservation trust land; specifically a Tribal Designated Statistical Area or Oklahoma Tribal Statistical Area. Tribal Statistical Areas are largely located in Oklahoma, but they also include areas in California, New York, and Washington.

Fig. III.A.5
Service Availability (Millions) of Fixed Terrestrial Services at Different Speed Tiers in Tribal Areas (2020-2023)

	2020		2021		2022		2023	
	Pop.	%	Pop.	%	Pop.	%	Pop.	%
100/20 Mbps								
Tribal Areas	2.487	60.9%	2.998	74.0%	3.103	76.2%	3.394	82.6%
Rural Areas	0.926	43.1%	1.256	56.0%	1.359	60.3%	1.605	70.3%
Urban Areas	1.561	80.6%	1.743	96.4%	1.744	96.0%	1.788	97.9%
Alaska Native Village Statistical Areas	0.165	61.3%	0.182	67.0%	0.165	60.0%	0.177	64.1%
Rural Areas	0.086	49.2%	0.094	53.0%	0.079	43.8%	0.090	49.6%
Urban Areas	0.080	83.6%	0.088	93.8%	0.086	91.1%	0.087	91.8%
Federal Reservations	0.542	49.3%	0.603	55.4%	0.612	56.7%	0.702	64.4%
Rural Areas	0.296	38.7%	0.359	44.3%	0.370	46.2%	0.443	54.6%
Urban Areas	0.246	73.7%	0.244	88.2%	0.242	87.2%	0.258	92.9%
Hawaiian Home Lands	0.032	93.2%	0.034	98.9%	0.033	95.6%	0.034	96.9%
Rural Areas	0.004	65.8%	0.008	95.5%	0.007	81.8%	0.007	87.2%
Urban Areas	0.028	99.5%	0.026	100.0%	0.027	99.8%	0.027	99.9%
Tribal Statistical Areas	1.749	65.2%	2.179	82.0%	2.293	85.5%	2.481	91.6%
Rural Areas	0.541	45.0%	0.794	63.8%	0.903	71.4%	1.065	83.1%
Urban Areas	1.208	81.7%	1.385	98.1%	1.390	98.0%	1.416	99.3%
940/500 Mbps								
Tribal Areas	0.820	20.1%	1.096	27.1%	1.118	27.5%	1.432	34.9%
Rural Areas	0.399	18.6%	0.536	23.9%	0.585	25.9%	0.721	31.6%
Urban Areas	0.421	21.7%	0.561	31.0%	0.533	29.4%	0.711	38.9%
Alaska Native Village Statistical Areas	0.000	0.2%	0.014	5.2%	0.015	5.3%	0.015	5.3%
Rural Areas	0.000	0.3%	0.002	1.4%	0.003	1.6%	0.003	1.7%
Urban Areas	0.000	0.0%	0.012	12.6%	0.012	12.4%	0.012	12.3%
Federal Reservations	0.129	11.7%	0.159	14.6%	0.165	15.3%	0.224	20.6%
Rural Areas	0.087	11.3%	0.123	15.1%	0.112	14.0%	0.161	19.9%
Urban Areas	0.042	12.7%	0.037	13.2%	0.053	19.0%	0.063	22.7%
Hawaiian Home Lands	0.000	0.0%	0.007	20.2%	0.013	36.3%	0.017	47.2%

	2020		2021		2022		2023	
	Pop.	%	Pop.	%	Pop.	%	Pop.	%
Rural Areas	0.000	0.0%	0.001	9.8%	0.003	36.5%	0.004	51.7%
Urban Areas	0.000	0.0%	0.006	23.6%	0.010	36.2%	0.012	45.8%
Tribal Statistical Areas	0.691	25.8%	0.916	34.5%	0.926	34.5%	1.177	43.4%
Rural Areas	0.312	26.0%	0.409	32.9%	0.467	36.9%	0.552	43.1%
Urban Areas	0.378	25.6%	0.506	35.8%	0.459	32.4%	0.624	43.7%
Pop. Evaluated	4.083	100.0%	4.051	100.0%	4.071	100.0%	4.109	100.0%

Source: FCC BDC data, Dec. 2023; FCC BDC data, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020; Staff Block Estimates.

325. Figure III.A.6 shows the availability of mobile 5G-NR with minimum speeds of 35/3 Mbps in Tribal areas, by rural and urban areas and by major Tribal areas category. Similarly to fixed broadband, these data suggest that while the gap in service availability between urban areas and rural areas in Tribal areas has narrowed, service availability in rural Tribal areas continues to lag behind service availability in urban Tribal areas.

Fig. III.A.6
Service Availability (Millions) of Mobile 5G-NR with Minimum Speeds of 35/3 Mbps in Tribal Areas (2020-2023)

	2020		2021		2022		2023	
	Pop.	%	Pop.	%	Pop.	%	Pop.	%
Tribal Areas	2.308	56.5%	3.603	88.9%	3.147	77.3%	3.335	81.2%
Rural Areas	0.928	43.2%	1.832	81.7%	1.380	61.2%	1.557	68.2%
Urban Areas	1.380	71.3%	1.771	97.9%	1.767	97.3%	1.779	97.4%
Alaska Native Village Statistical Areas	0.110	40.9%	0.147	54.0%	0.119	43.2%	0.143	51.9%
Rural Areas	0.050	29.0%	0.075	42.1%	0.050	27.9%	0.072	39.7%
Urban Areas	0.060	62.7%	0.072	76.8%	0.068	72.7%	0.071	75.2%
Federal Reservations	0.407	37.1%	0.850	78.1%	0.693	64.3%	0.745	68.4%
Rural Areas	0.219	28.6%	0.583	71.8%	0.424	52.8%	0.480	59.1%
Urban Areas	0.188	56.5%	0.267	96.6%	0.270	97.3%	0.266	95.5%
Hawaiian Home Lands	0.010	29.3%	0.031	89.0%	0.033	94.1%	0.033	94.5%
Rural Areas	0.001	22.0%	0.006	74.8%	0.006	77.9%	0.007	79.8%
Urban Areas	0.009	30.9%	0.024	93.6%	0.026	99.1%	0.027	99.0%
Tribal Statistical Areas	1.781	66.4%	2.576	96.9%	2.303	85.8%	2.414	89.1%
Rural Areas	0.657	54.7%	1.168	93.8%	0.900	71.2%	0.999	77.9%
Urban Areas	1.124	76.0%	1.408	99.7%	1.402	98.9%	1.415	99.2%
Pop. Evaluated	4.083	100.0%	4.051	100.0%	4.071	100.0%	4.109	100.0%

Source: FCC BDC data, Dec. 2023; FCC BDC data, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020; Staff Block Estimates.

326. Figure III.A.7 shows service availability of the combination of fixed terrestrial services and mobile 5G-NR with minimum speeds of 35/3 Mbps in Tribal areas, by rural and urban areas and by major Tribal area category. Figure III.A.7 suggests that while the gap in service availability between urban areas and rural areas in Tribal areas has narrowed, service availability on rural Tribal areas continues to lag behind service availability in urban Tribal areas. Between 2022 and 2023, the percentage of the U.S. population with access to services at speeds of 100/20 Mbps fixed and 35/3 Mbps mobile increased from approximately 66% to approximately 73% in Tribal areas.

Fig. III.A.7
Service Availability (Millions) of Fixed Terrestrial and Mobile 5G-NR Services in Tribal Areas (2020-2023)

	2020		2021		2022		2023	
	Pop.	%	Pop.	%	Pop.	%	Pop.	%
100/20 Mbps Fixed and 5G-NR 35/3 Mbps Mobile								
Tribal Areas	1.685	41.3%	2.842	70.1%	2.671	65.6%	2.997	72.9%
Rural Areas	0.477	22.2%	1.123	50.1%	0.967	42.9%	1.243	54.5%
Urban Areas	1.208	62.4%	1.719	95.1%	1.704	93.8%	1.754	96.0%
Alaska Native Village Statistical Areas	0.095	35.3%	0.133	49.0%	0.099	36.1%	0.118	42.8%
Rural Areas	0.036	20.7%	0.062	34.8%	0.033	18.4%	0.049	27.1%
Urban Areas	0.059	62.0%	0.071	76.2%	0.066	69.9%	0.069	72.8%
Federal Reservations	0.271	24.7%	0.539	49.5%	0.474	44.0%	0.576	52.9%
Rural Areas	0.109	14.2%	0.296	36.5%	0.238	29.7%	0.323	39.7%
Urban Areas	0.163	48.8%	0.242	87.7%	0.237	85.4%	0.254	91.2%
Hawaiian Home Lands	0.010	28.5%	0.030	88.3%	0.031	90.5%	0.032	92.0%
Rural Areas	0.001	18.5%	0.006	72.1%	0.005	63.0%	0.006	69.3%
Urban Areas	0.009	30.8%	0.024	93.6%	0.026	98.8%	0.027	98.9%
Tribal Statistical Areas	1.309	48.8%	2.140	80.5%	2.066	77.0%	2.270	83.8%
Rural Areas	0.331	27.6%	0.759	61.0%	0.691	54.6%	0.866	67.6%
Urban Areas	0.978	66.1%	1.381	97.8%	1.375	96.9%	1.405	98.5%
940/500 Mbps Fixed and 5G-NR 35/3 Mbps Mobile								
Tribal Areas	0.562	13.8%	1.043	25.8%	0.937	23.0%	1.257	30.6%
Rural Areas	0.202	9.4%	0.493	22.0%	0.415	18.4%	0.556	24.4%
Urban Areas	0.360	18.6%	0.551	30.4%	0.522	28.7%	0.700	38.3%
Alaska Native Village Statistical Areas	0.000	0.0%	0.004	1.3%	0.008	2.8%	0.009	3.3%
Rural Areas	0.000	0.0%	0.001	0.4%	0.001	0.4%	0.001	0.7%
Urban Areas	0.000	0.0%	0.003	3.2%	0.007	7.4%	0.008	8.3%
Federal Reservations	0.057	5.2%	0.135	12.4%	0.116	10.8%	0.176	16.1%
Rural Areas	0.023	3.0%	0.098	12.1%	0.065	8.1%	0.115	14.1%
Urban Areas	0.034	10.3%	0.037	13.2%	0.051	18.6%	0.061	22.1%
Hawaiian Home Lands	0.000	0.0%	0.006	16.5%	0.012	33.8%	0.015	43.8%

	2020		2021		2022		2023	
	Pop.	%	Pop.	%	Pop.	%	Pop.	%
Rural Areas	0.000	0.0%	0.001	7.2%	0.002	27.9%	0.003	40.1%
Urban Areas	0.000	0.0%	0.005	19.5%	0.009	35.6%	0.012	45.0%
Tribal Statistical Areas	0.505	18.8%	0.899	33.8%	0.801	29.9%	1.056	39.0%
Rural Areas	0.179	14.9%	0.393	31.6%	0.347	27.5%	0.437	34.1%
Urban Areas	0.326	22.0%	0.506	35.8%	0.454	32.0%	0.619	43.4%
Pop. Evaluated	4.083	100.0%	4.051	100.0%	4.071	100.0%	4.109	100.0%

Source: FCC BDC data, Dec. 2023; FCC BDC data, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020; Staff Block Estimates.

B. International Broadband Data Report[1004]

327. As part of its statutory requirement, the Commission must include "information comparing the extent of broadband service capability (including data transmission speeds and price for broadband service capability) in a total of 75 communities in at least 25 countries abroad for each of the data rate benchmarks for broadband service used by the Commission to reflect different speed tiers."[1005] The Commission must choose international communities comparable to various communities in the United States with respect to population size, population density, topography, and demographic profile.[1006] The Commission is required to include "a geographically diverse selection of countries" and "communities including the capital cities of such countries."[1007] The Commission must "identify relevant similarities and differences in each community, including their market structures, the number of competitors, the number of facilities-based providers, the types of technologies deployed by such providers, the applications and services those technologies enable, the regulatory model under which broadband service capability is provided, the types of applications and services used, business and residential use of such services, and other media available to consumers."[1008]

328. *Selection of Comparison Countries.* We reviewed 35 Organisation for Economic Co-operation and Development (OECD) countries that meet the statutory directive of developing a geographically diverse set of countries for comparison with the United States concerning international broadband services capability. These 35 OECD countries in alphabetical order are: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.[1009] For the fixed and mobile deployment comparison, we report on 26

[1004] The full IBDR is attached as Appx. G.

[1005] 47 U.S.C. § 1303(b)(1).

[1006] *Id.* § 1303(b)(2). Fig. IV.C.2 depicts how the average proportion of the U.S. population with coverage by fixed terrestrial services at different speed tiers varies with median household income, population density, and the household poverty rate at the census block group level. On average, deployment is highest in census blocks with the highest median household incomes, the highest population densities, and the lowest household poverty rates. *See infra* Fig. IV.C.2.

[1007] 47 U.S.C. § 1303(b)(2)(A), (B).

[1008] *Id.* § 1303(b)(3).

European comparison countries. For the fixed and mobile broadband speed and performance comparison, we present data for 35 comparison countries. For the fixed and mobile broadband pricing comparisons, we report on a smaller subset of 25 comparison countries.[1010] A complete list of comparison countries is presented in section I of Appendix G.

1. Broadband Deployment Comparison

329. In section II of Appendix G, we compare fixed high-speed broadband deployment and mobile broadband deployment in the United States and 26 European comparison countries. We rely on the European Commission (EC) deployment data published in the 2023 Broadband Coverage in Europe Report and the FCC BDC and FCC Form 477 deployment data for the United States.[1011] Because they are collected under different methodologies and definitions, we cannot make comparisons between the FCC BDC and FCC Form 477 data.

330. *Fixed Broadband Results—Speed-Tier Results*. The United States ranked 17th, 10th, and 8th out of 27 countries in the percentage of total households[1012] with access to fixed broadband with a download speed greater than 30 Mbps, 100 Mbps, and 1 Gbps, respectively, in 2023.[1013]

331. *Fixed Broadband Results—Technology-Specific Results.* The United States ranked 22nd and 20th out of 27 countries in the percentage of total households and rural households, respectively, with access to FTTP in 2023, with approximately 42% of total households and approximately 30% of rural households having access to FTTP. The United States ranked 4th and 5th out of 27 countries in the percentage of total households and rural households, respectively, with access to fixed broadband through either DOCSIS 3.0 or 3.1 technology in 2023, with approximately 87% of total households and approximately 50% of rural households having access to either DOCSIS 3.0 or 3.1.

332. *Mobile Broadband Results*. The United States ranked 11th and 14th out of 27 countries in the percentage of total households and rural households, respectively, with access to 5G-NR networks in 2023, with approximately 97% of total households and approximately 85% of rural households having access to 5G-NR networks.

2. Broadband Speed and Performance Comparison

333. In section III of Appendix G, based on Ookla Speedtest datasets, we present a comparison of fixed broadband and mobile broadband performance metrics in terms of data transmission

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[1009] OECD, *Members and Partners*, https://www.oecd.org/en/about/members-partners.html (last visited Aug. 9, 2024) (navigate to the "Member countries" subsection in order to obtain the list of member countries).

[1010] The countries excluded from the pricing analysis are Chile, Hungary, Israel, Japan, Lithuania, Poland, Slovakia, Slovenia, South Korea, and Turkey. Due to the time-intensive nature of collecting both fixed broadband and mobile broadband pricing data from multiple providers in each country, we limited the pricing analysis to the same countries analyzed in the *2022 International Broadband Data Report. See 2022 Communications Marketplace Report*, 37 FCC Rcd at 16336, Appx. G-1: International Broadband Data Report, para. 2.

[1011] EC, Broadband Coverage in Europe 2023 (July 2024), https://digital-strategy.ec.europa.eu/en/library/digital-decade-2024-broadband-coverage-europe-2023 (2023 Broadband Coverage in Europe Report) (the report and associated data can be accessed by clicking on the appropriate item listed under the "Downloads" sub header). For FCC Form 477 data, a provider that reports offering service in a particular census block may not offer service, or service at that speed, to all locations in the census block. Accordingly, the number of providers presented in this *Report* does not necessarily reflect the number of choices available to a particular household and does not purport to measure competition.

[1012] "Total households" include both urban and rural households.

[1013] To keep the speed tiers consistent across countries, we use 1 Gbps as the threshold for the highest download speed tier for fixed broadband services. If a provider's plan has a download speed of 940 Mbps, it is not included in the 1 Gbps tier for the international comparisons.

speeds (download and upload speeds) and latency for the United States and the 35 comparison countries. For fixed broadband, we examine all technologies accounted for by Ookla,[1014] and for mobile broadband, we examine 4G LTE and 5G-NR. Our analysis covers a five-year time horizon for fixed broadband and for 4G LTE, but we only consider three years of data for 5G-NR.[1015] We rank speeds from the fastest (1st) to the slowest (36th) and latency from the lowest (1st) to the highest (36th).

334. *Fixed Broadband Results.* The mean download speed in the United States in 2023 was 271.4 Mbps, ranking 6th out of 36 countries—an improvement from a ranking of 9th out of 36 countries in 2021 when the mean download speed was 195.5 Mbps. The mean upload speed in the United States in 2023 was 111.8 Mbps, ranking 18th of 36 countries—no change in ranking since 2021. For mean latency, although the United States slipped from a ranking of 29th out of 36 countries in 2021 to a ranking of 31st out of 36 countries in 2023, the mean latency in the United States improved from 21.3 ms in 2021 to 20.6 ms in 2023.

335. *Mobile Broadband—4G LTE Results.* For mean download speeds, the United States ranked 26th out of 36 countries in 2023, with a mean download speed of 51.3 Mbps, a decline in ranking of 23rd out of 36 countries in 2021. For mean upload speeds, the United States had the slowest mean upload speed out of 36 countries in 2023. The mean upload speed in the United States in 2023 was 8.8 Mbps, a decrease from 9.9 Mbps in 2021. For mean latency, the United States ranked 34th in 2023, with the mean latency of 45.3 ms, increasing from a mean latency of 41.5 ms in 2021.

336. *Mobile Broadband—5G-NR Results*. The mean download speed in the United States in 2023 was 243.9 Mbps, ranking 16th out of 36 countries. The mean upload speed in the United States in 2023 was 22.6 Mbps, ranking 32nd out of 36 countries. For mean latency, the United States ranked 32nd out of 36 countries in 2023, with a mean latency of 32.6 ms.

3. Broadband Pricing Comparison

337. In section IV of Appendix G, we present analyses of fixed broadband and mobile broadband prices for the United States and 25 comparison countries. We collected fixed broadband and mobile broadband prices from the websites of the largest providers in each country between January and June of 2024.[1016] We compare broadband prices using two methods: (1) a broadband price index; and (2) a hedonic broadband price index. The broadband price index ranks countries by their weighted average price, while the hedonic price index accounts for quality differences as well as country-level cost and demographic differences, such as population density, income, topography, and education levels, which are likely to affect pricing across countries. These analyses seek to provide meaningful broadband pricing comparison across countries. We rank the countries from the least expensive (1st) to the most expensive (26th) based on the two price indexes.

338. *Fixed Broadband Results.* Based on the broadband price index approach, without adjusting for cost, quality, and demand factor differences across countries, the United States ranked 8th among the 26 comparison countries for the weighted combination of the standalone and bundle plans of fixed broadband service. Using the hedonic price index approach, which adjusted for cost, demographics, and broadband plan characteristics, the United States ranked 11th among the 26 countries. The U.S.

[1014] Ookla does not specify which technologies are included in their fixed results because Ookla is unable to distinguish the technology that the test taker is using. Data based on Wi-Fi-using devices are included in these results.

[1015] We present three years of data on 5G (2021 through 2023) because 5G deployment was limited in most countries prior to 2021.

[1016] We collected fixed residential broadband plan prices and terms from 87 providers in 26 countries, including the United States, between April and June of 2024. We also collected mobile broadband plan prices and terms from 84 providers from 26 countries, including the United States, between January and March of 2024.

ranking remained at 11th after adding additional controls for fixed broadband network quality to the hedonic model.

339. *Mobile Broadband Results.* Based on the broadband price index approach, without adjusting for cost, quality, and demand factor differences across countries, the United States ranked 25th among the 26 comparison countries in single-line plan pricing, 24th in multi-line pricing, and 25th in the overall pricing across single-line and multi-line plans of mobile broadband services. However, using the hedonic price index approach which adjusted for cost, demographics, and mobile broadband plan characteristics, the United States ranked 19th among the 26 countries. The ranking of the United States remained the same at 19th out of the 26 countries after adding additional controls for mobile network quality to the hedonic model.

4. International Regulatory Developments

340. We discuss several new market and regulatory developments, including national broadband, satellite, and 5G and 6G developments.[1017] We limit our discussion to developments that have occurred since the last *Report*, and identify the relevant similarities and differences between the United States, the comparison countries, and others, based on multiple criteria.[1018]

341. *National Broadband Developments*.[1019] The number of Internet users grew to 5.4 billion in 2023 (approximately 2.8 billion male and 2.6 billion female users), and is projected to hit 5.5 billion by the end of 2024, equivalent to 67% of the total global population.[1020] Still, 2.6 billion people remain offline, with an estimated 38% of individuals worldwide having access to, but not using, mobile broadband coverage where they live and 5% of the population still not covered by mobile broadband.[1021] As new and more advanced technologies become available, many countries are updating their national broadband agendas to account for new and innovative applications and services such as 5G, IoT, and AI. For example, in May 2024, the European Union's (EU) Gigabit Infrastructure Act (GIA) entered into force.[1022] The GIA seeks to promote easier network deployment by simplifying and reducing infrastructure access and permitting processes, and easing coordination between communications operators and utility providers, and it is intended to support the EU's Digital Decade target on connectivity, which seeks to ensure everyone across the EU has access to Gigabit connectivity by 2030.[1023] The EU has also been working to enhance IoT cybersecurity, under the EU Cyber Resilience

[1017] 47 U.S.C. § 1303(b)(3) ("The Commission shall identify relevant similarities and differences in each community, including their market structures, the number of competitors, the number of facilities-based providers, the types of technologies deployed by such providers, the applications and services those technologies enable, the regulatory model under which broadband service capability is provided, the types of applications and services used, business and residential use of such services, and other media available to consumers.").

[1018] *See 2022 Communications Marketplace Report,* 37 FCC Rcd at 15727-37, paras. 364-84.

[1019] According to the ITU, due to not renewing or expirations at the end of 2022, 155 countries had national broadband plans, down from 165 in 2021. *See* Broadband Commission for Sustainable Development, The State of Broadband: Digital Connectivity, A Transformative Opportunity at 9 (Sept. 2023), https://www.broadbandcommission.org/publication/state-of-broadband-2023. The United Nations Broadband Commission for Sustainable Development has set seven global broadband targets, including a target for all countries to have a funded national broadband plan or strategy, or to include broadband in their universal access and services definition, by 2025. *Id.* at 9, 15, 19, 22, 29, 33, 37.

[1020] Broadband Commission for Sustainable Development, The State of Broadband 2024: Leveraging AI for Universal Connectivity at 3 (June 2024), https://www.broadbandcommission.org/publication/state-of-broadband-2024/.

[1021] *Id.*

[1022] EC, *Gigabit Infrastructure Act* (May 15, 2024), https://digital-strategy.ec.europa.eu/en/policies/gigabit-infrastructure-act.

Act, which introduces mandatory cybersecurity requirements for IoT product manufacturers and retailers.[1024]

342. The United Kingdom is similarly targeting gigabit connectivity to 85% of the UK premises by 2025 and to 100% of premises by 2030.[1025] In 2023, the UK had 5.7 million full fiber lines, which is an increase of 53% from the previous year, accounting for 20% of the UK's 28.5 million fixed broadband lines.[1026] Consumers in the UK have also experienced higher speeds through their fiber connections.[1027] In 2023, 88% of home broadband lines delivered speeds of 30 Mbps or higher, while 10% delivered speeds of 300 Mbps or higher.[1028]

343. The Government of Canada, through an initiative titled High-Speed Access for All: Canada's Connectivity Strategy, continues providing access to broadband at speeds of at least 50 /10 Mbps, and mobile wireless coverage for consumers across the country.[1029] Canada is also committed to bridging the digital divide and complements this strategy with its Economic Development Strategy for Rural Canada, which aims to bring universal 50/10 Mbps Internet speeds to all rural, remote households, and Indigenous communities, and to strengthen cell coverage for consumers using a variety of technologies including fiber optics, LEO satellites, and 5G wireless networks.[1030] In December 2023, 93.5% of households in Canada had access to minimum Internet speeds of 50/10 Mbps.[1031] The Government of Canada projects that 100% of Canadians will have access to high-speed Internet (50/10 Mbps) by 2030.[1032]

344. Countries in the Asia-Pacific region are also making significant strides in broadband deployment. As of March 2024, Japan had approximately 54.6 million fixed broadband subscriptions, with fiber-to-the-home (FTTH) and Fiber LAN lines remaining the dominant technologies.[1033] Additionally, LEO satellite services are being used to provide backhaul for 5G networks in mountainous and remote island regions.[1034] A total of 188.9 million mobile connections were active in Japan in early

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[1023] *Id.*

[1024] EC, *EU Cyber Resilience Act* (July 8, 2024), https://digital-strategy.ec.europa.eu/en/policies/cyber-resilience-act.

[1025] UK Parliament, *Gigabit Broadband in the UK: Government Targets, Policy, and Funding* (July 3, 2023), https://commonslibrary.parliament.uk/research-briefings/cbp-8392/.

[1026] Ofcom, Communications Market Report 2024 at 3 (July 18, 2024), https://www.ofcom.org.uk/siteassets/resources/documents/research-and-data/multi-sector/cmr/cmr24/communications-market-report-2024.pdf?v=370341.

[1027] *Id.*

[1028] *Id.*

[1029] Innovation, Science and Economic Development Canada (ISED), *High-Speed Access for All: Canada's Connectivity Strategy* (Oct. 24, 2024), https://ised-isde.canada.ca/site/high-speed-internet-canada/en/canadas-connectivity-strategy/high-speed-access-all-canadas-connectivity-strategy.

[1030] ISED, *Rural Opportunity, National Prosperity: An Economic Development Strategy for Rural Canada* (Aug. 22, 2024), https://ised-isde.canada.ca/site/rural/en/rural-opportunity-national-prosperity-economic-development-strategy-rural-canada.

[1031] Cison, *Government of Canada on Track to Exceed High-Speed Internet Connectivity Targets* (Dec. 28, 2023), https://www.newswire.ca/news-releases/government-of-canada-on-track-to-exceed-high-speed-internet-connectivity-targets-820140355.html.

[1032] *Id.*

[1033] TeleGeography, *TeleGeography GlobalComms Database*, https://www.telegeography.com/products/globalcomms/data/country-profiles/as/japan/fixed-broadband.html (last accessed Sept. 11, 2024).

2024, equivalent to 153.6% of the total population,[1035] and almost 79% of people in Japan owned a smartphone in 2023.[1036] In Australia, there is a dynamic shift in the fixed broadband marketplace as customers increasingly migrate to fiber networks.[1037] This infrastructure is being developed by NBN Co, the Commonwealth-owned company responsible for deploying the National Broadband Network (NBN), which utilizes a multi-technology mix including Very High-Speed DSL, fiber, HFC, fixed wireless, and satellite.[1038] As a result, the DSL sector is steadily shrinking as customers transition to the NBN.[1039] In India, the government announced an additional $13 billion investment in 2023 for its National Broadband Mission,[1040] and the Telecom Regulatory Authority of India announced that the total number of broadband connections reached approximately 924 million in March 2024.[1041] The Indian government is also considering a bill that would enable free Internet access to every Indian citizen.[1042] Under the bill, the central government would be required to either directly provide free Internet access or fully subsidize the services offered by operators.[1043]

345. In Africa, South Africa, Rwanda, and Kenya have made significant strides incorporating emerging technologies in their national broadband plans and strategies, leveraging these technologies to increase connectivity. South Africa's AI strategy encourages collaboration with the private sector to promote IoT and the adoption of AI in industry, government, and public services, including smart cities and agriculture.[1044] For instance, in January 2024, inq., a South African Convergence Partners company, announced AI and IoT solutions for advanced video analytics, aimed at improving security and customer insights, and enhancing safety with AI-driven surveillance systems.[1045] Rwanda's government and private

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[1034] Globe Newswire, *Japan Telecoms Telecoms, Mobile and Broadband Market Report 2024: Japan's MNOs Step Up 5G Deployments* (June 14, 2024), https://www.globenewswire.com/news-release/2024/06/14/2898827/28124/en/Japan-Telecoms-Telecoms-Mobile-and-Broadband-Market-Report-2024-Japan-s-MNOs-Step-Up-5G-Deployments.html.

[1035] Simon Kemp, DataReportal, *Digital 2024: Japan* (Feb. 21, 2024), https://datareportal.com/reports/digital-2024-japan.

[1036] Statista, *Share of People Who Own Smartphones in Japan from 2014 to 2023*, https://www.statista.com/statistics/996309/japan-ownership-rates-smartphones (last visited Aug. 9, 2024).

[1037] Yahoo Finance, *Australia Telecoms Market Statistics and Analyses Report 2024: Aussie Telcos Contract with SpaceX for National Mobile Coverage* (June 13, 2024), https://finance.yahoo.com/news/australia-telecoms-market-statistics-analyses-135900235.html.

[1038] *Id.*

[1039] *Id.*

[1040] Sev Sadura, Belden/PPC, *Looking at the Future of Fiber Broadband in 2024*, https://www.ppc-online.com/blog/future-of-fiber-broadband-in-2024 (last visited Sept. 4, 2024).

[1041] Kamya Pandey, Medianama, *TRAI Subscription Data: Total Broadband Connections in India Rise by 0.80% in March 2024* (May 6, 2024), https://www.medianama.com/2024/05/223-trai-subscription-data-total-broadband-connections-march-2024/#:~:text=TRAI%20subscription%20data%3A%20Total%20Broadband,by%200.80%25%20in%20March%202024&text=The%20total%20broadband%20connections%20in,(TRAI)%20latest%20subscription%20data.

[1042] Gagandeep Kaur, Light Reading, *India to Discuss Bill that Would Provide Free Internet for All* (July 25, 2024), https://www.lightreading.com/digital-divide/india-to-discuss-bill-that-would-provide-free-internet-for-all.

[1043] *Id.*

[1044] Department of Communications and Digital Technologies (South Africa), South Africa's Artificial Intelligence (AI) Planning: Adoption of AI by Government at 2, 16, 37, 46 (Oct. 2023), https://www.dcdt.gov.za/images/phocadownload/AI_Government_Summit/National_AI_Government_Summit_Discussion_Document.pdf.

sector are leveraging IoT, AI, and Big Data to address challenges in connectivity, healthcare, e-governance, education, and agriculture.[1046] In April 2024, the country approved a five-year national AI policy, allocating $76.5 million to advance AI in these fields, among others.[1047] The government also introduced a smart ID system (Single Digital ID) and announced plans to establish a state-of-the-art data storage facility.[1048] Kenya is leveraging emerging technologies to enhance connectivity and digital services, supporting sectors such as agriculture, health, and education.[1049] The country is using AI for dynamic spectrum management, particularly for 5G networks,[1050] and is enhancing the Kenyan agricultural market through IoT sensors, remote farm monitoring, and smart irrigation systems.[1051] Additionally, in April 2024, the United States Department of Commerce announced a partnership with the Kenyan Ministry of Information, Communication, and the Digital Economy to harness and promote AI, facilitate data flows, and empower digital upskilling.[1052]

346. In the Middle East, Saudi Arabia's Vision 2030 outlines goals that include investing in cutting-edge network infrastructure such as 5G core technology and cloud solutions; increasing investments in IoT, network slicing, and cloud-native solutions; and building AI-friendly ecosystems.[1053] Vision 2030 also supports more ambitious goals, such as project NEOM, the country's $500 billion smart city initiative.[1054] Project NEOM aims to transform over 10,000 square miles of territory near the Red Sea into a high-tech, sustainable urban region, leveraging technologies like AI and renewable energy.[1055]

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[1045] ITWeb, *inq. SA Unveils Cutting-Edge AI, IoT Solutions for Digital Age* (Jan. 17, 2024), https://www.itweb.co.za/article/inq-sa-unveils-cutting-edge-ai-iot-solutions-for-digital-age/RgeVDqPRW5N7KJN3.

[1046] Republic of Rwanda Ministry of ICT and Innovation, The National AI Policy at 3-5 (2022), https://www.minict.gov.rw/index.php?eID=dumpFile&t=f&f=67550&token=6195a53203e197efa47592f40ff4aaf24579640e.

[1047] IGIHE, *Smart IDs, 5G, and High Computing Data Center: A Glimpse into Rwanda's Ambitious Tech Agenda for the Next Five Years* (July 3, 2024), https://en.igihe.com/news/article/smart-ids-5g-and-high-computing-data-center-a-glimpse-into-rwanda-s-ambitious.

[1048] *Id.*

[1049] The Communications Authority of Kenya, Strategic Plan 2023-2027 at 14-15 (2023), https://ca.go.ke/sites/default/files/CA/Strategic%20Plan/CA%20Strategic%20Plan%202023-2027%20Final.pdf.

[1050] The Communications Authority of Kenya, Dynamic Spectrum Access Framework for Authorisation of the Use of TV White Spaces (May 2021), https://www.ca.go.ke/sites/default/files/CA/Frequency%20Procedures/Dynamic-Spectrum-Access-Framework-for-Authorisation-of-the-use-of-TV-White-Spaces-May-2021.pdf.

[1051] GSMA, Assessment of Smart Farming Solutions for Smallholders in Low and Middle-income Countries at 27 (Aug. 2022), https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2022/08/Smart-Farming-GSMA-2.pdf.

[1052] Press Release, U. S. Department of Commerce, Joint Statement on Harnessing Artificial Intelligence, Facilitating Data Flows and Empowering Digital Upskilling Between the United States Department of Commerce and the Kenyan Ministry of Information, Communication and the Digital Economy (Apr. 24, 2024), https://www.commerce.gov/news/press-releases/2024/04/joint-statement-harnessing-artificial-intelligence-facilitating-data.

[1053] Hakan Cervell, Ericsson, *Leveraging Digital Transformation for Saudi Arabia's Economic Growth* (Feb. 6, 2023), https://www.ericsson.com/en/blog/5/2022/leveraging-digital-transformation-for-saudi-arabias-economic-growth.

[1054] *Id.*; Dan Avery, Architectural Digest, *Saudi Arabia Building 100-Mile-Long "Linear" City* (Jan. 26, 2021), https://www.architecturaldigest.com/story/saudi-arabia-building-100-mile-long-linear-city.

[1055] Hakan Cervell, Ericsson, *Leveraging Digital Transformation for Saudi Arabia's Economic Growth* (Feb. 6, 2023), https://www.ericsson.com/en/blog/5/2022/leveraging-digital-transformation-for-saudi-arabias-economic-

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347. *Promoting Universal Service.* The Commission has continued to expand broadband connectivity to unserved and underserved communities in the United States through its Universal Service Fund (USF) Programs.[1056] Other regulators are likewise working to provide universal service to unserved consumers within their countries, particularly to those consumers in rural and remote communities.

348. For example, the Japanese government is considering amendments to its Telecommunications Business Act that would allow the Japanese Ministry of Internal Affairs and Communications (MIC) to include fixed broadband in its universal service regime for the first time.[1057] Additionally, India's Telecommunications Act of 2023, enacted June 26, 2024, also modernizes India's telecom industry, including updates to rights of way, public safety and national security, universal service obligation funding, and consumer protection and enforcement laws.[1058]

349. In July 2024, the Croatian Regulatory Authority for Networks Industries (HAKOM) launched a public tender to request bids from companies interested in supporting the deployment of universal service across the country.[1059] The selected company would be contracted to provide affordable, high-speed broadband and voice services; public phone booths in key locations; and special pricing plans for low-income consumers.[1060]

350. Similarly, in Canada, the federal government is on track to exceed its goal of providing access to high-speed Internet to 98% of Canadian households by 2026 and 100% by 2030, due to the CAD $3.225 billion Universal Broadband Fund as well as other federal and provincial investments.[1061] As of December 2023, 93.5% of Canadian households have access to high-speed Internet compared to just 79% in 2014.[1062] Notably, in March 2023, the Canadian Radio-Television and Telecommunications Commission (CRTC) launched a consultation to improve its 2019 Broadband Fund with a focus on high-speed Internet connectivity for rural, remote and Indigenous communities.[1063] The CRTC's Broadband Fund will provide up to CAD $750 million over five years to support high speed fixed/mobile Internet connectivity projects across Canada.[1064]

351. *5G Developments.* Many countries have been approaching mobile broadband development and deployment with a particular focus on 5G infrastructure. Although commercial 5G

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growth; Dan Avery, Architectural Digest, *Saudi Arabia Building 100-Mile-Long "Linear" City* (Jan. 26, 2021), https://www.architecturaldigest.com/story/saudi-arabia-building-100-mile-long-linear-city.

[1056] *See* FCC, *Universal Service*, https://www.fcc.gov/general/universal-service (last visited July 25, 2024).

[1057] Lexology, *In Brief: Telecoms Regulation in Japan* (Sept. 14, 2024), https://www.lexology.com/library/detail.aspx?g=78280893-e6ea-4bfc-9a59-cca0a44832ba.

[1058] TeleGeography CommsUpdate, *Govt Partially Implements New Telecommunications Act* (June 26, 2024), https://www.commsupdate.com/articles/2024/06/26/govt-partially-implements-new-telecommunications-act/ (last accessed Sept. 11, 2024).

[1059] HAKOM, *Public Tender for Selecting the Universal Services Operator* (July 18, 2024), https://www.hakom.hr/en/public-tender-for-selecting-the-universal-services-operator/11813.

[1060] *Id.*

[1061] Cison, *Government of Canada on Track to Exceed High-Speed Internet Connectivity Targets* (Dec. 28, 2023), https://www.newswire.ca/news-releases/government-of-canada-on-track-to-exceed-high-speed-internet-connectivity-targets-820140355.html.

[1062] *Id.*

[1063] Press Release, CRTC, CRTC to Improve Access to Internet and Mobile Services Across Canada (Mar. 23, 2023), https://www.canada.ca/en/radio-television-telecommunications/news/2023/03/crtc-to-improve-access-to-internet-and-mobile-services-across-canada.html.

[1064] *Id.*

services are now available in every region of the world, approaches to 5G development and the status of deployment efforts continue to vary across countries. As of March 2024, there were 314 commercial 5G networks deployed worldwide, which takes into account 1.76 billion global connections.[1065] The number of 5G networks is expected to grow to 450 by 2025.[1066]

352. The Commission has focused on five key principles for delivering 5G that is fast, secure, resilient, and available everywhere in the United States: (1) making additional and appropriate spectrum available for 5G services; (2) expanding the reach of fiber facilities; (3) diversifying network equipment; (4) building secure and resilient supply chains; and (5) setting the technology standards of the future.[1067]

353. Regulators around the world have continued to allocate, auction, and/or license additional spectrum across various bands to support 5G services. All EU member states have introduced commercial 5G services in some capacity, with approximately 89% of the EU's population receiving 5G coverage as of mid-2023.[1068] While 5G service in Europe predominantly relies on 4G bands, EU member states have made significant progress in authorizing the use of certain 5G bands, including the 700 MHz and 3.6 GHz bands.[1069] Some EU member states have also authorized use of the 26 GHz band.[1070] Out of 27 Member States, 25 have awarded spectrum in the 700 MHz band, 26 have awarded spectrum in the 3.6 GHz band, and 12 have awarded spectrum in the 26 GHz band.[1071] For example, in March 2024, Croatia's HAKOM concluded its 5G auction, awarding spectrum to operators in the 800, 900, 1800, 2100 and 2600 MHz bands for national licenses and spectrum in the 3600 MHz band for regional licenses.[1072]

354. In the Americas, as of July 2024, Argentina, Brazil, Canada,[1073] Chile, Colombia, the Dominican Republic, French Guiana, Guatemala, Mexico, Peru and Uruguay have allocated, auctioned or licensed additional spectrum mainly in the 3.5 GHz band[1074] to support 5G services.[1075] For example, Argentina's three largest mobile operators secured spectrum in the country's first 5G Auction, completed in October 2023, which offered 300 megahertz of spectrum across the 3300-3600 MHz band.[1076] Also, in

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[1065] 5G Americas, *Global 5G Connections Surge to 1.76 billion, 66 Percent Growth Year Over Year as North America Leads Charge* (Mar. 28, 2024), https://www.5gamericas.org/global-5g-connections-surge-to-1-76-billion-66-percent-growth-year-over-year-as-north-america-leads-charge/.

[1066] *Id.*

[1067] *See, e.g.*, FCC, Remarks of Acting Chairwoman Jessica Rosenworcel to the 10th Americas Spectrum Management Conference at 2-3 (Oct. 12, 2021), https://www.fcc.gov/document/acting-chair-rosenworcel-americas-spectrum-management-conference.

[1068] EC, 5G Observatory Biannual Report at 6 (June 2024), https://digital-strategy.ec.europa.eu/en/library/digital-decade-2024-5g-observatory-report (navigate to "Downloads" subheader to download report).

[1069] *Id.* at 1.

[1070] *Id.*

[1071] *Id.*

[1072] European 5G Observatory, *Croatian 5G Auction Concluded* (Mar. 15, 2023), https://5gobservatory.eu/croatian-5g-auction-concluded/.

[1073] *See* Ashee Pamma, IT World Canada, *5G Spectrum Auction Concludes; Bell, Rogers and Telus Bag the Most Licenses* (Dec. 1, 2023), https://www.itworldcanada.com/article/5g-spectrum-auction-concludes-bell-rogers-and-telus-bag-the-most-licenses/554405.

[1074] *See* GSMA, 5G in Latin America: Unleashing the Potential at 47-55 (Aug. 2023), https://www.gsma.com/about-us/regions/latin-america/wp-content/uploads/2023/08/290623-5G-in-Latam-ENG.pdf.

[1075] *See* GSMA, The Mobile Economy Latin America 2024 at 22-26 (June 2024), https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-economy/wp-content/uploads/2024/06/The-Mobile-Economy-Latin-America-2024.pdf.

December 2023, Colombia concluded its spectrum auction for 5G mobile network technologies with the four main operators acquiring four 80-megahertz blocks in the 3.5 GHz band suitable for 5G.[1077] In November 2023, Innovation, Science and Economic Development Canada (ISED) published the final results of the country's 5G license auction in the 3.8 GHz band; ISED indicated a total of 4,099 licenses were awarded to 20 bidders, including 870 licenses to small and regional operators allowing them to double their spectrum holdings, when combined with the previous 3.5 GHz auction in 2021.[1078]

355. By the end of 2023, India's 5G rollout reached 738 districts and close to 100 million subscribers.[1079] In 2024, India's second 5G spectrum auction generated USD 1.35 billion.[1080] Vietnam also conducted its first 5G auction in March of 2024.[1081] Vietnam's Ministry of Information and Communications announced MobiFone as the winner of the 3800-3900 MHz spectrum license.[1082] In the same auction, Viettel won the 2500-2600 MHz license and VNPT-Vinaphone secured the 3700-3800 MHz block.[1083] Singapore's IMDA is pursuing an expansive, multi-pronged approach to 5G development and deployment, advancing the "5GSG" ecosystem through four focus areas: policy and regulatory (e.g., 5G spectrum allocation), 5G innovation (e.g., industry technical trials in strategic sectors considered most promising for 5G), 5G talent development, and 5G testbeds.[1084] And by the end of 2023, South Korea had over 31 million 5G connections, accounting for more than 48% of all mobile connections in the country.[1085] This high adoption rate is supported by widespread 5G smartphone penetration and comprehensive network coverage.[1086]

356. 5G is still in its early stages in Africa, with coverage at 6.4%[1087] and an adoption rate of around 1%.[1088] Nonetheless, 27 operators across 16 markets have launched commercial mobile 5G

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[1076] *See* Vaughan O'Grady, Developing Telecoms, *5G 3300-3600 MHz Spectrum Nets Argentina over US$875 Million* (Oct. 25, 2023), https://developingtelecoms.com/telecom-business/telecom-regulation/15685-5g-3300-3600mhz-spectrum-nets-argentina-over-us-875-million.html.

[1077] *See* Vaughan O'Grady, Developing Telecoms, *Colombia 5G Auction Sees Big Sales for 3.5 GHz* (Dec. 21, 2023), https://developingtelecoms.com/telecom-business/telecom-regulation/15987-colombian-5g-auction-sees-big-sales-for-3-5ghz.html.

[1078] *See* Jonathan Lamont, MobileSyrup, *Feds Pull in $2.1 Billion from 5G-critical 3,800 MHz Spectrum Auction* (Dec. 1, 2023), https://mobilesyrup.com/2023/12/01/feds-pull-2-billion-3800mhz-spectrum-auction/.

[1079] Kiran Rathee, The Economic Times, *5G Has Reach 738 Districts, Around 100 million Users So Far, Govt Tells Lok Sabha* (Dec. 6, 2023), https://economictimes.indiatimes.com/industry/telecom/telecom-news/5g-has-reached-738-districts-around-100-million-users-so-far-govt-tells-lok-sabha/articleshow/105786570.cms?from=mdr.

[1080] Telecom Review, *India's Second 5G Spectrum Auction Yields Disappointing USD 1.35 Billion Outcome* (July 1, 2024), https://www.telecomreviewasia.com/news/industry-news/4359-india-s-second-5g-spectrum-auction-yields-disappointing-usd-1-35-billion-outcome/.

[1081] TeleGeography CommsUpdate, *MobieFone Secures 5G Spectrum License* (July 11, 2024), https://www.commsupdate.com/articles/2024/07/11/mobifone-secures-5g-spectrum-licence/ (last accessed Sept. 11, 2024).

[1082] *Id.*

[1083] *Id.*

[1084] Infocomm Media Development Authority, *About 5G Innovation* (Aug. 21, 2023), https://www.imda.gov.sg/how-we-can-help/5g-innovation.

[1085] GSMA, *5G in Asia Pacific: Deployment Momentum Continues* (July 31, 2023), https://www.gsma.com/get-involved/gsma-membership/gsma_resources/5g-in-asia-pacific-deployment-momentum-continues/.

[1086] *Id.*

[1087] *See* ITU, Africa: Population Coverage, By Mobile Network Technology, https://datahub.itu.int/data/?e=1&i=100095&s=34236 (last visited July 22, 2024).

services,[1089] a significant increase from just five markets in 2021.[1090] More are expected to follow, with operators in an additional 10 countries committed to launching 5G in the coming years.[1091] In addition, several countries have awarded spectrum for 5G services. In 2023 alone, Namibia awarded spectrum in the 700 MHz and 800 MHz bands to Loc8 Mobile, Telecom Namibia Limited, and Mobile Telecommunications Limited.[1092] Uganda awarded spectrum in the 800 MHz, 2300 MHz, and 2600 MHz bands to Airtel and MTN.[1093] 5G FWA has also emerged as an important technology for operators aiming to address the gap in last-mile fixed broadband connectivity. For example, Safaricom launched its commercial 5G FWA service in Kenya to expand its presence in the home broadband segment.[1094] Telkom SA launched a 5G FWA service in Johannesburg, deploying 123 5G base stations.[1095]

357. Operators around the world are increasingly considering using Open RAN to upgrade their networks to 5G.[1096] For example, in December 2023, 1&1 activated its services, in partnership with Rakuten and Mavenir, becoming Germany's first fully virtualized mobile network, based entirely on Open RAN technology.[1097] 1&1 labels its network as Europe's first commercial, fully virtualized 5G Open RAN mobile network.[1098] Similarly, in February 2024, Japanese mobile phone operator NTT DOCOMO selected Amazon Web Services to support its nationwide 5G Open RAN deployment.[1099] The Japanese government, with support from Japanese industry and the U.S. government, announced in April 2024 that it would provide at least $8 million to support Open RAN field trials and the Asia Open RAN Academy based in Manila to enable future commercial deployment and an open, interoperable, secure, reliable, and trusted Information and Communications Technology (ICT) ecosystem in the Philippines.[1100]

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[1088] GSMA, 5G in Africa 2023: Market Status, Trends, and Outlook at 11 (Oct. 2023), https://event-assets.gsma.com/pdf/5G-in-Africa-2023.pdf.

[1089] GSMA, The Mobile Economy: Sub-Saharan Africa 2023 at 26 (2023), https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-economy/wp-content/uploads/2023/10/20231017-GSMA-Mobile-Economy-Sub-Saharan-Africa-report.pdf.

[1090] GSMA, The Mobile Economy: Sub-Saharan Africa 2021 at 2 (2021), https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-economy/wp-content/uploads/2021/09/GSMA_ME_SSA_2021_English_Web_Singles.pdf.

[1091] GSMA, 5G in Africa 2023: Market Status, Trends, and Outlook at 8 (Oct. 2023), https://event-assets.gsma.com/pdf/5G-in-Africa-2023.pdf.

[1092] *Id.* at 10,

[1093] *Id.* at 10.

[1094] *Id.* at 13-14.

[1095] *Id.* at 18.

[1096] *See, e.g.*, Open RAN Policy Coalition, Compilation of Open RAN Announcements and Demonstrations (2021), https://www.openranpolicy.org/wp-content/uploads/2021/10/ORPC-Compilation-of-Announcements-and-Demos-9.30.21.pdf; *see also* RCR Wireless News, *Open RAN 101–Open RAN Adoption in Different Regions: Why, What, When, How?* (*Reader Forum*) (Aug. 6, 2020), https://www.rcrwireless.com/20200806/opinion/readerforum/open-ran-101-open-ran-adoption-in-different-regions-why-what-when-how-reader-forum.

[1097] Press Release, Rakuten Symphony, Europe's First Open RAN is Fully Functional—Rakuten and Mavenir are Technology Partners in 1&1's Cloud-native Mobile Network (Dec. 8, 2023), https://symphony.rakuten.com/newsroom/symphony-launches-open-ran-in-europe.

[1098] *Id.*

[1099] Juan Pedro Tomas, RCR Wireless News, *AWS Said It Has Also Joined NTT Docomo's OREX Initiative to Promote O-RAN Efforts at a Global Scale* (Feb. 29, 2024), https://www.rcrwireless.com/20240229/open_ran/ntt-docomo-selects-aws-deploy-5g-o-ran-japan#:~:text=Japanese%20operator%20NTT%20Docomo%20has,efforts%20at%20a%20global%20scale.

Indonesian cellular operator Indosat Ooredoo has conducted field trials for open RAN in several locations of the Maluku region to prepare for 5G deployment.[1101]

358. *6G Developments.* The Commission has recognized the importance of planning for 6G, the "next-next-generation" of wireless technology.[1102] Accordingly, the Commission launched the first Federal effort in the United States to plan for 6G through the Technology Advisory Committee 6G Working Group, which has initiated discussions on supply chain vulnerability, Open RAN, the impact 6G can have on autonomous driving, edge computing, emergency alerting, smart city technology, and the digital divide among others.[1103]

359. Likewise, regulators around the world are exploring the possibilities of 6G technology to further facilitate next-generation broadband connectivity. In February 2024, the United States, Canada, Australia, the Czech Republic, Finland, France, Japan, South Korea, Sweden, and the United Kingdom endorsed a Joint Statement of Principles for the research and development of 6G technologies, focusing on promoting free, open, resilient, and interoperable connectivity for the future.[1104] In alignment with these principles, in June 2024, Japanese telecom operator SoftBank announced its exploration of the terahertz band, ranging from 100 GHz to 10 THz, for 6G technology, expected to be available by 2030.[1105] In July 2024, Singapore's Singtel and South Korea's SK Telecom signed a MoU to develop 6G technology, explore AI, virtualization, and network slicing.[1106] Hexa-X-II, the second European-level 6G Flagship project, led by Nokia, launched in January 2023.[1107] It seeks to build a technical system view of 6G, and it outlines 6G's value for society, highlighting its impact on sustainability, inclusion, and trustworthiness.[1108] In April 2024, the United Arab Emirates unveiled the country's 6G roadmap which outlines a plan to establish a committee to conduct scientific studies, research, and to develop technical standards and specifications for 6G.[1109] The committee will submit the resulting studies to global

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[1100] Press Release, The White House, Joint Vision Statement from the Leaders of Japan, the Philippines, and the United States (Apr. 11, 2024), https://www.whitehouse.gov/briefing-room/statements-releases/2024/04/11/joint-vision-statement-from-the-leaders-of-japan-the-philippines-and-the-united-states/#:~:text=The%20United%20States%2C%20subject%20to,an%20open%2C%20interoperable%2C%20secure%2C.

[1101] Telecom.com, *Know All About Open RAN Trials, Deployments Happening Globally* (July 18, 2023), https://telecom.economictimes.indiatimes.com/news/telecom-equipment/know-all-about-open-ran-trials-deployments-happening-across-globally/101826682.

[1102] *See, e.g.*, FCC, Remarks of Chairwoman Jessica Rosenworcel to the National Science Foundation, 6G: Open and Resilient by Design (Apr. 21, 2023), https://www.fcc.gov/document/chairwoman-rosenworcel-national-science-foundation-6g-event.

[1103] *See, e.g.*, Caio Castro, 6GWorld, *FCC Launches Advisory Committee, 6G Security Working Group in the US*, https://www.6gworld.com/industry-news/fcc-launches-advisory-committee-6g-security-working-group-in-the-us/ (last visited Sept. 17, 2024).

[1104] The White House, Joint Statement Endorsing Principles for 6G: Secure, Open, and Resilient by Design (Feb. 26, 2024), https://www.whitehouse.gov/briefing-room/statements-releases/2024/02/26/joint-statement-endorsing-principles-for-6g-secure-open-and-resilient-by-design/.

[1105] TeleGeography CommsUpdate, *Softbank Corp. Explores Terahertz Band to Deliver 6G* (June 11, 2024), https://www.commsupdate.com/articles/2024/06/11/softbank-corp-explores-terahertz-band-to-deliver-6g/ (last accessed Sept. 11, 2024).

[1106] TeleGeography CommsUpdate, *Tomorrow is Today: Singtel and SKT Forge MoU on '6G' Next-Generation Technology* (July 9, 2024), https://www.commsupdate.com/articles/2024/07/09/tomorrow-is-today-singtel-and-skt-forge-mou-on-6g-next-generation-technology/ (last accessed Sept. 11, 2024).

[1107] *See* Hexa-X-II, *Hexa-X-II Vision,* https://hexa-x-ii.eu/vision/ (last visited July 24, 2024).

[1108] *Id.*

standards organizations including the ITU, the Institute of Electrical and Electronics Engineers, and 3GPP.[1110]

360. *Fiber Deployments.* Providers in several countries are actively increasing fiber deployment to enhance broadband services. NBN Co, which manages Australia's NBN, announced an additional 400,000 Australian homes and businesses are part of the program and are on target to become eligible for full fiber by 2025, with new suburbs added across the country.[1111] Additionally, Singapore's major telecom providers are upgrading their networks to support 10 Gbps fixed broadband for 500,000 premises, expected by 2028.[1112] South Korea continues to be at the forefront of fiber deployment, building on its reputation as a leader in telecommunications. The country has made significant investments in both urban and rural fiber networks to support its advanced digital infrastructure needs.[1113]

361. In February 2024, Chilean telecommunications firm ENTEL announced that its FTTH subscribers have increased by four times in the past three years, resulting in annual network traffic growth of over 40%.[1114] ENTEL began upgrading its network to 100 Gbps nationwide in 2017 and 200 Gbps in the capital area in 2022, and is currently (as of 2024) launching the country's first 800 Gbps optical network.[1115] In April 2024, U.S. network infrastructure provider CommScope announced its partnership with Canadian rural ISP Xplore to bring new rural broadband services to Ontario Canada and connect more than 35,000 homes and businesses to fiber Internet, providing access to gigabit-speed streaming and downloads, upgraded video calls and online services, and telemedicine services.[1116]

362. Romania has made considerable strides in deploying fiber, having deployed to 97.7% of households, including homes in rural areas, in 2023, achieving one of the highest fiber penetration rates in Europe.[1117] Countries in Africa and the Middle East have also made strides in replacing legacy copper networks with fiber. In May 2022, Telkom South Africa announced plans to replace its entire copper broadband infrastructure with fiber over time,[1118] Tunisie Telecom announced in December 2023, that

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[1109] John Tanner, Developing Telecoms, *UAE Regulator TDRA Releases Its 6G Roadmap to 2030* (Apr. 25, 2024), https://developingtelecoms.com/telecom-business/telecom-regulation/16609-uae-regulator-tdra-releases-its-6g-roadmap-to-2030.html.

[1110] *Id.*

[1111] NBN, *Millions More Aussies Ready for 18x Faster NBN* (Dec. 13, 2023), https://www.nbnco.com.au/corporate-information/media-centre/media-statements/millions-more-aussies-ready-for-18x-faster-nbn#:~:text=An%20additional%20400%2C000%20Australian%20homes,suburbs%20added%20across%20the%20country.

[1112] TeleGeography Comms Update, *Singapore Telcos Scale Up Plans to Deliver 20Gbps Broadband to 500k Homes by 2028* (July 18, 2024), https://www.commsupdate.com/articles/2024/07/18/singapore-telcos-scale-up-plans-to-deliver-10gbps-broadband-to-500k-homes-by-2028/ (last accessed Sept. 11, 2024).

[1113] GSMA, *5G in Asia Pacific: Deployment Momentum Continues* (July 31, 2023), https://www.gsma.com/get-involved/gsma-membership/gsma_resources/5g-in-asia-pacific-deployment-momentum-continues/.

[1114] Light Reading, *Chile Entel is Building the World's First 800G Mesh Backbone Network, Entering the F5.5G Era* (Feb. 21, 2024), https://www.lightreading.com/network-technology/chile-entel-is-building-the-world-s-first-800g-mesh-backbone-network-entering-the-f5-5g-era.

[1115] *See* Total Telecom, *Entel: Building an 800G Optical Backbone Network to Enable Digital Chile* (Apr. 9, 2024), https://totaltele.com/entel-building-an-800g-optical-backbone-network-to-enable-digital-chile/.

[1116] Brad Randall, Broadband Communities, *Xplore Selects CommScope to Deploy High-Speed Fiber in Rural Ontario* (Apr. 15, 2024), https://bbcmag.com/xplore-selects-commscope-to-deploy-high-speed-fiber-in-rural-ontario/.

[1117] Sylwia Kechiche, Ookla, *A Reality Check on the Progress Toward a Gigabit Society* (Oct. 23, 2023), https://www.ookla.com/articles/europe-fiber-gigabit-society-q3-2023.

they were on track to deliver fiber to 500,000 households by 2025,[1119] and in Bahrain, the country's national infrastructure provider, Bahrain Network, announced in June 2024, a project to transfer all the Kingdom's copper Internet networks to an ultra-high-speed fiber network.[1120]

363. *Satellite Developments.* Many countries are also increasingly recognizing the potential of innovative satellite technologies. The EU has been working to spur the growth of a competitive European space marketplace. In January 2024, the EC, the European Investment Bank, and the European Space Agency entered into a collaboration agreement to coordinate efforts to improve European space companies' access to financing and advisory support.[1121] The United Kingdom's Ofcom is also working to leverage satellite technology, launching, in July 2024, a call for input from stakeholders to assess the demand for D2D service and mobile-satellite service in the UK, as well as any related spectrum needs.[1122]

364. In Canada, ISED continues to release spectrum and adopt innovative licensing and spectrum assignment measures to support improved mobile coverage, particularly for rural and remote areas through a mix of connectivity solutions including fiber, satellite and terrestrial wireless technologies. Notably, Rogers and Telus, two of the largest telecommunications companies in Canada, are planning to launch D2D service in 2024, connecting satellites to smartphones.[1123] Telus has partnered with Canadian satellite operators TerreStar and Skylo, while Rogers has partnered with operators using terrestrial airwaves, such as SpaceX and Lynk Global.[1124] Additionally, in June 2024, ISED lunched a public consultation on a policy, licensing and technical framework to use certain bands allocated for flexible use or commercial mobiles services to expand satellite coverage.[1125] This would enable satellites to communicate directly with cell phones when they are outside the range of wireless towers.[1126] The proposed policy seeks to expand wireless services particularly in unserved and underserved areas,

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[1118] Myles Illidge, MyBroadband, *Telkom's Plan to Switch off ADSL* (May 3, 2022), https://mybroadband.co.za/news/adsl/439338-telkoms-plan-to-switch-off-adsl.html.

[1119] Ken Wieland, Telecoms.com, *Tunisie Telecom Charts All Optical Progress with Huawei* (Dec. 10, 2023), https://www.telecoms.com/broadband/tunisie-telecom-charts-all-optical-progress-with-huawei.

[1120] Vaughan O'Grady, Developing Telecoms, *Bahrain Network to Replace Legacy Copper with All-Fibre Network* (June 10, 2024), https://developingtelecoms.com/telecom-technology/optical-fixed-networks/16824-bahrain-network-to-replace-legacy-copper-with-all-fibre-network.html.

[1121] European Investment Bank, *European Institutions Join Forces to Boost the European Space Sector* (Jan. 24, 2024), https://www.eib.org/en/press/all/2024-021-european-institutions-join-forces-to-boost-the-european-space-sector.

[1122] Ofcom, *Call for Input: Improving Mobile Connectivity from the Sky and Space* (July 23, 2024), https://www.ofcom.org.uk/spectrum/space-and-satellites/improving-mobile-connectivity-from-the-sky-and-space/.

[1123] Monica Alleven, Fierce Network, *Lynk, Rogers Eye Sat-to-Phone Service in 2024* (Dec. 15, 2023), https://www.fierce-network.com/tech/lynk-rogers-eye-sat-phone-service-2024; TELUS, *TELUS, TerreStar and Skylo Demonstrate Canada's First Two-Way Communication Between Smartphones and Satellites* (Nov. 1, 2023), https://www.telus.com/en/about/news-and-events/media-releases/telus-terrestar-and-skylo-demonstrate-canadas-first-two-way-communication-between-smartphones-and-satellites.

[1124] *See* Vikram Barhat, Stock Insight, *Three Stocks for Satellite Cellphone Service* (Jan. 17, 2024), https://www.morningstar.ca/ca/news/244900/three-stocks-for-satellite-cellphone-service.aspx.

[1125] Press Release, Government of Canada, Government of Canada Launches Consultation to Expand Wireless Services Via Satellites (June 17, 2024), https://www.canada.ca/en/innovation-science-economic-development/news/2024/06/government-of-canada-launches-consultation-to-expand-wireless-services-via-satellites.html.

[1126] *Id.*

improve access to emergency and 9-1-1 services, increase reliability and resiliency of telecom services, and increase investment in wireless networks.[1127]

365. Several countries in the Asia-Pacific region are also creating opportunities to increase satellite development in their countries. As part of its Five-Year Spectrum Outlook from 2021 to 2026, the Australian Communications and Media Authority is considering how best to address spectrum management challenges arising from rapid innovations in satellite technologies and services.[1128] On April 12, 2024, the United States and New Zealand held a bilateral Space Dialogue in Washington, D.C., where participants discussed the growth of the commercial space sector, policy and regulatory interoperability, and opportunities in scientific education and research.[1129] Japan's MIC is exploring the development of ICT in space.[1130] In February 2024, Japan's MIC convened, for the first time, a Space Communications Advisory Board to enable experts in the field to advise the MIC on space communication policies, including on research and development and spectrum use.[1131] Additionally, SKY Perfect JSAT made an agreement with the United Nations' World Food Program, allowing them to use their JCSAT-1C satellite to provide assistance to the Philippines during natural disasters.[1132]

366. African countries have also made significant strides in satellite deployments, with several countries launching satellites to address various national and regional challenges. In June 2022, Egypt launched the Nilesat 301 communications satellite using a SpaceX Falcon 9 rocket, aiming to deliver communication and satellite broadband services to Egypt and neighboring countries in North Africa and the Middle East.[1133] Additionally, Egypt launched NExSAT-1 on February 3, 2024, marking the country's latest advancement in space technology.[1134] In April 2023, Kenya launched its Taifa-1 satellite to collect agricultural and environmental data, including information on floods, droughts, and wildfires, that authorities plan to use for disaster management and to combat food insecurity.[1135] And in November 2022, both Uganda and Zimbabwe launched their first satellites.[1136] Uganda's PearlAfricaSat-1 will perform multispectral observations of Earth and assist in analyzing water quality, soil fertility, and land

[1127] *Id.*

[1128] Australian Communications & Media Authority, *2021-26 Five-Year Spectrum Outlook* (July 2022), https://www.acma.gov.au/publications/2021-09/plan/five-year-spectrum-outlook-2021-26.

[1129] U.S. Department of State, *Joint Statement on the U.S.-New Zealand Space Dialogue* (Apr. 19, 2024), https://www.state.gov/joint-statement-on-the-u-s-new-zealand-space-dialogue/.

[1130] Ministry of Internal Affairs and Communications, Japan, *Convening of the Space Communications Advisory Board* (Feb. 15, 2024), https://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/pressrelease/2024/2/15_1.html.

[1131] *Id.*

[1132] Press Release, SKY Perfect JSAT Group, SKY Perfect JSAT Signs Contribution Agreement with the United Nations World Food Programme to Provide Emergency Satellite Internet in the Philippines (June 18, 2024), https://www.skyperfectjsat.space/en/news/detail/sky_perfect_jsat_signs_contribution_agreementwith_the_united_nations_world_food_programmeto_provide_.html.

[1133] Ayooluwa Adetola, Space in Africa, *Egypt Launches Nilesat 301 Aboard SpaceX' Falcon 9* (June 8, 2022), https://spaceinafrica.com/2022/06/08/egypt-launches-nilesat-301-aboard-spacex-falcon-9/.

[1134] Mustapha Iderawumi, Space in Africa, *Egypt Launches Experimental Satellite, Nexsat-1* (Feb. 3, 2024), https://spaceinafrica.com/2024/02/03/egypt-launches-experimental-satellite-nexsat-1/.

[1135] Reuters, *Kenya Launches First Operational Satellite into Space* (Apr. 15, 2023), https://www.reuters.com/business/aerospace-defense/kenya-launches-first-operational-satellite-into-space-space-x-2023-04-15/.

[1136] Ayooluwa Adetola, Space in Africa, *Zimbabwe and Uganda Launched their First Satellites Today* (Nov. 7, 2022), https://spaceinafrica.com/2022/11/07/zimbabwe-and-uganda-launched-their-first-satellites-today/.

use.[1137] Zimbabwe's ZimSat-1 will enhance mineral exploration and monitoring of environmental hazards and droughts, as well as aid in mapping human settlements and disease outbreaks.[1138]

367. In the Middle East, several countries have launched satellites to enhance communications, environmental monitoring, and national security. In November 2023, Oman launched its first satellite, Aman-1,[1139] to monitor agriculture, renewable energy, oil fields, mining, weather, and border and national security.[1140] In May 2023, Saudi Arabia launched the Badr-8 telecommunications satellite, which will provide high-capacity optical communications and offer connectivity across Europe, the Middle East, Africa, and Central Asia.[1141] And in July 2024, Turkey launched its first domestically-built communications satellite to carry secure military traffic within Turkish borders while also providing expanded commercial services across India, Thailand, Malaysia and Indonesia.[1142]

IV. BRIDGING THE DIGITAL DIVIDE

368. In this section, we examine broadband adoption, broadband affordability, and equitable access. Access to affordable, reliable broadband is essential for Americans to be able to fully participate in modern life. As we noted in the *2024 Section 706 Report*, consumers rely on both their fixed and mobile connections to work, learn, access health care, and connect with each other.[1143]

A. Adoption

369. Barriers to adoption include the affordability of devices used to access broadband services (including those used by people with disabilities), lack of digital literacy, and the lack of information about programs that make broadband services more affordable.[1144] Consumers' ability to access devices used to connect to broadband is related to adoption because even if broadband service is affordable, potential subscribers may not adopt it if the devices needed to connect to it are too expensive.[1145] For example, 37% of non-broadband users in a Pew Research Center survey stated that the cost of a computer is a reason that they do not subscribe.[1146] The ACP's up-to-$100 device subsidy,

[1137] Reuters, *Uganda Says Its Debut Satellite Launched into Orbit* (Dec. 2, 2022), https://www.reuters.com/lifestyle/science/uganda-says-its-debut-satellite-launched-into-orbit-2022-12-02/.

[1138] Ayooluwa Adetola, Space in Africa, *Zimbabwe and Uganda Launched their First Satellites Today* (Nov. 7, 2022), https://spaceinafrica.com/2022/11/07/zimbabwe-and-uganda-launched-their-first-satellites-today/.

[1139] Times of Oman, *Aman-1: The First Satellite from Oman Launched into Space* (Nov. 13, 2023), https://timesofoman.com/article/138470-aman-1-the-first-satellite-from-oman-launched-into-space.

[1140] AMAN, *The First Omani Space Mission*, https://aman.etco.om/ (last visited Oct. 31, 2024) (navigate to "Benefits" subheading); *see also* Satellite Pro Middle East, *Oman to Launch Its First Satellite in 2022* (Oct. 31, 2021), https://satelliteprome.com/news/oman-to-launch-its-first-satellite-in-2022/.

[1141] Jason Rainbow, SpaceNews, *SpaceX Launches Badr-8 to Bolster Arabsat's Satellite Fleet* (May 27, 2023), https://spacenews.com/spacex-launches-badr-8-to-bolster-arabsats-satellite-fleet/.

[1142] William Harwood, CBS News, *SpaceX Launches Turkey's First Domestically-Built Communications Satellite* (July 8, 2024), https://www.cbsnews.com/news/spacex-launches-turkeys-first-domestically-built-communications-satellite/.

[1143] *2024 Section 706 Report* at 1, para. 1.

[1144] *Id.* at 63, para. 105.

[1145] *Id.* at 63-64, para. 107.

[1146] Andrew Perrin, Pew Research Center, *Mobile Technology and Home Broadband 2021* (June 3, 2021), https://www.pewresearch.org/internet/2021/06/03/mobile-technology-and-home-broadband-2021/; *see also 2024 Section 706 Report* at 63-64, para. 107 & n.324.

which was available in certain circumstances,[1147] may have played a role in reducing this barrier to adoption while the ACP was active,[1148] but the extent to which it fully and universally did so is unclear.

370. Another barrier to adoption can be lack of digital literacy.[1149] The National Digital Inclusion Alliance has stated that digital literacy and cost are the greatest barriers to broadband adoption.[1150] Further, potential subscribers' awareness of broadband affordability programs impact their effectiveness.[1151] In 2021, Congress recognized this issue when authorizing the Commission to provide grants to ACP outreach partners.[1152] The Commission continued to implement this program until the enrollment freeze on February 8, 2024 stopped grant-funded outreach activities consistent with wind-down procedures.[1153] While the ACP was accepting enrollments, the Commission, both directly and through partners, conducted its own significant ACP awareness programs.[1154]

371. Many commenters highlighted the growth in adoption due to increased subscription to fixed wireless and satellite service. Citing to research from the Leichtman Research Group and Ericsson, WISPA points out that nearly all net additions to fixed broadband service in 2022 and 2023 are attributable to fixed wireless.[1155] ACA states that fixed wireless providers have been taking a disproportionate share of subscriber growth, while cable's growth has stalled.[1156] CTIA states that 90% of new broadband customers chose fixed wireless in 2022, up from 3% in 2020.[1157] NCTA asserts that fixed wireless now accounts for 9% of all broadband subscribers only five years after launching.[1158] In certain remote areas, such as Alaska, satellite adoption is substantial. In its comments, Pacific Dataport (PDI) states that Starlink has penetrated 10% of all households in Alaska, and in Alaska Native villages, the penetration rate is estimated at 60 to 70%.[1159]

1. Fixed Adoption

372. Our assessment of adoption of fixed terrestrial broadband services in the United States from 2020 to 2021 is based on FCC Form 477 subscriber/connection data collected at the census tract level, and FCC Form 477 deployment data collected at the census block level.[1160] The assessment of

[1147] *2024 Section 706 Report* at 63-64, para. 107 & n.325.

[1148] *Id.* at 63-64, para. 107 & n.326.

[1149] *Id.* at 64, para. 108 & n.330.

[1150] Empowering and Connection Communities Through Digital Equity and Internet Adoption: Hearing Before the Subcomm. on Commc'ns and Tech, 116th Cong. 2 (2020) (Written Testimony of Angela Siefer, Executive Director, National Digital Inclusion Alliance), https://docs.house.gov/meetings/IF/IF16/20200129/110416/HHRG-116-IF16-Wstate-SieferA-20200129.pdf. We note that the Digital Equity Act, enacted as part of the Infrastructure Act, provides for State Digital Equity Capacity Grants that are to include State Digital Equity Plans in their applications with measurable objectives for promoting, among other things, digital literacy. *2024 Section 706 Report* at 64, para. 108 & n.332.

[1151] *2024 Section 706 Report* at 63-64, para. 107.

[1152] *Id.* at 63-64, para. 107 & n.327.

[1153] *Id.* at 63-64, para. 107 & n.328.

[1154] *Id.* at 102, para. 184.

[1155] WISPA Comments at 10.

[1156] ACA Connects Comments at 7.

[1157] CTIA Comments at 7.

[1158] NCTA Comments at 9.

[1159] PDI Comments at 2.

[1160] *2024 Section 706 Report* at 65, para. 110.

adoption of broadband services in 2022 and 2023 is based on the same tract-level FCC Form 477 connection data, and FCC BDC service availability data that are collected at a location-by-location level based on the BSLs identified in the December 2023 Fabric.[1161] For this analysis, we aggregate data up to the geographic level reported in each figure; for example, the United States, Tribal Areas, and Urban and Non-Urban Core Areas located therein.[1162] We evaluate the adoption of fixed terrestrial services at speeds of our fixed speed benchmark of 100/20 Mbps and an approximation of our long-term goal using 940/500 Mbps.[1163]

373. For the years 2019 through 2021, the reported adoption rates are the number of residential fixed terrestrial connections divided by the number of households located in the census blocks in which the FCC Form 477 deployment data indicate that fixed terrestrial services are deployed and meet the reported speed threshold. Similarly, for the years 2022 and 2023, the reported adoption rate is the number of fixed terrestrial connections divided by the number of households in which the FCC BDC service availability data indicate fixed terrestrial services are deployed and meet the reported speed threshold.

374. Figure IV.A.1 reports adoption rates based on year-end data from 2020 to 2023 for the United States, Urban Core and Non-Urban Core Areas, and Tribal Areas. The data show that as of year-end 2023, approximately 53% of households subscribe to broadband at the Commission's fixed speed benchmark of 100/20 Mbps when it is available. Approximately 26% of households subscribe to broadband at the Commission's long-term speed goal of 940/500 Mbps when it is available. Adoption rates for the United States as a whole are higher in Urban areas at speeds of 100/20 Mbps, while Non-Urban areas have slightly higher adoption rates at speeds of 940/500 Mbps until 2023. For Tribal Areas, adoption rates are higher in Non-Urban Areas, except for 100/20 Mbps in 2023.[1164]

[1161] *Id.*

[1162] A census tract is designated as "Urban Core" if it has a land area less than three square miles and a population density of at least 1,000 people per square mile. A census tract is designated as "Non-Urban Core" if it has not been designated as Urban Core. We define a census tract as a Tribal Area if more than 50% of the land area in the census tract is designated as Tribal. *Id.* at 65, para. 111. Because our subscriber data are submitted at the census-tract level, some census tracts will contain a mixture of census blocks in Tribal areas and census blocks that are not in Tribal areas. For example, for 2023, the Tribal lands area category in the figures below contain 97% of households and 69% of the land area of census blocks that are designated as Tribal areas, and 3% of households and 31% of the land area of census blocks that are not designated as Tribal areas. Moreover, because connections data are collected at the census tract level, we have no ability to determine whether the residential connections are for households located on census blocks designated as urban, non-urban (rural), or Tribal. *Id.* at 65, para. 110 & n.334.

[1163] *See infra* Appx. H-1 (reporting the adoption rates of fixed terrestrial services by state, the District of Columbia, and U.S. Territory) and Appx. F-5 (presenting service availability for fixed terrestrial services by state, the District of Columbia, and U.S. Territory).

[1164] For December 2018-2022 data, *see 2024 Section 706 Report* at 66-67, para. 112, Fig. 21.

Fig. IV.A.1
Overall Adoption Rate for Fixed Terrestrial Services at Different Speed Tiers

	2020	2021	2022	2023
100/20 Mbps				
United States	27.5%	32.6%	46.1%	53.2%
Non-Urban Core Areas	25.2%	29.6%	44.7%	50.2%
Urban Core Areas	29.1%	34.4%	46.9%	55.2%
Tribal Areas	23.3%	24.6%	36.0%	46.5%
Non-Urban Core Areas	24.9%	26.6%	38.9%	43.9%
Urban Core Areas	19.9%	20.6%	29.9%	52.9%
940/500 Mbps				
United States	16.1%	15.9%	21.5%	26.3%
Non-Urban Core Areas	16.5%	16.0%	21.8%	23.9%
Urban Core Areas	15.9%	15.8%	21.3%	27.8%
Tribal Areas	14.6%	14.9%	23.5%	24.3%
Non-Urban Core Areas	15.7%	15.9%	25.8%	26.3%
Urban Core Areas	12.4%	12.9%	17.4%	19.2%

Source: FCC Form 477, Dec. 2023; FCC Form 477, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020; Staff Population Estimates.

375. Figure IV.A.2 reports average county-level adoption rates for fixed terrestrial services by quartile ranking for median household income, population density, household poverty rate, and the proportion of the population that resides in a rural area.[1165] The data are further disaggregated by speed tier. In general, these data suggest that the average household adoption rate in a county increases with median household income and population density and declines with increases in the poverty rate and rural population rate.

[1165] For December 2022 data, *see id.* at 67-68, para. 113, Fig. 22.

Fig. IV.A.2
Average County Overall Adoption Rate for Fixed Terrestrial Services by County-Level Demographic Variable (Dec. 31, 2023)[1166]

	100/20 Mbps	940/500 Mbps
Median Household Income		
First Quartile (Lowest Median Household Income)	36.1%	13.6%
Second Quartile	40.9%	14.1%
Third Quartile	42.7%	13.6%
Fourth Quartile (Highest Median Household Income)	53.4%	21.9%
Population Density		
First Quartile (Lowest Population Density)	41.5%	11.1%
Second Quartile	39.9%	14.9%
Third Quartile	42.2%	15.5%
Fourth Quartile (Highest Population Density)	49.4%	21.3%
Household Poverty Rate		
First Quartile (Lowest Household Poverty Rate)	51.4%	18.6%
Second Quartile	43.3%	14.8%
Third Quartile	41.6%	16.7%
Fourth Quartile (Highest Household Poverty Rate)	36.7%	13.1%
Rural Population Rate		
First Quartile (Lowest Rural Population Rate)	49.8%	20.1%
Second Quartile	41.7%	15.3%
Third Quartile	38.5%	15.8%
Fourth Quartile (Highest Rural Population Rate)	41.8%	12.9%

Source: FCC Form 477, Dec. 2023; Staff Population Estimates; ACS Five-Year Estimates for 2018-2022.

376. Based on December 2023 FCC BDC data, we also analyze the non-adoption rate of fixed broadband at speeds of 100/20 Mbps or higher across counties in the United States.[1167] We measure the adoption gap as the number of households in a county for which 100/20 Mbps or higher broadband is available minus the number of households in a county subscribing to 100/20 Mbps or higher service.[1168] Then, we divide the adoption gap by the number of households in a county for which 100/20 Mbps or higher broadband is available.[1169] Households that are counted as non-adopters include those subscribed

[1166] The median household income breakpoints are approximately $52,000, $60,000, and $70,000, respectively. The population density breakpoints are approximately 17, 47, and 139 people per square mile, respectively. The household poverty rate breakpoints are 10%, 14%, and 18%, respectively. The rural population rate breakpoints are 34%, 66%, and 100%, respectively.

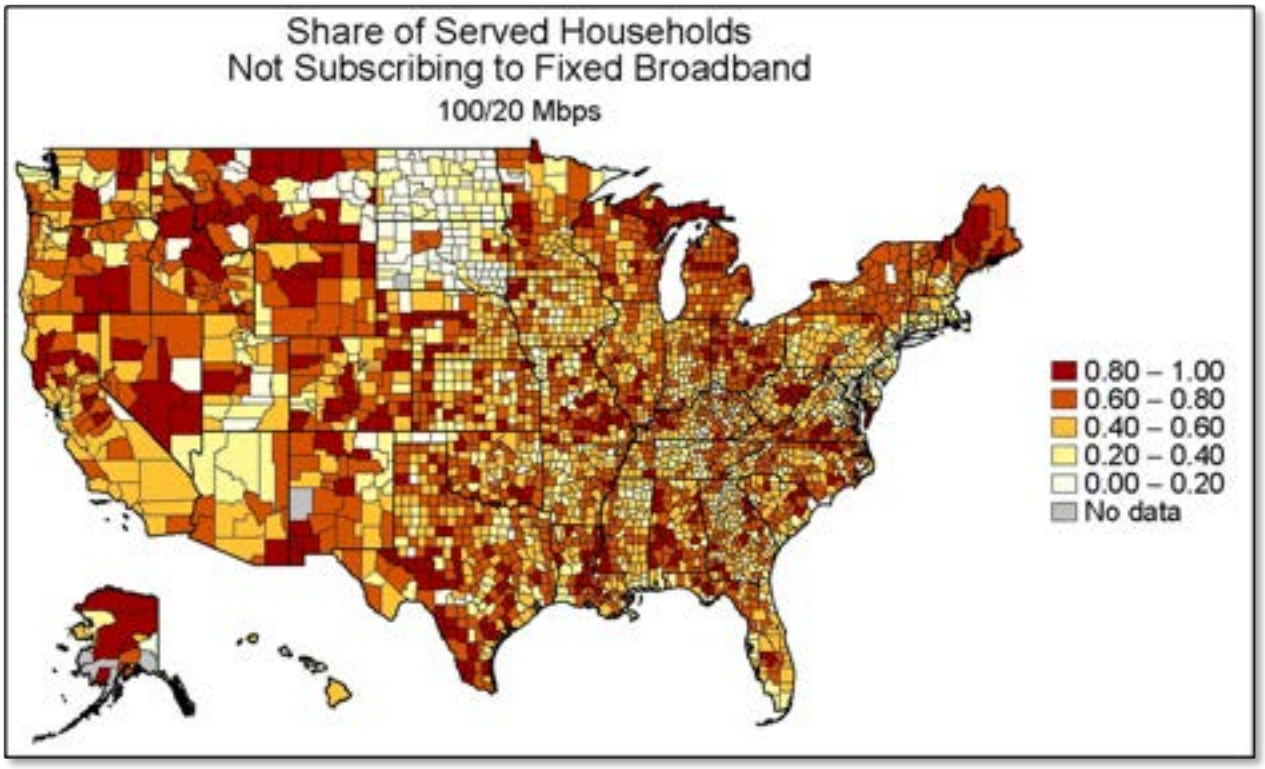
[1167] For December 2022 data, *see 2024 Section 706 Report* at 68-69, para. 114, Fig. 23.

[1168] *Id.* at 68-69, para. 114.

[1169] *Id.*

to satellite plans or fixed broadband at lower speeds, as well as those who are not subscribed to fixed broadband at all—this includes households for whom broadband is not affordable but also others who opt not to subscribe, even though they could afford it.[1170] There is a great deal of variation in non-adoption at both the state- and county-level, as seen in Figure IV.A.3. For example, counties in North Dakota have quite low non-adoption rates, while counties in Maine and Montana have higher non-adoption rates. Even more states have a great deal of variation in non-adoption on a county-by-county basis, such as Missouri and Utah.

Fig. IV.A.3
Non-Adoption Rate of Fixed Terrestrial Services at 100/20 Mbps, By County



Source: Staff analysis based on Dec. 2023 FCC BDC data.
Note: Figure IV.A.3 depicts the ratio of households in a county that do not subscribe to 100/20 Mbps service even though the service is available at the location. It includes terrestrial fixed service (fixed wireline and wireless), but does not include satellite or mobile broadband. As seen in Figure IV.A.2 above, many households continue to subscribe to slower speed tiers, even when 100/20 Mbps service is available. Several reasons can explain this, such as the needs of a household may be served at lower access speeds, a household may not be aware of the availability of service, or the service may not be affordable.

2. Mobile Adoption

377. Figure IV.A.4 presents mobile broadband subscribership ratios from 2020 to 2023 using data collected through FCC Form 477.[1171] We find that the number of residential connections has increased at a faster rate than the population over this time period. As of December 31, 2023, there were more residential mobile broadband connections than people. This fast growth can be attributed to

[1170] *Id.*

[1171] In contrast to adoption ratios presented elsewhere in this Report, the subscribership ratios reported in this figure and in Appx. H-2 are defined as the number of residential connections divided by the total population in the area, regardless of whether services are available in the area.

multiple factors including the proliferation of handheld devices such as tablets and smart watches. Because FCC Form 477 collects mobile broadband subscribership data at the state-level, it is not possible for us to examine differences in subscribership across rural and urban areas or in Tribal areas. Appendix H-2 presents state-level subscribership ratios as of December 31, 2023.

Fig. IV.A.4
Subscribership Ratios for Residential Mobile Broadband Services (2020-2023)

Year	Population (in Millions)	Residential Connections (in Millions)	Subscribership Ratio
2020	333.018	296.031	88.9%
2021	335.530	320.785	95.6%
2022	336.881	330.065	98.0%
2023	338.491	339.571	100.3%

Source: FCC Form 477, Dec. 2023; FCC Form 477, Dec. 2022; FCC Form 477, Dec. 2021; FCC Form 477, Dec. 2020; Staff Population Estimates.

378. As an alternative estimate of mobile adoption, we also present mobile penetration rates, defined as the number of mobile wireless devices per capita, by state in Appendix H-3 based on NRUF data.[1172] As seen in Appendix H-3, the mobile penetration rate exceeds 100% in every state.[1173] This indicates that the average consumer has more than one connected device.

B. Affordability

379. Examining affordability is important—even if broadband has been physically deployed, it is not effectively available if it is unaffordable.[1174] According to 2023 data collected by the Pew Research Center, adults with annual household incomes of $30,000-$69,999 per year were over four times more likely not to subscribe to home broadband service than those with incomes of $100,000 or more per year, while those with incomes less than $30,000 per year were over eight times more likely not to have home broadband service.[1175] According to an EveryoneOn survey taken during the COVID-19 pandemic, 18% of households making $50,000 or less lost broadband connectivity and 49% were on the brink of doing so due to an inability to pay.[1176]

[1172] We use NRUF data to estimate state-level mobile penetration rates (the number of mobile wireless connections per 100 people). NRUF data track how many phone numbers have been assigned to mobile wireless devices. Note that NRUF-based mobile penetration rates can exceed 100% because NRUF identifies the number of connected devices that have associated telephone numbers, and a single subscriber may have multiple connected devices.

[1173] CTIA estimates that, as of 2023, there were approximately 1.6 wireless connections for every person in the United States. CTIA, 2024 Annual Survey Highlights at 4 (2024), https://api.ctia.org/wp-content/uploads/2024/09/2024-Annual-Survey.pdf.

[1174] *2024 Section 706 Report* at 52, para. 89.

[1175] Pew Research Center, *Internet, Broadband Fact Sheet* (Jan. 31, 2024), https://www.pewresearch.org/internet/fact-sheet/internet-broadband/; *see also 2024 Section 706 Report* at 52, para. 89 & n.283.

[1176] EveryoneOn, Affordability and the Digital Divide at 5 (Dec. 2021), https://static1.squarespace.com/static/5aa8af1fc3c16a54bcbb0415/t/61ad7722de56262d89e76c94/1638758180025 (EveryoneOn Report 2021); *see also 2024 Section 706 Report* at 53, para. 89 & n.284.

380. Thoughtful consideration is required to determine whether broadband service is affordable.[1177] There is currently no consensus on how to define affordability.[1178] According to the Cambridge Dictionary, "affordability" is defined as "the state of being cheap enough for people to be able to buy,"[1179] while economists have devised other definitions of affordability,[1180] and some recent studies recommend assessing affordability across the income distribution (e.g., for different income deciles), with emphasis on the lower deciles.[1181] In addition, broadband adoption and broadband affordability are related but distinct.[1182] For example, a household might have the income to afford broadband service, but choose not to subscribe because it does not believe it has a need for the Internet, or because broadband is not available.[1183] A household might, alternatively, subscribe to broadband even though it imposes significant financial hardship on the household.[1184] Finally, affordability is likely to vary not only with a household's income, but also with the available broadband service characteristics (including the number of competing providers, the attributes of the broadband offerings, and the price of such offerings), and the price of other goods and services the household consumes.[1185] A household's ultimate decision regarding broadband adoption depends on a combination of affordability, preferences, and other household characteristics.

381. Various commenters highlight the price trends of fixed broadband relative to other goods and services.[1186] In addition, several commenters argue that the rise in fixed wireless and satellite is increasing competition in the fixed broadband marketplace and putting downward pressure on prices.[1187]

[1177] *2024 Section 706 Report* at 53, para. 90.

[1178] *Id.*

[1179] Cambridge Dictionary, *Meaning of Affordability in English*, https://dictionary.cambridge.org/us/dictionary/english/affordability (last visited Sept. 25, 2024); *see also 2024 Section 706 Report* at 53, para. 90 & n.285.

[1180] *2024 Section 706 Report* at 53, para. 90 & n.286. In general, economists define affordability by relating prices to income. In a narrow sense, this can be seen as the ability of a household to purchase a specific bundle of necessary goods and services with the available disposable income. More broadly, this can be seen as the ability to purchase such a bundle without having to constrain the consumption of other necessities. These concepts are difficult to translate into empirical measures; in practice, these measures may include prices, the share of income needed to purchase a good or service, and the residual income left after expenses for a necessity. However, affordability thresholds are likely misleading, as a meaningful threshold will have to consider income and residual income. *See generally* Karen E. Hancock, *"Can Pay? Won't Pay?" or Economic Principles of "Affordability,"* 30 Urban Studies 127 (1993).

[1181] *See, e.g.*, Diego S. Cardoso & Casey J. Wichman, *Water Affordability in the United States*, 58 Water Resources Research (2022).

[1182] *2024 Section 706 Report* at 53, para. 90.

[1183] *Id.*

[1184] *Id.*

[1185] *Id.* at 53-54, para. 90.

[1186] USTelecom Comments at 3; USTelecom Reply at 2-3; FSF Comments at 16-17 (citing to research by USTelecom and CTIA); FSF Reply at 2-3; ICLE Comments at 15 (citing to research by USTelecom); NCTA Comments at 12-13.

[1187] NCTA Comments at 9-10; WISPA Comments at 5; SIA Reply at 2; PDI Comments at 3.

Finally, several commenters report on the improvement in affordability for low-income consumers as a result of the ACP when it was active, which we investigate using the ACP Data Collection.[1188]

382. Two recent studies suggest that affordability is a barrier to broadband subscription for low-income households,[1189] and cost appears to be a primary obstacle.[1190] In addition, recent research by the Benton Institute for Broadband & Society estimates that 43% of low-income households are subscription-vulnerable and 53% of low-income households find that affording monthly Internet service is either very or somewhat difficult.[1191] Other studies suggest that affordability varies across different demographics and geographies.[1192] Overall, these studies suggest that broadband affordability depends on various household characteristics, including household income and expenditures, and the choices, product characteristics, and prices of not only broadband service but also the prices of other products and services that a household consumes. This suggests that a comprehensive analysis of affordability will require

[1188] NCTA Comments at 14-15 (describing the impacts of the cable providers' participation in the ACP); CCA Comments at 14 (stating, in part, that the ACP allowed small providers to offer services and rates on par with larger competitors).

[1189] *See, e.g.*, National Telecommunications and Information Administration (NTIA), *New Analysis Shows Offline Households are Willing to Pay $10-a-Month on Average for Home Internet Service, Though Three in Four Say Any Cost is Too Much* (Oct. 6, 2022), https://www.ntia.gov/blog/2022/new-analysis-shows-offline-households-are-willing-pay-10-month-average-home-internet; John B. Horrigan, Benton Institute for Broadband & Society, Are We There Yet? Affordability, Adoption, Equity, and the United States's Universal Broadband Goals at 4-5 (Dec. 2023), https://www.benton.org/sites/default/files/arewethereyet1.pdf; *see also 2024 Section 706 Report* at 54-55, para. 92 & n.293.

[1190] *See*, *e.g.*, NTIA, *New Analysis Shows Offline Households are Willing to Pay $10-a-Month on Average for Home Internet Service, Though Three in Four Say Any Cost is Too Much* (Oct. 6, 2022), https://www.ntia.gov/blog/2022/new-analysis-shows-offline-households-are-willing-pay-10-month-average-home-internet; EveryoneOn Report 2021 at 5 (survey finding that 40% of households making $50,000 or less report being unable to pay anything for high-speed Internet and 22% of them report being able to pay only $25/month for it); Andrew Perrin, Pew Research Center, *Mobile Technology and Home Broadband 2021* (June 3, 2021), https://www.pewresearch.org/internet/2021/06/03/mobile-technology-and-home-broadband-2021/ (finding that 45% of non-adopters "do not subscribe to high-speed internet at home . . . [because] the monthly cost of a subscription is too expensive"); Becky Chao & Claire Park, New America's Open Technology Institute, The Cost of Connectivity 2020 at 10 (July 2020), https://d1y8sb8igg2f8e.cloudfront.net/documents/The_Cost_of_Connectivity_2020__XatkXnf.pdf; Jonathan Sallet, Benton Institute for Broadband & Society, Broadband for America's Future: A Vision for the 2020s at 65-66 (Oct. 2019), https://www.benton.org/sites/default/files/BBA_full_F5_10.30.pdf (discussing multiple studies); Rafi Goldberg, National Telecommunications and Information Administration, Unplugged: NTIA Survey Finds Some Americans Still Avoid Home Internet Use (Apr. 15, 2019), https://www.ntia.doc.gov/blog/2019/unplugged-ntia-survey-finds-some-americans-still-avoid-home-internet-use (with respect to families with incomes of less than $25,000/year); *see also 2024 Section 706 Report* at 54-55, para. 92 & n.294.

[1191] John B. Horrigan, Leaving Money on the Table: The ACP's Expiration Means Billions in Lost Savings, Benton Institute for Broadband & Society (July 2024) at 3, 4, https://www.benton.org/sites/default/files/ACP-survey_0.pdf (Benton 2024 ACP Survey) (defining subscription-vulnerable households as households that "have lost service because of difficulty paying broadband bills, find it very difficult to afford service, or live at or near the poverty line"). The findings are based on a representative sample of 2,535 households with annual incomes of $50,000 or less. *Id*. at 3.

[1192] *See*, *e.g.*, Donna K. Ginther et al., University of Kansas Institute for Policy & Social Research, Broadband in Kansas: The Challenges of Digital Access and Affordability at 24 (Mar. 2023), https://kuscholarworks.ku.edu/server/api/core/bitstreams/c3b7a143-96b7-4a1e-8e6f-7ce898534be5/content; *see also* 2024 *Section 706 Report* at 54-55, para. 92 & n.295; EveryoneOn Report 2021 at 8-10.

access to detailed and disaggregated data on broadband characteristics and prices, the prices of other household goods and services, and on geographically varying household characteristics.[1193]

383. In this *Report*, as in the *2024 Section 706 Report*, we provide an analysis of some of the factors that affect affordability. We note that as a preliminary matter, we do not have sufficient data to draw detailed conclusions as to the general affordability of broadband service or its affordability for particular types of households.[1194] Specifically, we examine the level and variability of prices for fixed and mobile broadband service, the share of income used to pay for broadband for different income groups and geographies, and we present information on an example household.[1195]

1. Prices for Broadband

384. We examine the costs of fixed and mobile stand-alone services as well as combined service. We also discuss the contribution of low-cost plans and of subsidy programs in improving affordability. Figure IV.B.1 compares prices for telecommunications and Internet services with the chained CPI for all Urban Consumers (chained CPI-U).[1196] Between 2010 and 2023, prices for goods and services overall increased by approximately 35%. Prices for Internet services increased at a lower rate, by approximately 9%. In real, i.e., inflation-adjusted terms, prices for Internet services declined by approximately 20%. Prices for wireless telephone services decreased by approximately 23% (43% in inflation-adjusted prices). On the other hand, prices for landline telephone services increased faster than prices overall, by approximately 48% (10% in inflation-adjusted prices).[1197]

[1193] *2024 Section 706 Report* at 55, para. 92.

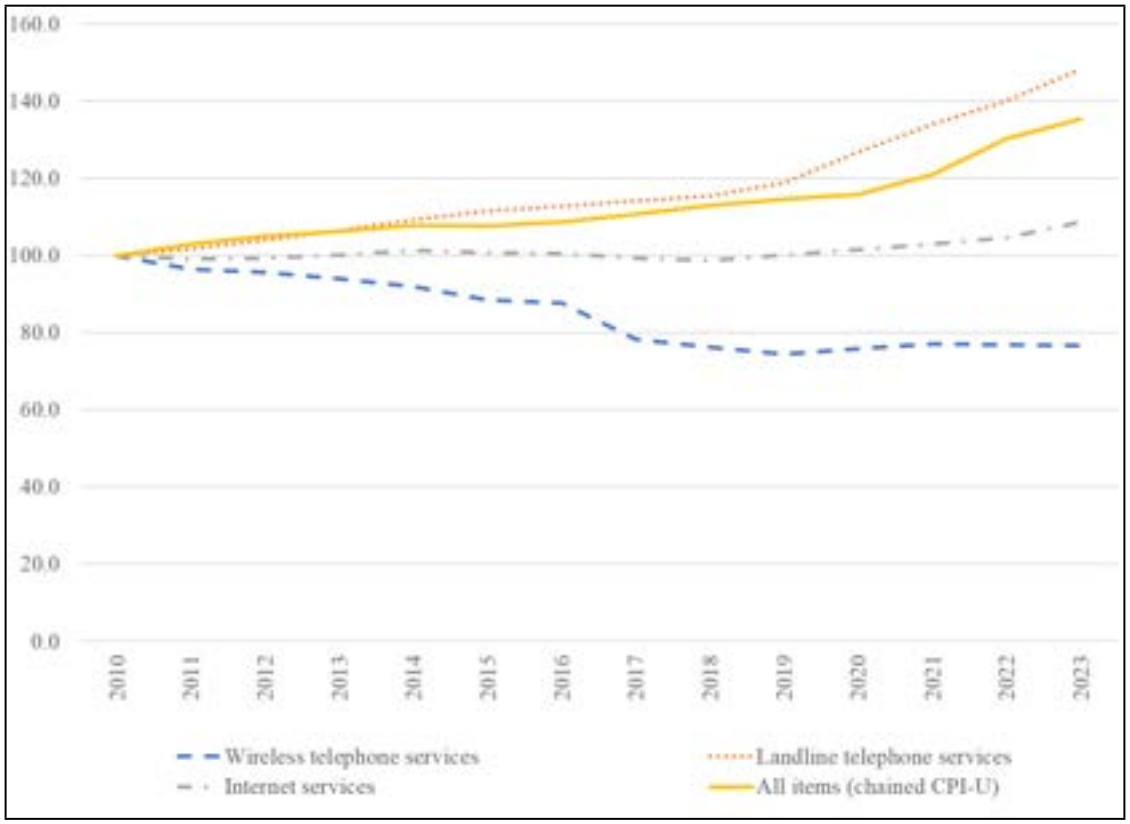
[1194] *Id.* at 55, para. 93.

[1195] *Id.* at 55, para. 93 & n.296. To overcome data limitations, we explore several scenarios using an "example household" which is a hypothetical household with characteristics suitable for assessing affordability. For the purposes of our analysis, we assume that this household has an income of 135% of the federal poverty level, as this was the proposed qualifying criteria for the ACP in recent legislation. Secure and Affordable Broadband Extension Act, S.4317, 118th Cong. (2024), https://www.congress.gov/bill/118th-congress/senate-bill/4317. It is also one of the current qualifying criteria for Lifeline and was one of the qualifying criteria for the EBB Program. 47 CFR § 54.409(a)(1); 47 CFR § 54.1605(a)(1). To reflect variation in household sizes, we look at households with one to four members. To reflect price and income variation across geographies, we create example households for each census division and Alaska, which accommodates our use of the URS data. For one, two, three, and four member households in the 48 contiguous states and the District of Columbia, the 2023 federal poverty level for annual income is $14,580, $19,720, $24,860, and $30,000, respectively. In Alaska, the 2023 federal poverty level for one, two, three, and four member households is $18,210, $24,640, $31,070, and $37,500, respectively. The federal poverty income levels are then multiplied by 1.35 and used to determine the share of income that households of varying size would have to spend on fixed and mobile Internet access and for fixed and mobile service combined.

[1196] U.S. Bureau of Labor Statistics, *Databases, Tables & Calculators by Subject, Wireless Telephone Services in U.S. City Average, All Urban Consumers, Not Seasonally Adjusted*, https://data.bls.gov/timeseries/CUUR0000SEED03?output_view=data (last visited Nov. 6, 2024); U.S. Bureau of Labor Statistics, *Databases, Tables & Calculators by Subject, Residential Telephone Services in U.S. City Average, All Urban Consumers, Not Seasonally Adjusted*, https://data.bls.gov/timeseries/CUUR0000SEED04?output_view=data (last visited Nov. 6, 2024); U.S. Bureau of Labor Statistics, *Databases, Tables & Calculators by Subject, Internet Services and Electronic Information Providers in U.S. City Average, All Urban Consumers, Not Seasonally Adjusted*, https://data.bls.gov/timeseries/CUUR0000SEEE03?output_view=data (last visited Nov. 6, 2024); U.S. Bureau of Labor Statistics, *Databases, Tables & Calculators by Subject, All Items in U.S. City Average, All Urban Consumers, Chained, Not Seasonally Adjusted,* https://data.bls.gov/timeseries/SUUR0000SA0?output_view=data (last visited Nov. 6, 2024).

[1197] For December 2009 to 2023 data, *see 2024 Section 706 Report* at 55-56, para. 95, Fig. 16.

Fig. IV.B.1
Annual CPI-U and Telecommunications CPI
2010-2023 (Benchmarked to 2010)



Source: U.S. Bureau of Labor Statistics, *Databases, Tables & Calculators by Subject, Wireless Telephone Services in U.S. City Average, All Urban Consumers, Not Seasonally Adjusted*, https://data.bls.gov/timeseries/CUUR0000SEED03?output_view=data (last visited Nov. 6, 2024); U.S. Bureau of Labor Statistics, *Databases, Tables & Calculators by Subject, Residential Telephone Services in U.S. City Average, All Urban Consumers, Not Seasonally Adjusted*, https://data.bls.gov/timeseries/CUUR0000SEED04?output_view=data (last visited Nov. 6, 2024); U.S. Bureau of Labor Statistics, *Databases, Tables & Calculators by Subject, Internet Services and Electronic Information Providers in U.S. City Average, All Urban Consumers, Not Seasonally Adjusted*, https://data.bls.gov/timeseries/CUUR0000SEEE03?output_view=data (last visited Nov. 6, 2024); U.S. Bureau of Labor Statistics, *Databases, Tables & Calculators by Subject, All Items in U.S. City Average, All Urban Consumers, Chained, Not Seasonally Adjusted,* https://data.bls.gov/timeseries/SUUR0000SA0?output_view=data (last visited Nov. 6, 2024).

385. The Commission currently collects price data in the URS.[1198] The URS collects advertised prices for undiscounted, residential fixed broadband.[1199] While the URS includes prices from across the United States, for many providers and for multiple speed tiers, it is not a comprehensive census of all fixed prices.[1200] The URS data only document prices for certain urban areas,[1201] and even for the

[1198] FCC, *Urban Rate Survey Data & Resources*, https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources (last visited Nov. 9, 2024); *see also 2024 Section 706 Report* at 56, para. 96 & n.298.

[1199] *2024 Section 706 Report* at 56, para. 96 & n.299.

[1200] *Id.* at 56, para. 96 & n.300.

[1201] *Id.* at 56, para. 96 & n.301.

reported geographic areas, URS prices are not necessarily the ones faced by households due to differences in promotional pricing or service availability. We therefore use the URS data only to construct average prices for large areas, in line with its use in the Universal Service program to construct national average prices for speed tiers.[1202]

386. In this *Report*, as in the *2024 Section 706 Report*, we use the 2024 URS, documenting prices for fixed broadband in December 2023, to examine fixed broadband prices.[1203] In addition, we use the same methodology as in the IBDR[1204] to collect mobile broadband prices for 26 representative service providers (both facilities based and MVNOs).[1205] We then use this price information to examine the share of income an example household at 135% of the 2023 federal poverty level—one of the recently proposed income thresholds used to determine whether a household qualifies for the ACP, the current income threshold for Lifeline eligibility, and the income threshold for EBB Program eligibility when it was active—would need to spend to obtain fixed, mobile, and both fixed and mobile broadband.[1206]

387. Figure IV.B.2 below (included as Figure 17 in the *2024 Section 706 Report*) shows weighted summary statistics of the monthly fixed broadband Internet prices per household at the national-level and for the nine census divisions, Alaska, and Puerto Rico.[1207] We include plans with unlimited capacity across three speed tiers: 25/3 Mbps, 100/20 Mbps, and 940/500 Mbps.[1208] Because prices vary depending on local conditions such as population density and dispersion, difficulty of construction, technology, and the intensity of competition, both the mean and standard deviation of prices vary across census divisions.[1209] The high standard deviation points to the variability of prices within each geographic area.[1210] This suggests that across geographies, low-cost options are available, but it does not imply that such options are available at every location.[1211] Recent research by the Benton Institute finds that low-income households (defined as households with annual income of less than $50,000) paid an average price of $66.53 per month for home broadband service.[1212] When asked what they considered to be too expensive a price to pay for service, 56% said monthly prices of up to $75—which is approximately the national average price for 25/3 Mbps service based on the URS—would be too expensive.[1213] Only 23% of low-income respondents indicated that paying up to $100 per month for service, which is

[1202] *Id.* at 56, para. 96 & n.302.

[1203] *Id.* at 57-58, para. 98, Fig. 17. There have been no new URS data published since the release of the *2024 Section 706 Report*.

[1204] *See 2022 Communications Marketplace Report*, 37 FCC Rcd at 16415, para. 96, Appx. G; *see also 2024 Section 706 Report* at 56-57, para. 97 & n.303.

[1205] *See 2024 Section 706 Report* at 58-59, para. 99, Fig. 18.

[1206] For calculations using 200% of the federal poverty guidelines, *see id.* at 61-63, paras. 102-103, Fig. 20. The calculation assumes that households subscribe to broadband for the entire household but obtain mobile broadband for each household member, taking advantage of multi-line discounts. *Id.* at 56-57, para. 97 & n.304. Because the ACP is no longer active, we choose to use 135% instead of 200% in this *Report.*

[1207] *Id.* at 57-58, para. 98, Fig. 17. Census divisions are the smallest geographic unit for which the 2024 URS data are statistically representative. *Id.* at 57, para. 98 & n.305.

[1208] *Id.* at 57, para. 98.

[1209] *Id.*

[1210] *Id.*

[1211] *Id.* at 57, para. 98 & n.306.

[1212] Benton 2024 ACP Survey at 4.

[1213] *Id.*

approximately the national average price for 100/20 Mbps service based on the URS, was affordable to them.[1214]

[1214] *Id.*

Fig. IV.B.2
Monthly Fixed Broadband Internet Prices Per Household, by Census Division and Speed Tier

Download / Upload	Census Division/AK/PR	Mean ($)	St.Dev. ($)	Min. ($)	Median ($)	Max. ($)	Count
25/3 Mbps	New England	83.83	17.25	30.00	87.00	112.00	62
	Middle Atlantic	86.24	17.26	15.00	87.00	160.39	298
	East North Central	69.63	24.39	14.95	79.99	139.99	354
	West North Central	42.94	24.93	14.95	30.00	111.50	340
	South Atlantic	78.71	17.39	14.95	79.99	144.94	390
	East South Central	67.14	20.46	14.95	79.99	95.00	128
	West South Central	81.59	10.50	25.00	80.41	129.99	125
	Mountain	66.70	25.58	14.95	55.00	150.00	215
	Pacific Except Alaska	77.22	13.26	14.95	79.99	185.00	232
	Alaska	131.38	14.02	60.00	129.99	159.00	199
	Puerto Rico	77.08	48.01	29.99	49.99	149.00	226
	National	75.94	22.95	14.95	79.99	185.00	2569
100/20 Mbps	New England	105.38	22.77	39.95	109.99	188.96	173
	Middle Atlantic	104.49	24.96	30.00	109.99	186.39	738
	East North Central	98.94	28.45	30.00	99.99	185.76	657
	West North Central	81.41	25.63	30.00	79.00	148.50	607
	South Atlantic	101.78	25.85	15.00	107.00	315.00	780
	East South Central	97.50	20.58	41.95	99.99	119.99	168
	West South Central	100.35	25.21	15.00	100.51	159.99	340
	Mountain	74.43	33.44	30.00	72.75	139.99	162
	Pacific Except Alaska	99.03	23.83	30.00	99.99	127.76	297
	Alaska	184.99	1.10	179.99	184.99	199.00	125
	Puerto Rico	74.71	9.12	30.00	79.99	84.99	292
	National	100.18	26.26	15.00	100.99	315.00	4339
940/500 Mbps	New England	231.10	92.14	69.95	300.00	350.00	72
	Middle Atlantic	206.21	93.09	69.95	180.00	350.00	272
	East North Central	203.15	107.49	69.99	255.00	1000.00	240
	West North Central	159.40	82.97	49.00	125.00	299.95	273
	South Atlantic	199.07	108.10	35.00	255.00	599.99	367
	East South Central	167.38	89.89	30.00	119.99	350.00	96
	West South Central	176.50	89.28	69.95	140.97	301.52	197
	Mountain	220.23	103.74	20.00	299.95	299.95	112
	Pacific Except Alaska	208.69	96.62	49.99	255.00	300.00	339
	Alaska	-	-	-	-	-	0
	Puerto Rico	88.43	13.39	70.00	84.99	140.00	62
	National	197.85	99.46	20.00	240.00	1000.00	2030

Source: FCC, *Urban Rate Survey Data and Resources*, https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources (last visited Nov. 9, 2024).
Note: The download/upload speed indicates that the advertised speed is between that speed and the higher tier (e.g., 25/3 Mbps means advertised download/upload speed is at least 25/3 Mbps but not greater than 100/20 Mbps).

388. We collect price information for 26 facilities-based service providers and MVNOs.[1215] Price information comes from manual data collection from providers' websites, as of June and July 2024.[1216] Only plans that offered at least 30 GB of unthrottled data per month and line were considered,[1217] and we also collected information for both post-paid and pre-paid service options.[1218] For comparability reasons, we exclude plans with device discounts, and only include plans that assume consumers bring their own devices.[1219] We also exclude provider discounts that may be inaccessible for low-income households.[1220] Providers sometimes have multiple plans that meet our requirements for inclusion into the dataset. In those cases, we only include a provider's lowest priced plan or combination of plans that serve one, two, three, and four lines.[1221] Figure IV.B.3 summarizes the median, mean, minimum, and maximum prices for the cheapest available one-, two-, three-, and four-line plans across the 26 providers sampled. Figure IV.B.3 reflects the overall price level and variance across the nation but does not imply that all plans are available in all locations. Cheaper plans with lower data caps are available in many locations for consumers with lower mobile data use, but these are not included in the price collection due to our 30 GB data minimum.[1222]

[1215] For December 2023 to January 2024 data, *see 2024 Section 706 Report* at 58-59, para. 99, Fig. 18. The sample includes 26 providers with extensive nationwide service either as a facilities based provider or an MVNO: AT&T, T-Mobile, Verizon, Consumer Cellular, Boost Mobile, Boost Infinite, Cricket, FreeUp, Gen Mobile, Good2Go, Google Fi, H2O Wireless, Metro by T-Mobile, Mint, Pure Talk, RedPocket, Simple Mobile, Straight Talk, Tello, Ting, Total by Verizon, UScellular, US Mobile, Ultra Mobile, Visible, and Wing.

[1216] We use the following formula (that takes into account one-time and on-going fees) to calculate the average monthly rate:

$$Price_{24Month} = [(PromoPrice_1 * PromoDuration_1) + (PromoPrice_2 * PromoDuration_2) + NonPromoPrice * (24 - PromoDuration_1 - PromoDuration_2) + 24 * (AccessFee + MonthlyOtherFees - MonthlyRebate) + ActivationFee + OtherFees - Rebate]/24$$

See 2024 Section 706 Report at 58-59, para. 99 & n.308; *2022 Communications Marketplace Report*, 37 FCC Rcd 15514, Appx. G, para. 102.

[1217] *2024 Section 706 Report* at 58-59, para. 99 & n.309. We therefore did not include plans that provided lower data limits at a lower price such as Twigby, TracFone, Reach Mobile, Unreal, and Spectrum, nor did we include providers that have no data component in their plans, like Textnow and Go Talk. *Id.* The provider Credo was in the collection for the *2024 Section 706 Report* but was removed for this collection since it now slows speeds after 20 GB of usage on its unlimited plan. *See* Credo, *How Many Lines Do You Need?*, https://www.credomobile.com/plan/ (last visited Sept. 25, 2024).

[1218] *2024 Section 706 Report* at 58-59, para. 99.

[1219] *Id.* at 59, para. 99.

[1220] *Id.* at 59, para. 99 & n.310.

[1221] *Id.* at 59, para. 99.

[1222] *Id.* at 59, para. 99 & n.311.

Fig. IV.B.3
Lowest Cost 30 GB Nationwide Mobile Plan Prices (Price per Line)

	Mean ($)	St.Dev. ($)	Min. ($)	Median ($)	Max. ($)
1 Line ($)	47.63	11.96	25.00	50.69	66.15
2 Lines ($)	43.45	11.00	25.00	43.25	66.15
3 Lines ($)	41.05	10.81	25.00	40.05	65.00
4 Lines ($)	39.53	11.72	25.00	39.47	65.00

Source: Statistics calculated over the lowest cost plan or combination of plans from each provider that provides unthrottled 30 GB 5G service for specified number of lines. No discounts included other than introductory promotional offers. Staff data collection is from providers' websites between June 10, 2024 and July 16, 2024.

389. *Overview of the ACP.* During the COVID-19 pandemic, Congress acted to help close the broadband affordability gap by establishing the $3.2 billion EBB Program as part of the Consolidated Appropriations Act. Eligible low-income households could receive a discount off the cost of broadband service and certain connected devices during the emergency period, and participating providers could receive a reimbursement for such discounts.[1223] The Infrastructure Act[1224] then extended the program beyond the emergency period, renamed it as the ACP, and appropriated an additional $14.2 billion for the program.[1225] The ACP supported discounted broadband service to qualifying low-income households by providing a monthly benefit of up to $30 per month or up to $75 per month for eligible households on qualifying Tribal lands.[1226] One of the stated goals of the ACP was to help close the digital divide by reducing the affordability gap for American households.[1227] However, due to the depletion of funding for the ACP and a lack of additional funding from Congress, April 2024 was the final full month of the ACP benefit and only partial reimbursement was available for May 2024.[1228] At the time new ACP enrollments stopped on February 8, 2024, there were over 23 million households benefiting from it.[1229]

390. *ACP Survey.* In December 2023, the FCC conducted a survey of ACP households to better understand the effect of the ACP on households.[1230] The survey provided an opportunity to

[1223] Consolidated Appropriations Act, 2021, Pub. L. No. 116-260, div. N, tit. IX, § 904(i), 134 Stat. 1182, 2130, 2135 (2020); *Emergency Broadband Benefit Program*, WC Docket No. 20-445, Report and Order, 36 FCC Rcd 4612 (2021); *see also 2024 Section 706 Report* at 61-62, para. 103 & n.316.

[1224] Infrastructure Act, div. F, Tit. V, § 60502(a), 135 Stat. at 1238; *id.*, div. J, Tit. IV, 135 Stat. at 1382 (appropriating $14.2 billion to the Commission for the ACP); *see also 2024 Section 706 Report* at 61, para. 103 & n.317.

[1225] *2024 Section 706 Report* at 61-62, para. 103 & n.318.

[1226] 47 U.S.C. § 1752(a)(7).

[1227] *ACP Report and Order and Further Notice*, 37 FCC Rcd at 581, para. 211.

[1228] *Wireline Competition Bureau Announces the Final Month of the Affordable Connectivity Program*, WC Docket No. 21-450, Public Notice, DA 24-194, at 1 (WCB Mar. 4, 2024). The wind-down process included an enrollment freeze, which went into effect on February 8, 2024.

[1229] *2024 Section 706 Report* at 62, para. 103 & n.321.

[1230] FCC, *ACP Consumer Survey*, https://www.fcc.gov/acp-survey (last visited Sept. 6, 2024) (*2023 ACP Survey*). Survey results are published on that webpage (navigate to "Survey Questions & Results" subheading and click on link entitled "Full Survey"). *See* Measuring the Impact of the ACP: Survey Results. The FCC released the survey results on February 29, 2024. Press Release, FCC, New FCC Survey Shows Over Two-Thirds of ACP Households Had Inconsistent or Zero Connectivity Prior to ACP Enrollment (Feb. 29, 2024), https://docs.fcc.gov/public/attachments/DOC-400836A1.pdf.

examine how affordability impacts consumers' ability to have consistent Internet access. Over two-thirds of the survey respondents reported they had inconsistent connectivity or zero connectivity prior to the ACP.[1231] Approximately one-third of respondents reported they only have Internet in the months they could afford it, and an additional 22% of respondents cited affordability as the reason for not having Internet *at all* in the year prior to their enrollment in the ACP.[1232] Further, the survey indicated that 85% of the respondents would need to make a change to their Internet service choices if their monthly bill were $30 or higher.[1233]

391. Closing the affordability gap is an important factor in bridging the digital divide because it enables low-income households to adopt Internet service, mitigates subscription vulnerability, and improves the quality of their options for Internet services. The ACP survey indicated that the ACP helped bridge the digital divide in each of these three dimensions. Approximately 22% of ACP households did not have Internet service in the year prior to enrolling in the ACP because they could not afford it.[1234] The survey indicated that an additional 15% of ACP households used their ACP benefit to either improve the quality of their Internet service or add an additional service for their household.[1235] Lastly, another 57% of respondents reported that they used their ACP benefit to reduce the cost for an existing service they had prior to ACP, but many in this group also responded that they did not have this service consistently in the year prior to ACP due to affordability issues.[1236]

392. *ACP Data Collection*. The Infrastructure Act also directed the Commission to establish an annual mandatory collection "of data relating to the price and subscription rates of each Internet service offering of a participating provider under the Affordable Connectivity Program . . . to which an eligible household subscribes."[1237] In November 2022, the Commission established the ACP Data Collection that set out what information related to the price, subscription rates, and plan[1238] characteristics of the Internet service offerings of ACP would be collected.[1239] Participating providers were required to submit a snapshot of the broadband services their ACP households were receiving on August 1, 2023.[1240] Sixteen hundred providers submitted ACP plan and subscription data at the ZIP code level, and the Office of Economics and Analytics (OEA) aggregated these data to the state, county, and ZIP Code level.[1241] In

[1231] *2023 ACP Survey* at eighth unnumbered slide (Survey Question 2).

[1232] *Id.*

[1233] *Id.* at eleventh unnumbered slide (Survey Question 3).

[1234] *Id.* at eighth unnumbered slide (Survey Question 2).

[1235] *Id.* at sixth unnumbered slide (Survey Question 1 Follow-up).

[1236] *Id.*

[1237] Infrastructure Act, div. F, Tit. V, § 60502(c)(1), 135 Stat. at 1243.

[1238] A "plan" referred to in this data collection has the same meaning as an "Internet service offering" as defined in 47 CFR § 54.1800(n).

[1239] *Affordable Connectivity Program*, WC Docket No. 21-450, Fourth Report and Order and Further Notice of Proposed Rulemaking, 37 FCC Rcd 13773, 13774, para. 1 (2022).

[1240] *The Office of Economics and Analytics and the Wireline Competition Bureau Announce Publication of Affordable Connectivity Program Transparency Data Collection Summary*, WC Docket No. 21-450, Public Notice, DA 23-450 (WCB May. 30, 2024).

[1241] *Id*.

May 2024, the FCC published data from the ACP Data Collection, which offered a snapshot of the broadband services for nearly 20 million households as of August 1, 2023.[1242]

393. As of August 1, 2023—the snapshot date for the ACP Data Collection—there were over 9 million ACP households using their ACP benefit for a fixed Internet service. Figure IV.B.4 shows the weighted average maximum download speed for the plans with a fixed broadband component over a range of base monthly prices.[1243] Approximately 16% of the ACP households using their benefit on a fixed broadband plan had a base monthly price equal to or less than $30, meaning the base monthly price was completely covered by the non-Tribal ACP benefit.[1244] The median base monthly price in the ACP Data Collection data is approximately $65 for plans with a fixed component.[1245] As Figure IV.B.4 shows, as the base monthly price increases, the weighted average maximum download speed also generally increases.

Fig IV.B.4
Fixed ACP Households Nationwide by Base Monthly Price & Maximum Advertised Download Speed (Aug. 1, 2023)

Base Monthly Price	Total ACP Households	Total Providers	Weighted Avg. Max Download Speed
$0 - $20	748,023	121	41.7 Mbps
$20.01 - $30	754,635	340	135.5 Mbps
$30.01 - $40	175,337	501	177.6 Mbps
$40.01 - $50	342,070	838	238.1 Mbps
$50.01 - $60	1,353,492	917	165.6 Mbps
$60.01 - $80	3,212,532	1,198	323.1 Mbps
Over $80	2,538,088	1,040	586.8 Mbps
Total	9,124,177	1,503	328.5 Mbps

Source: ACP Data Collection; Staff Calculations
Note: Base Monthly Price in Fig. IV.B.4 reflects plans adopted using the $30 monthly ACP benefit and plans adopted using the ACP benefit of up to $75 for households on Tribal lands.

394. Figure IV.B.5 shows the weighted average minimum download speed for the 10.6 million ACP households on a mobile broadband plan over a range of base monthly prices. The median base monthly price for ACP households using their ACP benefit on a mobile broadband plan was approximately $40, which is 38% lower than the median fixed base monthly price.[1246] Additionally, over

[1242] *The Office of Economics and Analytics and the Wireless Competition Bureau Announce Publication of Affordable Connectivity Program Transparency Data Collection Summary*, WC Docket No. 21-450, Public Notice, DA 24-504 (OEA/WCB May 30, 2024).

[1243] The term "Base Monthly Price" means the monthly price that would be paid by a household enrolled in the ACP, absent the ACP benefit. The "Base Monthly Price" does not include the price of any recurring monthly fees (such as fees providers impose at their discretion, or equipment rental fees), government taxes or fees, or one-time charges (such as installation charges, equipment purchase fee, etc.). Likewise, the "Base Monthly Price" would not include ongoing discounts for auto-pay, paperless billing, etc., but does include the introductory discount. ACP households could use their benefit on an Internet-only plan or an Internet service bundled with other products; the "Base Monthly Price" can in some cases be the total bundled price or separated out bundled price.

[1244] ACP households who were eligible for the Tribal benefit could receive up to $75 per month, so if their base monthly price was $75 or less they would be completely covered by the ACP benefit. Additionally, households enrolled in both ACP and Lifeline could stack both benefits, and non-Tribal households would be fully covered up to $39.25 per month. Also, the base monthly price does not include re-occurring discounts or fees, so the total bill amount may or may not be fully covered by the ACP benefit.

[1245] Staff calculations using non-public ACP Data Collection data.

one third of mobile ACP households' base monthly price is completely covered by the non-Tribal ACP benefit.

Fig. IV.B.5
Mobile ACP Households by Base Monthly Price & Minimum Advertised Download Speed
(Aug. 1, 2023)

Base Monthly Price	Total ACP Households	Total Providers	Weighted Avg. Min Download Speed
$0 - $20	171,546	25	3.0 Mbps
$20.01 - $30	3,673,215	92	35.8 Mbps
$30.01 - $40	3,122,598	50	14.8 Mbps
$40.01 - $60	1,516,617	45	12.2 Mbps
$60.01 - $80	1,937,516	79	102.2 Mbps
Over $80	186,380	32	6.1 Mbps
Total	10,607,872	130	37.3 Mbps

Source: ACP Data Collection; Staff Calculations.
Note: Base Monthly Price in Fig. IV.B.5 reflects plans adopted using the $30 monthly ACP benefit and plans adopted using the enhanced ACP benefit of up to $75 on Tribal lands.

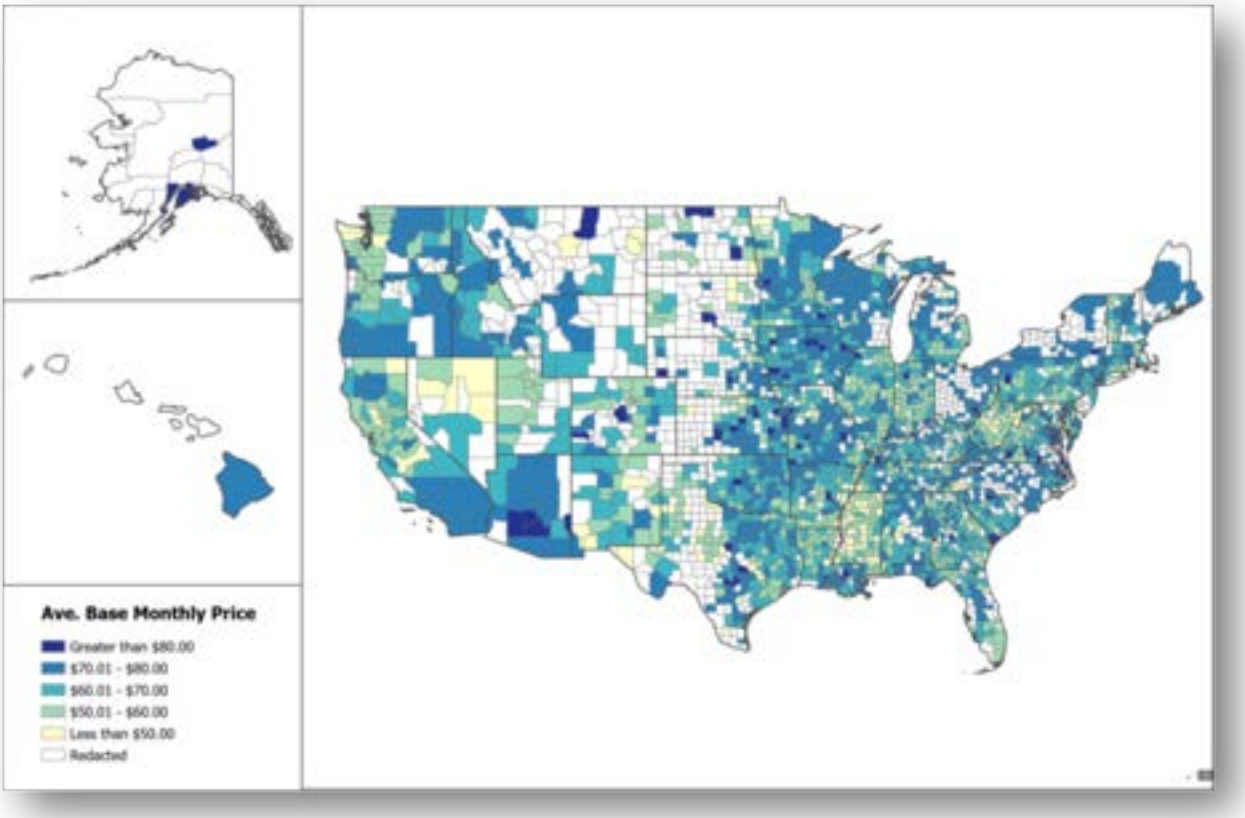
395. Figures IV.B.6 and IV.B.7 show the average base monthly price for each county in the continental United States for fixed services and mobile services, respectively.[1247] The mobile services map illustrates that higher prices tend to be in counties with Tribal lands. The ACP benefit amount is higher for qualifying households on Tribal lands. Tribal lands tend to be associated with higher costs of supplying broadband because of the "unique challenges that Tribal rural lands present, such as rough terrain, thick foliage that may interrupt wireless signals, and sacred sites that must be circumvented, among others."[1248]

(Continued from previous page)
[1246] *Id.*

[1247] Certain counties in the map were redacted to protect the confidentiality of provider data.

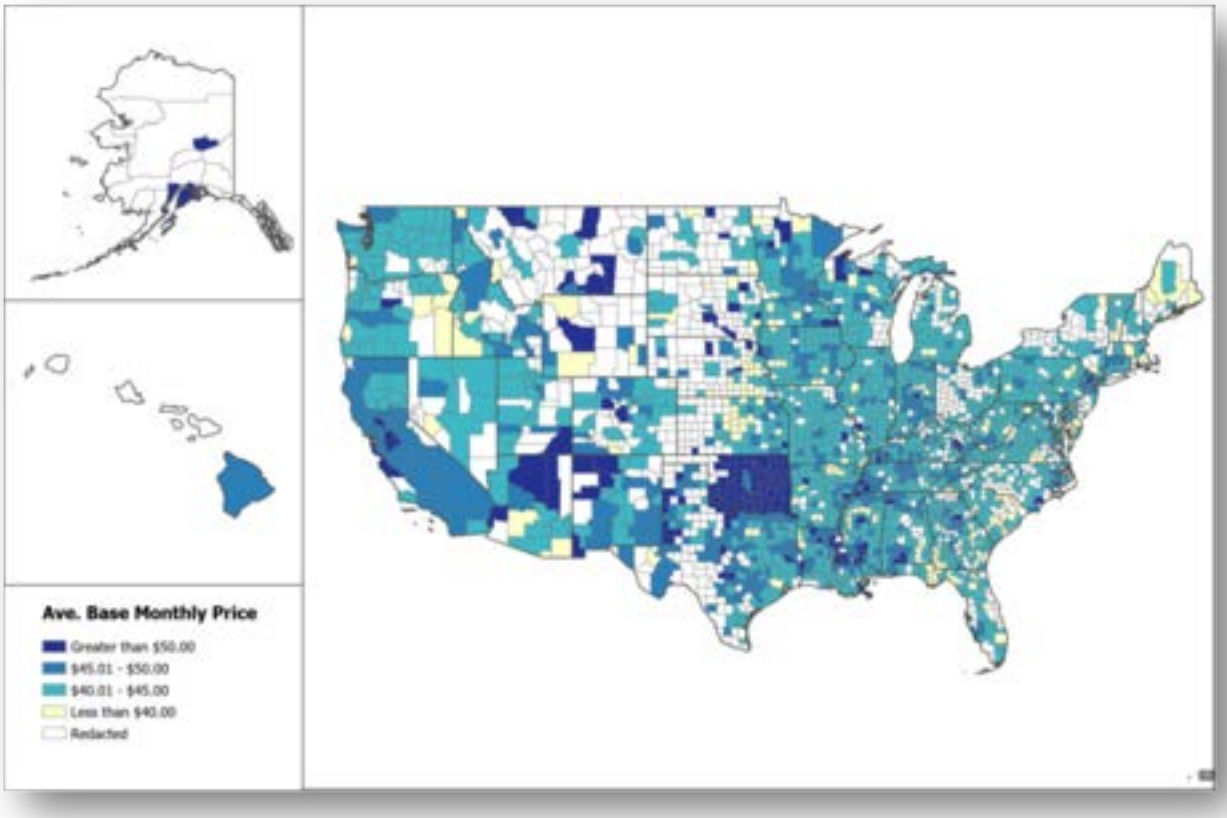
[1248] Darrah Blackwater, *Broadband Internet Access: A Solution to Tribal Economic Development Challenges*, The Indigenous Peoples' Journal of Law, Culture, & Resistance 110 (2020).

Fig. IV.B.6
Fixed ACP Household Average Base Monthly Price by County for the United States



Source: ACP Data Collection.
Note: The FCC redacted data for certain counties to prevent potential disclosure of subscribers' privacy and/or provider-specific information.

Fig. IV.B.7
Mobile ACP Household Average Base Monthly Price by County for the United States



Source: ACP Data Collection.
Note: The FCC redacted data for certain counties to prevent potential disclosure of subscribers' privacy and/or provider-specific information.

2. Income Shares Used to Subscribe to Broadband

396. Whether a particular price for broadband is affordable also depends in part on a household's disposable income.[1249] This *Report* discusses data on broadband expenses across income deciles[1250] and on the burden of broadband on an example household with an income corresponding to 135% of the 2023 federal poverty level.[1251] Economic analysis suggests that affordability is most reliably measured by the effect of an expense on the remaining (residual) income. Thus, it is not meaningful to establish a fixed percentage of income as a threshold for affordability.[1252] Nonetheless, evaluating the share of income spent on broadband across regions and income groups is broadly informative of the degree of affordability.[1253]

[1249] *2024 Section 706 Report* at 59, para. 100 & n.312.

[1250] *Id.* at 60-61, para. 101, Fig. 19.

[1251] *See id.* at 61-63, paras. 102-103, Fig. 20 (using income at 200% of the federal poverty guidelines).

[1252] *See* Karen E. Hancock, *"Can Pay? Won't Pay?" or Economic Principles of "Affordability,"* 30 Urban Studies 127 (1993); *see also 2024 Section 706 Report* at 60, para. 100 & n.313.

[1253] *2024 Section 706 Report* at 60, para. 100.

397. Figure IV.B.8 below (reported as Figure 19 in the *2024 Section 706 Report*) shows the median cost of fixed broadband as a share of household income,[1254] differentiated for three speed tiers, by Census division.[1255] Differences in broadband prices and regional incomes translate into considerable variation even within speed tiers, particularly for the two lowest income deciles.[1256] For example, households at the 10th income percentile must spend between approximately 5% of their income in the Mountain Census Division and approximately 11% in Alaska for subscription to median-priced 100/20 Mbps broadband service.[1257] Households at the 20th percentile must spend between approximately 3% (Mountain) and approximately 6% (Alaska) for median-priced 100/20 Mbps broadband service.[1258]

[1254] *Id.* at 60-61, para. 101 & n.314.

[1255] *Id.* at 60-61, para. 101, Fig. 19.

[1256] *Id.* at 60, para. 101.

[1257] *Id.*

[1258] *Id.*

Fig. IV.B.8
Median Fixed Broadband Internet Cost as a Share of Household Income, by Census Division, Speed Tier, and Income Percentile

Download/ Upload	Census Division/AK	Income Percentile			
		10th	20th	50th	90th
25/3 Mbps	New England	6.0%	3.1%	1.2%	0.4%
	Middle Atlantic	6.7%	3.4%	1.3%	0.4%
	East North Central	6.2%	3.3%	1.4%	0.5%
	West North Central	2.1%	1.2%	0.5%	0.2%
	South Atlantic	6.0%	3.2%	1.3%	0.5%
	East South Central	7.6%	4.0%	1.6%	0.6%
	West South Central	6.5%	3.5%	1.4%	0.5%
	Mountain	3.6%	2.0%	0.9%	0.3%
	Pacific Except Alaska	5.1%	2.7%	1.1%	0.4%
	Alaska	7.6%	4.1%	1.8%	0.7%
100/20 Mbps	New England	7.5%	3.9%	1.5%	0.5%
	Middle Atlantic	8.5%	4.3%	1.7%	0.6%
	East North Central	7.8%	4.1%	1.7%	0.6%
	West North Central	5.6%	3.1%	1.3%	0.5%
	South Atlantic	8.0%	4.2%	1.8%	0.6%
	East South Central	9.5%	5.1%	2.0%	0.7%
	West South Central	8.2%	4.4%	1.8%	0.6%
	Mountain	4.7%	2.6%	1.1%	0.4%
	Pacific Except Alaska	6.4%	3.3%	1.3%	0.5%
	Alaska	10.8%	5.8%	2.6%	1.1%
940/500 Mbps	New England	20.5%	10.6%	4.1%	1.5%
	Middle Atlantic	14.0%	7.0%	2.7%	0.9%
	East North Central	19.8%	10.4%	4.4%	1.6%
	West North Central	8.9%	4.8%	2.1%	0.8%
	South Atlantic	19.0%	10.1%	4.2%	1.5%
	East South Central	11.4%	6.1%	2.4%	0.9%
	West South Central	11.5%	6.2%	2.5%	0.9%
	Mountain	19.5%	10.9%	4.7%	1.8%
	Pacific Except Alaska	16.3%	8.5%	3.4%	1.2%
	Alaska	-	-	-	-

Source: FCC, *Urban Rate Survey Data and Resources*, https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources (last visited Nov. 9, 2024); U.S. Census Bureau, *Explore Data*, https://data.census.gov/mdat/#/ (last visited Jan. 9, 2024); U.S. Bureau of Labor Statistics, *BLS Data Viewer*, https://beta.bls.gov/dataViewer/view/timeseries/SUUR0000SA0 (last visited Jan. 12, 2024). We note that there is no 940/500 Mbps plan in Alaska.

398. Figure IV.B.9 shows the share of income that example households of varying size would have to spend for fixed, mobile, and both fixed and mobile broadband, assuming that fixed broadband is obtained for the entire household and that all individuals in the household have mobile broadband.[1259] Income shares are calculated by census division—with Alaska separated as in the URS—for households

[1259] The weighted median monthly price of fixed broadband is for service at advertised speeds of at least 25/3 Mbps but not greater than 100/20 Mbps, as shown in Fig. 19 of the *2024 Section 706 Report*. *Id.* at 60-61, para. 101, Fig. 19. The median monthly price of wireless is derived from the data collection conducted by staff in June and July 2024 as shown in Fig. IV.B.3.

at 135% of the 2023 federal poverty level, based on the U.S. Department of Health and Human Services 2023 poverty guidelines.[1260] Figure IV.B.9 shows wide regional variation in the share of income that households would have to spend on broadband. In addition, the income share varies with the size of the household. For example, one-member households require between 4.9% and 8.8% of their income for both fixed and mobile broadband, while four-member households require between 5.6% and 7.3% of their income for both fixed and mobile broadband.

399. In Figure IV.B.9, we consider the effect of ACP and Lifeline subsidies on the share of income spent on broadband for example households of varying size with an income of 135% of the federal poverty level.[1261] Taking ACP and Lifeline subsidies into account, a one-member household required between 2.5% and 6.0% of their income for both fixed and mobile broadband, while four-member households required between 4.2% and 6.1% of their income for both fixed and mobile broadband.

[1260] *See id.* at 61-63, paras. 102-103, Fig. 20 (using income at 200% of the federal poverty guidelines).

[1261] *Id.* at 62, para. 103 & n.322 (using income at 200% of the federal poverty level).

Fig. IV.B.9
Estimated Expense of Fixed and Mobile Broadband as a Share of Household Income (at 135% Federal Poverty Level), by Census Division and Household Size

Division	Household Size	Median Monthly Price of Fixed	Median Monthly Price of Mobile	Monthly Household Income at 135% of FPL	Income Share Spent on Fixed	Income Share Spent on Mobile	Income Share Spent on Both	Income Share Spent on Both, Minus ACP	Income Share Spent on Both, Minus ACP and Lifeline
New England	1	$87.00	$50.69	$1,640	5.3%	3.1%	8.4%	6.6%	6.0%
	2	$87.00	$86.50	$2,219	3.9%	3.9%	7.8%	6.5%	6.1%
	3	$87.00	$120.14	$2,797	3.1%	4.3%	7.4%	6.3%	6.0%
	4	$87.00	$157.86	$3,375	2.6%	4.7%	7.3%	6.4%	6.1%
Middle Atlantic	1	$87.00	$50.69	$1,640	5.3%	3.1%	8.4%	6.6%	6.0%
	2	$87.00	$86.50	$2,219	3.9%	3.9%	7.8%	6.5%	6.1%
	3	$87.00	$120.14	$2,797	3.1%	4.3%	7.4%	6.3%	6.0%
	4	$87.00	$157.86	$3,375	2.6%	4.7%	7.3%	6.4%	6.1%
East North Central	1	$79.99	$50.69	$1,640	4.9%	3.1%	8.0%	6.1%	5.6%
	2	$79.99	$86.50	$2,219	3.6%	3.9%	7.5%	6.2%	5.7%
	3	$79.99	$120.14	$2,797	2.9%	4.3%	7.2%	6.1%	5.8%
	4	$79.99	$157.86	$3,375	2.4%	4.7%	7.0%	6.2%	5.9%
West North Central	1	$30.00	$50.69	$1,640	1.8%	3.1%	4.9%	3.1%	2.5%
	2	$30.00	$86.50	$2,219	1.4%	3.9%	5.3%	3.9%	3.5%
	3	$30.00	$120.14	$2,797	1.1%	4.3%	5.4%	4.3%	4.0%
	4	$30.00	$157.86	$3,375	0.9%	4.7%	5.6%	4.7%	4.4%
South Atlantic	1	$79.99	$50.69	$1,640	4.9%	3.1%	8.0%	6.1%	5.6%
	2	$79.99	$86.50	$2,219	3.6%	3.9%	7.5%	6.2%	5.7%
	3	$79.99	$120.14	$2,797	2.9%	4.3%	7.2%	6.1%	5.8%
	4	$79.99	$157.86	$3,375	2.4%	4.7%	7.0%	6.2%	5.9%
East South Central	1	$79.99	$50.69	$1,640	4.9%	3.1%	8.0%	6.1%	5.6%
	2	$79.99	$86.50	$2,219	3.6%	3.9%	7.5%	6.2%	5.7%
	3	$79.99	$120.14	$2,797	2.9%	4.3%	7.2%	6.1%	5.8%
	4	$79.99	$157.86	$3,375	2.4%	4.7%	7.0%	6.2%	5.9%
West South Central	1	$80.41	$50.69	$1,640	4.9%	3.1%	8.0%	6.2%	5.6%
	2	$80.41	$86.50	$2,219	3.6%	3.9%	7.5%	6.2%	5.8%
	3	$80.41	$120.14	$2,797	2.9%	4.3%	7.2%	6.1%	5.8%
	4	$80.41	$157.86	$3,375	2.4%	4.7%	7.1%	6.2%	5.9%
Mountain	1	$55.00	$50.69	$1,640	3.4%	3.1%	6.4%	4.6%	4.1%
	2	$55.00	$86.50	$2,219	2.5%	3.9%	6.4%	5.0%	4.6%
	3	$55.00	$120.14	$2,797	2.0%	4.3%	6.3%	5.2%	4.9%
	4	$55.00	$157.86	$3,375	1.6%	4.7%	6.3%	5.4%	5.1%
Pacific Except Alaska	1	$79.99	$50.69	$1,640	4.9%	3.1%	8.0%	6.1%	5.6%
	2	$79.99	$86.50	$2,219	3.6%	3.9%	7.5%	6.2%	5.7%
	3	$79.99	$120.14	$2,797	2.9%	4.3%	7.2%	6.1%	5.8%
	4	$79.99	$157.86	$3,375	2.4%	4.7%	7.0%	6.2%	5.9%
Alaska	1	$129.99	$50.69	$2,049	6.3%	2.5%	8.8%	5.2%	3.5%
	2	$129.99	$86.50	$2,772	4.7%	3.1%	7.8%	5.1%	3.9%
	3	$129.99	$120.14	$3,495	3.7%	3.4%	7.2%	5.0%	4.0%
	4	$129.99	$157.86	$4,219	3.1%	3.7%	6.8%	5.0%	4.2%

Source: U.S. Department of Health and Human Services, Annual Update of the HHS Poverty Guidelines, 88 Fed. Reg. 3424 (Jan. 19, 2023); FCC, *Urban Rate Survey Data and Resources*, https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources (last visited Nov. 9, 2024); Staff mobile pricing data collection is from June 10, 2024 to July 16, 2024.
Note: The column "Income Share Spent on Both, Minus ACP" is based on $30 of support for all areas except Alaska, where it is $75 of support. The column "Income Share Spent on Both, Minus ACP and Lifeline" is based on $30 ACP support and $9.25 Lifeline support for all areas except Alaska, where it is $75 ACP support and $34.25 Lifeline support.

C. Equitable Access

400. In the *Future of USF Report*, the Commission adopted equitable access as one of the universal service goals for broadband.[1262] The Commission explained that, in order to monitor the availability of broadband, it also had to assess the equitability of access.[1263] The granular broadband mapping provided by the BDC is one important way that we can measure whether our universal service goals are being achieved.[1264] Because variations in access are likely highly context-specific, the Commission envisioned that progress toward equitable access would also be informed by the actions of the Commission to eliminate digital discrimination of access.[1265] Our discussion of equitable access here is limited to presenting and analyzing the data available in the BDC in conjunction with the Census data available in the ACS.

401. Our analysis in this report uses the granular data available from the BDC. Because demographic and other data are not available for the specific service territories of providers, our analysis assesses the equitability of access at the level of Census Block Groups (CBGs), for which there are sufficiently accurate sociodemographic data. We include below an analysis of demographic data that examines the options available to consumers for fixed terrestrial services at two speed tiers[1266] and mobile 5G-NR services at 35/3 Mbps and, using the Census data and ACS demographic data,[1267] we also analyze the demographic characteristics of areas where consumers have access to multiple broadband providers.

402. Figure IV.C.1 presents an analysis of the average percentage of households with access to zero, one, two, and three or more providers at the speed benchmark of 100/20 Mbps,[1268] broken out by population density quartile,[1269] median household income quartile,[1270] and household poverty rate

[1262] *Report on the Future of the Universal Service Fund*, WC Docket No. 21-476, Report, 37 FCC Rcd 10041, 10046-47, para. 12 (2022) (*Future of USF Report*).

[1263] *See id.* at 10047, para. 13. No commenter directly addressed the issue of equitable access. Several comments and reply comments relate indirectly to equitable access. They discuss technologies that could help mitigate digital divides, such as FWA and satellite services (*see*, *e.g.*, CTIA Comments at 8; MSSA Comments at 2-3; SIA Reply at 10); the need for continued support programs to reduce digital divides (*see,* e.g., CTIA Comments at 39; USTelecom Comments at 4; WIA Comments at 2; WISPA Comments at 7; Public Knowledge/OTI Reply at 43; Recon Analytics *Ex Parte* at 3); economic and technical reasons why access will vary across regions and populations (*see, e.g.*, ACA Connects Comments at 11-13); and potential unintended consequences of FCC policies related to equitable access (*see, e.g.*, ICLE Comments at 26-29).

[1264] *See Future of USF Report*, 37 FCC Rcd at 10049, para. 18.

[1265] *See id.* at 10049-50, para. 20.

[1266] Fixed terrestrial services are all fixed broadband services excluding FSS.

[1267] For this analysis, we examine population density, the number of households, and median household income. We rely upon the 2018-2022 ACS 5-Year Estimates for median household income (in 2022 inflation-adjusted dollars) reported at the census block group level. *See* U.S. Census Bureau, *2022 Data Release New and Notable*, https://www.census.gov/programs-surveys/acs/news/data-releases/2022/release.html (last visited July 11, 2024).

[1268] We include only the areas for which we have complete data. We aggregate households within a census block group by provider count category; that is, we group households within a census block group by the number of providers and then sum the households by provider count category. The households within a census block group are aggregated by the number of competing providers offering a particular category of service (zero, one, two, and at least three). The census block group is the smallest geographic area for which income data are available. We use the 2018-2022 ACS 5-Year Estimates for income measures for CBGs. Median household income is based on 2022 data and is measured in 2022 inflation-adjusted dollars. Population density is the total population residing in the census block group as of 2022 divided by the square miles of land in the census block group, with the estimate of land area based on the 2020 Census. Household count is the number of households in the census block group.

quartile.[1271] We observe that the number of provider options generally increases with population density and median household income but decreases with household poverty rate. In general, the CBGs in rural areas tend to have the lowest population density and they are likely to have the highest percentage of the households with zero provider options, that is, no service availability of the reported service.

403. The more granular and accurate FCC BDC data also allow consistent comparisons of statistical changes over time (at least for more recent periods). Although the *2022 Communications Marketplace Report* relied primarily on FCC Form 477 data, we can compare the December 2023 data reported here against data from December 2022, which were reported in the Commission's *2024 Section 706 Report*.[1272] As indicated in Figure IV.C.1, the average number of available providers offering fixed terrestrial speeds of 100/20 Mbps increased across the population density and median household income categories during the period December 2022 to December 2023.[1273] During that same time period, the percentage of households with no or only one provider offering fixed terrestrial speeds of 100/20 Mbps decreased in the population density and median household income categories, while the percentage of households with two or more such providers increased across the population density and median household income categories. Despite the increase in availability of providers to households, concerns about equitable access remain as the specific patterns vary, and not all of the analyzed demographic categories experienced comparable levels of improvement. For example, the percentage of locations in the lowest population density quartile without any fixed terrestrial provider decreased by 8.5 percentage points from 27.7% in 2022 to 19.2% in 2023, and the percentage of locations with only one provider decreased by 3.2 percentage points from 47.8% to 44.6%, whereas the number of locations with two or more fixed terrestrial providers increased by 11.8 percentage points from 24.4% to 36.2%. In other words, the increase in the percentage of locations with availability of multiple providers exceeded the decreases in the percentage of locations with availability of either zero providers or one provider in the lowest population density quartile. A similar pattern holds true for median household income.[1274]

(Continued from previous page)

[1269] The range of the first quartile for population density is 0 to 457 people per square mile, the range of the second quartile is 457 to 2,693, the range of the third quartile is 2,693 to 6,210, and the range of the fourth quartile is 6,211 to 718,367.

[1270] The range of the first quartile for median household income is $2,499 to $53,221, the range of the second quartile is $53,222 to $74,187, the range of the third quartile is $74,188 to $104,628, and the range of the fourth quartile is $104,630 to $250,001.

[1271] The range of the first quartile for household poverty rate is 0 to 3.8, the range of the second quartile is 3.8 to 9.4, the range of the third quartile is 9.4 to 18.5, and the range of the fourth quartile is 18.5 to 100.

[1272] *2024 Section 706 Report* at 27-28, para. 52 & n.203.

[1273] The analogous table in the *2024 Section 706 Report* presented household count instead of household poverty rate. *Id.* at 74-75, para. 126, Fig. 25.

[1274] For December 2022 data, *see id.*

Fig. IV.C.1
Average Percentage of Households with Zero, One, Two, or at Least Three Provider Options for 100/20 Mbps Fixed Terrestrial Services by Census Block Group (Dec. 31, 2023)

	Zero	One	Two	At Least Three
Population Density				
First Quartile (Lowest Population Density)	19.2%	44.6%	25.1%	11.1%
Second Quartile	1.4%	30.7%	40.1%	27.9%
Third Quartile	0.5%	22.8%	41.0%	35.7%
Fourth Quartile (Highest Population Density)	0.4%	18.2%	41.6%	39.8%
Median Household Income				
First Quartile (Lowest Median H/hold Income)	6.6%	32.9%	35.0%	25.5%
Second Quartile	7.3%	31.9%	35.0%	25.8%
Third Quartile	5.2%	28.9%	36.8%	29.1%
Fourth Quartile (Highest Median H/hold Income)	2.0%	22.4%	41.1%	34.5%
Household Poverty Rate				
First Quartile (Lowest H/hold Poverty Rate)	3.5%	25.9%	39.7%	30.9%
Second Quartile	5.3%	28.9%	36.8%	28.9%
Third Quartile	6.5%	30.5%	35.6%	27.4%
Fourth Quartile (Highest H/hold Poverty Rate)	5.7%	30.8%	35.9%	27.6%

Source: FCC BDC data; Staff Block Estimates; 2020 Census; ACS Five-Year Estimates for 2018-2022.

404. In Figure IV.C.2, we combine demographic data with our service availability analysis. Figure IV.C.2 depicts how the average proportion of the population with coverage by fixed terrestrial services by speed tier varies with median household income, population density, and household poverty rate at the census block group level. On average, service availability is highest in census blocks with the highest median household incomes, the highest population densities, and the lowest household poverty rates. Between December 2022 and December 2023, availability with 100/20 Mbps and 940/500 Mbps improved for all quartiles of the socio-demographic groups included in Figure IV.C.2.[1275]

[1275] For December 2022 data, *see id.* at 75-76, para. 127, Fig. 26.

Fig. IV.C.2
Average Percentage of Population With Availability of Fixed Terrestrial Services at Different Speed Tiers by Census Block Group (Dec. 31, 2023)

	100/20 Mbps	940/500 Mbps
Population Density		
First Quartile (Lowest Population Density)	80.7%	32.5%
Second Quartile	98.6%	45.5%
Third Quartile	99.5%	52.2%
Fourth Quartile (Highest Population Density)	99.6%	53.4%
Median Household Income		
First Quartile (Lowest Median H/hold Income)	93.4%	39.4%
Second Quartile	92.6%	43.0%
Third Quartile	94.8%	46.8%
Fourth Quartile (Highest Median H/hold Income)	98.0%	55.5%
Household Poverty Rate		
First Quartile (Lowest H/hold Poverty Rate)	96.5%	51.6%
Second Quartile	94.6%	47.0%
Third Quartile	93.4%	44.3%
Fourth Quartile (Highest H/hold Poverty Rate)	94.2%	41.5%

Source: FCC BDC data; Staff Block Estimates; 2020 Census; ACS Five-Year Estimates for 2018-2022.

405. Figure IV.C.3 presents an analysis of the percentage of the population with availability of fixed terrestrial services with speeds of at least 100/20 Mbps and 5G-NR broadband with minimum speeds of 35/3 Mbps, broken out by population density quartile, median household income quartile, and household poverty rate quartile. We observe that, on average, the percentage of population with availability of fixed and Mobile 5G-NR services is higher in areas with higher population density and higher median incomes. On average, as the poverty rate increases, availability of fixed terrestrial services declines, but mobile 5G-NR availability decreases from the first quartile to the third quartile before increasing in the highest quartile. Between December 2022 and December 2023, availability of fixed and Mobile 5G-NR services improved for all quartiles in all socio-demographic groups included in Figure IV.C.3.[1276]

[1276] For December 2022 data, *see id.* at 76-77, para. 128, Fig. 27.

Fig. IV.C.3
Average Percentage of Population With Availability of Fixed Terrestrial Services at 100/20 Mbps and Mobile 5G-NR with Minimum Speeds of 35/3 Mbps by Census Block Group (Dec. 31, 2023)

	Fixed Terrestrial 100/20 Mbps	Mobile 5G-NR 35/3 Mbps	Both Fixed and Mobile 5G-NR 35/3 Mbps
Population Density			
First Quartile (Lowest Population Density)	80.7%	73.5%	62.6%
Second Quartile	98.6%	97.8%	96.5%
Third Quartile	99.5%	99.5%	99.0%
Fourth Quartile (Highest Population Density)	99.6%	99.9%	99.5%
Median Household Income			
First Quartile (Lowest Median H/hold Income)	93.4%	91.6%	87.9%
Second Quartile	92.6%	89.3%	85.3%
Third Quartile	94.8%	92.6%	89.3%
Fourth Quartile (Highest Median H/hold Income)	98.0%	96.7%	95.2%
Household Poverty Rate			
First Quartile (Lowest H/hold Poverty Rate)	96.5%	94.9%	92.5%
Second Quartile	94.6%	91.9%	88.8%
Third Quartile	93.4%	90.7%	87.0%
Fourth Quartile (Highest H/hold Poverty Rate)	94.2%	93.0%	89.7%

Source: FCC BDC data; Staff Block Estimates; 2020 Census; ACS Five-Year Estimates for 2018-2022.

406. Figure IV.C.4 shows certain demographic characteristics of areas that are served and unserved by both fixed terrestrial services with speeds of at least 100/20 Mbps and 5G-NR broadband with minimum speeds of 35/3 Mbps.[1277] On average, areas served by both terrestrial and wireless services at those speeds have higher population densities, higher per capita incomes, and higher median household incomes, with the exception of unserved urban areas, which tend to have higher per capita and median household incomes than served urban areas.

[1277] To present demographic data and compare the demographic data between areas where services are and are not deployed, we aggregate the service availability data up to the census block group level, the lowest aggregation level for which demographic information is available. This unavoidable aggregation leads to areas with differing characteristics being grouped together. In the case of differing levels of deployment, we designate a census block group as without deployment if more than 5% of the population in the census block group is without services, regardless of the level of deployment in any particular census block in the group. We use the most recently available Census Bureau's ACS Five-Year Estimates 2018-2022 for income and poverty measures. Per capita income and median household income are based on 2022 data and are measured in 2022 inflation-adjusted dollars.

Fig. IV.C.4
Demographic Data Comparison Between Served and Unserved Areas of Fixed Terrestrial Services at 100/20 Mbps and Mobile 5G-NR 35/3 Mbps Availability (Dec. 31, 2023)

	Population	Population Density	Per Capita Income	Median Household Income	Household Poverty Rate
United States					
Served	1,438.3***	8,020.6***	$42,316.86***	$86,867.03***	13.4%***
Unserved	1,308.7	699.0	$38,372.75	$77,362.03	12.5%
Urban Areas					
Served	1,445.2***	8,422.9***	$42,614.71***	$87,356.34***	13.5%***
Unserved	1,487.0	2,360.9	$45,327.46	$90,656.41	12.6%
Rural Areas					
Served	1,310.0***	534.6***	$36,756.82***	$77,846.88***	12.2%
Unserved	1,246.4	118.9	$35,973.34	$72,868.06	12.4%
Tribal Areas					
Served	1,266.1	2,192.0***	$33,082.68***	$65,615.00***	16.3%***
Unserved	1,255.6	245.7	$29,763.92	$59,649.08	18.4%
Tribal Urban Areas					
Served	1,289.6**	2,746.7***	$33,864.54	$66,097.66	16.4%
Unserved	1,435.8	1,241.6	$34,428.00	$68,589.85	15.9%
Tribal Rural Areas					
Served	1,191.2	420.1***	$30,574.14	$64,047.34***	15.9%***
Unserved	1,229.0	98.4	$29,070.90	$58,329.28	18.7%

Source: FCC BDC data; Staff Block Estimates; 2020 Census; ACS Five-Year Estimates for 2018-2022.
Note: We test for a statistical difference in the reported means between areas with and without deployment of these services using a pooled t-test. This analysis does not control for other factors. The level of statistical significance is indicated by the number of stars. The absence of a star indicates no statistical difference between the reported figures. * signifies statistical significance at a 90% level of confidence, ** signifies statistical significance at a 95% level of confidence, and *** signifies statistical significance at a 99% level of confidence.

V. ENTRY CONDITIONS IN THE COMMUNICATIONS MARKETPLACE

407. New entry and incumbent expansion occur in the context of underlying regulatory and marketplace conditions that influence the total number of firms that can successfully compete and grow. To evaluate the competitiveness of any marketplace, one must consider multiple factors, including, as discussed in section II, prices and trends in prices, non-price competition, investment, innovation, as well as any barriers to entry or expansion by incumbents. While there is no single definition in the economics literature of what constitutes a barrier to entry,[1278] it is nonetheless the case that high barriers to entry reduce the threat to incumbents of new entry.[1279] In addition, barriers to expansion reduce the ability of existing competitors to successfully enter new geographic areas.

[1278] *See, e.g.*, Joe S. Bain, Barriers to New Competition (1950); George J. Stigler, The Organization of Industry (1968); Carl Christian von Weizsacker, *A Welfare Analysis of Barriers to Entry*, 11 Bell Journal of Economics 399 (1980); Richard Gilbert, *Mobility Barriers and the Value of Incumbency*, Handbook of Industrial Organization 475 (Richard Schmalensee and Robert Willig eds. 1989); R. Preston McAfee, Hugo M. Mialon & Michael A. Williams, *What is a Barrier to Entry?*, 94 AEA Papers and Proceedings, 461 (2004).

[1279] High economic profits encourage entry into the market, low economic profits discourage entry, and prolonged negative economic profits induce exit from the market. *See, e.g.*, Hal R. Varian, Intermediate Microeconomics: A Modern Approach, 433-34 (9th ed. 2014); Dennis W. Carlton and Jeffrey M. Perloff, Modern Industrial

(continued….)

A. The Fixed Communications Marketplace

408. In the fixed communications marketplace, both regulatory and non-regulatory factors may affect entry by newcomers and expansion by incumbents. Regulatory factors include government regulations, rules, and restrictions. Such regulatory factors can present as difficulties in obtaining the legal right to deploy facilities (such as on poles, in rights-of-way, and in multi-tenant environments (MTEs)). Examples of non-regulatory barriers include geography, the general cost of deploying wireline networks, and access to spectrum (for terrestrial fixed wireless providers).

409. Congress and the Commission have repeatedly recognized that the business case for delivering high-quality broadband service to sparsely populated rural and insular areas at affordable rates often requires financial subsidies, such as through the USF or separate programs, such as the Broadband Equity, Access, and Deployment (BEAD) Program authorized by the Infrastructure Act and managed by the National Telecommunications and Information Administration (NTIA).[1280] Some commenters acknowledge the benefits of these programs on lowering the costs to provide consumers with wider access to broadband services,[1281] while the International Center for Law and Economics (ICLE) raised concerns that rate control and preferences for government or municipal providers will harm competition and that the letter of credit and matching requirement of BEAD programs may harm competition by favoring large and well capitalized providers over smaller ISPs that may be better positioned to serve rural areas.[1282] Commenters offer suggestions for how such programs can be best coordinated and implemented—for instance, CTIA suggests that timing the 5G Fund auction to account for the BEAD-sponsored fiber deployment as a part of FWA backhaul facilities will expand 5G coverage in the unserved and underserved areas.[1283]

410. Commenters argue that difficulty in accessing poles and government rights of way remains a roadblock to network deployment. Specifically, the record contains allegations that pole owners process requests for access too slowly and shift too many costs, such as the costs of pole replacement, onto attachers.[1284] Regarding access to rights of way, commenters claim that they experience permitting delays and fees that exceed reasonable costs.[1285]

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Organization, 61, 76 (4th ed. 2005); *see also* George S. Ford, et al., *Competition After Unbundling: Entry, Industry Structure, and Convergence*, 59 Fed. Com. L.J. 344 (2007).

[1280] *See Future of USF Report*, 37 FCC Rcd at 10044-45, paras. 6-8; Infrastructure Act, div. F, tit. I, § 60102, 135 Stat. at 1182-1205.

[1281] City of Portland ERRATA Updated Comments at 6; USTelecom Reply at 1-4; WISPA Comments at 24.

[1282] ICLE Comments, Appendix Dynamic Competition in Broadband Markets: A 2024 Update at 25-26.

[1283] CTIA Comments at 13.

[1284] ACA Connects Comments at 14-15; CTIA Comments at 72-73; ICLE Comments, Appendix Dynamic Competition in Broadband Markets: A 2024 Update at 36-39; INCOMPAS Comments at 20-22; NTCA Comments at 15-17. USTelecom states that the Commission's December 2013 Pole Attachment Order expressly addressed cost allocation in circumstances where a pole replacement is not necessitated solely by the new attachment and urges the Commission to maintain its current pole attachment policies. USTelecom Reply at 5-7.

[1285] ACA Connects Comments at 2-3; FSF Reply at 8; INCOMPAS Comments at 17-18; USTelecom Comments at 8-9; USTelecom Reply at 4-5. City of Portland argues that the Commission's prohibition on local franchise authorities using their cable franchising authority to regulate any services other than cable services provided over the cable systems of a cable provider creates a competitive disparity between cable providers and broadband-only providers because the former pay right-of-way fees based only on declining cable revenue (and not broadband revenue), while broadband-only providers pay right-of-way fees on "much higher" broadband revenues. City of Portland ERRATA Updated Comments at 3-4. CTIA advocates for removing deployment barriers at the state-level including streamlining the pole attachment process by requiring pole owners to provide a substantive, fact-based reason for denying approved alternative attachment methods; imposing cost-based fees for siting; reducing utility

(continued….)

411. Despite the Commission's adoption of disclosure requirements for MTE exclusive marketing arrangements to ensure competitive choice of communications services for those living and working in MTEs,[1286] INCOMPAS argues that difficulty in accessing MTEs is a roadblock to deployment.[1287] They specifically argue that commercial agreements, such as exclusive wiring arrangements, bulk billing arrangements, and exclusivity agreements regarding access to rooftops, serve to maintain monopolies in MTEs.[1288] Further, INCOMPAS urges the Commission to carefully monitor whether adoption of the *2022 MTE Order* has had the intended effect on competition and to consider whether barriers to entry remain.[1289] City of Portland argues that increasing transparency in MTE advertising and pricing would reduce competitive market barriers and therefore decrease the cost of services.[1290] Specifically, the City of Portland suggests that requiring broadband providers to disclose services provided rather than advertised would reduce market barriers and increase transparency for local jurisdictions to guide infrastructure development and target digital equity services.[1291]

412. In addition to identifying areas in which additional Commission action would be useful, some commenters argue that recently taken actions may result in additional regulatory burdens particularly detrimental to small providers and stifle competition in the marketplace. The specific Commission actions identified by these commenters include reimposition of the Open Internet rules, the BDC, broadband labeling requirements, data breach reporting, and digital-discrimination compliance.[1292] Further, USTelecom argues that removing legacy obligations such as section 214 (of the Communications Act) discontinuance approval requirements and streamlining or eliminating carrier-of-last-resort obligations would promote deployment and competition.[1293]

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delays during the siting process through shot clocks, one-touch-make-ready policies, rapid dispute resolution, and other regulatory protections; granting access to pole-tops and prohibiting categorical bans on deployment; authorizing timely for telecommunications installations; and maintaining transparency in pole owners' safety guidelines. CTIA Comments at 72-73.

[1286] *See Improving Competitive Broadband Access to Multiple Tenant Environments*, GN Docket No. 17-142, Report and Order and Declaratory Ruling, 37 FCC Rcd 2448, 2464-69, paras. 33-42 (Feb. 22, 2022) (*2022 MTE Order); see also* City of Portland ERRATA Updated Comments at 4-5.

[1287] INCOMPAS Comments at 23-27.

[1288] *Id.* WISPA argues that banning bulk billing outright would be harmful to consumers, and bulk billing is only problematic when coupled with exclusive rights to market, install wiring or gain rooftop access, or restrictions on an individual tenant's right to opt-out and select an alternative service provider. WISPA Comments at 22-23. The Coalition of Independent Providers of Broadband Bulk Service (Coalition) argues against WISPA's suggestion on offering residents in MTEs an opt-out choice by claiming it would eliminate bulk contracts and result in a higher price for consumers. Coalition Reply at 5-8.

[1289] INCOMPAS Comments at 25.

[1290] City of Portland ERRATA Updated Comments at 7.

[1291] *Id*.

[1292] ACA Connects Comments at 11-12; ICLE Comments, Appendix Dynamic Competition in Broadband Markets: A 2024 Update at 3-4, 26-36; USTelecom Comments at 9; WISPA Comments at 15-21. The Commission's *2024 Open Internet Order* and the rules adopted therein are currently subject to a stay by the U.S. Court of Appeals for the Sixth Circuit. Federal Communications Commission, Safeguarding and Securing the Open Internet; Restoring Internet Freedom, Declaratory Ruling, Order, Report and Order, and Order on Reconsideration, 89 Fed. Reg. 45404 (May 7, 2024) (*2024 Open Internet Order*). On August 1, 2024, the Sixth Circuit granted a stay of the *2024 Open Internet Order* pending judicial review. *In re: MCP No. 185; Federal Communications Commission, In the matter of Safeguarding and Securing the Open Internet*, Declaratory Ruling, Order, Report and Order, and Order On Reconsideration, 89 Fed. Reg. 45404, Published May 22, 2024, No. 24-7000 (6th Cir. Aug. 1, 2024).

[1293] USTelecom Comments at 7.

B. The Mobile Wireless Communications Marketplace

413. In the mobile wireless marketplace, both regulatory and non-regulatory factors may affect entry or expansion. For the most part, these factors are related to the inputs necessary to offer mobile wireless services. Spectrum policy, which affects the spectrum capacity available for mobile wireless services, and infrastructure regulations that govern tower and antenna siting, may be barriers to entry or expansion. Non-regulatory or marketplace conditions that may determine the number of providers that can operate in the marketplace, or may deter entry or expansion, include efficiencies of size and scale, asymmetries across service providers' costs, and capital cost requirements, such as those costs incurred in acquiring spectrum or deploying a nationwide network.[1294]

414. *Spectrum*. The Commission has made significant efforts to make more spectrum available and to reduce the cost of infrastructure deployment. The Commission has pursued a comprehensive strategy that emphasizes the need to free up spectrum in the mid-, low-, and high-frequency bands. Commenters applaud the Commission, particularly for its actions of offering shared, unlicensed access to 1,200 megahertz across the 6 GHz band and the innovative sharing mechanism for the CBRS band to convert underutilized spectrum for more intensive licensed and opportunistic use by various users.[1295]

415. The FCC's authority to auction spectrum expired in March 2023 and has not been restored by Congress.[1296] The Competitive Carriers Association (CCA) and WIA stress the importance of reinstating the FCC's auction authority, which is essential in allowing access to spectrum.[1297] Public Knowledge and the Open Technology Institute at New America (OTI) state that access to spectrum is a significant market barrier to new competitors,[1298] and urge the Commission to continue the type of balanced spectrum policy with more unlicensed, shared, and licensed access to promote competition.[1299] CTIA urges the Commission to adopt and support policies that increase access to spectrum resources, particularly mid-band spectrum, for full-power, exclusive licensed use to continue fostering competition.[1300]

416. Some commenters urge the Commission to update its spectrum holdings policies, and argue for the consideration of a lower threshold for the Commission's spectrum screen for proposed secondary market transactions.[1301] FSF observes that the spectrum screen is only an analytical tool, not a hard cap on spectrum holding, highlighting that the Commission can address transaction-specific concerns by applying targeted conditions to disallow the screen to be manipulated to insulate certain

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[1294] Relatively high fixed costs in relation to the number of customers may limit the number of firms that can enter and survive in a market. *See, e.g.*, John Sutton, *Sunk Costs and Market Structure* (1991); Luis Cabral, *Introduction to Industrial Organization* (2000); Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization* 41 (4th ed. 2005); George S. Ford, et al., *Competition After Unbundling: Entry, Industry Structure, and Convergence*, 59 Fed. Com. L.J. 59:2, 332, 337 (2007).

[1295] NCTA *Ex Parte* at 2-3; Public Knowledge/OTI Reply at 25-26, 29-30.

[1296] *See* 47 U.S.C. § 309(j)(11) (terminating Commission authority to grant licenses by competitive bidding on March 9, 2023, with specified exceptions); *see also* Press Release, FCC, Chairwoman Rosenworcel Statement on the Expiration of FCC Spectrum Auction Authority (Mar. 10, 2023), https://www.fcc.gov/document/chairwoman-rosenworcel-expiration-spectrum-auction-authority.

[1297] CCA Comments at 15; WIA Comments at 3.

[1298] Public Knowledge/OTI Reply at 4.

[1299] *Id.* at 22-28.

[1300] CTIA Comments at 65.

[1301] EchoStar Comments at 11-13; Public Knowledge/OTI Reply at 33-35.

provider's market share from their rivals, and only make changes to the screen on a prospective basis after careful study in a generic proceeding.[1302]

417. *Infrastructure*. Wireless infrastructure constitutes another major input in the provision of mobile wireless services. Section 706 of the Telecommunications Act of 1996 directs the Commission to encourage deployment of advanced telecommunications capability by, among other things, "remov[ing] barriers to infrastructure investment."[1303] Encouraging investment in broadband deployment is essential to closing the connectivity gap and combatting digital discrimination, and the Commission has continued its efforts to facilitate the deployment of infrastructure necessary to support modern wireless networks.[1304]

418. WIA states that the telecommunications ecosystem has flourished under a light-touch regulatory regime, and specifically highlights the Commission actions streamlining permitting as well as adding proportionality, predictability, and transparency to the deployment of wireless infrastructure.[1305] WIA recommends the Commission continue exploring ways to make its permitting process more streamlined, and urges the Commission to address its own infrastructure and technology to ensure its systems are sufficiently modernized to meet deployment needs.[1306] CTIA urges other federal agencies to streamline their policies to enable wireless deployment, to reduce barriers to deployment.[1307] CTIA further points to a 24% increase in operational cell sites from 2014 to 2018 following "pivotal siting reforms" by the FCC in 2018.[1308]

419. *Other Concerns.* Some commenters raise concerns that certain Commission policies may undermine competition in the mobile wireless marketplace due to the burdens on small and rural mobile wireless service providers. For example, while CCA supports the Commission's efforts under the SCS proceeding to advance solutions between terrestrial wireless and satellite operators to improve connectivity, it expresses concern that the rules may undercut competition in rural areas and limit opportunities for smaller carriers.[1309] Additionally, CCA expresses support for regulatory efforts to promote public safety and improve consumer protections but encourages the Commission to give careful consideration to the burdens of Commission reporting requirements and other mandates upon smaller providers, including the Mandatory Disaster Response Initiative, 911 and 988 outage reporting, Z-axis deployment and location-based routing for 911 calls, Wireless Emergency Alerts, the Safe Connections Act, digital discrimination, subscriber identity module (SIM) swap and port out fraud prevention, data breach prevention, and robocall and robotext blocking.[1310] In this regard, we note that the Commission

[1302] FSF Reply at 5-6.

[1303] 47 U.S.C. § 1302(a).

[1304] The Commission's *2024 Section 706 Report* catalogs a number of actions in support of wireless broadband deployment. *See 2024 Section 706 Report*, at 89-191, paras. 151-79.

[1305] WIA Comments at 5-6 & n.17, n.18.

[1306] *Id.* at 2.

[1307] CTIA Comments at 74 (supporting the Advisory Council on Historic Preservation in extending its 2017 Program Comment to more federal agencies that impact communications projects and to more lands and properties used for communications deployments).

[1308] CTIA *Ex Parte* at 2. While CTIA does not explicitly reference the FCC item in question, in 2018, the FCC issued a declaratory ruling that clarified the limits and scope local and state authorities have on wireless siting and a report and order that established the current "shot clock" system for wireless siting review. *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, WT Docket No. 17-79, Declaratory Ruling and Third Report and Order, 33 FCC Rcd 9088 (2018).

[1309] CCA Comments at 16.

[1310] *Id.* at 17-18.

routinely seeks comment upon and gives particular consideration to impacts of its proposed rules upon small entities.[1311]

C. The Satellite Marketplace

420. Government rules and regulations as well as non-regulatory factors can likewise affect entry or expansion in the satellite communications services marketplace. Entry into or expansion in the U.S. satellite communications marketplace requires Commission authorization, which could entail obtaining a market access authorization, a space station license, an earth station license, or other kinds of licenses or authorizations.[1312] Licensing requirements depend on the proposed spectrum frequencies as well as the orbits in which the relevant space stations will be deployed (i.e., GSO or NGSO), among other factors. Licensees are required to engage in frequency coordination, including at the international level,[1313] in order to avoid interference with federal or other non-federal operators using the same spectrum from different orbital slots or at different earth stations. Space station licensees must also take steps to mitigate orbital debris. Non-regulatory factors that can impact entry or expansion include the degree of competition, which includes competition between satellite providers with different mixes of satellite assets as well as competition between satellite operators and terrestrial alternatives; capital requirements needed to design and manufacture satellites;[1314] launch costs and the availability of launch services; and the state of technology.

421. *Satellite and Earth Station Licensing and Authorizations.* The number and complexity of satellite and earth station applications continues to grow, particularly with the advent of large-scale NGSO constellations. As a result, reviewing applications for either space or earth stations can be a time consuming process, which may impact satellite operators' timeframe for entry or expansion. For example, in considering NGSO applications, the Commission must not only ensure that the applicant is legally, technically, and otherwise qualified, it often will also need to account for multiple applications that may be filed in response to a public notice of the initial application for a particular frequency band and grant all applications that meet its standards of review.[1315] As discussed in section VI.C, in 2023, the Commission took a major step to recognize the growth and importance of the space industry to the U.S. economy by creating SB and a standalone Office of International Affairs.[1316] As part of this restructuring,

[1311] Such analysis is required under the Regulatory Flexibility Act of 1980, as amended. 5 U.S.C. § 603. We also issue a final regulatory flexibility analysis upon the adoption of rules which: describes the need for and objectives of the rule; summarizes significant issues raised in response to comments on its initial regulatory flexibility analysis; describes and estimates the number of small entities to which the rule applies; describes the projected reporting, recordkeeping and other compliance requirements and the professional skills needed to prepare any records or reports; and describes how the agency has minimized the significant economic impact on small entities, including a description of why significant alternatives that affect the impact on small entities were rejected. 5 U.S.C. § 604. *See also, e.g.*, *Rules and Regulations Implementing the Telephone Consumer Protection Act of 1991*, CG Docket No. 02-278, Report and Order and Further Notice of Proposed Rulemaking, FCC 24-24, App. B (Feb. 16, 2024) (FRFA assessing the effects of changes to the robocall and robotext blocking rules).

[1312] *See* 47 CFR part 25.

[1313] *Id.* § 25.108.

[1314] We discuss the high upfront costs of satellite manufacturing in section II.D.4.

[1315] 47 CFR § 25.156, 25.157.

[1316] *Establishment of the Space Bureau and the Office of International Affairs and Reorganization of the Consumer and Governmental Affairs Bureau and the Office of the Managing Director*, MD Docket No. 23-12, Order, 37 FCC Rcd 608 (2023).

the Commission charged SB with authorizing satellite systems, streamlining regulatory processes, and fostering the efficient use of spectrum and orbital resources.[1317]

422. The launch of the new SB has enabled the Commission to better resource its processing of space and earth station applications, as well as more quickly adjust its regulatory framework to address emerging technological, competitive, or other developments. Since establishing SB, the Commission has taken additional steps to streamline regulatory processes and to foster more efficient use of spectrum in light of technological developments. As discussed in section VI.C, in September 2023, the Commission improved the process that Commission staff use to review space and earth station applications for acceptability for filing, established timeframes for placing space and earth stations on public notice, and undertook additional actions to expedite the processing of applications.[1318] The Commission concurrently committed to undertake a transparency initiative to provide information and guidance to enable interested parties to understand the Commission's procedures for authorizing proposed space station and earth station operations.[1319] SB has since launched a comprehensive Transparency Initiative, which has included six separate workshops to date on issues ranging from space and earth station licensing to orbital debris mitigation to the inter-agency payload review process for satellite launches. In addition, detailed application roadmaps and guidance can be found at this dedicated webpage: https://www.fcc.gov/space/transparency-initiative.

423. *Spectrum*. To provide regulatory certainty and improve efficiency for commercial space launch operations, the Commission, also in September 2023, allocated additional spectrum for non-Federal space launch operations.[1320] These actions were undertaken with the explicit intention of encouraging continued development of the U.S. commercial space sector.[1321] In addition, as discussed in section II.B.5.b, in March 2024, the Commission established conditions for the use of terrestrial spectrum for communications between mobile phones and satellites.[1322] With this new regulatory framework, the Commission made it easier for wireless providers to expand their coverage to connect remote areas.

424. *Market Barriers and Developments*. The satellite industry has invested heavily to provide a variety of communications and observation services to the U.S. economy.[1323] However, there are technical and competitive limitations to industry growth. Barriers to entry into the satellite sector, which might hinder the introduction of new services and the expansion of current services include: (1) the limited number of geostationary orbital slots available; (2) the limited amount of spectrum available for satellite use; (3) spectrum sharing and interference concerns that can limit multiple uses of the same spectrum; (4) the high cost of launches and of building and managing a satellite and ground communications network; (5) limitations to availability for some locations; and (6) limitations to quality of service for some satellite services, in terms of latency or capacity.[1324] In addition, satellite service is

[1317] *Establishment of the Space Bureau and the Office of International Affairs and Reorganization of the Consumer and Governmental Affairs Bureau and the Office of the Managing Director*, MD Docket No. 23-12, Order, 37 FCC Rcd 608, 609, para. 4 (2023).

[1318] *Expediting Initial Processing of Satellite and Earth Station Applications, Space Innovation*, IB Docket No. 22-411, 22-271, Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 8838 (2023).

[1319] *Id.* at 8839, para. 2.

[1320] *Allocation of Spectrum for Non-Federal Space Launch Operations, Amendment of Part 2 of the Commission's Rules for Federal Earth Stations Communicating with Non-Federal Fixed Satellite Service Space Stations; and Federal Space Station Use of the 399.9-400.05 MHz Band*, ET Docket No. 13-115, RM-11341, Second Report and Order and Second Further Notice of Proposed Rulemaking, 38 FCC Rcd 9029 (2023).

[1321] *Id*. at 9030, para. 2.

[1322] *Supplemental Coverage from Space Report and Order*, 39 FCC Rcd at 2623, para. 4.

[1323] SIA Reply at 11-13.

[1324] *See supra* section II.D.4.

often in competition with terrestrial networks, where they are available, with relatively low latency and high bandwidth, especially in the case of fiber networks.

425. The development of new technologies and business models have helped overcome some of these barriers, particularly in the areas of antenna technology, satellite capacity and processing, sensors, and launch costs. The development of spot beams and more powerful satellites has increased the capabilities and capacity of GSO HTS.[1325] At the same time, thousands of new NGSO satellites from multiple providers have launched to offer low-latency, high-speed broadband, with thousands planned over the next decade.[1326] As discussed in section II.D, commenters claim that new technologies such as satellite-based supplementary network coverage from space have spurred additional economic activity.[1327] Finally, launch costs have fallen dramatically over the past decade and are projected to fall substantially more throughout the following decade,[1328] which has contributed to increased launches, improved satellite operator profitability, and increased entry by satellite operators using small satellites.[1329]

D. The Video and Audio Communications Marketplaces

426. *Regulatory Barriers*. Many video and audio marketplace participants need authorization to operate from either the federal government or a local municipality. In addition, they often are subject to a range of regulations, including technical and interference standards, as well as programming and public interest obligations. As a result, some marketplace participants may face barriers to entry or compliance costs that may be different from those of other participants. Many regulated entities, however, hold exclusive spectrum licenses and/or often enjoy a strong position as the legacy service provider in the marketplace. We discuss below a few of the basic regulatory issues that industry participants confront.

427. Broadcast television and radio stations operate pursuant to a license from the Commission and must receive authorization before they may construct and operate in the United States.[1330] Further, broadcast stations are subject to the Communications Act of 1934, as amended, and regulations promulgated by the Commission thereunder. In allocating and authorizing broadcast stations, the Commission is charged with ensuring that its decisions result in a "fair, efficient, and equitable distribution" of service among states and communities.[1331] In addition, licensees of broadcast stations

[1325] SIA Reply at 11.

[1326] *Id.*

[1327] MSSA Comments at 3-5; SIA Reply 12-13.

[1328] According to one estimate, payload costs will decline by 40% per kilo of payload between 2023 and 2035 due to declines in launch vehicle costs. Jeremy Jurgens, World Economic Forum & Ryan Brukardt, McKinsey & Company, Space: The $1.8 Trillion Opportunity for Global Economic Growth at 13 (Apr. 2024), https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/space-the-1-point-8-trillion-dollar-opportunity-for-global-economic-growth. Citi forecasts that launch costs will fall by approximately 95% between 2020 and 2040 to roughly $100/kg by 2040. Citi GPS, Space: The Dawn of a New Age at 10 (May 2022), https://www.citigroup.com/global/insights/citigps/space_20220509.

[1329] Jeremy Jurgens, World Economic Forum & Ryan Brukardt, McKinsey & Company, Space: The $1.8 Trillion Opportunity for Global Economic Growth at 13 (Apr. 2024), https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/space-the-1-point-8-trillion-dollar-opportunity-for-global-economic-growth; SIA Reply at 11-12.

[1330] In accordance with its statutory authority, the Commission licenses broadcast spectrum to applicants and acts on applications to assign or transfer control of broadcast licenses. *See* 47 U.S.C. §§ 301, 303(c), 307(c), 308(a), 309(a), 310(d). In addition, the Commission has adopted rules to ensure that the licensed spectrum is used to serve the public interest during each license term. *See* 47 CFR part 73; *id.* part 74 Subpts. L, G; *see also* FCC, *The Public and Broadcasting* (Sept. 13, 2022), https://www.fcc.gov/media/radio/public-and-broadcasting.

[1331] 47 U.S.C. § 307(b).

must comply with certain obligations and rules to ensure that the licensed spectrum is used to serve the public interest.[1332] These include structural limits governing ownership of broadcast television and radio stations.[1333] Broadcast licenses are awarded for an eight-year term that may be renewed upon application and Commission approval.[1334]

428. The broadcast license market is limited, as new station licenses can only be awarded by the Commission by auction,[1335] or entities can purchase an existing license or permit from an existing permittee or station owner. In many areas of the country, no frequencies are available on which a new station could commence operation without causing impermissible interference to existing stations.[1336] As a result, the Commission does not allocate many new broadcast stations, and stations that are allocated tend to be outside the top markets and for lower power. Nonetheless, as noted in the previous report, new commercial stations are sometimes available.[1337] In June 2023, the Media Bureau announced a filing application window for construction permits for new LPFM stations, a class of radio stations designed to serve very localized communities or underrepresented groups within communities.[1338] Also, in October 2024, the Media Bureau announced a filing window for new NCE television stations.[1339] Given the limited number of new broadcast licenses, however, particularly in the television service or in large metropolitan areas, the typical means for new entrants to enter the broadcast television or radio business is by purchasing a construction permit, a station, or a group of stations on the secondary market (i.e., by purchasing from an existing permittee or station owner).

429. MVPDs must obtain appropriate regulatory authority before providing video services and are subject to Commission rules implicating the operation of their services, which vary depending on whether the entity is a cable MVPD or a non-cable MVPD. These rules include regulations that govern franchising and licensing, effective competition, program carriage, program access, must-carry and

[1332] *Id.* §§ 301, 303(c), 308(a), 309(a), 310(d).

[1333] 47 CFR § 73.3555.

[1334] 47 U.S.C. §§ 307(c), 309(k); 47 CFR § 73.1020, 73.3539.

[1335] The Commission's auction authority expired on March 9, 2023. *See* 47 U.S.C. § 309(j)(11). The Chairwoman has asked Congress to renew this authority. *See*, *e.g.*, Press Release, Chairwoman Rosenworcel Highlights One-Year Expiration of Agency's Spectrum Auction Authority and Potential Creative Solutions to Maintain U.S. Leadership (Mar. 7, 2024), https://www.fcc.gov/document/fcc-chairwoman-highlights-1-year-expiration-spectrum-auction-authority.

[1336] *See, e.g.*, FCC, *How to Apply for a Radio or Television Broadcast Station*, https://www.fcc.gov/media/radio/how-to-apply (last visited Aug. 1, 2024).

[1337] In June 2022, the Commission auctioned construction permits for 27 FPTV stations—the first FPTV auction opportunity since 2011—and in 2021, the Commission auctioned new construction permits for 135 commercial FM and four AM radio stations. *2022 Communications Marketplace Report*, 37 FCC at 15746, para. 407. In addition, the Commission continues to identify tentative selectees in groups of mutually exclusive applicants and grant construction permits in response to its 2021 filing window for parties seeking construction permits for new NCE FM stations, the first new licensing opportunity for full power noncommercial stations in more than 10 years. *Comparative Consideration of Three Groups of Mutually Exclusive Applications for Permits to Construct New Noncommercial Educational FM Stations*, Memorandum Opinion and Order, FCC 24-115 (Oct. 28, 2024); *2022 Communications Marketplace Report*, 37 FCC Rcd at 15784, para. 492.

[1338] *Media Bureau Announces LPFM New Station Application Filing Window; Window Open from November 1, 2023 to November 8, 2023*, Public Notice, DA 23-531 (MB June 22, 2023); *Creation of a Low Power Radio Service*, Report and Order, 15 FCC Rcd 2205 (2000).

[1339] *Media Bureau Announces Filing Window for New Noncommercial Educational Television Stations from December 4 Through December 11, 2024, and Sets Forth Filing Procedures and Requirements*, Public Notice, DA 24-1065 (MB Oct. 10, 2024).

retransmission consent, protection of exclusive broadcast distribution rights, public interest programming, access to multiple dwelling units, and OTA reception devices.

430. In addition to broadcast radio stations, the Commission has authorized SDARS. Because there are no additional SDARS licenses available, any new entity wishing to provide SDARS service would be required to purchase licenses from SiriusXM, the only incumbent provider in the marketplace. Further, because the service is delivered via satellite, SDARS requires a significant capital investment for operation.[1340]

431. Online audio and video providers generally are not subject to Commission regulation. In some circumstances, rules applicable to regulated entities may extend online. For example, the Commission's closed captioning rules require programming distributed via IP to be captioned if the programming was previously shown on television with captions.[1341]

432. Statutes and regulations that are outside of the Commission's purview can also have a competitive impact on broadcast and non-broadcast service providers. For example, under federal copyright law, AM and FM radio stations, unlike other audio platforms, do not pay performance rights fees for sound recordings they transmit via OTA broadcasts.[1342] Commenters in this proceeding disagree about the competitive impact of this difference in statutory requirements.[1343] The musicFIRST Coalition (musicFIRST) and Future of Music Coalition (FMC assert that being exempt from royalties payment requirements gives broadcasters an unfair advantage over competing audio service providers which are required to pay for licenses to use sound recordings.[1344] National Association of Broadcasters (NAB) notes that musicFIRST's and FMC's assertions stem from frustration over the lack of any action by Congress to establish a sound recording performance right for terrestrial radio.[1345] NAB reiterates that radio broadcasters pay royalties to composers whose music they play OTA and online, and that webcasting broadcasters also pay performance rights fees to record labels and performers when they stream copyrighted sound recordings online.[1346] NAB states that this differential treatment under copyright law does not confer any significant competitive advantage to terrestrial radio broadcasters because these broadcasters must acquire licenses from the Commission, provide their OTA product for free to the public, and have many costs and burdens that non-broadcast audio providers do not have.[1347]

433. *Market Barriers.* Commenters state that non-regulatory entry barriers in the media marketplace include the lack of access to capital, especially for women and minority owners,[1348] and asymmetric market power between broadcasters and distributors and between cable networks and distributors. While NAB maintains that the increase in retransmission consent fees have slowed in recent years and will attain a growth rate of zero for the next half-decade,[1349] ACA Connects argues that the

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[1340] *Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, IB Docket No. 95-91, Second Further Notice of Proposed Rulemaking, 22 FCC Rcd 22123, 22150, Appx. B (2007).

[1341] 47 CFR § 79.4; *see also* 47 U.S.C. § 613(c)(2)(A).

[1342] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15747, para. 410.

[1343] musicFIRST/FMC Comments at 27; NAB Reply at 27-29. Our previous report described a similar disagreement among commenters. *2022 Communications Marketplace Report*, 37 FCC Rcd at 15747, para. 410.

[1344] musicFIRST/FMC Comments at 27.

[1345] NAB Comments at 50 & n.127; NAB Reply at 26.

[1346] NAB Reply at 27.

[1347] *Id.* at 27-29.

[1348] NAB Comments at 34.

[1349] NAB Reply at 44.

main issue affecting MVPDs is the rise of retransmission consent and other program fees by broadcasters, which leads to more people cutting the cord and moving towards online video services.[1350] ACA Connects members report that programmers impose an increase in their programming costs of around 8 to 10% annually.[1351] ACA Connects claims that small MVPDs face particular challenges due to the bargaining power imbalance they have when negotiating with broadcasters, citing the 2022 Report on Cable Industry Prices showing that on average, monthly fees paid by smaller providers were 55% higher per subscriber per station when compared to larger providers' payments.[1352]

434. DIRECTV claims that a major reason behind the increase in retransmission consent fees is the consolidation of broadcasters.[1353] According to DIRECTV, market consolidation gave broadcasters the power to use blackouts as a strategy to demand higher retransmission and carriage prices from MVPDs, to the detriment of MVPDs' competitivity.[1354] EchoStar asserts that the rise of retransmission consent fees is a driving force behind blackouts to consumers, which it describes as an anticompetitive conduct of powerful programming conglomerates.[1355] Furthermore, EchoStar claims that the consolidation of the broadcast industry, along with the retransmission price increases, has resulted in the progressive vanishing of "small independent groups of two or three stations."[1356]

435. NAB argues that retransmission consent disruptions have increased "when the FCC and/or Congress actively contemplate changes to the retransmission consent regime," stating that these periods represent an incentive for the pay TV industry to show problems with the retransmission process. According to NAB, there was a record number of disruptions in 2016 (54), when the Commission was evaluating its retransmission consent good faith rules. Similarly, NAB claims that the average length of disruptions attained its highest point in 2019 (an average of 177 days), as Congress was considering an extension of the Satellite Television Extension and Reauthorization Act (STELAR).[1357]

436. NCTA argues that vertical integration in the cable industry is declining, as the percentage of national cable programming networks in which cable operators have an ownership interest went from 9.1% in 2017, to its current level of 5.8%, making it necessary to reevaluate the need of regulations for cable industry.[1358]

437. One Ministries (OMI), however, states that the vertical integration of media companies with programmers has led to discrimination against television stations that do not have major network affiliation, arguing for a need to update the must-carry rules to a "carry one–carry all" policy to be applied to all FPTV and low-power Class A television stations.[1359] OMI describes the case in which Comcast does not carry smaller minority-owned or religious stations not programmed by it in the San Francisco-Oakland-San Jose market.[1360] In comparison, OMI claims that Charter does not own any major television

[1350] ACA Connects Comments at 18.

[1351] *Id.* at 19.

[1352] *Id.* at 20.

[1353] DIRECTV Comments at 12.

[1354] *Id.* at 11.

[1355] EchoStar Comments at 14.

[1356] *Id.* at 19.

[1357] NAB Comments at 48.

[1358] NCTA Comments at 35.

[1359] OMI Comments at 2.

[1360] *Id.*

network in the San Francisco Bay area and does carry their licensed TV station KQSL, along with many Low Power TV (LPTV) stations.[1361]

438. EchoStar asserts that vertically-integrated programmers often engage in forced bundling, while holding back popular content for their streaming platforms.[1362] Public Knowledge and OTI claim that forced bundling by large programmers harm independent programmers' ability to negotiate with MVPDs by forcing the latter to carry undesired networks at the expense of independent programmers.[1363] Furthermore, ACA Connects argues that large programmers impose bundling of unwanted multicast channels, tiering, and penetration requirements that hinder MVPDs' ability to expand the number of cable packages in response to costumers' needs.[1364]

439. EchoStar argues that the existence of vertically integrated programming conglomerates creates built-in incentives for these groups to favor their own distribution, "handicapping" independent distributors.[1365] According to Rural Media Group (RMG), vertical integration among media conglomerates alongside oppressive carriage agreements, such as Most Favored Nation (MFN) and Alternative Distribution Method (ADM) clauses, have resulted in MVPDs cutting back or eliminating rural independent programming[1366] from their channel lineups.[1367] Furthermore, RMG asserts that lengthy contracts and high early termination fees restrain consumers from switching to a channel lineup that better reflect their interests.[1368]

440. Public Knowledge and OTI claim that MVPDs use their market power as buyers of video distributed to consumers to force independent programmers to unfavorable contract terms.[1369] PK/OTI claims that MVPDs can prevent independent programmers from accessing carriage by favoring their own programming, by refusing to carry a programmer unless it already has a certain level of distribution, by paying lower rates than to larger distributors, and through MFN clauses.[1370] According to PK/OTI, these clauses restrict the ability of independent programmers to negotiate fair carriage agreements and innovate in their distribution methods, limiting reach and revenue potential.[1371]

[1361] *Id.* at 1.

[1362] EchoStar Comments at 23.

[1363] Public Knowledge/OTI Reply at 15.

[1364] ACA Connects Comments at 23.

[1365] EchoStar Comments at 14.

[1366] RMG describes itself as "the nation's preeminent source of agricultural news and rural TV programming." Its RFD-TV network features "programming focused on agricultural news and rural content, including agribusiness, equine, rural lifestyle, Western sports, music, and family-friendly entertainment." RMG Reply at 3.

[1367] *Id.* at 2, 5-7. While the meaning of an MFN or ADM depends on specific contract terms, in general, an MFN provision entitles an MVPD to more favorable economic or non-economic contract terms that a video programming vendor has provided to another video programming distributor, whether an MVPD or an OVD. An ADM provision generally prohibits or restricts a video programming vendor from exhibiting its programming on OVDs, often for a specified period of time (sometimes referred to as a "holdback period" or "window") following the programming's original linear airing, or until certain conditions are met. *Fostering Independent and Diverse Sources of Video Programming*, MB Docket No. 24-115, Notice of Proposed Rulemaking, FCC 24-44, at 3-4, para. 4 (Apr. 19, 2024).

[1368] RMG Reply at 8.

[1369] Public Knowledge/OTI Reply at 11.

[1370] *Id.* at 12.

[1371] *Id.* at 17.

VI. COMMISSION ACTIONS TAKEN TO CLOSE THE DIGITAL DIVIDE, ENHANCE COMPETITION, AND ENCOURAGE THE DEPLOYMENT OF COMMUNICATIONS SERVICES

441. RAY BAUM'S Act of 2018 requires the Commission to describe the actions it has taken over the previous two years in addressing the competitive challenges and opportunities in the communications marketplace.[1372]

A. The Fixed Communications Marketplace

1. Measuring Broadband Deployment and Inter-Agency and Federal Advisory Committee Coordination

442. *BDC and National Broadband Map.* The Commission has continued its work implementing and refining the BDC. On July 12, 2024, the Commission released a Fourth Report and Order, Declaratory Ruling, and Fourth Further Notice of Proposed Rulemaking.[1373] The Fourth Report and Order, among other things, codified details of the mapping challenge processing deadline and memorialized the Commission's challenge process in the Commission's rules and formally delegated authority to OEA, in coordination with WTB, the Wireline Competition Bureau (WCB), and SB, to continue to perform audits of data submissions.[1374] The order also amended the Commission's rules to streamline the fixed challenge timetable.[1375] In the Declaratory Ruling, the Commission clarified that providers must submit more detailed data in subsequent BDC filings when claiming availability for locations or areas that were previously removed through the challenge, verification or audit processes.[1376] The Fourth Further Notice of Proposed Rulemaking sought comment on whether the Commission should limit the publication of availability data to avoid the potential for releasing subscribership information, typically treated as confidential in other contexts, with respect to grandfathered services that providers are phasing out[1377] and on several proposed changes to the Commission's rules to improve the validation, audit, and Fabric challenge processes, and facilitate provider certification of BDC submissions.[1378]

443. The Commission released its first pre-production draft of the FCC National Broadband Map in November 2022, showing broadband service availability based on provider reported data as of June 30, 2022, and opened the fixed and mobile service availability challenge processes, as well as the Fabric location challenge process.[1379] The Commission has released further iterations of the National

[1372] 47 U.S.C. § 163(b)(5).

[1373] *Establishing the Digital Opportunity Data Collection; Modernizing the FCC Form 477 Data Program*, WC Docket Nos. 19-195, 11-10, Fourth Report and Order, Declaratory Rule, and Fourth Further Notice of Proposed Rulemaking, FCC 24-72 (July 12, 2024).

[1374] *Id.* at 10-11, paras. 11-16, 24-26.

[1375] *Id*. at 7-8, paras. 14-16 (clarifying that a disputed challenge enters the adjudication phase of the challenge timeline when the provider disputes the challenge and reports that status of its efforts to resolve the challenge).

[1376] *Id.* at 12-18, paras. 28-44. The Commission delegated "authority to OEA, in coordination with WCB, WTB, OET, and SB, to develop detailed data specifications setting out the categories of information a provider must submit when seeking to restore a previously Removed Location or Area through a subsequent BDC filing." *Id.* at 12, para. 29.

[1377] *Id.* at 18-21, paras. 45-57.

[1378] *Id.* at 28-43, paras. 77-122.

[1379] *Broadband Data Task Force Releases Pre-Production Draft of the National Broadband Map; Announces the Start of the Broadband Availability Challenge Processes*, WC Docket Nos. 11-10, 19-195, Public Notice, 37 FCC Rcd 13348 (WCB/WTB/OEA 2022). The launch of the pre-production draft of the National Broadband Map marked the start of the broadband availability challenge processes, as well as the ability for consumers to submit individual challenges to the location data in the Fabric. *Id.* The process for entities to submit bulk challenges to the Fabric began earlier, on September 12, 2022. *Broadband Data Task Force, Wireline Competition Bureau, and*

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Broadband Map since that time, the latest of which was November 2024 (based on data as of June 30, 2024).[1380]

444. *Interagency Information Sharing and Coordination*. Recognizing the importance of a comprehensive approach to federal broadband funding, Commission staff have been engaging in extensive coordination with other agencies pertaining to broadband funding programs. Through the use of the FCC broadband maps and interagency agreements to share program data, the relevant federal agencies have adopted and refined coordination practices necessary for effectively administering their respective broadband funding programs. The agencies coordinate to identify potential duplicative funding of broadband deployment, and to discuss amendments to these existing enforceable commitments by participating awardees with the goal to prevent overlapping funding. Moreover, through these coordination efforts, the agencies work to further ensure, in instances where an awardee is unable to fulfill its broadband deployment commitments, that an alternative broadband funding source is available so that broadband will be made available to everyone, everywhere.

445. Consistent with the Broadband Interagency Coordination Act of 2020,[1381] the Commission, the U.S. Department of Agriculture (USDA), and NTIA finalized an agreement on June 25, 2021 (Interagency Agreement) to provide for information sharing related to broadband funding awarded through programs administered by the agencies.[1382] Following the Interagency Agreement, on May 12, 2022, the Commission, USDA, NTIA, and the U.S. Department of the Treasury (Treasury) announced an interagency Memorandum of Understanding (MOU),[1383] which provides that the agencies will consult with one another and share information on data collected from programs administered by the Commission and USDA's Rural Utilities Service (RUS), programs administered or coordinated by NTIA, and Treasury's Coronavirus Capital Projects Fund and the Coronavirus State and Local Fiscal Recovery

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Office of Economics and Analytics Announce Start of Fabric Bulk Challenge Process, WC Docket Nos. 19-195, 11-10, Public Notice, 37 FCC Rcd 10140 (BDTF/WCB/OEA 2022). Shortly after the first iteration of the map was released, the Commission sunset the collection of broadband deployment data through the FCC Form 477. *2022 Form 477 Order, 3*7 FCC Rcd at 14957, para. 1. The Commission clarified that it will continue to collect broadband and voice subscription data using the FCC Form 477, but filers will submit their data through the FCC BDC system. *Id*.

[1380] *See* FCC, Chairwoman Rosenworcel, *National Broadband Map: It Keeps Getting Better* (May 30, 2023), https://www.fcc.gov/national-broadband-map-it-keeps-getting-better; FCC, Chairwoman Rosenworcel, *National Broadband Map 3.0: Thankful for Continued Improvement* (Nov. 17, 2023), https://www.fcc.gov/news-events/notes/2023/11/17/national-broadband-map-30-thankful-continued-improvements; Press Release, FCC, FCC Makes Updates to Broadband Data Collection Efforts (May 22, 2024), https://docs.fcc.gov/public/attachments/DOC-402753A1.pdf; FCC, *Broadband Data Collection*, https://www.fcc.gov/BroadbandData (last visited Oct. 24, 2024) ("National Broadband Map: 2024 Key Dates," with respect to November 2024 releases).

[1381] Consolidated Appropriations Act, 2021, Pub. L. No. 116-260, div. FF, tit. IX. § 904, 134 Stat. 1182, 3214 (codified at 47 U.S.C. § 1308).

[1382] Press Release, Federal Communications Commission, FCC, NTIA, and USDA Announce Interagency Agreement to Coordinate Broadband Funding Deployment (June 25, 2021), https://www.fcc.gov/document/fcc-ntia-usda-sign-interagency-pact-broadband-funding-deployment. In anticipation of the need for close coordination of both existing and newly established federal funding programs, the Commission, USDA, and NTIA began regular meetings to discuss these important issues in early 2021 and have continued to share information and develop plans together since the execution of the agreement required by the Broadband Interagency Coordination Act.

[1383] Memorandum of Understanding Regarding Information Sharing, dated as of May 9, 2022, between the Federal Communications Commission, U.S. Department of Agriculture, the National Telecommunications and Information Administration of the U.S. Department of Commerce, and the U.S. Department of the Treasury, at 1 (May 11, 2022), https://docs.fcc.gov/public/attachments/DOC-383278A1.pdf.

Funds.[1384] The agencies also agreed to "develop consistent, complementary, and, to the extent possible, uniform formats, standards, protocols, and reporting processes" for data collection and to make data related to funded projects publicly available.[1385] In May 2024, the agencies renewed this MOU for an additional four-year period through May 9, 2028.[1386]

446. After soliciting and reviewing public comment, the Commission sent a report to Congress in February 2023 assessing the effectiveness of the Interagency Agreement, as required by the Broadband Interagency Coordination Act.[1387] The report concluded that the Interagency Agreement has been effective in facilitating the exchange of information and prevention or limiting of overlap and duplication among the signatory agencies' broadband deployment funding.[1388] The report also acknowledged that while certain challenges remain, such as statutorily prescribed differences in programs, the Interagency Agreement has enabled the agencies to avoid, limit, or unwind duplication to a significant degree.[1389] Where it has not been possible to do so, the data sharing and dialogues fostered by the Interagency Agreement, as well as the MOU, have given the agencies the resources to make informed funding decisions, and the agencies continue to develop and refine a common process that respects each agency's resources, statutory obligations, and leadership preferences.[1390]

447. Effective deployment of unprecedented broadband funding by the Commission, NTIA, USDA, and Treasury requires extensive interagency coordination with regard to mapping and funding commitments to identify proper locations for broadband funding and to avoid duplicative support. NTIA is required by the Infrastructure Act to rely on the maps created using FCC BDC data to determine unserved and underserved areas eligible for BEAD Program support.[1391] Further, the Infrastructure Act also requires the Commission to establish and maintain the Broadband Funding Map to be an authoritative source of federal funding that supports broadband infrastructure.[1392] The Broadband Funding Map identifies locations served by federally funded infrastructure, as well as provides detailed data for each agency's funding programs, including network details, company names, project timelines, and broadband speeds.[1393] On May 15, 2023, the Commission released the Broadband Funding Map, pursuant to section 60105 of the Infrastructure Act,[1394] containing data received from USDA, NTIA, and

[1384] Memorandum of Understanding Regarding Information Sharing, dated as of May 9, 2024, between the Federal Communications Commission, U.S. Department of Agriculture, the National Telecommunications and Information Administration of the U.S. Department of Commerce, and the U.S. Department of the Treasury, at 1 https://docs.fcc.gov/public/attachments/DOC-404166A1.pdf.

[1385] Press Release, Federal Communications Commission, FCC, NTIA, USDA and Treasury Announce Interagency Agreement to Collaborate on Federal Broadband Funding (May 12, 2022), https://www.fcc.gov/document/fcc-ntia-usda-treasury-announce-broadband-info-sharing-agreement.

[1386] *See* FCC, Memorandum of Understanding Between FCC, NTIA, USDA, and Treasury (July 23, 2024), https://www.fcc.gov/document/memorandum-understanding-between-fcc-ntia-usda-and-treasury.

[1387] Wireline Competition Bureau, Report on the Effectiveness of the Broadband Interagency Coordination Agreement Pursuant to § 1308 of the Broadband Interagency Coordination Act (Feb. 2023), https://docs.fcc.gov/public/attachments/DOC-391167A1.pdf (*FCC BICA Report*); 47 U.S.C. § 1308(b)(4)(B).

[1388] *FCC BICA Report* at 4-7.

[1389] *Id.* at 7, 10.

[1390] *Id*.

[1391] Infrastructure Act, § 60102(c).

[1392] Infrastructure Act, div. F, tit. I, § 60105.

[1393] *Id*.

[1394] *FCC Releases Broadband Funding Map*, WC Docket Nos. 11-10, 19-195, Public Notice, 38 FCC Rcd 4315 (OEA/WCB 2023); Infrastructure Act, div. F, tit. I, § 60105 (requiring the Commission "to establish an online

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Treasury, as well as the Commission's own data.[1395] The Broadband Funding Map is a valuable resource for federal agencies, as well as states, Tribal governments, and other stakeholders working to harmonize distinct broadband funding streams. The Commission and NTIA have also engaged with other federal agencies with broadband funding programs to ensure that the Broadband Funding Map captures all available deployment data across the federal government.

448. *Communications Equity and Diversity Council (CEDC)*. The CEDC continued its work in 2023 and 2024 to make recommendations to the Commission on advancing equity in the provision of, and access to, digital communication services and products for all people of the United States, without discrimination on the basis of race, color, religion, national origin, sex, or disability. The CEDC conducted several events during this period including: a Media Ownership Diversity Symposium on February 7, 2023; a Digital Ecosystem Forum on March 6, 2023; and Lessons Learned from the Pandemic—Roundtable on Broadband Access, Affordability, and Deployment on March 23, 2023.[1396] At its June 15, 2023 meeting, the CEDC adopted reports from its Digital Empowerment and Inclusion Working Group (Connecting Opportunity Communities to Broadband During the COVID-19 Pandemic: Lessons Learned and Recommendations); its Diversity and Equity Working Group (Future of Work and Non-Traditional Anchor Institutions; Enhancing Media Ownership and Entrepreneurial Opportunities for Minorities and Women); and its Innovation and Access Working Group (Access to Capital; America's Digital Transformation Urgent National Priority and Opportunity: Digital Upskilling).[1397] The CEDC was re-chartered for a second term on June 22, 2023, and held subsequent meetings on March 27, 2024, August 13, 2024, and December 6, 2024.[1398]

449. *Precision Agriculture Connectivity Task Force*. The Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States (Precision Agriculture Connectivity Task Force) continued its work in 2023 and 2024 by providing advice and recommendations to the Commission and USDA on how to assess and advance deployment of broadband access service on unserved and underserved agricultural lands, and to promote precision agriculture for both cropping and husbandry.[1399] In 2023, the Precision Agriculture Connectivity Task Force met three times[1400] and

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mapping tool to provide a locations overview of the overall geographic footprint of each broadband infrastructure deployment project funded by the Federal Government").

[1395] The Broadband Funding Map can be found at https://fundingmap.fcc.gov/home.

[1396] *Communications Equity and Diversity Council to Host February 7, 2023 Media Ownership Diversity Symposium*, GN Docket No. 17-208, 38 FCC Rcd 374 (MB 2023); *Communications Equity and Diversity Council to Host March 6, 2023 Digital Ecosystem Forum*, GN Docket No. 17-208, 38 FCC Rcd 1320 (MB 2023); *Communications Equity and Diversity Council to Host March 23, 2023 Lessons Learned From the Pandemic Roundtable*, GN Docket No. 17-208, 38 FCC Rcd 1978 (MB 2023).

[1397] Letter from Heather Gate, Chairwoman, CEDC, to Jessica Rosenworcel, Chairwoman, FCC (June 21, 2023), https://www.fcc.gov/sites/default/files/cedc-chair-to-fcc-chair-transmittal-letter-report-06152023.pdf. The approved reports are available on the Commission's CEDC webpage. FCC, *Communications Equity and Diversity Council*, https://www.fcc.gov/communications-equity-and-diversity-council (last visited Oct. 24, 2024). The June 15, 2023 meeting was the second CEDC meeting in 2023. *Agenda Released for February 23, 2023 Virtual Meeting of the Communications Equity and Diversity Council*, GN Docket No. 17-208, 38 FCC Rcd 120 (MB 2023).

[1398] *FCC Announces March 27, 2024 Meeting and Leadership of the Communications Equity and Diversity Council*, GN Docket No. 17-208, DA 24-254 (WCB Mar. 14, 2024); *FCC Announces August 13, 2024 Meeting of the Communications Equity and Diversity Council*, GN Docket No. 17-208, DA 24-773 (WCB Aug. 5, 2024); *FCC Announces December 6, 2024 Meeting and Leadership of the Communications Equity and Diversity Council*, GN Docket No. 17-208, DA 24-1175 (WCB Nov. 21, 2024).

[1399] *See FCC Announces the Establishment of the Task Force for Reviewing Connectivity and Technology Needs of Precision Agriculture in the United States and Seeks Nominations for Membership*, Public Notice, 34 FCC Rcd 5057 (WCB 2019) (announcing the 2019-20 charter); *FCC Announces the Membership and First Meeting of the Re-chartered Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United*
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adopted its annual report at its November 6, 2023 meeting.[1401] The report made various recommendations in the following four categories: (1) mapping and analyzing connectivity on agricultural lands, where the Task Force's recommendations include enhancing the BDC Map to improve its usability for precision agriculture;[1402] (2) examining current and future connectivity demand, where the Task Force's recommendations include prioritizing deployment of broadband infrastructure in agricultural lands, significantly raising the current standard for upload and download speeds, making ample spectrum available for agricultural use, and addressing cellular network limitations;[1403] (3) accelerating broadband deployment on unserved agricultural lands, where the Task Force's recommendations include harmonizing the definition and standards of broadband used by all federal agencies for funding decisions,[1404] prioritizing grant applications that include wide-area coverage to agricultural acreage, incentivizing connectivity to rural agricultural land headquarters, dedicating low-cost terrestrial spectrum for precision agriculture, and providing funding for build-out and operation of last-acre networks;[1405] and (4) encouraging adoption and availability of high-quality jobs, where the Task Force's recommendations include that USDA and the FCC consider precision agriculture connectivity as a critical component of the nation's food and homeland security, pivoting USDA's ReConnect program to prioritizing on-farm connectivity, and making FCC, NTIA, and USDA reporting metrics and survey requirements consistent to identify broadband development and precision agriculture adoption.[1406]

450. On November 29, 2023, the Commission re-chartered the Precision Agriculture Connectivity Task Force for its third term that will end January 1, 2025, consistent with section 12511(b)(6) of the 2018 Farm Bill.[1407] The Precision Agriculture Connectivity Task Force held its first

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States, GN Docket No. 19-329, Public Notice, 36 FCC Rcd 16828 (WCB Dec. 9, 2021) (*2021-22 Precision Agriculture Connectivity Task Force Re-Charter Public Notice*); *FCC Announces the Membership and First Meeting of the Re-Chartered Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States,* GN Docket No. 19-329, Public Notice, DA 24-53 (WCB Jan. 17, 2024) (*2023-25 Precision Agriculture Connectivity Task Force Re-Charter Public Notice*); *see also* Agriculture Improvement Act of 2018, Pub. L. No. 115-334, 132 Stat. 4490, 4993, § 12511(b)(2), (3) (2018) (2018 Farm Bill) (establishing the Task Force and setting forth its duties and obligations). The Precision Agriculture Connectivity Task Force will perform duties and submit reports annually consistent with section 12511 of the 2018 Farm Bill and in consultation with USDA until the Task Force ends on January 1, 2025. 2018 Farm Bill § 12511(b)(3), (5), (6).

[1400] *FCC Announces Next Meeting of the Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States on March 28, 2023*, GN Docket No. 19-329, Public Notice, 38 FCC Rcd 1626 (WCB Mar. 7, 2023); *FCC Announces Next Meeting of the Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States on July 11, 2023*, GN Docket No. 19-329, Public Notice, DA 23-516 (WCB June 15, 2023); *FCC Announces Next Meeting of the Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States on November 6, 2023*, GN Docket No. 19-329, Public Notice, DA 23-923 (WCB Oct. 3, 2023).

[1401] FCC, Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States (Nov. 6, 2023), https://www.fcc.gov/sites/default/files/2024-Report-PrecisionAg-Task-Force-without-Signatures.pdf.

[1402] *Id.* at 3-4, 12-17.

[1403] *Id.* at 4-6, 18-31.

[1404] We note that Commission does not have a definition of broadband, but rather various benchmarks and standards used for various purposes, such as those discussed in this *Report*.

[1405] FCC, Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States at 7-8, 32-41 (Nov. 6, 2023), https://www.fcc.gov/sites/default/files/2024-Report-PrecisionAg-Task-Force-without-Signatures.pdf.

[1406] *Id.* at 8-11, 42-55.

meeting of the new term on January 31, 2024,[1408] and subsequently met in August and September 2024.[1409] The Precision Agriculture Connectivity Task Force met again on December 5, 2024, adopting its final annual report.[1410]

451. *Connect2Health^{FCC} Task Force*. The Connect2Health^{FCC} Task Force,[1411] charged with exploring the intersection of and relationship between broadband, advanced technology, and health, continued its work in 2023 and 2024, reflecting the Commission's commitment to closing the digital divide in health; leveraging broadband connectivity to improve health and healthcare for all Americans; and supporting the development and advancement of new communications technologies that could help address national health crises. During this period, the Task Force released significant updates to *Mapping Broadband Health in America*—a data visualization platform that intersects broadband and health data and allows users to generate customizable maps to assess areas where broadband access and Internet adoption could be leveraged to improve health and health outcomes or where a lack of broadband connectivity creates a broadband health gap. In June 2023, the Commission, in response to the *Data Mapping to Save Moms' Lives Act*,[1412] and in consultation with the CDC,[1413] released a maternal health module in that allows policymakers, state, local, and tribal governments, advocacy organizations, and

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[1407] FCC, Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States, Charter (Nov. 29, 2023), https://www.fcc.gov/sites/default/files/precision-ag-task-force-charter-11292023.pdf.

[1408] *FCC Announces the Membership and First Meeting of the Re-Chartered Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States on August 14, 2024*, GN Docket No. 19-329, Public Notice, DA 24-53, at 1 (WCB Jan. 17 2024).

[1409] *FCC Announces Next Meeting of the Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States on August 14, 2024*, GN Docket No. 19-329, Public Notice, DA 24-714 (WCB July 23, 2024); *FCC Announces Next Meeting of the Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States on September 18, 2024*, GN Docket No. 19-329, Public Notice, DA 24-813 (WCB Aug. 13, 2024); *FCC Announces Next Meeting of the Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States on October 15, 2024*, GN Docket No. 19-329, Public Notice, DA 24-936 (WCB Sept. 12, 2024).

[1410] *FCC Announces Next Meeting of the Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States on December 5, 2024*, GN Docket No. 19-329, DA 24-1127 (WCB Nov. 7, 2024).

[1411] Recognizing that technology innovations in clinical practice and care delivery are poised to fundamentally change the face of health care, in 2014 the Commission created the Connect2Health^{FCC} Task Force—a senior-level, multi-disciplinary internal team, housed in the Office of General Counsel—to help the agency move the needle on broadband and advanced health care technologies. *See* FCC, Connect2Health^{FCC}, https://www.fcc.gov/about-fcc/fcc-initiatives/connect2healthfcc (last visited Oct. 28, 2024). On behalf of the agency, the Task Force charts the broadband future of health and care through its various projects and initiatives and advises and provides recommendations to the Commission on matters concerning broadband and health.

[1412] Data Mapping to Save Moms' Lives Act, Pub. L. No. 117-247, 136 Stat. 2347 (2022). In adopting the Act, Congress determined that "[b]roadband mapping could lead to better maternal health outcomes," S. Rep. No. 117-65, at 3 (2022), and identified the Commission's Mapping Broadband Health in America platform as the tool to chart which areas of the country are most in need of critical broadband-enabled health resources. *See* FCC, Connect2Health^{FCC}, https://www.fcc.gov/health/maps (last visited Oct. 28, 2024).

[1413] *See* Letter from Jessica Rosenworcel, Chairwoman, FCC, to Dr. Rochelle P. Walensky, Director, CDC (Apr. 11, 2023), https://www.fcc.gov/document/chairwoman-letter-cdc-director-maternal-health-collaboration.

service providers to identify and prioritize the communities with lower connectivity resources and higher maternal health need.[1414]

452. During the past year, the Task Force continued to research, develop and innovate to implement critical updates to the platform which will be unveiled by the end of 2024.[1415] The 2024 release will include expanded broadband, maternal health, chronic disease, opioids, and demographics data sets, as well as refined features and functionalities that will allow users to visualize patterns, possible disparities, and areas where broadband deployment and Internet adoption could create the greatest impact in health.[1416] Specifically, utilizing the Task Force's County Categorization Framework, the platform identifies and organizes areas based on their respective broadband and health need. "Double Burden" counties—the places where broadband-enabled health solutions could be a critical part of the toolkit in improving health, but where broadband resources still need to be deployed—and "Opportunity" counties, or areas where existing broadband resources could be leveraged immediately to help address health crises, both present market opportunities for stakeholders to introduce innovative broadband-enabled health technologies and solutions.

453. The Task Force also continued to engage a variety of stakeholders in the telecommunications and healthcare industries to more fully understand the evolving intersection of broadband and health, as well as developments in the digital health marketplace. In October 2023, the Commission initiated a proceeding to solicit public comment on the current landscape and barriers to widespread use of broadband-enabled health solutions and services.[1417] And in November 2023, the Commission, in partnership with the U.S. Department of Health and Human Services, convened policymakers, grassroots organizations, telecommunications and public health experts, researchers, and clinicians to explore how advancing digital equity—including increased access to reliable, high-speed broadband and broadband-enabled health technologies—improves maternal health equity.[1418] The Task

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[1414] *See* Press Release, FCC, FCC Explores Role of Broadband Connectivity in Maternal Health Outcomes (June 20, 2023), https://www.fcc.gov/document/fcc-explores-broadband-connectivity-role-maternal-health-outcomes.

[1415] The Commission announced the 2024 release of the platform during the Task Force's presentation on Broadband Connectivity & Maternal Health at the October 2024 Open Commission Meeting. *See Broadband Connectivity and Maternal Health—Implementation of the Data Mapping to Save Moms' Lives Act*, GN Docket No. 23-309, Statement of Chairwoman Rosenworcel on Broadband Connectivity and Maternal Health Open Meeting Presentation by the FCC's Connect2Health Task Force (Oct. 17, 2024), https://docs.fcc.gov/public/attachments/DOC-406710A1.pdf. A full recording of the presentation is available at https://www.fcc.gov/october-2024-open-commission-meeting.

[1416] Specifically, to overcome significant data suppression in the reportable maternal mortality and morbidity data, the platform will soon incorporate "proxy" variables, maternal health risk factors, and infant health outcome metrics. The platform will also incorporate data from the Commission's Broadband Data Collection process (reflecting the revised definition of broadband), including mobile access and rural access variables. Recognizing that fixed and mobile broadband are not interchangeable, and many broadband-enabled health technologies require both a fixed connection and mobile connection on-the-go, the platform will also include fixed and mobile access variables. The 2024 update also includes device ownership data to allow users to identify areas of the country where consumers have access to the tools required for digital care. *See* Letter from Jessica Rosenworcel, Chairwoman, FCC, to Senator Maria Cantwell, Chair, U.S. Senate Committee on Commerce, Science, and Transportation, et. al (Oct. 17, 2024), https://docs.fcc.gov/public/attachments/DOC-406738A1.pdf.

[1417] *Broadband Connectivity and Maternal Health—Implementation of the Data Mapping to Save Moms' Lives Act*, GN Docket No. 23-309, Notice of Inquiry, 38 FCC Rcd 9959 (2023). Commenters generally agreed that access to affordable high-speed broadband remains one of the primary barriers to universal adoption of broadband-enabled health solutions, and one commenter emphasized that broadband speeds of 25/3 Mbps are insufficient for connected health technologies. *See* Next Century Cities Comments, GN Docket No. 23-309, at 7-8 (rec. Nov. 20, 2023).

[1418] *Federal Communications Commission and U.S. Department of Health and Human Services Announce Agenda for Maternal Health and Broadband Roundtable on November 17, 2023*, GN Docket No. 23-309, Public Notice, DA 23-1083 (OGC Nov. 15, 2023). The Roundtable engaged a wide cross-section of thought leaders, advocacy groups, (continued….)

Force also coordinated with federal partners across government to gather further recommendations to inform its work and to better understand their utilization of broadband and digital health technologies across various connected health projects and initiatives.[1419] In addition, the Task Force participated in the Office of the National Coordinator for Health Information Technology's Coordinating Council, contributing to the development of the 2024-2030 Federal Health IT Strategic Plan, and advising on the importance of broadband connectivity in health, broadband as a distinct social determinant of health, and the critical need for access to affordable and reliable fixed and mobile broadband services to promote health equity.[1420]

2. Encouraging Broadband Investment

454. *Pole Attachments*. On December 15, 2023, the Commission released a Fourth Report and Order, Declaratory Ruling, and Third Further Notice of Proposed Rulemaking in furtherance of the Commission's efforts to reform its pole attachment rules and policies to promote faster and more cost-effective broadband deployment.[1421] These reforms will speed the pole attachment dispute resolution process by establishing a new intra-agency rapid response team—the Rapid Broadband Assessment Team (RBAT)—to provide coordinated review and assessment of pole attachment disputes and recommend effective dispute resolution procedures, and by adopting specific criteria for the RBAT to use when considering whether a complaint (or portion thereof) should be included on the Commission's Accelerated Docket.[1422] The new rules will also increase transparency for new broadband buildouts by amending the Commission's pole attachment make-ready rules to require utilities to provide to potential attachers, upon request, the information contained in the utilities' most recent cyclical pole inspection reports, or any intervening, periodic reports created before the next cyclical inspection, for the poles covered by a submitted attachment application.[1423] In the Declaratory Ruling, the Commission clarified that for purposes of the Commission's pole replacement policies, a "red tagged" pole is one that the utility has identified as needing replacement for any reason other than the pole's lack of capacity to accommodate a new attachment, provided additional examples for when a pole replacement is not

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entrepreneurs, and policymakers to explore the intersection of broadband connectivity and maternal health, the role of broadband as a social determinant of health, and the implications of that framework for improving maternal health outcomes and informing broadband and health policies. A full recording of the Roundtable is available at https://www.fcc.gov/news-events/events/2023/11/maternal-health-roundtable.

[1419] This effort included engaging with the CDC, the Health Resources & Services Administration, USDA, NTIA, the United States Department of Veterans Affairs, the Bureau of Indian Affairs, the National Institutes of Health, the Substance Abuse and Mental Health Services Administration, and the Indian Health Service.

[1420] Assistant Secretary for Technology Policy/Office of the National Coordinator for Health Information Technology, Office of the Secretary, United States Department of Health and Human Services, 2024-2030 Federal Health IT Strategic Plan (Sept. 30, 2024), https://www.healthit.gov/sites/default/files/page/2024-09/ASTP%202024-2030%20Strategic%20Plan_508.pdf; *see also* Press Release, HHS, HHS Finalizes Federal Health IT Strategy to Drive Systemic Improvements in Health and Care (Sept. 30, 2024), https://www.hhs.gov/about/news/2024/09/30/hhs-finalizes-federal-health-it-strategy-drive-systemic-improvements-health-care.html ("The latest Federal Health IT Strategic Plan recognizes how our health system can benefit from cutting-edge communications infrastructure, particularly in rural and underserved areas—enabling us to better engage individuals, their caregivers, and physicians across the care continuum and drive high-quality care, while lowering cost. We salute the Plan's focus on promoting equitable access to affordable broadband and mobile phone service, so that all people have access to their electronic health information and can benefit from advancements in digital health technologies." (quote from Michele Ellison, FCC General Counsel and Chair of the agency's Connect2Health[FCC] Task Force)).

[1421] Federal Communications Commission, Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment, 38 FCC Rcd 12379, 12382-83, para. 7 (*2023 Wireline Infrastructure Order*).

[1422] *Id.* at 12383-90, paras. 8-22.

[1423] *Id.* at 12390-96, paras. 23-29.

"necessitated solely" as a result of a third party's attachment or modification request when a pole already requires replacement at the time that the new attacher's request is made, clarified attachers' right to access documentation regarding utility easements, and clarified that the first 3,000 poles in an attachment application are subject to the pre-existing processing timeline in the Commission's rules.[1424] In the Further Notice, the Commission seeks comment on whether the Commission should take further action to facilitate the processing of pole attachment applications that are submitted in large numbers, whether the Commission should modify its self-help rules to enable prospective attachers to access poles more quickly, and the effect of contractor availability when attachers seek to use their own contractors when conducting self-help or one-touch make-ready for surveys and make-ready work.[1425]

3. Supporting Affordability, Adoption, and Reasonable Access

455. *ACP*. At Congress's direction, the Commission established programs designed to offer discounted broadband service and connected devices to help low-income households get connected and stay connected to work, school, healthcare, family, and social services. The ACP, which was launched on December 31, 2021, provided discounted Internet service to more than 23 million low-income households, benefiting both rural and urban households.[1426] Results from a Commission survey were released on February 29, 2024, and demonstrated the effect of the ACP on low-income households, showing that 68% of ACP households had inconsistent or zero connectivity prior to ACP enrollment.[1427] However, due to a lack of additional Congressional funding, the ACP ended effective June 1, 2024.[1428]

456. Congress created the ACP as part of its investment in broadband affordability, deployment, and access in the Infrastructure Act.[1429] Under the ACP, eligible households could receive a discount of up to $30 per month off the price of broadband service, with an enhanced benefit of up to a $75 monthly discount available for eligible consumers on qualifying Tribal lands. The ACP provided a one-time discount of up to $100 for a laptop, desktop, or tablet per household, provided that the household contributed more than $10 but less than $50 toward the cost of the device.[1430] On August 4,

[1424] *Id.* at 12402-09, paras. 39-50; *see also* 47 CFR § 1.1411(g)(3).

[1425] *2023 Wireline Infrastructure Order* at 12410-14, paras. 52-59.

[1426] *See* Universal Service Administrative Service Company, *ACP Enrollment and Claims Tracker*, https://www.usac.org/about/affordable-connectivity-program/acp-enrollment-and-claims-tracker/#total-enrolled (last visited Oct. 24, 2024) (Total Households at Enrollment Freeze); FCC, *More Than 20 Million Households Enroll in Nation's Largest Broadband Affordability Program* (Aug. 14, 2023), https://docs.fcc.gov/public/attachments/DOC-396000A1.pdf.

[1427] Press Release, FCC, New FCC Survey Shows Over Two-Thirds of ACP Households Had Inconsistent or Zero Connectivity Prior to ACP Enrollment (Feb. 29, 2024), https://docs.fcc.gov/public/attachments/DOC-400836A1.pdf.

[1428] Press Release, FCC, FCC Brings Affordable Connectivity Program to a Close (May 31, 2024), https://docs.fcc.gov/public/attachments/DOC-402930A1.pdf.

[1429] Infrastructure Act, div. F, tit. V, § 60502, 135 Stat. at 1238; *ACP Report and Order and Further Notice*, 37 FCC Rcd at 486, para. 2. In establishing the ACP, Congress made several changes to a predecessor program, the EBB Program to transform it from an emergency program designed to respond to a public health crisis to a longer-term broadband affordability program, and appropriated to the Commission an additional $14.2 billion for the ACP. *ACP Report and Order and Further Notice*, 37 FCC Rcd at 485-86, para. 1.

[1430] 47 U.S.C. § 1752(b)(5); *ACP Report and Order and Further Notice,* 37 FCC Rcd at 548, para. 136. As with the EBB Program, a household qualified for the ACP if a member of the household: (1) qualifies for Lifeline (household income is at or below 135% of the federal poverty guidelines or a household member participated in the Supplemental Nutrition Assistance Program, Medicaid, Supplemental Security Income, Federal Public Housing Assistance, Veterans Pension/Survivors Benefit, or certain Tribal assistance programs); (2) had applied for and been approved to receive benefits under the free and reduced price lunch program or the school breakfast program; (3) had received a Federal Pell Grant in the current award year; or (4) meets the eligibility criteria for a participating provider's existing low-income program, subject to approval by the Commission. *ACP Report and Order and Further Notice*, 37 FCC Rcd at 509, para. 49. The Infrastructure Act further expanded eligibility to those

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2023, as directed by Congress, the Commission released a Report and Order establishing a mechanism by which a participating provider in the ACP can apply to offer an enhanced monthly discount of up to $75 for broadband services to ACP-enrolled households in a high-cost area, upon the provider's showing of a particularized economic hardship.[1431] WCB provided additional information on the application process for this high-cost area benefit on November 1, 2023.[1432] However, the high-cost area benefit was not implemented because the ACP ended on June 1, 2024 due to the lack of additional funding from Congress.

457. As directed by Congress in section 60502(c) of the Infrastructure Act,[1433] the Commission adopted the *ACP Fourth Report and Order* on November 15, 2022, establishing rules for the ACP Transparency Data Collection, which required all participating providers to annually submit data on the price and subscription rates of Internet service offerings received by households enrolled in the ACP.[1434] Participating providers were required to submit data for the collection by November 30, 2023, based on a reference or snapshot date of August 1, 2023.[1435] On May 30, 2024, OEA, in conjunction with WCB, released data related to the price, subscription rates, and plan characteristics of the Internet service offerings of participating providers in the ACP.[1436]

458. After launching the ACP, the Commission undertook a number of initiatives to promote awareness of and increase enrollment in the program among eligible households, and improve the application process.[1437] Recognizing the importance of effective outreach to eligible households from trusted messengers to historically underserved communities, Congress authorized the Commission to provide grants to outreach partners.[1438] Pursuant to that authority, on August 5, 2022, the Commission

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households with a member that received assistance through the Special Supplemental Nutritional Program for Woman, Infants, and Children and those households with an income below 200% of the Federal Poverty Guidelines. *Id.*

[1431] *Affordable Connectivity Program*, WC Docket No. 21-450, Sixth Report and Order, 38 FCC Rcd 7186, 7186, para. 1 (2023).

[1432] *Wireline Competition Bureau Announces Affordable Connectivity Program High-Cost Area Benefit Application Submission Timing and Processes*, WC Docket No. 21-450, Public Notice, 38 FCC Rcd 10351 (WCB 2023). On January 11, 2024, due to the depletion in funding and enrollment freeze, the Bureau announced that the Universal Service Access Company (USAC) would no longer begin accepting provider applications to offer the high-cost area benefit. The Wireline Competition Bureau will re-evaluate the status of the ACP high-cost area benefit provider applications if the ACP receives additional funding. *Affordable Connectivity Program*, WC Docket No. 21-450, Order, 39 FCC Rcd 144, 156, para. 33 (2024).

[1433] Infrastructure Act, div. F, tit. V, § 60502(c), 135 Stat. at 1243.

[1434] *Affordable Connectivity Program*, WC Docket No. 21-450, Fourth Report and Order and Further Notice of Proposed Rulemaking, 37 FCC Rcd 13773 (2022) (*ACP Fourth Report and Order*).

[1435] *Wireline Competition Bureau Announced Completion of OMB Review and Key Dates for Affordable Connectivity Program Transparency Data Collection*, WC Docket No. 21-450, Public Notice, 38 FCC Rcd 7346 (WCB 2023); *Affordable Connectivity Program Transparency Data Collection Deadline Extended to November 30, 2023*, WC Docket No. 21-450, Public Notice, 38 FCC Rcd 10471 (WCB 2023).

[1436] *The Office of Economics and Analytics and the Wireline Competition Bureau Announce Publication of Affordable Connectivity Program Transparency Data Collection Summary*, WC Docket No. 21-450, Public Notice, DA 24-504 (OEA/WCB May 30, 2024).

[1437] In addition to the actions to promote and increase enrollment in the ACP, as a response to certain catastrophic weather events, the Commission temporarily waived certain deadlines and rules for ACP participants in affected areas to ensure that they did not lose access to vital communications services when they needed them the most. *See*, *e.g.*, *Affordable Connectivity Program et al.*, WC Docket No. 21-450 et al., Order, 38 FCC Rcd 7922 (WCB 2023).

[1438] *See* 47 U.S.C. § 1752(b)(10)(C)(ii)(IV).

adopted rules establishing the Affordable Connectivity Outreach Grant Program to increase awareness of and enrollment in the ACP among eligible households.[1439] The Commission also established the Your Home, Your Internet Pilot Program (focused on ACP eligible households receiving qualifying federal housing assistance)[1440] and the ACP Navigator Pilot Program. Both pilot programs also provided outreach grant funding and were designed to increase awareness of and facilitate enrollment in the ACP and to provide assistance with ACP applications through direct access to the National Verifier.[1441]

459. On March 10, 2023, the Commission announced target funding allocations for the Affordable Connectivity Outreach Grant Program.[1442] The Commission selected 197 applicants representing 50 states and territories to pursue a broad range of outreach projects for a combined targeted funding allocation of $66 million.[1443] On March 15, 2023, the Commission announced target funding allocations for the 31 pilot participants in the Your Home, Your Internet and ACP Navigator Pilot Programs for a combined target funding allocation totaling approximately $7.4 million.[1444] On March 13, 2023, the Commission adopted a Report and Order providing additional funding of up to $10 million for the Affordable Connectivity Outreach Grant Program.[1445] On August 17, 2023, and September 6, 2023, the Commission announced it had selected 17 applicants for this second round of grant funding, with target funding allocations totaling over $5.5 million.[1446]

460. The Commission also used multiple media outlets to promote the ACP.[1447] The Commission hired paid media consultants to target certain locations with large low-income populations, certain demographics, and specific cities and counties (including both rural and urban areas) throughout the United States to increase awareness of the ACP through print and radio campaigns. The campaign included print media, earned media (radio and satellite radio tours), mobile display banners, paid search tactics, local newspaper, out-of-home placements (at grocery stores, gas stations, pharmacies, etc.), mailers, and digital video ads. Paid media outreach was conducted in English and Spanish, with

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[1439] *See generally Affordable Connectivity Program*, Second Report and Order, WC Docket No. 21-450, Report and Order, 37 FCC Rcd 9928 (2022) (*ACP Second Report and Order*).

[1440] *See id.* at 9954, para. 47; *see also Affordable Connectivity Program*, WC Docket No. 21-450, Report and Order, 37 FCC Rcd 9989, 9989, para. 1 (2022) (*ACP Third Report and Order*).

[1441] *See ACP Report and Order and Further Notice*, 37 FCC Rcd at 519-20, para. 70; *see generally ACP Third Report and Order*.

[1442] *Consumer and Governmental Affairs Bureau Announces ACP Outreach Grant Program Target Funding*, WC Docket No. 21-450, Public Notice, 38 FCC Rcd 1665 (CGB 2023).

[1443] Press Release, FCC, FCC Announces $66 Million in Outreach Grants to Fund Projects to Expand Participation in Affordable Connectivity Program (Mar. 10, 2023), https://docs.fcc.gov/public/attachments/DOC-391570A1.pdf.

[1444] *Consumer and Governmental Affairs Bureau and Wireline Competition Bureau Announce ACP Pilot Program Grants Target Funding*, WC Docket No. 21-450, Public Notice, 38 FCC Rcd 1938 (CGB/WCB 2023).

[1445] *Affordable Connectivity Program*, WC Docket No. 21-450, Fifth Report and Order, 38 FCC Rcd 2546, 2546, para. 1 (2023) (*ACP Fifth Report and Order*). This funding came from a combination of: (a) previously allocated unspent funding; and (2) funding that had not yet been allocated to specific outreach efforts. *Id.*

[1446] *Consumer and Governmental Affairs Bureau Announces Second Round of ACP Outreach Grant Program Awards*, WC Docket No. 21-450, Public Notice, 38 FCC Rcd 7548 (CGB 2023); *Consumer and Governmental Affairs Bureau Announces Second Round of ACP Tribal Outreach Grant Program Awards*, WC Docket No. 21-450, Public Notice, 38 FCC Rcd 7971 (CGB 2023).

[1447] The Infrastructure Act expressly authorized the Commission to use ACP funds to conduct outreach to encourage households to enroll in the ACP by engaging in paid media campaigns. *ACP Fifth Report and Order*, 38 FCC Rcd at 2548, para. 6 (citing 47 U.S.C. § 1752(b)(10)(C)(ii)(I)-(IV)). Accordingly, the Commission set aside funding for its own ACP outreach efforts. *Id.* at 2550 & n.30.

application support made available in over 10 languages. This campaign launched in Spring 2023 and continued through fall of that year.

461. The Commission and the Universal Service Access Company (USAC) also deployed multiple enhancements throughout 2023 to simplify the application and enrollment process for eligible households.[1448] This work responded in part to a January 2023 GAO report regarding the ACP, which included nine recommendations, including establishing quantifiable and measurable program performance goals, improving program outreach by addressing outreach translation issues and developing an educational plan consistent with leading practices and taking steps to improve program integrity efforts. The Commission was able to address all of the GAO recommendations and GAO has closed out all nine recommendations.[1449]

462. *Lifeline*. In addition to emergency support regulatory flexibility that the Commission has provided for the Lifeline program and the affordability aspects of our implementation of the Safe Connections Act discussed above, the Commission has taken actions to ensure the Lifeline program continues to make discounted communications services available to low-income consumers. For instance, on July 7, 2023, WCB adopted an order continuing the pause of the scheduled increase in the mobile broadband data capacity minimum service standard and also continued the pause in the phase-down of support for Lifeline plans that only meet the minimum service standards for voice service,[1450] which WCB further extended on July 3, 2024.[1451] These actions ensure that Lifeline subscribers continue to have access to discounted voice-only service and also that mobile data Lifeline subscribers have access to plans that are sufficiently robust while remaining affordable.[1452] Collectively, these actions reflect the Commission's commitment to ensuring that low-income consumers continue to have access to affordable communications services.[1453]

463. *Supporting Survivors of Domestic Violence*. In July 2022, the Commission opened an inquiry to evaluate how the FCC's low-income programs might help survivors of domestic violence and

[1448] USAC, *ACP National Verifier Enhancements* (Feb. 14, 2023), https://www.usac.org/wp-content/uploads/about/documents/acp/bulletins/ACP-National-Verifier-Enhancements.pdf. *See generally* USAC, *ACP Bulletins*, https://www.usac.org/about/affordable-connectivity-program/affordable-connectivity-program-learn/acp-bulletins (last visited Oct. 24, 2024).

[1449] Gov't Accountability Office, FCC Could Improve Performance Goals and Measures, Consumer Outreach, and Fraud Risk Management, GAO-23-105399 (Jan. 2023), https://www.gao.gov/assets/d23105399.pdf. The status of the recommendations are listed at the bottom of the GAO page that includes the aforementioned report. *Affordable Broadband: FCC Could Improve Performance Goals and Measures, Consumer Outreach, and Fraud Risk Management*, https://www.gao.gov/products/gao-23-105399 (last visited Oct. 24, 2024).

[1450] *Lifeline and Link Up Reform and Modernization et al.*, WC Docket No. 11-42 et al., Order, 38 FCC Rcd 6096 (WCB 2023).

[1451] *Lifeline and Link Up Reform and Modernization et al.*, WC Docket No. 11-42 et al., Order, DA 24-642 (WCB July 3, 2024).

[1452] *Id.* at 5-6, paras. 12, 15.

[1453] In addition, the Commission took action in response to certain catastrophic weather events to temporarily waive certain deadlines and rules for Lifeline participants in affected areas to ensure access to vital services. *See*, *e.g.*, *Lifeline and Link Up Reform and Modernization*, WC Docket No. 11-42, Order, FCC 24-108 (Oct. 11, 2024); *Lifeline and Link Up Reform and Modernization,* WC Docket No. 11-42 et al., Order, DA 24-1059 (WCB Oct. 9, 2024); *Lifeline and Link Up Reform and Modernization*, WC Docket No. 11-42, Order, FCC 24-107 (Oct. 2, 2024); *Lifeline and Link Up Reform and Modernization,* WC Docket No. 11-42 et al., Order, DA 24-1025 (WCB Oct. 1, 2024), *Affordable Connectivity Program et al.*, WC Docket No. 21-450 et al., Order, 38 FCC Rcd 7922 (WCB 2023). Furthermore, the Commission continued its response to the COVID pandemic, extending previous waivers of certain Lifeline program rules, notably recertification and reverification rules, to minimize de-enrollment during this period of high reliance on remote connectivity. *See Lifeline and Link Up Reform and Modernization*, WC Docket No. 11-42, Order, 38 FCC Rcd 1001 (WCB 2023).

other harmful abuse get access to connectivity services.[1454] Following passage of the Safe Connections Act of 2022, the Commission adopted a Notice of Proposed Rulemaking relating to the legislation and, later, in November 2023, the *Safe Connections Act Report and Order*.[1455] The rules adopted in the *Safe Connections Act Report and Order*, among other things, implement the requirement that mobile service providers separate the line of a survivor of domestic violence (and other related crimes and abuse), and any individuals in the care of the survivor, from a mobile service contract shared with an abuser within two business days after receiving a request from the survivor.[1456] The rules largely track the statutory language, with key additions and clarifications to address privacy, account security, fraud detection, and operational or technical infeasibility.[1457] Among other things, the Commission established requirements regarding the information that survivors must submit to request a line separation and the options providers must offer to survivors making a line separation request.[1458] The Commission also adopted requirements regarding communications with consumers and survivors and restrictions on various practices in connection with line separation requests.[1459] In addition, the Commission required covered providers to train employees who may interact with survivors on how to assist them or direct them to other employees who have received such training.[1460] The Commission also delineated the financial responsibilities for monthly service costs and mobile devices following a line separation.[1461] Furthermore, the Commission designated the Lifeline program to support emergency communications service for survivors that have pursued the line separation process and are suffering financial hardship.[1462] The Commission directed USAC to develop processes to allow survivors experiencing financial hardship to apply for and enroll in the Lifeline program, and to transition survivors from emergency communications support at the end of the six-month emergency support period mandated by the Safe Connections Act.[1463] The rules

[1454] *Lifeline and Link Up Reform and Modernization et al.*, WC Docket No. 11-42, Notice of Inquiry, 37 FCC Rcd 8964 (2022).

[1455] *Supporting Survivors of Domestic and Sexual Violence et al.*, WC Docket Nos. 22-238 et al., Notice of Proposed Rulemaking, 38 FCC Rcd 1768 (2023); *Supporting Survivors of Domestic and Sexual Violence et al.*, WC Docket Nos. 22-238 et al., Report and Order, 38 FCC Rcd 11280 (2023) (*Safe Connections Act Report and Order*).

[1456] *See* 47 CFR § 64.6402; 47 U.S.C. § 345(b); *see also* Safe Connections Act of 2022, Pub. L. No. 117-223, 116 Stat. 2280, § 4 (adding section 345 to the Communications Act, 47 U.S.C. § 345).

[1457] *See* 47 CFR § 64.6400-6409; *Safe Connections Act Report and Order*, 38 FCC Rcd at 11283-355, paras. 6-149.

[1458] *See* 47 CFR §§ 64.6401, 64.6406; *Safe Connections Act Report and Order*, 38 FCC Rcd at 11292-96, 11304-06, paras. 26-32, 45-49.

[1459] *See* 47 CFR §§ 64.6404, 64.6406; *Safe Connections Act Report and Order*, 38 FCC Rcd at 11325-29, paras. 80-88.

[1460] *See* 47 CFR § 64.6407; *Safe Connections Act Report and Order*, 38 FCC Rcd at 11324-25, para. 79.

[1461] *See* 47 CFR § 64.6405; *Safe Connections Act Report and Order*, 38 FCC Rcd at 11329-332, paras. 89-95.

[1462] *See Safe Connections Act Report and Order*, 38 FCC Rcd at 11355-63, paras. 150-66.

[1463] *Id.* at 11364-67, paras. 167-73. In addition to these provisions, the Commission also considered matters relating to protecting the privacy of calls and text messages to domestic violence hotlines. In the *Safe Connections Act Report and Order*, the Commission required covered providers and wireline, fixed wireless, and fixed satellite providers of voice service to: (1) omit from consumer-facing logs of calls and text messages any records of calls or text messages to covered hotlines in the central database established by the Commission; and (2) maintain internal records of calls and text messages excluded from consumer-facing logs of calls and text messages. *Id.* at 11338-55. Providers were generally given 12 months to comply with these requirements, except that small service providers were given 18 months. *Id.* at 11349-53, paras. 137-44. Further, the order specified that the compliance deadline will be no earlier than eight months after WCB publishes the database download file specification, and no earlier than two months after WCB announces that the database administrator has made the initial database download file available for testing. *Id*. at 11350-51, para. 138.

implementing the SCA's line separation provisions became effective July 15, 2024,[1464] and the Commission's rules allowing survivors to more easily enter the Lifeline program went into effect on August 29, 2024.[1465] The Lifeline program application process for survivors launched on September 4, 2024.[1466] As of that date, qualifying survivors who have attempted a line separation request with their service providers and are experiencing financial hardship may benefit from the program.[1467]

464. In April 2024, the Commission adopted a *Further Notice of Proposed Rulemaking* seeking comment on additional action the Commission can take to help domestic violence survivors safely access connectivity, particularly in the context of connected car services.[1468] The *Further Notice* seeks comment on the types and frequency of use of connected car services that are available in the marketplace today, asks whether changes to the Commission's rules implementing the Safe Connections Act are needed to address the impact of connected car services on domestic violence survivors, and asks what steps connected car service providers can proactively take to protect survivors from the misuse of connected car services.[1469]

465. *SIM Swap Fraud*. In a *Report and Order* released November 16, 2023, the Commission adopted rules aimed at foreclosing the opportunistic ways in which bad actors take over customers' cell phone accounts.[1470] Specifically, the Commission revised its Customer Proprietary Network Information (CPNI) and Local Number Portability rules to require wireless providers to adopt secure methods of authenticating a customer before redirecting a customer's phone number to a new device or provider.[1471] These rule revisions also require wireless providers to immediately notify customers whenever a SIM change or port-out request is made on customers' accounts, and take additional steps to protect customers from SIM swap and port-out fraud.[1472] In the accompanying Further Notice of Proposed Rulemaking, the Commission sought comment on whether to harmonize the existing requirements governing customer access to CPNI with the newly-adopted SIM change authentication and protection measures. The Commission also sought comment on what steps the Commission can take to harmonize government efforts to address SIM swap and port-out fraud.[1473]

466. *Preventing Digital Discrimination*. One of the Commission's foremost goals is to ensure that every person in the United States has equal access to high-quality, affordable broadband Internet

[1464] *See Wireline Competition Bureau Announces Compliance Date of July 15, 2024 for Safe Connections Act Rules*, WC Docket Nos. 22-238 et al., Public Notice, DA 24-503 (WCB May 29, 2024).

[1465] *Wireline Competition Bureau Announces Compliance Date of August 29, 2024 for Lifeline Rules Implementing the Safe Connections Act*, WC Docket Nos. 22-238, 11-42, and 21-450, Public Notice, DA 24-881 (WCB Aug. 29, 2024).

[1466] Universal Service Administrative Company, *Safe Connections Act*, https://www.usac.org/lifeline/safe-connections-act/ (last visited Oct. 2, 2024).

[1467] *See id.*

[1468] *Supporting Survivors of Domestic and Sexual Violence*, WC Docket No. 22-238, Further Notice of Proposed Rulemaking, FCC 24-38 (Apr. 8, 2024).

[1469] *Id.* at 1, para. 2.

[1470] *Protecting Consumers from SIM Swap and Port-Out Fraud*, WC Docket No. 21-341, Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 11182 (2023).

[1471] *Id*. at 11183, para. 2.

[1472] *Id*.

[1473] *Id.* at 11236-39, paras. 98-108.

access service.[1474] Among many steps towards achieving that goal, in February 2022 Chairwoman Rosenworcel established the cross-agency Task Force to Prevent Digital Discrimination.[1475] On March 17, 2022, the Commission commenced a proceeding "to ensure that all people of the United States benefit from equal access to broadband internet access service," with the intention of preventing and identifying steps the Commission should take to eliminate "digital discrimination of access based on income level, race, ethnicity, color, religion, or national origin," pursuant to Congress's directive in section 60506 of the Infrastructure Act.[1476] Following a Notice of Inquiry and a later Notice of Proposed Rulemaking, the Commission adopted a Report and Order in November 2023 establishing a framework to facilitate equal access to broadband Internet access service as directed by Congress.[1477] In the Report and Order, the Commission adopted a definition of "digital discrimination of access," as that term is used in section 60506 of the Infrastructure Act, that encompasses both intentionally discriminatory conduct as well as conduct that produces discriminatory effects; adopted and identified the contours of a specific carve out from that definition for policies and practices that are justified by genuine issues of technical and economic feasibility; adopted rules that prohibit digital discrimination of access as so defined; amended the Commission's enforcement rules so they specifically encompass investigations regarding digital discrimination of access; revised the Commission's informal consumer complaint process to, among other changes, provide a designated pathway for accepting complaints of digital discrimination of access; and adopted model policies and best practices for states, local and Tribal governments to support their efforts in preventing digital discrimination of access.[1478] In an accompanying Further Notice of Proposed Rulemaking, the Commission proposed that each ISP be required to submit annually a publicly available supplement to the BDC that describes, on a state-by-state or territory-by-territory basis, all major deployment, upgrade, and maintenance projects completed or substantially completed in the preceding calendar year; and proposed that each provider be required to establish and maintain an internal compliance program to ensure that the provider regularly assesses whether and how its policies and practices advance or impede equal access to broadband Internet service in its service areas.[1479] The Commission sought comment on these proposed measures as well as the merits of establishing an Office of Civil Rights within the Commission and the responsibilities such an office might be assigned.[1480]

467. *Open Internet*. On April 25, 2024, the Commission adopted a Declaratory Ruling, Order, Report and Order, and Order on Reconsideration safeguarding and securing the open Internet (*2024 Open*

[1474] *Implementing the Infrastructure Investment and Jobs Act: Prevention and Elimination of Digital Discrimination*, GN Docket No. 22-69, Notice of Inquiry, 37 FCC Rcd 4198, 4198, para. 1 (2022) (*Digital Discrimination NOI*).

[1475] FCC, Press Release, Chairwoman Rosenworcel Announces Cross-Agency Task Force to Prevent Digital Discrimination (Feb. 8, 2022), https://docs.fcc.gov/public/attachments/DOC-380060A1.pdf.

[1476] *Digital Discrimination NOI*, 37 FCC Rcd at 4198-99, para. 2 (quoting section 60506(a)(3) and (b)(1) of the Infrastructure Act, 135 Stat. at 1246). Section 60506 of the Infrastructure Act is codified at 47 U.S.C. § 1754, Digital Discrimination.

[1477] *Digital Discrimination NOI*; *Implementing the Infrastructure Investment and Jobs Act: Prevention and Elimination of Digital Discrimination*, GN Docket No. 22-69, Notice of Proposed Rulemaking, 37 FCC Rcd 15274 (2022); *Implementing the Infrastructure Investment and Jobs Act: Prevention and Elimination of Digital Discrimination*, GN Docket No. 22-69, Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 11440 (2023) (*Preventing Digital Discrimination Report and Order*), *appeal filed, Minnesota Telecom Alliance v. FCC*, 24-1179 (8th Cir. argued Sept. 25, 2024).

[1478] *Preventing Digital Discrimination Report and Order*, 38 FCC Rcd at 11454-11528, paras. 27-178.

[1479] *Id.* at 11528-38, paras. 179-213.

[1480] *Id.* at 11538, para. 214.

Internet Order).[1481] The *2024 Open Internet Order* classified broadband Internet access service as a telecommunications service and classified mobile broadband Internet access service as a commercial mobile service while establishing broad, tailored forbearance—including no rate regulation, no tariffing, no unbundling of last-mile facilities, and no cost accounting rules—in the Commission's application of Title II to broadband Internet access service providers.[1482] In addition, the *2024 Open Internet Order* reinstated straightforward, clear rules that prohibit blocking, throttling, or engaging in paid or affiliated prioritization arrangements, adopted certain enhancements to the transparency rule, and reinstated a general conduct standard that prohibits unreasonable interference or unreasonable disadvantage to consumers or edge providers.[1483] Further, the *2024 Open Internet Order* made clear that the Commission will employ a case-by-case review under sections 201 and 202 to ensure that Internet traffic exchange practices do not harm the open Internet and established a multi-faceted enforcement framework comprised of advisory opinions, enforcement advisories, Commission-initiated investigations, and informal and formal complaints.[1484] In addition, the *2024 Open Internet Order* partially granted and otherwise dismissed as moot several petitions for reconsideration filed in response to the *RIF Remand Order*.[1485]

468. *Access Stimulation*. In April 2023, the Commission also adopted a Second Report and Order to address a perceived loophole in the existing rules by extending the Access Stimulation Rules to traffic that terminates through Internet Protocol Enabled Service (IPES) providers.[1486] Under the Second Report and Order, IPES providers are now required to abide by the same parameters as local exchange carriers (LECs). First, IPES providers must calculate the ratio of their terminating and originating call volumes, in line with the existing requirements for LECs.[1487] The Second Report and Order also established that IPES Provider's would be found to have engaged in access stimulation if the IPES Provider's traffic ratio meets or exceeds the triggers established by the Access Stimulation Rules.[1488] In addition, the Second Report and Order established a bright-line methodology for calculating traffic ratios of both LECs and IPES Providers.[1489] Under the new and revised rules, LECs and IPES Providers would be required to count all calls that go through each end office or its equivalent, to and from any telephone number associated with the operating company number that identifies the LEC or IPES Provider.[1490] Lastly, the Second Report and Order established that if an IPES Provider were to engage in access stimulation, the Intermediate Access Provider would be prohibited from collecting tariffed terminating

[1481] *Safeguarding and Securing the Open Internet; Restoring Internet Freedom*, WC Docket Nos. 23-320 and 17-108, Declaratory Ruling, Order, Report and Order, and Order on Reconsideration, FCC 24-52 (rel. May 7, 2024) (*2024 Open Internet Order*). On August 1, 2024, the Sixth Circuit granted a stay of the *2024 Open Internet Order* pending judicial review. *In re: MCP No. 185; Federal Communications Commission, Safeguarding and Securing the Open Internet, Declaratory Ruling, Order, Report and Order, and Order On Reconsideration*, *FCC 24-52,* 89 Fed. Reg. 45404, Published May 22, 2024, No. 24-7000 (6th Cir., Aug. 1, 2024).

[1482] *2024 Open Internet Order* at 60-102, 144-154, 188--271, paras. 106-53, 214-36, 303-442.

[1483] *Id.* at 297-344, paras. 492-567.

[1484] *Id.* at 349-59, paras. 576-92.

[1485] *Id.* at 396-401, paras. 683-91.

[1486] *Updating the Intercarrier Compensation Regime to Eliminate Access Arbitrage*, WC Docket No. 18-155, Second Report and Order, 38 FCC Rcd 3822 (Apr. 20, 2023).

[1487] *Id.* at 3838-42 paras. 28-36.

[1488] *Id.* at 3829-30, paras. 14-15.

[1489] *Id.* at 3838-42, paras. 28-36.

[1490] *Id.* at 3836-38, paras. 24-27.

switching and transport charges from an interexchange carrier for traffic bound to the access-stimulating IPES Provider or its customers.[1491]

469. *Calling Services for Incarcerated People*. Access to affordable communications services is critical for everyone in the United States, especially for incarcerated people whose primary or only communications option is to purchase telephone service from providers that typically operate on a monopoly basis. On January 5, 2023, President Biden signed into law the Martha Wright-Reed Just and Reasonable Communications Act of 2022 (Martha Wright-Reed Act),[1492] which directs the Commission to adopt, not earlier than 18 months and not later than 24 months after the date of enactment, regulations that establish a compensation plan that ensures fair compensation for incarcerated people's communications services (IPCS) providers and just and reasonable rates and charges for incarcerated people's audio and video communications services.[1493] In a March 2023 Notice of Proposed Rulemaking and Order,[1494] the Commission sought comment on implementation of the Martha Wright-Reed Act and reaffirmed a prior delegation of data collection authority to WCB and OEA, and directed them to update and restructure their most recent data collection as appropriate in light of the requirements of the new statute.[1495] In July 2023, WCB and OEA exercised this delegated authority, adopting an order to collect information on the additional services and providers subject to the Commission's newly expanded authority and address the Act's other provisions where necessary.[1496]

470. On July 18, 2024, the Commission adopted a Report and Order and Further Notice of Proposed Rulemaking implementing the Martha Wright-Reed Act and seeking comment on additional reforms.[1497] Among other reforms, the Report and Order: (1) lowered existing per-minute rate caps for voice services by more than half and established interim per-minute rate caps for video communications services, such as video conferencing and video visitation; (2) limited the costs associated with safety and security measures that can be recovered in the per-minute rates to only those costs that the Commission finds are used and useful in the provision of IPCS; (3) allowed IPCS providers to offer alternate pricing plans for IPCS; (4) prohibited IPCS providers from making site commission payments for IPCS and preempted state and local laws and regulations requiring such commissions, subject to a transition period; (5) revised and strengthened IPCS accessibility requirements for incarcerated people with disabilities; and (6) strengthened the Commission's IPCS consumer disclosure rules.[1498] The Further Notice of Proposed

[1491] *Id.* at 3833-34, para. 20.

[1492] Martha Wright-Reed Just and Reasonable Communications Act of 2022, Pub. Law No. 117-338, 136 Stat. 6156 (Martha Wright-Reed Act) (codified in amendments to 47 U.S.C. §§ 152(b), 153(1)(E), 276(b)(1)(A), (d)).

[1493] Martha Wright-Reed Act § 3(a); 47 U.S.C. § 276(b)(1)(A).

[1494] *Incarcerated People's Communications Services*; *Implementation of the Martha Wright-Reed Act*; *Rates for Interstate Inmate Calling Services*, WC Docket Nos. 23-62 and 12-375, Notice of Proposed Rulemaking and Order, 38 FCC Rcd 2669 (2023).

[1495] *Id.* at 2701-2702, para. 84.

[1496] Federal Communications Commission, 2023 Mandatory Data Collection for Incarcerated People's Communications Services, Order, 38 FCC Rcd 6625 (July 26, 2023); *Wireline Competition Bureau Announces the Due Date for Responses to the Commission's 2023 Mandatory Data Collection*, WC Docket Nos. 23-62 and 12-375, Public Notice, 38 FCC Rcd 8350 (WCB/OEA 2023) (announcing the Office of Management and Budget's (OMB) approval of the Commission's 2023 Mandatory Data Collection); Notice of Office of Management and Budget Action for New Collection, OMB Control No. 3060-1314 (approved Sept. 11, 2023).

[1497] *Incarcerated People's Communications Services; Implementation of the Martha Wright-Reed Act Rates for Interstate Inmate Calling Services*, WC Docket Nos. 23-62 and 12-375, Report and Order, Order on Reconsideration, Clarification and Waiver, and Further Notice of Proposed Rulemaking, FCC 24-75 (July 22, 2024) (*2024 IPCS Order* or *2024 IPCS Notice*).

[1498] *Id.* at 4, para. 4.

Rulemaking sought comment on, among other matters, establishing permanent rate caps for video IPCS and potentially disaggregating the Commission's rate cap tier for very small jails into separate tiers that more accurately reflect the costs of providing IPCS.[1499]

4. Providing High Cost Universal Service Support

471. *Administrative Improvements to High-Cost Programs*. In October 2023, the Commission made certain administrative modifications to, and clarifications of, Commission rules to improve the administration of the high-cost program, including the reduction in duplicative filing requirements and the elimination of unnecessary optional filings, the modification of certain reporting deadlines, grace periods and associated support reductions to align the requirements more closely with the high-cost program, and the expansion of certain reporting requirements as necessary to improve Commission oversight.[1500] These changes do not alter providers' existing obligations.[1501]

472. *Enhanced Alternative Connect America Cost Model (A-CAM) Support*. In July 2023, the Commission adopted the Enhanced A-CAM program as a voluntary path for supporting the widespread deployment of 100/20 Mbps broadband service throughout the rural areas served by carriers currently receiving A-CAM support and in areas served by legacy rate-of-return support recipients.[1502] In adopting this program, the Commission furthered its long-standing goals by promoting the universal availability of voice and broadband networks, while also taking measures to minimize the burden on the nation's ratepayers.[1503] The Commission also adopted requirements for the Enhanced A-CAM program to complement existing federal, state, and local funding programs, so that broadband funding can be used efficiently to maximize the deployment of high-quality broadband service across the United States.[1504] On August 30, 2023, WCB announced carrier-specific offers of Enhanced A-CAM support based on a revised version of the A-CAM to existing A-CAM carriers and carriers that are still receiving legacy support to fund the deployment of voice and broadband-capable networks in their service territories.[1505] On October 30, 2023, WCB announced that 368 rate-of-return companies had elected such offers, representing commitments to deploy at least 100/20 Mbps service to over 700,000 unserved locations and maintain or improve existing 100/20 Mbps service to approximately 2 million locations.[1506]

473. *Legacy Rate-of-Return High-Cost Funding.* In a July 2023 Notice of Proposed Rulemaking, the Commission sought comment on how to address the immediate needs of legacy rate-of

[1499] *Id.* at 313-20, paras. 608-25.

[1500] *Connect America Fund—Alaska Plan et al.*, WC Docket No. 16-271 et al., Notice of Proposed Rulemaking and Report and Order, 38 FCC Rcd 9982, 10041-63, paras. 131-85 (2023).

[1501] As a response to certain catastrophic weather events, the Commission temporarily waived certain deadlines and rules for service provider high-cost USF program recipients, as well as service provider contributors, in affected areas. *See*, *e.g.*, *Lifeline and Link Up Reform and Modernization,* WC Docket No. 11-42 et al., Order, DA 24-1059 (WCB Oct. 9, 2024); *Lifeline and Link Up Reform and Modernization,* WC Docket No. 11-42 et al., Order, DA 24-1025 (WCB Oct. 1, 2024); *Affordable Connectivity Program et al.*, WC Docket No. 21-450 et al., Order, 38 FCC Rcd 792 (WCB 2023).

[1502] *Connect America Fund, et al*., WC Docket No. 10-90 et al., Report and Order, Notice of Proposed Rulemaking, and Notice of Inquiry, 38 FCC Rcd 7040, 7041, para. 2 (2023) (*Enhanced A-CAM Order*).

[1503] *Id*.

[1504] *Id*.

[1505] *Wireline Competition Bureau Announces Enhanced Alternative Connect America Cost Model Support Amounts Offered to Rate-Of-Return Carriers to Expand Rural Broadband*, WC Docket No. 10-90, Public Notice, 38 FCC Rcd 7828 (WCB 2023).

[1506] *Wireline Competition Bureau Authorizes 368 Companies in 44 States to Receive Enhanced Alternative Connect America Cost Model Support to Expand Rural Broadband*, WC Docket No. 10-90, Public Notice, 38 FCC Rcd 10304 (WCB 2023).

return support mechanisms, while balancing the Commission's objectives of maintaining its commitment to supporting broadband at evolving levels of service and also avoiding unnecessary duplication of support in light of other available funding programs.[1507] The Commission released an order in December 2023 deferring the commencement of the next five-year deployment obligation term for legacy rate-of-return carriers receiving CAF Broadband Loop Support in 2024 until January 1, 2025, while the Commission considers general program reforms in the ongoing Notice of Proposed Rulemaking proceeding.[1508] Legacy carriers will remain subject to the Commission's rules, requiring the offering of broadband service at actual speeds of at least 25/3 Mbps to the previously determined number of unserved locations under the current five-year term that ends on December 31, 2023.[1509] In July 2023, the Commission also released a Notice of Inquiry seeking to build a record to help it explore methods for new USF high-cost support mechanism(s) to promote affordable and available broadband services in the years to come for full service networks.[1510]

474. On May 23, 2023, the Commission temporarily waived the application of the budget control mechanism for rate-of-return carriers that receive high-cost universal service support from legacy mechanisms.[1511] Instead, the Commission adopted a budget constraint of 0%, that is, a full waiver of the budget constraint, for the July 2023 to June 2024 tariff year.[1512] Absent a waiver, the projected budget control mechanism would exceed 18%, resulting in a substantial reduction in support for most legacy rate-of-return carries at a time when they continue to face cash flow issues and increased expenses as they emerge from the pandemic.[1513] However, for the July 2024 to June 2025 tariff year, the budget control adjustment factor is 1.85%.[1514]

475. *Alaska Connect Fund*. On November 1, 2024, the Commission adopted the *Alaska Connect Fund Order and FNPRM*, addressing the continuation of high-cost Universal Service support for Alaska after high-cost support for Alaska ends on December 31, 2026.[1515] The *Alaska Connect Fund Order and FNPRM* established separate mechanisms for mobile and fixed providers, with each mechanism tailored to the needs of the supported services.[1516] With regard to fixed providers, the Commission's support and broadband service goals will be materially affected by, and are intended to be complementary to, the BEAD awards, as well as other federal broadband infrastructure funding.[1517] The Commission provides a period of transitional support (ACF Transition) for existing support recipients through 2028 to allow time for network deployments funded by these programs to be completed or nearly completed.[1518] During the ACF Transition, carriers will be responsible for maintaining the same level of

[1507] *Enhanced A-CAM Order*, 38 FCC Rcd 7040, 7089-7101, paras. 115-53.

[1508] *Connect America Fund: A National Broadband Plan for our Future High-Cost Universal Service Support*, WC Docket No. 10-90, Second Report and Order, 38 FCC Rcd 12876 (2023).

[1509] *Id.* at 6-7, para. 14.

[1510] *Enhanced A-CAM Order*, 38 FCC Rcd at 7101-13, paras. 154-83.

[1511] *Connect America Fund*, WC Docket No. 10-90, Order, 38 FCC Rcd 5479, 5479, para. 1 (2023).

[1512] *Id*.

[1513] *Id.* at 5481, para. 8. For the July 2024 to June 2025 tariff year, the budget control adjustment factor is 1.85%. *See* 2024-2025 Budget Analysis, https://www.usac.org/wp-content/uploads/high-cost/documents/Budget-Analysis/2024-2025-Budget-Analysis.xlsx.

[1514] *See* 2024-2025 Budget Analysis, https://www.usac.org/wp-content/uploads/high-cost/documents/Budget-Analysis/2024-2025-Budget-Analysis.xlsx.

[1515] *Connect America Fund et al*., WC Docket Nos. 10-90 et al., Report and Order and Further Notice of Proposed Rulemaking, FCC 24-116 (Nov. 4, 2024) (*Alaska Connect Fund Order and FNPRM*).

[1516] *Id.* at 8, para. 12.

[1517] *Id.* at 15, para. 28.

service and meeting any deployment obligations they are committed to under the Commission's Alaska Plan, Alaska Communications Systems, and A-CAM programs.[1519] For the period following the ACF Transition, beginning January 1, 2029, the Commission established the framework for the Alaska Connect Fund Fixed services program (Fixed ACF) to provide fixed service providers ongoing technology-neutral support through the end of 2034, focused on supporting the maintenance and operation of broadband and voice-capable networks in Alaska.[1520] Because a full picture of fixed broadband deployment will not be clear until BEAD and other federal funding is awarded, the Commission incorporated flexibility into Fixed ACF to evaluate and address future deployment needs.[1521] This two-phased approach will allow for continued and certain support for existing USF participants for a set period, while allowing the Commission to develop a complete picture of how the BEAD program and other federal network deployment funding will be allocated in Alaska to ensure that the Fixed ACF program complements these programs most effectively for the benefit of Alaskan consumers.[1522]

476. *Rural Broadband Accountability Plan (RBAP) and Broadband Deployment Alignment Plan (BDAP)*. The RBAP is an effort to monitor and ensure compliance for universal service high-cost programs, including the Rural Digital Opportunity Fund and Connect America Fund Phase II Auction.[1523] The RBAP makes several changes and enhancements to existing audit and verification procedures, including significantly increasing the number of audits and verifications initiating verifications earlier in the deployment process, and conducting on-site audits.[1524] The largest dollar recipients are subject to an on-site audit in at least one state, and higher-risk recipients are subject to additional audits and verifications.[1525] Results of verifications, audits, and speed and latency performance testing are publicly available.[1526] The Commission established the RBAP as part of an ongoing effort to increase accountability and to build upon existing audit and verification processes performed by USAC.[1527]

477. In addition to monitoring for and ensuring compliance for the high-cost programs, the FCC also coordinates extensively with other federal agencies to avoid duplication of funding, and to maximize the impact of federal funding for broadband deployment. The FCC has developed the BDAP under which the FCC takes immediate action to coordinate with other federal and state agencies to minimize the impact on consumers and the geographic areas in the event a carrier defaults from an FCC broadband deployment program.

478. *Other Federal Programs*. As discussed in a variety of contexts in this Report, the Commission's efforts to provide high-cost USF support for broadband deployment are part of, and conducted in concert (and coordination) with, other federal programs that provide financial support for broadband deployment. The largest of these programs is NTIA's BEAD Program, for which Congress

(Continued from previous page)

[1518] *Id.* at 15-17, paras. 28-32.

[1519] *Id.* at 17, para. 32.

[1520] *Id.* at 17-29, paras. 33-58.

[1521] *Id.* at 22, para. 42.

[1522] *Id.* at 3-4, para. 4.

[1523] FCC, *Rural Broadband Accountability Plan*, https://www.fcc.gov/rbap (last visited Oct. 24, 2024).

[1524] FCC, *Fact Sheet: Rural Broadband Accountability Plan*, https://docs.fcc.gov/public/attachments/DOC-379729A1.pdf (last visited Oct. 24, 2024).

[1525] *Id.*

[1526] *Id.*

[1527] *Id.*

allocated $42.45 billion in the Infrastructure Act among states for grants "to bridge the digital divide."[1528] NTIA has fully approved the proposals of all states, territories, and the District of Columbia.[1529] Once deployment goals are met, any remaining funding can be used on high-speed Internet adoption, training, and workforce development efforts, among other eligible uses.[1530] NTIA also administers the $1 billion Enabling Middle Mile Broadband Infrastructure Program, also created by the Infrastructure Act, which funds middle mile infrastructure used to connect local, regional, and national networks, as well as anchor institutions such as schools, libraries, medical and healthcare providers, and various institutions of higher education.[1531] Further, NTIA administers the Tribal Broadband Connectivity Program, a program used for broadband deployment on Tribal lands, as well as for telehealth, distance learning, broadband affordability, and digital inclusion recently funded combined $3 billion appropriations in the Consolidated Appropriations Act, 2021, and Infrastructure Act.[1532]

479. In addition to programs administered by NTIA, Treasury administers a broadband infrastructure funding program,[1533] which requires recipients to invest in projects designed to provide service to households and businesses with an identified need for additional broadband investment, including increasing access to high-speed broadband, increasing the affordability of broadband services, and improving the reliability of broadband service.[1534] In addition to its historic grant and loan programs,[1535] USDA's RUS administers the ReConnect Program, which provides loans, grants, and loan-grant combinations to bring high-speed Internet to rural areas that lack sufficient access to broadband. ReConnect Program funds can be used to fund the costs of construction, improvement, or acquisition of facilities and equipment needed to provide broadband service.[1536]

[1528] Infrastructure Act, div. F, tit. I, § 60102(b)(1), 135 Stat. at 1184. On June 26, 2023, the BEAD Program allocations for all 50 states and the U.S. Territories were announced. NTIA, U.S. Department of Commerce, *Biden-Harris Administration Announces State Allocations for $42.45 Billion High-Speed Internet Grant Program as Part of Investing in America Agenda* (June 26, 2023), https://www.ntia.gov/press-release/2023/biden-harris-administration-announces-state-allocations-4245-billion-high-speed.

[1529] NTIA, *Bead Initial Proposal Progress Dashboard*, https://www.ntia.gov/funding-programs/internet-all/broadband-equity-access-and-deployment-bead-program/progress-dashboardprogress-dashboard (last visited Nov. 21, 2024); NTIA, *Biden-Harris Administration Approves Texas' "Internet for All" Initial Proposal* (Nov. 19, 2024), https://www.internetforall.gov/news-media/biden-harris-administration-approves-texas-internet-all-initial-proposal.

[1530] *See* NTIA, Broadband Equity, Access, and Deployment Program Notice of Funding Opportunity 39-40 (2022), https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf.

[1531] *See* Infrastructure Act, div. F, tit. I, § 60401, 135 Stat. at 1231. For award routes and project information, *see* NTIA, U.S. Department of Commerce, *Funding Recipients,* https://broadbandusa.ntia.doc.gov/funding-programs/enabling-middle-mile-broadband-infrastructure-program/funding-recipients (last visited Dec. 18, 2024).

[1532] *See* NTIA, U.S. Department of Commerce, *Tribal Broadband Connectivity Program*, https://broadbandusa.ntia.doc.gov/funding-programs/tribal-broadband-connectivity (last visited Oct. 24, 2024).

[1533] *See* American Rescue Plan Act, tit. IX, § 9901(c)(1)(D) (codified at 42 U.S.C. § 802(c)(1)(D)), 135 Stat. at 226; 42 U.S.C. § 804(e) (funding level).

[1534] *See* Department of the Treasury, Coronavirus State and Local Fiscal Recovery Funds, Final Rule, 87 Fed. Reg. 4338, 4443 (Jan. 27, 2022).

[1535] *See* USDA, Rural Development, *Telecom Programs*, https://www.rd.usda.gov/programs-services/telecommunications-programs (last visited Dec. 18, 2024).

[1536] USDA, Rural Development, *ReConnect Loan and Grant Program*, https://www.usda.gov/reconnect (last visited Dec. 18, 2024). There have been five rounds of ReConnect funding, with the application window for the fifth round of funding having closed on May 28, 2024. *See id.*

5. Facilitating Access for Schools, Libraries, and Health Care Facilities

480. *E-Rate*. In July 2023, the Commission adopted a Report and Order providing Tribal libraries enhanced access to E-Rate funding, and improving and simplifying program rules.[1537] Among other things, the Commission updated its E-Rate program rules to allow Tribal college and university libraries that also serve as public libraries in their communities to apply for and receive E-Rate support; created an exemption to the competitive bidding requirements for all libraries seeking E-Rate support for category two equipment or services that total a pre-discount price of $3,600 or less per library per funding year; and increased the maximum category two discount rate to 90% and the category two funding floor to $55,000 for Tribal libraries.[1538] The Commission also amended the E-Rate program rules to add a Tribal community representative to the USAC Board of Directors and directed USAC to provide increased outreach and training to Tribal applicants.[1539] In an accompanying Notice of Proposed Rulemaking, the Commission sought comment on ways to further simplify the E-Rate program for all applicants.[1540]

481. In the fall of 2023, the Commission took two actions regarding the use of E-Rate funding to support school bus Wi-Fi and Wi-Fi hotspots so that schools and libraries can make additional connectivity services available to students, school staff, and library patrons in need. On October 19, 2023, the Commission adopted a Declaratory Ruling finding that the use of Wi-Fi, or other similar access point technologies, on school buses serves an educational purpose, and the provision of such service, including the equipment needed to provide such service, is eligible for E-Rate funding, consistent with the Commission's past determinations regarding other eligible off-campus uses of E-Rate-supported services.[1541] The Commission directed WCB to seek comment on the specific services and equipment that would be eligible as part of the Funding Year 2024 Eligible Services List proceeding.[1542] On October 25, 2023, WCB issued a supplemental Public Notice seeking additional comment on several questions, including: (1) what equipment is needed to provide Wi-Fi on school buses and whether the equipment should be eligible as a Category One or Category two service; (2) how to ensure the use of Wi-Fi equipment and services on school buses is consistent with E-Rate program rules and limitations; (3) how to ensure support is only provided for educational purposes consistent with E-Rate rules; and (4) what are the estimated costs for providing Wi-Fi on school buses.[1543] On December 15, 2023, WCB issued an order approving the Funding Year 2024 Eligible Services List and making the services and equipment necessary to provide Wi-Fi on school buses eligible for E-Rate support.[1544] On November 1, 2023, the Commission adopted a Notice of Proposed Rulemaking seeking comment on making updates to the E-Rate program to permit the off-campus use of Wi-Fi hotspots and services by students, school staff, and library patrons.[1545]

[1537] *Schools and Libraries Universal Service Support Mechanism et al.*, CC Docket No. 02-6 et al., Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 6842 (2023) (*Tribal E-Rate Order and FNPRM*).

[1538] *Id.* at 6847-57, paras. 11-30.

[1539] *Id.* at 6857-61, paras. 31-39.

[1540] *Id.* at 6861-80, paras. 40-81.

[1541] *Modernizing the E-Rate Program for Schools and Libraries*, WC Docket No. 13-184, Declaratory Ruling, 38 FCC Rcd 9943 (2023).

[1542] *See id*. at 9948, para. 9.

[1543] *Wireline Competition Bureau Seeks Additional Comment on Adding Wi-Fi on School Buses to Proposed Eligible Services List for the E-Rate Program*, WC Docket 13-184, Public Notice, 38 FCC Rcd 9697 (WCB 2023).

[1544] *Modernizing the E-Rate Program for Schools and Libraries*, WC Docket 13-184, Order, 38 FCC Rcd 11948, 11951-55, paras. 8-14 (WCB 2023).

[1545] *Addressing the Homework Gap through the E-Rate Program*, WC Docket No. 21-31, Notice of Proposed Rulemaking, 38 FCC Rcd 10726 (2023).

482. The Commission also recognizes that many students, school staff, and library patrons around the country are still caught in the Homework Gap or on the wrong side of the digital divide and are unable to fully participate in educational opportunities. To address the Homework Gap, the Commission adopted a Report and Order and Further Notice of Proposed Rulemaking in July 2024.[1546] The Report and Order modernizes the E-Rate program rules by permitting eligible schools and libraries to request E-Rate support for the off-premises use of Wi-Fi hotspots and wireless mobile Internet services so that students, staff, and library patrons can remain connected to the Internet.[1547] As part of the Report and Order, the Commission established a three-year budget mechanism to allow for the equitable distribution among students, school staff, and library patrons, by setting a limit on the amount of support that an applicant can request for Wi-Fi hotspots and services.[1548] To ensure the integrity of the E-Rate program, the Report and Order established several safeguards, including measures to ensure the supported Wi-Fi hotspots and services are in use, are used for educational purposes, are not funded through other sources, and are properly documented for auditing purposes.[1549] Lastly, the Report and Order established that the Children's Internet Protection Act requirements apply if the school or library receives E-Rate support for Wi-Fi hotspots.[1550] The Further Notice of Proposed Rulemaking seeks comment on further refining E-Rate program rules to maximize the use of E-Rate-funded Wi-Fi hotspots and services without unfairly burdening applicants and service providers and to ensure additional cybersecurity vulnerabilities are not introduced through the E-Rate-supported Wi-Fi hotspots.[1551] On October 25, 2024, the Funding Year 2025 Eligible Services List for the E-Rate program was updated to make wireless mobile service for use with Wi-Fi hotspots eligible for funding as a Category One service.[1552]

483. *Schools and Libraries Cybersecurity Pilot Program (Pilot Program)*. In June 2024, the Commission adopted a Report and Order in an effort to reduce the effects of cyberattacks directed at schools and libraries by establishing the Pilot Program.[1553] The Report and Order establishes a three-year Pilot Program to study the effectiveness of providing up to $200 million in USF support to participating eligible schools and libraries to ease the costs of purchasing eligible cybersecurity services and equipment,[1554] with USAC serving as the Administrator.[1555] The Report and Order established performance goals, along with a data reporting requirement, that will allow the Commission to evaluate the success of the program while also limiting the burden on program participants.[1556] A diverse array of

[1546] *Addressing the Homework Gap through the E-Rate Program*, WC Docket No. 21-31, Report and Order and Further Notice of Proposed Rulemaking, FCC 24-76 (July 29, 2024).

[1547] *Id.* at 11-12, para. 17.

[1548] *Id.* at 20-28, paras. 30-43.

[1549] *Id.* at 29-49, paras. 46-87.

[1550] *Id.* at 57-60, paras. 97-101.

[1551] *Id.* at 60-65, paras. 103-13.

[1552] *Modernizing the E-Rate Program for Schools and Libraries*, WC Docket No. 13-184, Order, DA 24-1104, 2, para. 4 (WCB Oct. 25, 2024). In addition, as a response to certain catastrophic weather events, the Commission temporarily waived certain deadlines and rules for E-Rate participants in affected areas. *See*, *e.g., Lifeline and Link Up Reform and Modernization,* WC Docket No. 11-42 et al., Order, DA 24-1059 (WCB Oct. 9, 2024); *Lifeline and Link Up Reform and Modernization,* WC Docket No. 11-42 et al., Order, DA 24-1025 (WCB Oct. 1, 2024); *Affordable Connectivity Program et al.*, WC Docket No. 21-450 *et al*., Order, 38 FCC Rcd 7922 (WCB 2023).

[1553] *Schools and Libraries Cybersecurity Pilot Program*, WC Docket No. 23-234, Report and Order, FCC 24-63 (June 11, 2024).

[1554] *Id.* at 10-13, paras. 15-21. The Pilot Program is being funded with universal service funding outside of the E-Rate program. *See id*. at 12-13, paras. 19-21.

[1555] *Id.* at 53-54, paras. 88-89.

[1556] *Id.* at 59-64, paras. 101-12.

eligible schools and libraries may apply to be selected as participants to the Pilot Program.[1557] Applicants will be evaluated, and selections will be made, on the basis of a broad and objective set of evaluation factors, including applicant type, discount rate, and the strength of the proposed projects described in the applications.[1558] To facilitate the program, the Commission is leveraging several existing forms, rules, and processes from the E-Rate, Emergency Connectivity Fund (ECF), and Connected Care pilot programs that will cover all aspects of the Pilot Program such as seeking competitive bids, requesting eligible services and equipment, and submitting requests for reimbursement.[1559] Lastly, the Report and Order established several requirements to protect the integrity of the program such as competitive bidding requirements, document retention, audits, restrictions on gifts, certifications, and suspension and debarment of bad actors.[1560]

484. *Emergency Connectivity Fund (ECF)*. Pursuant to the American Rescue Plan Act of 2021, the Commission established the ECF program on May 10, 2021 to distribute up to $7.171 billion to eligible schools and libraries for the purchases of Wi-Fi hotspot devices, modems, routers, devices that combine a modem and router, connected devices and broadband connections for use by students, school staff, and library patrons at locations that include locations other than the schools and libraries during the COVID-19 pandemic.[1561] The ECF program reimbursed 100% of the reasonable costs associated with the eligible broadband Internet services and equipment, and set a maximum support cap of $400 for connected devices (laptop and tablet computers) and a $250 support cap for Wi-Fi hotspots provided to an individual student, school staff, or library patron in need.[1562] This program allowed students, school staff, and library patrons who do not have an Internet connecting device or service at home to be connected and gain educational resources online. USAC and the Commission have opened and closed three application filing windows, with the requests received totaling more than $9.2 billion.[1563] Total funding originally committed was nearly $7.1 billion.[1564] On May 12, 2023, pursuant to statute and consistent with the intended emergency nature of the program and expiration of the public health emergency on May 11,

[1557] *Id.* at 20-22, paras. 34-35.

[1558] *Id.* at 43-45, paras. 70-73. The Commission opened the application filing window to participate in the Pilot Program on September 17, 2024, and closed the filing window on November 1, 2024. *See Wireline Competition Bureau Announces Application Filing Window for Cybersecurity Pilot Program and Provides Guidance for Submitting Applications*, WC Docket No. 23-234, Public Notice, DA 24-887 (WCB Sept. 4, 2024).

[1559] *Schools and Libraries Cybersecurity Pilot Program*, WC Docket No. 23-234, Report and Order, FCC 24-63, at 10, para. 14 (June 11, 2024).

[1560] *Id.* at 55-58, paras. 90-100.

[1561] *Establishing Emergency Connectivity Fund to Close the Homework Gap*, WC Docket No. 21-93, Report and Order, 36 FCC Rcd 8696, 8697-98, paras. 1, 3-4 (2021).

[1562] *Id.* at 8730-31, 8734, paras. 69, 71, 78.

[1563] *See* FCC, Press Release, FCC Announces Over $5 Billion in Funding Requests Received in the Emergency Connectivity Fund Program (Aug. 25, 2021), https://www.fcc.gov/document/fcc-announces-over-5-billion-emergency-connectivity-fund-requests; FCC, Press Release, FCC Announces Nearly $1.3 Billion in Funding Requests Received in Emergency Connectivity Fund Program Second Application Filing Window (Oct. 25, 2021), https://docs.fcc.gov/public/attachments/DOC-376868A1.pdf; FCC, Press Release, FCC Announces Over $2.8 Billion in Funding Requests for Final Window in Ongoing Work to Close the Homework Gap (May 25, 2022), https://docs.fcc.gov/public/attachments/DOC-383685A1.pdf. In addition, as a response to certain catastrophic weather events, the Commission temporarily waived certain deadlines and rules for ECF participants in affected areas. *See*, *e.g., Lifeline and Link Up Reform and Modernization et al.*, WC Docket No. 11-42 et al., Order, DA 24-1059 (WCB Oct. 9, 2024); *Lifeline and Link Up Reform and Modernization,* WC Docket No. 11-42 et al., Order, DA 24-1025 (WCB Oct. 1, 2024); *Affordable Connectivity Program et al.*, WC Docket No. 21-450 et al., Order, 38 FCC Rcd 7922 (WCB 2023).

[1564] FCC, Press Release, FCC Announces Over $450,000 in Emergency Connectivity Funding for Schools (Dec. 14, 2023), https://docs.fcc.gov/public/attachments/DOC-399143A1.pdf.

2023, WCB and the Office of the Managing Director announced the ECF program would sunset on June 30, 2024.[1565]

485. *Rural Health Care (RHC) Program.* The Commission continued its work to revise its rules to ensure that RHC providers receive funding necessary for broadband and telecommunications services to provide vital health care services, while limiting costly inefficiencies and the potential for waste, fraud, and abuse. On January 27, 2023, the Commission released an Order on Reconsideration, Second Report and Order, Order, and Second Further Notice of Proposed Rulemaking that makes it easier for health care providers to receive support, reduces delays in funding commitments, and improves the overall efficiency of the RHC program.[1566] The Commission eliminated the mechanism for funding that may have resulted in insufficient support and streamlined the invoicing process.[1567] It also proposed or sought comment on, among other things, simplifying the urban rate rule, permitting conditional eligibility for health care providers, and moving back the Service Provider Identification Number (SPIN) change deadline.[1568]

486. On December 14, 2023, the Commission released a Third Report and Order that improves the RHC Program administration and facilitates participation in the program. Specifically, the Commission revised the RHC Program rules to permit conditional eligibility for health care providers and eliminated the seldom-used "standard urban distance" component of the urban rate calculation rules.[1569] The Commission also made two changes relating to the RHC Program administrative deadlines by aligning the SPIN change deadline with the existing invoice deadline and permitting healthcare providers to request a change to evergreen contract dates, and amended program rules to shift to the use of the same form when determining RHC Telecommunications and Healthcare Connect Fund Program eligibility.[1570] Finally, the Commission established a deadline by which invoices must be submitted for undisbursed funding commitments from before funding year 2020.[1571]

487. *COVID-19 Telehealth Program.* In 2023, the Commission concluded the COVID-19 Telehealth Program, initially established in 2020 pursuant to the Coronavirus Aid, Relief, and Economic Security (CARES) Act.[1572] Over the course of the two funding rounds, the COVID-19 Telehealth

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[1565] *Wireline Competition Bureau and Office of the Managing Director Provide Guidance on Emergency Connectivity Fund Program Upon Termination of the Emergency Period*, WC Docket No. 21-93, Public Notice, 38 FCC Rcd 4282 (WCB 2023).

[1566] *Promoting Telehealth in Rural America*, WC Docket No. 17-310, Order on Reconsideration, Second Report and Order, Order, and Second Further Notice of Proposed Rulemaking, 38 FCC Rcd 827 (2023).

[1567] *Id.* at 831-37, 850-52, paras. 9-25, 55-59.

[1568] *Id.* at 862-64, 866-68, paras. 87-91, 97-103.

[1569] *Promoting Telehealth in Rural America*, WC Docket No. 17-310, Third Report and Order, 38 FCC Rcd 12476, 12478, para. 7 (2023).

[1570] *Id*

[1571] *Id*. In addition to the actions described above, WCB issued a waiver order extending the close of the funding year 2024 application filing window for the RHC until May 1, 2024 due to outages of a program form that delayed some participants' ability to begin competitive bidding. *Rural Health Care Support Mechanism; Promoting Telehealth in Rural America*, WC Docket Nos. 02-60, 17-310, Order, 39 FCC Rcd 2139 (WCB 2024). Further, as a response to certain catastrophic weather events, the Commission temporarily waived certain deadlines and rules for RHC participants in affected areas. *See*, *e.g.*, *Lifeline and Link Up Reform and Modernization,* WC Docket No. 11-42 et al., Order, DA 24-1059 (WCB Oct. 9, 2024); *Lifeline and Link Up Reform and Modernization,* WC Docket No. 11-42 et al., Order, DA 24-1025 (WCB Oct. 1, 2024); *Affordable Connectivity Program et al.*, WC Docket No. 21-450 et al., Order, 38 FCC Rcd 7922 (WCB 2023).

[1572] *Promoting Telehealth to Low-Income Consumers,COVID-19 Telehealth Program*, WC Docket Nos. 18-213, 20-89, Report, 38 FCC Rcd 1995, 1996-1997, para. 5 (WCB 2023) (*Interim Report on Telehealth and Connected*

(continued….)

Program approved 985 awards to health care providers in each state, territory, and the District of Columbia.[1573] On April 12, 2023, WCB and the Office of the Managing Director released a Public Notice announcing that the pandemic emergency period for the COVID-19 Telehealth Program ended on April 10, 2023, due to the enactment of House Joint Resolution 7, which ended the designated national emergency.[1574] Pursuant to the CARES Act, eligible telehealth expenses must have been paid for and received on or between March 13, 2020, and April 10, 2023, the end of the designated emergency period. The deadline for submission of all invoices and requests for reimbursement was October 31, 2023.[1575]

488. *Connected Care Pilot Program*. The Connected Care Pilot Program was established to provide up to $100 million in USF support over three years to help eligible health care providers defray the costs of providing connected care services to their patients and study how the USF can help support the continuing trend toward connected care services, with an emphasis on providing connected care services to low-income and veteran patients.[1576] On June 21, 2021, the Commission released an Order providing further guidance on the administration of the Connected Care Pilot Program, including guidance on eligible services, competitive bidding, invoicing, and data reporting for selected participants.[1577] From January 2021 to March 2022, more than 100 applicants were selected to participate in the Pilot.[1578] The projects selected by the Commission represent a broad array of geographic areas and a diversity of provider types, involve patients in underserved communities, and will address a range of health conditions.[1579] Connected Care Pilot Program projects are ongoing.

B. The Mobile Wireless Communications Marketplace

1. Broadband Deployment and Universal Access

489. The Commission has continued its work to ensure universal access to mobile services and evaluate the status of broadband deployment since the release of the 2022 Communications Marketplace Report.

490. *The National Broadband Map and BDC.* The Commission has established the BDC which implements the iterative data collection and challenge processes envisioned by the Broadband DATA Act.[1580] As part of the BDC, mobile providers generate the 3G, 4G LTE, and 5G-NR coverage areas shown on the National Broadband Map using certain standardized propagation modeling parameters for consistency.[1581] Providers reported their mobile broadband availability data as of June 30, 2022 in the

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Care); *COVID-19 Telehealth Program, Promoting Telehealth for Low-Income Consumers*, WC Docket Nos. 20-89, 18-213, Report and Order, 35 FCC Rcd 3366 (2020).

[1573] *Interim Report on Telehealth and Connected Care*, 38 FCC Rcd at 1999-2000, para. 12.

[1574] *Wireline Competition Bureau and Office of the Managing Director Announce Update on Wind Down of COVID-19 Telehealth Program*, WC Docket No. 20-89, Public Notice, 38 FCC Rcd 3344 (WCB 2023).

[1575] *Wireline Competition Bureau Extends Deadlines for the COVID-19 Telehealth Program Round 2*, WC Docket No. 20-89, Public Notice, 37 FCC Rcd 8820, 8820 (WCB 2022).

[1576] *Federal Communications Commission Announces Final Set of Projects Selected for the Connected Care Program*, WC Docket No. 18-213, Public Notice, 37 FCC Rcd 4358, 4358, para. 1 (WCB 2022) (*Final Set of Projects for Connected Care Program Public Notice*).

[1577] *Promoting Telehealth for Low Income Consumers*, WC Docket No. 18-213, Second Report and Order, 36 FCC Rcd 10642, 10643, para. 1 (2021).

[1578] *Final Set of Projects for Connected Care Program Public Notice,* 37 FCC Rcd at 4359, paras. 5-6 & n.11.

[1579] *Id.* at 4358, para. 2.

[1580] Broadband Deployment Accuracy and Technological Availability Act, Pub. L. No. 116-130, 134 Stat. 228 (2020) (codified at 47 U.S.C. §§ 641-647) (Broadband DATA Act).

initial BDC collection window and the FCC published the first version of the National Broadband Map in November of 2022.[1582] The Commission collects updated data from providers biannually and continues to publish new versions of the map twice per year.[1583] The FCC has also implemented a mobile challenge process that allows consumers, and other stakeholders, to challenge the data reported by providers using on-the-ground speed test data.[1584] The results of challenges, FCC-initiated verification efforts, and corrections from ISPs all contribute to a more accurate picture of mobile broadband availability.[1585]

491. In July 2024, the Commission released an Order, Declaratory Ruling, and Further Notice of Proposed Rulemaking that updates the FCC's biannual data collection procedures and audit processes and proposes further enhancements to the agency's verification processes to ensure that the Commission continues to receive and publish high-quality and accurate availability data on the National Broadband Map.[1586] The *BDC Order* clarifies and strengthens agency audit procedures to ensure that the Commission can better validate service providers' availability data, creates a process that better accounts for changes in network deployments over time while protecting the integrity of the availability data and results of challenges, and proposes modifications to data collection requirements based upon lessons learned, as well as enhancements to agency data validation processes in order to continue to improve the precision of the underlying BSL Fabric and broadband availability data.[1587]

492. Also in July 2024, the FCC launched its new Mobile Speed Test app. The new app replaces the original FCC Speed Test app and is part of the FCC's BDC program. It enables users to obtain free, open, and transparent information about the performance of their mobile network. Speed test data from the app help to improve the accuracy of the mobile coverage information displayed on the FCC's National Broadband Map. Users can submit their tests to the FCC either as challenges to provider-

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[1581] *FCC Improves Broadband Data and Maps to Bridge the Digital Divide*, WC Docket Nos. 11-10, 19-195, Second Report and Order and Third Further Notice of Proposed Rulemaking, 35 FCC Rcd 7460, 7474-83, paras. 32-51 (2020) (establishing the processes and parameters by which providers would submit propagation maps to the Commission); *see also* FCC, *About the National Broadband Map*, https://broadbandmap.fcc.gov/about (last visited Dec. 12, 2024).

[1582] *Broadband Data Task Force Releases Pre-Production Draft of the National Broadband Map; Announces the Start of the Broadband Availability Challenge Processes*, WC Docket Nos. 11-10, 19-195, Public Notice, 37 FCC Rcd 13348 (WCB/WTB/OEA 2022). The launch of the pre-production draft of the National Broadband Map marked the start of the broadband availability challenge processes, as well as the ability for consumers to submit individual challenges to the location data in the BSL Fabric. *Id.* The process for entities to submit bulk challenges to the Fabric began earlier, on September 12, 2022. *Broadband Data Task Force, Wireline Competition Bureau, and Office of Economics and Analytics Announce Start of Fabric Bulk Challenge Process*, WC Docket Nos. 19-195, 11-10, Public Notice, 37 FCC Rcd 10140 (BDTF/WCB/OEA 2022). Shortly after the first iteration of the map was released, the Commission sunset the collection of broadband deployment data through the FCC Form 477. 2022 *Form 477 Order*, 37 FCC Rcd at 14957, para. 1. The Commission clarified that it will continue to collect broadband and voice subscription data using the FCC Form 477, but filers will submit their data through the FCC BDC system. *Id*.

[1583] 47 U.S.C. § 642(a)(1)(A); 47 CFR § 1.7004(b). So far, the Commission has published four iterations of the National Broadband Map. The latest iteration of the map shows data as of December 31, 2023. *See* FCC, *National Broadband Map*, https://broadbandmap.fcc.gov (last visited Dec. 6, 2024).

[1584] *FCC Releases BDC Mobile Technical Requirements Order*, WC Docket Nos. 11-10, 19-195, Order, 37 FCC Rcd 3007, 3010-44 (OEA/OET/WTB 2022).

[1585] FCC, *About the National Broadband Map*, https://broadbandmap.fcc.gov/about (last visited Dec. 6, 2024).

[1586] *FCC Updates Broadband Data Collection Processes and Proposes Rules to Enhance Precision of Broadband Map*, WC Docket Nos. 11-10, 19-195, Fourth Report and Order, Declaratory Ruling, and Fourth Further Notice of Proposed Rulemaking, FCC 24-72 (July 12, 2024) (*BDC Order*).

[1587] *Id.* at 2-3, para. 3.

reported coverage, or as crowdsource data that is used to inform the Commission's verification and audit work, as well as other policy decisions.[1588]

493. *Alaska Plan*. The Commission has also continued its work to ensure that fixed and mobile providers meet their commitments to serve remote Alaska in exchange for receiving high-cost support under the Alaska Plan. Due to the unique challenges of providing communications services in remote Alaska, the Commission adopted the *Alaska Plan Report and Order* in 2016, as a ten-year plan to ensure eligible remote areas were able to receive advanced communications services.[1589] This *Order* required fixed and mobile-service provider participants to submit performance plans committing to cover a specific number of Alaskans by specified last-mile technology subject to the middle-mile technology available.[1590] The *Alaska Plan Report and Order* also required each service provider participant to certify that it met the obligations contained in its performance plan by the end of year five (ending December 31, 2021) and the end of year ten (ending December 31, 2026).[1591]

494. *Alaska Connect Fund*. As discussed above, the Commission adopted the *Alaska Connect Fund Order and FNPRM* on November 1, 2024, addressing the continuation of high-cost Universal Service support for fixed and mobile providers in Alaska after support under the Alaska Plan ends on December 31, 2026.[1592] For mobile service, the *Alaska Connect Fund Order and FNPRM* increases support by 30% to mobile providers for the last two years of the Alaska Plan—calendar years 2025 and 2026—and through the end of the Alaska Connect Fund on December 31, 2034. For mobile support, the Alaska Connect Fund will be based on BDC mobile coverage data.

495. The terms and goal speeds for mobile support under the Alaska Connect Fund will be based on whether an eligible area has a single or multiple subsidized providers. For eligible areas where there is only one subsidized provider (single-support areas), the current provider will continue receiving support through the end of 2034 and will be expected to enter into a new performance plan with 5G service where technically and financially feasible. For eligible areas with multiple subsidized providers (duplicate-support areas), the Commission adopted a two-phased approach to resolve duplicative support: (1) an Alaska Connect Fund Mobile Phase I that extends support for the mobile providers receiving support in these duplicate-support areas under the current Alaska Plan until December 31, 2029; and (2) an Alaska Connect Fund Mobile Phase II that would provide a single provider in those areas with support through the end of 2034.[1593] In the Further Notice of Proposed Rulemaking, the Commission seeks comment on how to determine which provider should receive support in duplicate-support areas after December 31, 2029. The Further Notice also seeks comment regarding other issues such how to determine support mechanisms, customer retention, and Tribal consent.

496. *5G Fund for Rural America*. With new mobile coverage data acquired through the BDC and reflected on the National Broadband Map, the Commission continues to work towards the implementation of the 5G Fund for Rural America to ensure the deployment of high-speed, 5G mobile services in parts of the country where, without subsidies, it would continue to be lacking.[1594] In August

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[1588] *See* Press Release, FCC, FCC Launches New Mobile Speed Test App: Consumers Can Use the Free App to Test Their Mobile Broadband Speeds and Participate in the FCC's National Broadband Map Challenge Process (July 23, 2024), https://www.fcc.gov/document/fcc-launches-new-mobile-speed-test-app.

[1589] *Connect America Fund et al.*, WC Docket No. 16-271, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 10139, 10140, para. 1 (2016) (*Alaska Plan Report and Order*).

[1590] *Id.* at 10166, 10172-73, paras. 85, 102.

[1591] *Id.* at 10166-67, 10173, paras. 85, 103; *see also* 47 CFR § 54.321; *Connect America Fund—Alaska Plan*, WC Docket No. 16-271, Order and Request for Comment, 37 FCC Rcd 5882, 5884, 5887, paras. 4, 9 (WTB 2022).

[1592] *See supra* section VI.A.4.

[1593] *Alaska Connect Fund Order and FNPRM* at 4-5, para. 6.

2024, the Commission released a Second Report and Order, Order on Reconsideration, and Second Further Notice of Proposed Rulemaking.[1595] The *5G Fund Second Report and Order and Second Further Notice*, among other things, increased the 5G Fund budget, explained how the Commission will aggregate areas eligible for support to minimum geographic areas for bidding, revised the schedule for transitioning from mobile legacy high-cost support to 5G Fund support consistent with recent legislative amendments, required 5G Fund support recipients to implement cybersecurity and supply chain risk management plans, and allocated additional funding and extensions on deployment deadlines if providers voluntarily agree to deploy Open RANs.[1596] The *5G Fund Second Report and Order and Second Further Notice* seeks comment on whether to require a winning bidder in the 5G Fund Phase I auction to demonstrate that it has obtained the consent of the relevant Tribal governments for any necessary access to deploy network facilities using its 5G Fund support on Tribal lands within the areas of its winning bids.[1597]

497. *Mobile Phone Unlocking Requirement*. In July 2024, the Commission released a *Notice of Proposed Rulemaking* that proposes to require mobile service providers to unlock customers' mobile phones within sixty days of activation.[1598] Mobile phone unlocking can increase consumer choice and competition in the mobile services marketplace. Updated unlocking rules would afford consumers more flexibility when switching service providers, increase competition among service providers, and lessen customer confusion by applying the same unlocking rules to all service providers.[1599]

498. *Hearing Aid Compatibility*. In October 2024, the Commission adopted new rules establishing that 100% of mobile handsets, such as smartphones, must be compatible with hearing aids, thus allowing 48 million American consumers with hearing loss to be able to choose among the same mobile handset models that are available to all consumers.[1600] Under these new rules, after a transition period, Americans with hearing loss will no longer be limited in their choice of technologies, features, and prices available in the mobile handset marketplace.[1601] The Commission also established a Bluetooth coupling requirement that will encourage handset manufacturers to move away from proprietary Bluetooth coupling standards and ensure more universal connectivity between handset models and hearing aids, including over-the-counter hearing aids.[1602] In addition, the Commission established revised package labeling and website posting requirements that will provide consumers with hearing loss the information that they need to make informed handset purchasing decisions. This information includes the

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[1594] *See generally Establishing a 5G Fund for Rural America*, GN Docket No. 20-32, Report and Order, 35 FCC Rcd 12174 (2020), modified by *Errata* released Nov. 10, 2020, Nov. 27, 2020, and Jan. 11, 2021.

[1595] *Establishing a 5G Fund for Rural America*, GN Docket No. 20-32, Second Report and Order, Order on Reconsideration, and Second Further Notice of Proposed Rulemaking, FCC 24-89 (Aug. 29, 2024) (*5G Fund Second Report and Order and Second Further Notice*).

[1596] *Id.* at 3, para. 3.

[1597] *Id.* at 82-83, para. 164.

[1598] *Promoting Consumer Choice and Wireless Competition Through Handset Unlocking Requirements and Policies*, WT Docket No. 24-186, Notice of Proposed Rulemaking, FCC 24-77 (July 19, 2024).

[1599] *See* Press Release, FCC, FCC Proposes Mobile Phone Unlocking Requirement; Rulemaking Would Take Comment on New Rules to Make It Easier for Consumers to Switch Mobile Providers and Increase Competition In the Marketplace (July 18, 2024), https://docs.fcc.gov/public/attachments/DOC-404092A1.pdf.

[1600] *Achieving 100% Wireless Handset Model Hearing Aid Compatibility*, WT Docket No. 23-388, Report and Order, FCC 24-112, at 2, para. 1 (Oct. 18, 2024) (*Hearing Aid Compatibility Report and Order*); *see also* Press Release, FCC, FCC Requires All Mobile Phones to be Hearing Aid Compatible (Oct. 17, 2024), https://docs.fcc.gov/public/attachments/DOC-406697A1.pdf (HAC 100% Press Release).

[1601] *Hearing Aid Compatibility Report and Order* at 2, para. 1; *see also* HAC 100% Press Release.

[1602] *Hearing Aid Compatibility Report and Order* at 2, para. 1.

kind of coupling technology included in the handset, the conversational gain of the handset, and whether the handset includes any bands or operations that do not meet compatibility standards.

2. Spectrum Policies for Terrestrial Wireless Service

499. Congress requires that the Commission implement spectrum policies that promote competition, innovation, and the efficient use of spectrum to serve the public interest, convenience, and necessity.[1603] Spectrum is an important component of 5G, as well as other advanced wireless services. By making spectrum available, the Commission ensures that wireless providers are able to deploy 5G networks and other advanced wireless services expeditiously. The Commission has pursued a comprehensive strategy to make additional mid-band, high-band, and low-band spectrum available through initial licensing and also through other innovative means, including secondary market transactions.

500. In April 2023, Public Safety and Homeland Security Bureau (PSHSB), Office of Engineering and Technology (OET), and WTB granted a joint request filed by a group of automakers, state departments of transportation, and equipment manufacturers requesting waiver of the Commission's rules applicable to ITS operations to allow deployment of Cellular C-V2X technology in the upper 30 megahertz portion of the 5.9 GHz band.[1604] C-V2X technology provides direct communications between vehicles, roadside infrastructure, and other road users such as cyclists, pedestrians, and road workers to facilitate, among other things, non-line-of-sight awareness, notice of changing driving conditions, and automated driving.[1605] In late 2023 and throughout 2024, PSHSB, OET, and WTB issued additional waiver orders granting similar requests from public and private stakeholders seeking to deploy C-V2X technology in the band.[1606]

501. In May 2023, the Commission released an item that preserved and protected existing satellite services in the 12.2-12.7 GHz band (12.2 GHz band) while taking steps to develop a pipeline of mid-band spectrum for mobile broadband or other expanded uses in the 12.7-13.25 GHz band (12.7 GHz band). The item also sought to further investigate the potential to expand terrestrial fixed use in the 12.2 GHz band.[1607] Through this proceeding, the Commission anticipates expanding the beneficial use of up to

[1603] *See, e.g.*, 47 U.S.C. § 309(j)(3)(B).

[1604] *Request for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, Order, DA 23-343 (PSHSB/OET/WTB Apr. 24, 2023). The Bureaus conditioned the waiver grant on certain technical and operational parameters, and further modified those conditions by a waiver modification order in July 2023. *See Request to Modify April 24, 2023 Waiver Order of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, Order, 38 FCC Rcd 6086 (PSHSB/OET/WTB 2023).

[1605] *See* Press Release, FCC, FCC to Vote on Auto Safety Spectrum Rules (July 17, 2024), https://docs.fcc.gov/public/attachments/DOC-404027A1.pdf .

[1606] *Requests for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, Letter Order (Aug. 16, 2023); *Requests for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, Letter Order, 38 FCC Rcd 10401 (PSHSB/OET/WTB 2023); *Requests for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, Letter Order, DA 24-363 (PSHSB/OET/WTB Apr. 18, 2024); *Requests for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, Letter Order, DA 24-707 (PSHSB/OET/WTB July 19, 2024).

[1607] *Expanding Flexible Use of the 12.2-12.7 GHz Band*, WT Docket No. 20-443 et al., Report and Order and Further Notice of Proposed Rulemaking and Notice of Proposed Rulemaking and Order, 38 FCC Rcd 5283 (2023).

1,050 megahertz of mid-band spectrum by a diverse set of terrestrial and satellite communications systems.[1608]

502. In June 2023, the Commission adopted a Notice of Proposed Rulemaking exploring how spectrum in the 42 GHz band (42-42.5 GHz) might be made available through a non-exclusive spectrum access model.[1609] The Notice of Proposed Rulemaking noted that such models might provide increased access to high-band spectrum, potentially lowering barriers to entry for smaller or emerging wireless providers; encourage competition; and support efficient, intensive use of the band.

503. The Commission continues to work to ensure that its policies and rules facilitate access to spectrum. In September 2023, WTB and OEA released a Public Notice that sought comment on the petition for rulemaking filed by AT&T seeking Commission action on such matters as the proposed establishment of a mid-band spectrum screen and other changes to its mobile spectrum holdings policies and rules.[1610]

504. In October 2023, the Commission adopted rules to support new Wi-Fi applications and services using spectrum in the 6 GHz band.[1611] The new rules authorize very low power operations in the U-NII-5 and U-NII-7 portions of the 6 GHz band totaling 850 megahertz of spectrum. Operations at power levels significantly lower than other unlicensed 6 GHz devices can occur anywhere, indoors or outdoors, without requiring a frequency coordination system.[1612] The mix of capacity and wide channels offers the unique potential for augmented and virtual reality applications.

505. The Commission took steps to enable innovative commercial uses of the 71-76 GHz, 81-86 GHz, 92-94 GHz, and 94.1-95 GHz bands (collectively, the 70/80/90 GHz bands), including provision of wireless backhaul for 5G and delivery of broadband connectivity to ships and aircraft. In January 2024, the Commission adopted a Report and Order and Further Notice of Proposed Rulemaking authorizing certain point-to-point links to endpoints in motion in the 70 GHz and 80 GHz bands for aeronautical and maritime use; providing for smaller, lower-cost antennas to facilitate backhaul service in those bands; and adopting changes to the link registration process. The item also sought comment on the

[1608] *Id.*

[1609] *Shared Use of the 42-42.5 GHz Band; Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, WT Docket No. 23-158 and GN Docket No. 14-177, Notice of Proposed Rulemaking, 38 FCC Rcd 6362, 6362-63, para. 1 (WTB 2023).

[1610] *Wireless Telecommunications Bureau and Office of Economics and Analytics Seek Comment on AT&T Petition for Rulemaking and Mobile Spectrum Holdings Policies*, WT Docket No. 23-319, Public Notice, 38 FCC Rcd 8542 (WTB/OEA 2023); AT&T Petition for a Rulemaking to Establish a Mid-Band Spectrum Screen (filed Sept. 1, 2021).

[1611] Federal Communications Commission, Unlicensed Use of the 6 GHz Band; and Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, Second Report and Order, Second Further Notice of Proposed Rulemaking, and Memorandum Opinion and Order on Remand, 89 Fed. Reg. 874 (Nov. 1, 2023); Press Release, FCC, FCC Permits Very Low Power Device Operations in 6 GHz Band (Oct. 19, 2023), https://docs.fcc.gov/public/attachments/DOC-397829A1.pdf (6 GHz Press Release); *see also Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 23 GHz*, ET Docket No. 18-295, GN Docket No. 17-183, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852, 3853, para. 1 (2020) (In April 2020, the Commission opened up the entire 6 GHz band (5.925-7.125 GHz) for unlicensed indoor lower power access points. The Commission determined these access points to be ideal for connecting devices, in homes and businesses, such as smartphones, tablet devices, laptops, and IoT devices, to the Internet.).

[1612] 6 GHz Press Release at 1.

potential inclusion of ship-to-aerostat operations as part of maritime operations, and adding FSS earth stations in the light-licensing regime for the 70 GHz and 80 GHz bands.[1613]

506. The Commission also furthered the efficient use of available spectrum. In February 2024, WTB launched the Enhanced Competition Incentive Program (ECIP) by beginning to accept assignment and lease applications to participate in the program.[1614] ECIP provides incentives for wireless licensees to make underutilized spectrum available to small carriers, Tribal Nations, and entities serving rural areas.[1615] Under ECIP, any covered geographic licensee may offer spectrum to an unaffiliated eligible entity through partition and/or disaggregation, and any covered geographic licensee eligible to lease in an included service may offer spectrum to an unaffiliated eligible entity through a long-term leasing arrangement.[1616] ECIP encourages licensees to partition, disaggregate, or lease spectrum to better align available spectrum resources with entities seeking to provide services to underserved communities.[1617] Independent of the program itself, the *ECIP Report and Order* reduces regulatory burdens by allowing reaggregation of geographic licenses.[1618]

507. In March 2024, the Commission adopted a Report and Order and Further Notice of Proposed Rulemaking to facilitate the integration of satellite and terrestrial networks by creating a new regulatory framework for SCS.[1619] The *Report and Order* largely adopts the rules proposed in the March 2023 *Notice of Proposed Rulemaking* in this proceeding.[1620] Through this novel approach, satellite operators collaborating with terrestrial service providers will be able to obtain Commission authorization to operate space stations on certain flexible-use spectrum bands previously allocated only to terrestrial services. This new framework will enable expanded coverage for the terrestrial licensees' subscribers, especially in remote, unserved, and underserved areas, and will increase the availability of emergency communications.

508. Auction 108, the auction of flexible-use overlay licenses in the 2.5 GHz band, made valuable mid-band spectrum available for advanced wireless services in certain areas.[1621] As of February 29, 2024, WTB had issued all of the 2.5 GHz band licenses won in Auction 108, pursuant to a grant of

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[1613] *Modernizing and Expanding Access to the 70/80/90 GHz Bands*, WT Docket No. 20-133, Report and Order and Further Notice of Proposed Rulemaking, 39 FCC Rcd 109 (WTB 2024).

[1614] *WTB Launches Enhanced Competition Incentive Program Beginning February 15, 2024*, WT Docket No. 19-38, Public Notice, 39 FCC Rcd 1277 (WTB 2024); *see also* Press Release, FCC, FCC Launches Enhanced Competition Incentive Program for Wireless Radio Services: Expands Spectrum Opportunities for Small Carriers, Tribal Nations, and Rural Wireless Entities (Feb. 15, 2024), https://docs.fcc.gov/public/attachments/DOC-400540A1.pdf.

[1615] *Partitioning, Disaggregation, and Leasing of Spectrum*, WT Docket No. 19-38, Report and Order and Second Further Notice of Proposed Rulemaking, 37 FCC Rcd 8825 (2022) (*ECIP Report and Order*); *see also* Press Release, FCC, FCC Establishes Enhanced Competition Incentive Program for Wireless Radio Services: Expanding Opportunities for Small Carriers, Tribal Nations, and Rural Wireless Entities (July 14, 2022), https://docs.fcc.gov/public/attachments/DOC-385265A1.pdf (*ECIP Press Release*).

[1616] *ECIP Report and Order*, 37 FCC Rcd at 8830-31, para. 18; *ECIP Press Release* at 1.

[1617] *ECIP Report and Order*, 37 FCC Rcd at 8826, para. 2; *ECIP Press Release* at 1.

[1618] *ECIP Report and Order*, 37 FCC Rcd at 8826, para. 3.

[1619] *Supplemental Coverage from Space Report and Order*.

[1620] *Supplemental Coverage from Space NPRM*.

[1621] *Auction of Flexible-Use Licenses in the 2.5 GHz Band Closes; Winning Bidders Announced for Auction 108*, AU Docket No. 20-429, Public Notice, 37 FCC Rcd 10117, 10117, para. 1 (2022).

authority from Congress.[1622] As of April 23, 2024, a total of 363 licenses have also been granted thus far to Tribal Nations and Tribal entities in connection with the 2.5 GHz Rural Tribal Priority Window. [1623]

509. In February 2024, ten entities filed a petition for rulemaking asking the Commission to provide an option for 5x5 megahertz[1624] broadband networks in the 900 MHz band to support the growing demand for wide-area, private, and secure wireless broadband networks for utilities, critical infrastructure, and business enterprise entities, among other benefits.[1625] In April 2024, the Commission released a public notice seeking comment on the petition.[1626]

510. In June and July 2024, WTB and OET, in partnership with NTIA and the Department of Defense, announced that certified Spectrum Access System administrators could utilize a revised aggregate interference model to protect federal operations in the 3.5 GHz band, the result of which authorizes service to approximately 72 million more people nationwide without periodic service adjustments to protect federal operations.[1627] In August 2024, the Commission voted unanimously to begin a proceeding to update the Citizens Broadband Radio Service.[1628] The *Notice* proposes rules to add definitions to part 96 related to protection of federal incumbent users and modify other part 96 rules governing such protections. The *Notice* also proposes to sunset rules related to the transition of grandfathered wireless broadband services in the 3.65-3.7 GHz band. In addition to the specific proposals made related to federal protection, the Notice seeks comment on, among other things, whether to align 3.5 GHz protection methodologies with those in adjacent bands, revisit Environmental Sensing Capability approval procedures, and facilitate the continued introduction of Citizens Broadband Radio Service in areas outside of the contiguous United States.[1629]

[1622] *Wireless Telecommunications Bureau Grants Auction 108 Licenses*, Auction No. 108, Public Notice, 39 FCC Rcd 962 (WTB 2024); *Wireless Telecommunications Bureau Grants Auction 108 Licenses*, Auction No. 108, Public Notice, 39 FCC Rcd 1495 (WTB 2024).

[1623] *See* FCC, *Rural Tribal Window Updates*, https://www.fcc.gov/rural-tribal-window-updates (last visited Dec. 6, 2024).

[1624] 5x5 megahertz means 5 megahertz is used for the downlink and 5 megahertz is used for the uplink, for a total of 10 megahertz.

[1625] Petition of Ameren Services Company, et al. for Rulemaking, INBOX-1.401 (filed Feb. 28, 2024), https://www.fcc.gov/ecfs/search/search-filings/filing/10229148220602 (Petition). The petitioners are Ameren Services Company; Anterix, Inc.; Enterprise Wireless Alliance; Evergy, Inc.; Lower Colorado River Authority; Portland General Electric; San Diego Gas & Electric; Southern Communications Services, Inc.; Utility Broadband Alliance; and Xcel Energy Services, Inc.

[1626] *Wireless Telecommunications Bureau Seeks Comment on Petition for Rulemaking to Expand Wireless Broadband in 900 MHz Band*, WT Docket No. 24-99, Public Notice, 39 FCC Rcd 3113 (WTB 2024).

[1627] *Wireless Telecommunications Bureau and Office of Engineering and Technology Announce Modified Aggregate Interference Model Used by Spectrum Access System Administrators*, GN Docket Nos. 17-258 and 15-319, Public Notice, DA 24-553 (WTB/OET June 12, 2024); *Wireless Telecommunications Bureau and Office of Engineering and Technology Approve Certified SAS Administrators to Use Modified Aggregate Interference Model*, GN Docket Nos. 17-258 and 15-319, Public Notice, DA 24-643 (WTB/OET July 3, 2024).

[1628] *Promoting Investment in the 3550-3700 MHz band*, GN Docket No. 17-258, Notice of Proposed Rulemaking and Declaratory Ruling, FCC 24-86 (Aug. 16, 2024).

[1629] *See* Press Release, FCC, FCC Chairwoman Proposes Proceeding to Update Citizens Broadband Radio Service Rules; Proposed NPRM Would Seek Comment on Modernizing Rules Governing the 3.5 GHz Band (June 13, 2024), https://docs.fcc.gov/public/attachments/DOC-403237A1.pdf.

511. In August 2024, the Commission adopted a Report and Order that enables initial uncrewed aircraft system (UAS) operations in the 5030-5091 MHz band.[1630] The Report and Order adopted service rules that will provide operators the ability to obtain direct frequency assignments in a portion of the 5030-5091 MHz band. Under the rules, one or more dynamic frequency management systems will manage and coordinate access to the spectrum and enable its safe and efficient use, by providing requesting operators with temporary frequency assignments to support UAS control link communications with a level of reliability suitable for operations in controlled airspace and other safety-critical circumstances.[1631] The Commission expects that enabling early, direct access to a portion of the band will facilitate safe integration of UAS into the National Airspace System and help the United States realize enormous potential benefits from UAS technology, including aiding in search and rescue missions, supporting agriculture, and inspecting infrastructure, among other important uses.[1632]

512. In January 2023, the Commission adopted a Seventh Report and Order and Ninth Further Notice of Proposed Rulemaking whereby it established a new nationwide band manager framework for the 4940-4990 MHz band (4.9 GHz band).[1633] In October 2024, the Commission adopted new rules to bolster its coordinated nationwide approach to the 4.9 GHz spectrum band through a nationwide band manager framework.[1634] To further the goals of coordinating operations in the band, optimizing public safety use, and facilitating the integration of the latest commercially available technologies, including 5G, for the benefit of public safety users, but also ensure that the 4.9 GHz band is put to more robust use nationwide in the near term, the 4.9 GHz Band Manager, once selected, will be eligible to apply for a nationwide overlay license and authorized to enter into a sharing agreement with the First Responder Network Authority.[1635]

3. Wireless Infrastructure

513. In November 2023, WTB hosted a workshop on the environmental compliance and historic preservation review process required for the construction of communications facilities supporting Commission-licensed services. Topics discussed at the workshop included: the Commission's National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance processes generally; requirements associated with the Antenna Structure Registration database; streamlined NEPA and NHPA processes associated with collocations and small wireless facilities; coordination with Tribes during the NHPA process; and compliance with the Endangered Species Act and Migratory Bird Treaty Act.

C. The Satellite Marketplace

514. The space industry has entered an era of unprecedented growth, which is fueling an increase in both the complexity and the number of applications for space services before the Commission. As communications and other services increasingly rely on advanced space-based technologies, the agency is adjusting its processes to meet the demands of the new Space Age.

515. On April 11, 2023, the Commission's new SB commenced operations. This development followed Chairwoman Rosenworcel's announced plan to reorganize the agency to better support the

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[1630] *Spectrum Rules and Policies for the Operation of Unmanned Aircraft Systems,* WT Docket No. 22-323, Report and Order, FCC 24-91 (Aug. 29, 2024).

[1631] *Id.* at 2 para. 3.

[1632] *Id.* at 2 paras. 1-3.

[1633] *Amendment of Part 90 of the Commission's Rules*, WP Docket No. 07-100, Seventh Report and Order and Ninth Further Notice of Proposed Rulemaking, 38 FCC Rcd 704 (2023).

[1634] *Amendment of Part 90 of the Commission's Rules*, WP Docket No. 07-100, Eighth Report and Order, FCC 24-114 (Oct. 22, 2024).

[1635] *Id.* at 1-2, para. 1.

needs of the growing satellite industry, promote long-term technical capacity at the Commission, and navigate 21st century communications policy.[1636] This plan reorganized the Commission's International Bureau into a new SB and a standalone Office of International Affairs. These changes are designed to help ensure that the Commission's resources are better aligned so that the agency can continue to fulfill its statutory obligations and keep pace with the rapidly changing realities of the satellite industry and global communications policy. SB promotes a competitive and innovative global communications marketplace by leading policy and licensing matters related to satellite and space-based communications and activities. Among its responsibilities, SB leads complex policy analysis and rulemakings; authorizes satellite and earth station systems used for space-based services; streamlines regulatory processes to provide maximum flexibility for operators to meet customer needs; and fosters the efficient use of scarce spectrum and orbital resources. SB also serves as the Commission's focal point for coordination with other U.S. government agencies on matters of space policy and governance, and collaborates with the Office of International Affairs for consultations with other countries, international and multilateral organizations, and foreign government officials on matters that involve satellite and space policy.[1637]

516. On April 20, 2023, the Commission adopted new rules to govern how NGSO FSS systems will function in a shared spectrum environment.[1638] These new rules provide clarity regarding spectrum sharing between systems licensed in different processing rounds, granting primary spectrum access to systems approved earlier, while enabling new entrants to participate in an established, cooperative spectrum sharing structure.[1639] These updates will provide certainty for operators and facilitate innovation in system design, which will ultimately benefit broadband users. The Commission also adopted a Further Notice of Proposed Rulemaking which seeks comment on the appropriate values and assumptions to be used in the methodology set forth for spectrum sharing between systems authorized in different processing rounds.[1640] It also considers whether to adopt a rule limiting aggregate interference from later-round NGSO FSS systems into earlier-round systems.[1641] On November 5, 2024, the Commission adopted a Second Report and Order to further clarify certain details of the degraded throughput methodology that, in the absence of a coordination agreement, must be used in compatibility analyses by NGSO FSS system licensees authorized through later processing rounds to show they can operate compatibly with, and protect, NGSO FSS systems authorized through earlier processing rounds.[1642]

517. On September 21, 2023, the Commission adopted a Report and Order that established new rules to expedite its processing of space and earth station applications to meet the growing needs of today's commercial space sector and to allow the Commission to keep pace with this rapid change.[1643] The application streamlining rules take concrete steps to expedite the initial processing of applications for

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[1636] Press Release, FCC, Chairwoman Rosenworcel Announces Plan To Modernize The FCC By Establishing A Space Bureau And Office Of International Affairs (Nov. 3, 2022), https://www.fcc.gov/document/chairwoman-rosenworcel-proposes-space-bureau.

[1637] *Id.*

[1638] *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems*, IB Docket No. 21-456, Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 3699 (2023).

[1639] *See id.* at 3699.

[1640] *Id.*

[1641] *Id*. at 3717-18, para. 38.

[1642] *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems*, IB Docket No. 21-456, Second Report and Order and Order on Reconsideration, FCC 24-117 (Nov. 15, 2024).

[1643] *Expediting Initial Processing of Satellite and Earth Station Applications and Space Innovation*, IB Docket Nos. 22-411 and 22-271, Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 8838 (2023) (*Expedited Initial Application Processing R&O and FNPRM*).

authority to operate space and earth stations under part 25 of the Commission's rules.[1644] The Report and Order establishes timeframes for placing space and earth station applications on notice for public comment, permits applicants to apply for authority to operate in frequencies in bands where there is not already an international allocation for the satellite services to be provided, provides flexibility for NGSO licensees to have more than one unbuilt system without facing potential dismissal of their applications, and streamlines processing of earth station operators' requests to add space stations as points of communication.[1645]

518. The Report and Order also laid the groundwork for SB's new Transparency Initiative, which will provide information and guidance, in a variety of forms, to potential applicants in order to prepare them to successfully obtain authorizations for space and earth stations—that is, satellites and the ground-based transmitters communicating with them.[1646] The Transparency Initiative aims to reduce administrative burdens on both applicants and Commission staff and further expedite the processing of applications. There is a webpage dedicated to the Transparency Initiative, which covers a variety of topics, including license application completeness, orbital debris requirements, and inter-bureau and inter-agency coordination.[1647] SB's Open House events with the public, industry, regulators, and other stakeholders continue to provide an opportunity to address ways to support the new space innovation age. To date, the Commission has held events on space station licensing, earth station licensing, international coordination, orbital debris mitigation, and experimental licensing.[1648] In addition, the Commission also adopted a Further Notice of Proposed Rulemaking that takes public comment on proposals to further improve its processing of space and earth station applications.[1649]

519. On February 15, 2024, the Commission adopted a Notice of Proposed Rulemaking that put forward a framework for licensing ISAM activities.[1650] ISAM refers to a set of capabilities used on-orbit, on the surface of space objects and celestial bodies, and in transit.[1651] The "servicing" aspect of ISAM includes activities such as the in-space inspection, life extension, repair, refueling, or alteration of a spacecraft after its initial launch. The term "servicing" is also used to describe transport of a spacecraft from one orbit to another, as well as debris collection and removal.[1652] "Assembly" refers to the on-orbit construction of a space system using pre-manufactured components, and "manufacturing" is the transformation of raw or recycled materials into components, products, or infrastructure in space.[1653] Space capabilities are expanding, opening economic and scientific opportunities, and providing new tools for the sustainable use of space. ISAM activities have the potential to support U.S. space leadership, including advanced communications, space exploration, and national security. The *ISAM NPRM* builds on a Notice of Inquiry adopted in August 2022 to open a proceeding on ISAM-specific licensing needs,[1654] and furthers the goals of the White House's ISAM National Strategy.[1655] As the ISAM industry

[1644] *Expedited Initial Application Processing R&O and FNPRM*, 38 FCC Rcd at 8838, para. 1.

[1645] *Id*. at 8848-49, 8852, 8857, 8863, paras. 26, 31, 40, 56.

[1646] *Id*. at 8838, para. 2.

[1647] *See* FCC, *Transparency Initiative*, https://www.fcc.gov/space/transparency-initiative (last visited Oct. 9, 2024).

[1648] *Id*.

[1649] *Expedited Initial Application Processing R&O and FNPRM*, 38 FCC Rcd at 8876, para. 88. This Further Notice is discussed in the "Commission Agenda to Promote Competition, Encourage Universal Deployment of Communications Services, and Ensure Inclusion " section below.

[1650] *Space Innovation; Facilitating Capabilities for In-space Servicing, Assembly, and Manufacturing*, IB Docket Nos. 22-271 and 22-272, Notice of Proposed Rulemaking, 39 FCC Rcd 1864 (2024) (*ISAM NPRM*).

[1651] *Id*. at 2, para. 2.

[1652] *Id*.

[1653] *Id*.

continues to develop, the Commission envisions taking additional steps as needed to foster innovation and growth in this field.

520. As discussed in Section II.B.5.b, on March 14, 2024, the Commission adopted final rules to establish a new regulatory framework to revolutionize connectivity across the United States.[1656] The world's first SCS framework leverages cutting-edge satellite technology to extend the reach of wireless networks to remote areas. This will enable collaborations between wireless carriers and satellite operators to make sure smartphone users stay connected even in areas where there is no terrestrial mobile service. Connecting consumers to essential wireless services where traditional mobile services are not available can be lifesaving in remote locations and can open up innovative opportunities for consumers and businesses. This action also builds on the Commission's efforts to promote innovative and collaborative use of radio spectrum resources, particularly as communications systems converge towards a single network future. The SCS framework allows satellite operators collaborating with terrestrial service providers to seek Commission authorization to operate space stations on certain licensed, flexible-use spectrum currently allocated to wireless services, provided they satisfy certain licensing prerequisites—including having a spectrum lease from a terrestrial licensee within a specified geographic area.[1657] Once authorized, a satellite operator can then serve a wireless provider's customers should they need connectivity outside of coverage areas.

521. Growth in space activity has heightened concerns about the risks of orbital debris, and post-mission disposal of spacecraft is a necessary part in the mitigation of orbital debris, with orbital lifetime a crucial element affecting collision risk. In 2024, the Commission took further actions to mitigate the dangers posed by orbital debris. On January 25, 2024, the Commission adopted an Order on Reconsideration that upheld the current regulatory environment for orbital debris mitigation while providing additional clarity and guidance for satellite operators and reinforced the Commission's commitment to space safety.[1658]

522. On September 26, 2024, the Commission adopted final rules to allow use of the 17.3-17.7 GHz band by NGSO space stations in the FSS in the space-to-Earth (downlink) direction on a co-primary basis with incumbent services and on a shared, co-primary basis with GSO space stations.[1659] The rules also allow NGSO FSS downlink use of the 17.7-17.8 GHz on a co-primary basis with GSO FSS operations and on an unprotected basis with respect to terrestrial fixed services, and permit authorization of NGSO FSS receiving earth stations and authorize ESIMs to receive FSS emissions from NGSO systems on an unprotected basis. With the appropriate technical safeguards, NGSO FSS can share the 17 GHz band in an efficient and effective manner with GSO FSS, BSS, and incumbent terrestrial fixed service without causing harmful interference. The actions taken in the Report and Order provide a contiguous 1300 megahertz of spectrum for NGSO FSS downlink operations, allowing for technologically innovative and enhanced satellite services to the benefit of American consumers.

(Continued from previous page)

[1654] *Id*. at 2-3, para. 3; *Space Innovation; Facilitating Capabilities for In-Space Servicing, Assembly, and Manufacturing*, IB Docket Nos. 22-271 and 22-272, Notice of Inquiry, 37 FCC Rcd 10022 (2022).

[1655] *See* National Science and Technology Council, In-Space Servicing, Assembly, and Manufacturing Interagency Working Group of the National Science & Technology Council, In-Space Servicing, Manufacturing, and Assembly National Strategy (2022), https://www.whitehouse.gov/wp-content/uploads/2022/04/04-2022-ISAM-National-Strategy-Final.pdf (ISAM National Strategy).

[1656] *Supplemental Coverage from Space Report and Order*.

[1657] *Id*. at 2, para. 4.

[1658] Federal Communications Commission, Mitigation of Orbital Debris in the New Space Age, Order on Reconsideration, 89 Fed. Reg. 13276 (Jan. 26, 2024).

[1659] *Amendment of Parts 2 and 25 of the Commission's Rules to Enable NGSO Fixed-Satellite Service (Space-to-Earth) Operations in the 17.3-17.8 GHz Band*, IB Docket 22-273, Report and Order, FCC 24-97 (Sept. 27, 2024).

D. The Video and Audio Communications Marketplaces

523. *All-In Pricing*. Observing that consumers who choose a video service based on an advertised monthly price often are surprised by unexpected junk fees that MVPDs charge and list in fine print separately from the top-line listed service price, the Commission proposed in June 2023 to enhance pricing transparency by requiring cable operators and DBS providers to provide the "all-in" price for video programming in their promotional materials and on subscribers' bills.[1660] In March 2024, after careful consideration of input from individuals, consumer advocates, cable, DBS, broadcast industry members, trade associations, state and local governments, and franchising authorities, the Commission adopted a rule that requires cable operators and DBS providers to provide the "all-in" price of video programming as a prominent single line item on subscribers' bills and in promotional materials that state a price.[1661] The "all-in" price must state the full amount the cable operator or DBS provider charges (or intends to charge) the customer in exchange for video programming, including costs relating to broadcast television retransmission and sports or entertainment programming.[1662] Amounts beyond those charged to the consumer for the video programming itself, such as taxes, administrative fees, equipment fees, and franchise fees or other such charges, are excluded from the "all-in" rule.[1663]

524. The adopted rule allows consumers to make purchasing decisions with access to clear, easy-to-understand, and accurate information disclosing the price of video programming.[1664] The Commission expects that "all-in" prices for cable and satellite video programming will increase transparency and have a positive effect on competition in the video programming marketplace by allowing consumers to make more informed choices among the ranges of video programming service options available to them.[1665]

525. *Form 395-B Reinstatement*. In February 2024, the Commission reinstated the collection of workforce composition data for television and radio broadcasters.[1666] Specifically, Form 395-B collects race, ethnicity, and gender information about a broadcaster's employees within specified job categories.[1667] Collecting and accessing this data is critical for allowing the Commission to analyze and to understand the broadcast industry workforce, as well as to prepare reports for Congress.[1668] Without objective and industry-wide data, assessing changes, trends, or progress in the industry would not be possible.[1669]

[1660] *All-In Pricing for Cable and Satellite Television Service*, MB Docket No. 23-203, Report and Order, 39 FCC Rcd 3586 (2024) (*All-In Report and Order*) (citing *All-In Pricing for Cable and Satellite Television Service*, MB Docket No. 23-203, Notice of Proposed Rulemaking, 38 FCC Rcd 6387 (2023)).

[1661] *Id.* at 3587-88, paras. 3-4. The Media Bureau will issue a Public Notice to announce when cable operators and DBS providers need to comply with the rule. *Media Bureau Announces Publication of "All-In" Pricing Report and Order*, MB Docket No. 23-203, Public Notice, DA 24-377 (MB Apr. 22, 2024).

[1662] *All-In Report and Order* at 3595, para. 13.

[1663] *Id.* at 3595-96, para. 14.

[1664] *Id.* at 3587, para. 1.

[1665] *Id.*

[1666] *Review of the Commission's Broadcast and Cable Equal Opportunity Rules and Policies*, MB Docket No. 98-204, Fourth Report and Order and Order on Reconsideration, 39 FCC Rcd 1791 (2024) (*Broadcast and Cable Equal Opportunity Fourth Order*). Parties have raised legal challenges to the reinstated data collection. *National Religious Broadcasters, et. al. v. FCC and the United States*, Case Nos. 24-60219 and 24-69226 (5th Cir.).

[1667] *Broadcast and Cable Equal Opportunity Fourth Order*, 39 FCC Rcd at 1791-92, para. 1.

[1668] *Id.* at 1792-93, para. 2.

[1669] *Id.*

526. *Communications Equity and Diversity Council (CEDC)*. On June 15, 2023, the CEDC adopted a number of reports and recommendations.[1670] The CEDC made recommendations aimed at assisting minority and women entrepreneurs in media and telecommunications with securing access to capital as well as at closing the digital divide by ensuring all individuals and communities have the skills and information technology capacity needed to participate fully in the United States' society and economy.[1671] The CEDCs "Recommendations and Best Practices to Prevent Digital Discrimination and Promote Digital Equity" were adopted on November 20, 2023, as part of a Report and Order on prevention and elimination of digital discrimination.[1672] On March 26, 2024, Chairwoman Rosenworcel re-chartered the CEDC.[1673]

527. *Audio Description*. Audio description makes video programming more accessible to individuals who are blind or visually impaired through "[t]he insertion of audio narrated descriptions of a television program's key visual elements into natural pauses between the program's dialogue."[1674] In 2011, pursuant to section 202 of the Twenty-First Century Communications and Video Accessibility Act of 2010, the Commission adopted rules requiring certain television broadcast stations and MVPDs to provide audio description for a portion of the video programming that they offer to consumers.[1675] The audio description requirements at first applied to certain television broadcast stations in Nielsen DMAs 1 through 60, and the Commission had the authority to phase in the requirements for up to an additional 10 DMAs each year if it determined that the costs to program owners, providers, and distributors of implementing audio descriptions in those additional DMAs were reasonable.[1676] Exercising this authority, the Commission extended audio description requirements to DMAs 61 through 70 on January 1, 2021; to DMAs 71 through 80 on January 1, 2022; to DMAs 81 through 90 on January 1, 2023; and to DMAs 91 through 100 on January 1, 2024.[1677]

528. In March 2023, the Commission proposed to continue expanding the audio description requirements through a phased schedule applicable to DMAs 101 through 210.[1678] All parties who responded in that proceeding supported the Commission's proposal.[1679] Accordingly, the Commission adopted an order in October 2023 to phase in the audio description requirements for an additional 10 DMAs each year until all 210 DMAs are included.[1680] This gradual expansion will help ensure that a

[1670] Letter from Heather Gate, Executive Vice President, Digital Inclusion, Connected Nation, to Jessica Rosenworcel, Chairwoman, FCC (filed June 15, 2023) (https://www.fcc.gov/sites/default/files/cedc-chair-to-fcc-chair-transmittal-letter-report-06152023.pdf).

[1671] FCC, *Communications Equity and Diversity Council*, https://www.fcc.gov/communications-equity-and-diversity-council (last visited July 30, 2024).

[1672] *Implementing the Infrastructure Investment and Jobs Act: Prevention and Elimination of Digital Discrimination*, GN Docket No. 22-69, Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 11440 (2023).

[1673] Press Release, FCC, FCC Recharters its Communications Equity and Diversity Council (Mar. 26, 2024), https://www.fcc.gov/document/fcc-recharters-its-communications-equity-and-diversity-council.

[1674] 47 CFR § 79.3(a)(3).

[1675] *Video Description: Implementation of the Twenty-First Century Communications and Video Accessibility Act of 2010*, MB Docket No. 11-43, Second Report and Order, 38 FCC Rcd 9774, 9774, para. 2 (2023).

[1676] *Id.* at 9775, paras. 3-4.

[1677] *Id.* at 9775-76, para. 4.

[1678] *Id.* at 9776, para. 5.

[1679] *Id.*

[1680] *Id.* at 9776, para. 6.

greater number of individuals who are blind or visually impaired can be connected, informed, and entertained by television programming.[1681]

529. *Closed Captioning Display Settings*. The Commission adopted a "readily accessible" rule in July 2024 that requires MVPDs and manufacturers of apparatus subject to closed captioning rules to make closed captioning display settings readily accessible to individuals who are deaf and hard of hearing.[1682] Many consumers had expressed having difficulty accessing caption display settings to customize the font, size, color, and other caption features.[1683] The adopted rule takes steps to alleviate this problem by ensuring that users are able to customize captions to fit their needs.[1684] Entities subject to this requirement have flexibility concerning how they meet this obligation, and the Commission will determine whether settings are readily accessible to consumers by evaluating four factors: proximity, discoverability, previewability, and consistency and persistence.[1685]

530. *Program Originating Boosters*. The Commission made changes to its rules in April 2024 that will allow FM booster stations to originate programming.[1686] Prior to these modifications, FM boosters were only permitted to rebroadcast primary FM (or LPFM) stations in areas of poor reception.[1687] Intervening technological developments allow licensees of primary FM broadcast stations to originate content using FM boosters while minimizing co-channel interference.[1688] This, in turn, allows broadcasters to use FM boosters to air "geo-targeted" content that differs from the primary station's signal to specific areas within the primary station's service contour.[1689] Proponents for the rule change argued that such geo-targeted programming would allow them to better compete with non-broadcast services.[1690]

531. *Next Generation Television Standard*. The Commission continues to work to enable the voluntary deployment of the Advanced Television Systems Committee (ATSC) 3.0 broadcast transmission standard while preserving OTA television viewers' access to the widest possible range of programming. The ATSC 3.0 standard, or Next Gen TV, has the potential to "bring Ultra-High Definition (4K)-quality images, two-way interactivity, greater accessibility options, and multi-screen applications to televisions via OTA broadcast signals working in tandem with broadband [. . . and to] ensure local TV stations serve their communities with the highest quality video."[1691] Chairwoman Rosenworcel announced in April 2023 that the Commission is participating in the ATSC 3.0 Future of Television Initiative "to establish a roadmap for the ATSC 3.0 transition that serves the public interest . . .

[1681] *Id.* at 9774, para. 1.

[1682] Federal Communications Commission, Accessibility of User Interfaces, and Video Programming Guides and Menus, MB Docket No. 12-108, Third Report and Order, FCC 24-79 (July 19, 2024).

[1683] *Id.* at 2, para. 1.

[1684] *Id.*

[1685] *Id.* at 2, para. 2. The Media Bureau will issue a Public Notice to announce when manufacturers and MVPDs need to comply with the rule. *Id.* at 38, para. 59.

[1686] *In the Matter of Amendment of Section 74.1231(i) of the Commission's Rules on FM Broadcaster Booster Stations*, MB Docket Nos. 20-401, 17-105; RM-11854, Report and Order and Further Notice of Proposed Rulemaking, 39 FCC Rcd 3718 (2024).

[1687] *Id.* at 3719-20, para. 2.

[1688] *Id.*

[1689] *Id.*

[1690] *Id.*

[1691] Press Release, FCC, FCC Chairwoman Announces Launch of 'Future Of TV' Public-Private Initiative Focused On Transition To NextGen TV (Apr. 17, 2023), https://www.fcc.gov/document/chairwoman-announces-future-tv-public-private-initiative. The ATSC 3.0 Future of Television Initiative consists of a public-private partnership with industry, government, and public interest stakeholders.

[and] allow[s] broadcasters to innovate while protecting consumers, especially those most vulnerable."[1692] The initiative intends to, among other things, "focus on addressing backwards compatibility and its impact on consumers; the final conditions needed to complete the national transition to ATSC 3.0; and consideration of the post-transition regulatory landscape."[1693] In June 2023, the Commission modified its ATSC 3.0 rules to permit multicast licensing.[1694] This allows a Next Gen TV station to seek modification of its license to include certain streams of its non-primary video programming, also known as multicast streams, that are aired on "host" stations during a transitional period.[1695] These modifications follow the same licensing framework and largely the same regulatory regime that was established for the simulcast of primary video programming streams on "host" station facilities.[1696]

532. The Order also extended the sunsets of the substantially similar rule and the A/322 standard through July 17, 2027[1697] to ensure ATSC 1.0 viewers without equipment capable of receiving ATSC 3.0 signals continue to have access to broadcast television service while certain broadcast television stations voluntarily transition to ATSC 3.0.[1698] The substantially similar rule requires that programming aired on a Next Gen TV station's ATSC 1.0 simulcast channel be the same as that of the primary video programming stream on the ATSC 3.0 channel except for programming features that are based on the enhanced capabilities of ATSC 3.0 and promotions for upcoming programs.[1699]

533. *Structural Ownership Rules*. In December 2023, the Commission closed the 2018 Quadrennial Review proceeding with the adoption of a Report and Order that retained the existing rules with slight modifications to the Local Radio Ownership Rule and the Local Television Ownership Rule.[1700] These modifications will enable the Commission to promote competition, localism, and viewpoint diversity more effectively going forward. The Report and Order modified the Local Radio Ownership Rule to make permanent the interim contour-overlap methodology long used to determine ownership limits in areas outside the boundaries of defined Nielsen Audio Metro markets and in Puerto

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[1692] *Id.*

[1693] *Id*.

[1694] *Authorizing Permissive Use of the "Next Generation" Broadcast Television Standard*, GN Docket No. 16-142, Third Report and Order and Fourth Further Notice of Proposed Rulemaking, 38 FCC Rcd 6409 (2023) (*Next Gen TV Order and FNPRM*). The Commission also sought comment on the current marketplace for ATSC 3.0 Standard Essential Patents, the ability of third parties to develop products that rely on them, and the impact on consumers if the Commission were to adopt or not adopt rules to require essential patent holders in 3.0 technology to commit to licensing them on reasonable and non-discriminatory terms. *Id.* at 6411, para. 3.

[1695] *Id.* at 6410, para. 1.

[1696] *Id.* In November 2023, the Media Bureau announced that all Next Generation Television multicast licensing rules had taken effect and that the Commission would begin accepting Next Generation Television license applications for multicast streams. *Media Bureau Announces That All Next Gen TV "Multicast Licensing" Rules are Now in Effect and Next Gen TV License Applications for Multicast Streams Will Now be Accepted*, MB Docket No. 16-142, Public Notice, 38 FCC Rcd 10933 (MB 2023).

[1697] *Next Gen TV Order and FNPRM*, 38 FCC Rcd at 6410, para. 1. A/322 refers to the standard that defines the waveforms that ATSC 3.0 signals may take and allows device manufacturers and MVPDs to predict reliably what signal modulation a broadcaster is using. *Id*. at 6416, para. 11.

[1698] *Id.* at 6410-11, para. 2.

[1699] *Id.* at 6415, para. 10.

[1700] *2018 Quadrennial Regulatory Review – Review of the Commission's Broadcast Ownership Rules and Other Rules Adopted Pursuant to Section 202 of the Telecommunications Act of 1996*, MB Docket No. 18-349, Report and Order, 38 FCC Rcd 12782, 12783, para. 2 (2023) (*2018 Quadrennial Review Report and Order*). Parties raised legal challenges to the Report and Order shortly after its adoption. *Zimmer Radio of Mid-Missouri, Inc., et al. v. FCC et al.*, 8th Cir. Nos. 24-1380, 24-1480, 24-1493, and 24-1516 (filed Feb. 23, 2024).

Rico.[1701] The modifications to the Local Television Ownership Rule updated the methodology for determining a television station's ranking within a market to better reflect current industry practices.[1702] In addition, the Local Television Ownership Rule was updated to expand an existing prohibition on the use of broadcast network affiliations to circumvent the restriction on acquiring a second top-four ranked station in a market to account for the use of multicast streams and LPTV stations.[1703]

534. *Radio Duplication Limit*. In June 2024, the Commission reinstated a prohibition on the duplication of FM radio programming.[1704] Prior to 2020, the Commission's rules limited the duplication of programming by commonly owned stations or stations commonly operated through a time brokerage agreement in the same service (AM or FM) with substantially overlapping signals to 25% of the average broadcast week.[1705] The limit reflected the Commission's recognition that some duplication of programming could be economically beneficial to stations while not compromising the public interest goals of diversity and efficient spectrum use to an extent that would warrant preclusion.[1706] In an August 2020 order, the Commission removed this duplication limit for both AM and FM stations.[1707] For FM stations, the rationale for this change primarily rested on the desire to afford radio stations flexibility in responding to the exigencies of the then-ongoing COVID-19 national emergency.[1708] The Commission asserted at the time that programming duplication in most cases would not become common practice but rather a short-term response to unique circumstances.[1709]

535. Shortly afterwards, in November 2020, parties filed a petition for reconsideration asking that the Commission reinstate the radio duplication rule for FM stations.[1710] After careful consideration of the record and finding that the petitioners provided valid reasons to reconsider eliminating the radio duplication rule as applied to FM stations, the Commission reinstated the duplication limits to further its goals of competition, programming diversity, localism, and spectrum efficiency.[1711] The Commission noted that the existing rule waiver process should address sufficiently any need by for flexibility to exceed the 25% duplication allowance by FM licensees.[1712]

536. *LPTV FM Operation on Channel 6*. As noted in the previous Communications Marketplace Report, the Commission sought comment on whether to allow continued analog FM radio

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[1701] *2018 Quadrennial Review Report and Order*, 38 FCC Rcd at 12783, para. 2.

[1702] *Id.*

[1703] *Id.* The Commission's rules already prohibit certain types of network affiliation acquisitions by one station from another station in the same market that have the effect of circumventing the Commission's local television ownership limits because such acquisitions do not involve stations changing ownership even though everything except the station's license would be acquired. *Id.* at 12835, para. 97. The *2018 Quadrennial Review Report and Order* extends the prohibition to cover using multicast streams and LPTV stations—which are otherwise not counted as stations for purposes of the local television ownership limits—to facilitate the already prohibited network affiliation acquisitions. *Id.*

[1704] *Amendment of Section 73.3556 of the Commission's Rules Regarding Duplication of Programming on Commonly Owned Radio Stations*, MB Docket No. 19-310, Order on Reconsideration, FCC 24-66 (June 10, 2024).

[1705] *Id*. at 1-3, paras. 2-4.

[1706] *Id*. at 2-3, para. 4.

[1707] *Id*. at 4-5, para. 8.

[1708] *Id*. at 5, para. 8.

[1709] *Id*.

[1710] *Id*. at 5, para. 9.

[1711] *Id*. at 5, para. 10.

[1712] *Id*.

operations on TV channel 6 (FM6 operations) by existing channel 6 LPTV stations.[1713] After a lengthy process involving multiple rounds of comments from interested parties, the Commission issued an order on July 20, 2023, and concluded that preserving existing operations serves the public interest.[1714] The Commission found that both the Communications Act and the Commission's rules allow existing LPTV stations operating on channel 6 to provide FM6 operations on an ancillary or supplementary basis to digital television operations.[1715]

537. *Digital FM Technical Rules*. In September 2024, the Commission modified the Digital Audio Broadcasting (DAB) rules to adopt a mode known as asymmetric sideband operation without the need for an annual experimental authorization from the Commission.[1716] The DAB system inserts redundant digital sidebands, which typically operate using the same power level, above and below a station's existing analog signal to prevent harmful interference.[1717] With asymmetric sidebands, an FM station does this using different power levels on each sideband, providing the station with additional flexibility.[1718] The rule modification allows a digital FM station to initiate asymmetric sideband operation upon simple notification to the Commission on an existing Media Bureau form and also simplifies how stations notify the Commission about changes in their digital power levels.[1719] Simplifying this process enables a digital FM station to maximize the efficiency of its digital signal by enabling reduction of power where it would be most likely to interfere with an adjacent-channel analog FM station.[1720] Additionally, eliminating the requirement of annual authorization removes a regulatory barrier and incentivizes more digital FM stations to adopt asymmetric sideband operations.[1721] Finally, expanding the use of an existing form to report certain FM digital operational changes streamlines the reporting process for broadcasters and places key information in the Media Bureau's LMS database.[1722]

538. *New Broadcast Stations*. As described in the previous Communications Marketplace Report, the Commission opened a filing window for parties seeking construction permits for new NCE FM stations in 2021 and received 1,282 applications.[1723] The Commission continues to identify tentative selectees in groups of mutually exclusive applicants for new stations and has continued to grant construction permits, enabling the introduction of new noncommercial radio service.[1724] Most recently, the Commission identified three groups of mutually exclusive applications for comparative considerations

[1713] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15789-90, para. 510.

[1714] *Amendment of Parts 73 and 74 of the Commission's Rules to Establish Rules for Digital Low Power Television and Television Translator Stations*, MB Docket No. 03-185, Fifth Report and Order, 38 FCC Rcd 6975 (2023).

[1715] *Id.* at 6980, para. 8.

[1716] *Modifying Rules for FM Terrestrial Digital Audio Broadcasting Systems*, MB Docket No. 22-405, First Report and Order, FCC 24-105 (Sept. 25, 2024) (*Modifying Rules for FM First R&O)*.

[1717] *Id.*

[1718] *Id.*

[1719] *Id.*

[1720] *Id.*

[1721] *Id.*

[1722] *Id.*

[1723] *2022 Communications Marketplace Report*, 37 FCC Rcd at 15782-83, para. 492.

[1724] *See*, *e.g.*, *Comparative Consideration of Three Groups of Mutually Exclusive Applications for Permits to Construct New Noncommercial Educational FM Stations*, Memorandum Opinion and Order, FCC 24-115 (Oct. 28, 2024).

and review.[1725] In October 2024, the Media Bureau announced a filing window for new NCE television stations.[1726]

539. Also, in June 2023, the Media Bureau announced a window for filing applications for LPFM new station construction permits.[1727] The Commission first created LPFM service as a class of radio stations designed to serve very localized communities or underrepresented groups within communities.[1728] As such, LPFM stations promote both inclusion and universal deployment of radio service. Since the window closed in December 2023,[1729] the Commission has issued more than 600 construction permits for new LPFM stations.

540. *LPTV and Class A Stations*. On August 20, 2024, the Media Bureau lifted a freeze on major modification applications and allowed Class A television, LPTV, and television translator stations to file major change applications in order to change their existing channel.[1730] The freeze had been in place since 2010, restricting the filing of major modifications for Class A, LPTV, and television translator stations and the filing of applications for new LPTV and television translator stations.[1731] Lifting the freeze enables stations negatively affected by the incentive auction repacking and digital transition to find better channels from which to operate.[1732] The action also encourages improvement of television services, especially those in rural and underserved areas, by enabling stations to improve service to existing viewers.[1733]

541. The Commission also implemented a Congressional directive under the Low Power Protection Act to open a one-year window for qualified LPTV stations to apply for Class A status.[1734] Class A status confers primary spectrum use and a measure of interference protection from FPTV stations that LPTV stations would not have otherwise.[1735] The window opened on May 31, 2024, and will close on May 30, 2025.[1736]

[1725] *Id*.

[1726] *Media Bureau Announces Filing Window for New Noncommercial Educational Television Stations from December 4 Through December 11, 2024, and Sets Forth Filing Procedures and Requirements*, Public Notice, DA 24-1065 (MB Oct. 10, 2024).

[1727] *Media Bureau Announces LPFM New Station Application Filing Window; Window Open from November 1, 2023 to November 8, 2023*, Public Notice, 38 FCC Rcd 5763 (MB 2023).

[1728] *Creation of a Low Power Radio Service*, MM Docket No. 99-25, Report and Order, 15 FCC Rcd 2205 (2000).

[1729] *Media Bureau Announces Close of LPFM New Station Filing Window and Temporary Filing Freeze on Amendments to Applications Submitted in the December 2023 Filing Window*, Public Notice, 38 FCC Rcd 11933 (MB 2023).

[1730] *Media Bureau Announces Commencement of First-Come, First-Serve Channel Change Opportunity for Class A Television, LPTV and TV Translator Stations Beginning On August 20, 2024*, Public Notice, DA 24-498, at 1 (MB May 28, 2024).

[1731] *Id.*

[1732] *Id.* at 2.

[1733] *See id.*

[1734] *Implementation of the Low Power Protection Act*, MB Docket No. 23-126, Report and Order, 38 FCC Rcd 12627 (2023); Low Power Protection Act, Pub. L. 117-344, 136 Stat. 6193 (2023), appeal pending sub nom *Radio Communications Corp. v. FCC*, No. 24-1004 (D.C. Cir. filed Jan. 10, 2024).

[1735] *Implementation of the Low Power Protection Act*, MB Docket No., Report and Order, 38 FCC Rcd 12627, 12628-29, paras. 2, 4 (2023).

VII. COMMISSION AGENDA TO FURTHER ENCOURAGE AND PROMOTE INVESTMENT, INNOVATION, DEPLOYMENT, AND COMPETITION

542. RAY BAUM'S Act of 2018 also requires the Commission to describe the agenda of the Commission for the next two-year period for addressing competitive challenges and opportunities in the communications marketplace.[1737]

A. The Fixed Communications Marketplace

543. Over the next two years, we expect the Commission to continue its efforts to ensure that every American has access to an affordable, high-speed broadband connection. As has historically been the case, a key component of that effort will be through use of the Commission's USF Programs. We expect to continue to evaluate USF high-cost support mechanism(s) to promote more affordable and available broadband services in the years to come for fully deployed networks, working to account for funding being made available through the BEAD program, as well as from other federal agencies (including NTIA, Treasury, and USDA) and state agencies to ensure the most efficient use of federal funding. We are also exploring further improvements to the E-Rate program.[1738]

544. We also expect to continue our non-USF Program rulemaking efforts regarding broadband availability. We expect to consider refinements to our rules to prevent digital discrimination by examining relevant supplemental reporting, requiring maintenance of internal compliance programs, and evaluating whether to establish an Office of Civil Rights within the Commission. In addition, we expect to continue to evaluate our pole attachment rules, examining, among other things, potentially streamlining the processing of large pole attachment applications, and modifying our self-help rules. We also expect to continue our work to ensure that the BDC represents the most accurate information possible regarding where broadband is currently available making additional changes to the collection as necessary. In addition to making technical improvements, we intend to examine whether the validation, audit, and Fabric challenge processes can be improved, as well as ways to facilitate provider certification of BDC submissions.

545. We expect the important work of various advisory committees and task forces to continue. The CEDC will continue its work analyzing opportunities to advance equity in the provision of and access to digital communication services and products for all people of the United States, without discrimination on the basis of race, color, religion, national origin, sex, or disability. The Native Nations Communications Task Force will sustain its efforts to provide guidance, expertise, and recommendations to specific requests from the Commission on a range of telecommunications issues that directly or indirectly affect Tribal governments and their people. And we expect that the Connect2HealthFCC Task Force will continue to explore the intersection of and relationship between broadband, advanced technology, and health, aiming to leverage broadband connectivity to improve health and healthcare for all Americans.

546. Further, we expect to continue development of our IPCS rules, including the evaluation of the evolving marketplace for video IPCS to eventually establish permanent rate caps for video IPCS. Other issues under consideration include potentially disaggregating our very small rate cap tier for jails.[1739] We may also explore other IPCS-related issues that undermine the quality of the services IPCS consumers receive, such as dropped calls and frozen video screens.[1740] As delegated by the Commission,

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[1736] *Media Bureau Announces Filing Window for Qualified Low Power Television Stations to Convert to Class A Status Pursuant to the Low Power Protection Act*, MB Docket No. 23-126, Public Notice, DA 24-508 (May 31, 2024).

[1737] 47 U.S.C. § 163(b)(4).

[1738] *See, e.g.*, *Tribal E-Rate Order and FNPRM*.

[1739] *2024 IPCS Notice* at 314, para. 612.

WCB and CGB plan to move expeditiously in modifying, supplementing, and updating the requirements for the annual reports and certifications that all IPCS providers will be required to file each year.[1741] We anticipate that the resulting filings will help us evaluate providers' compliance with our IPCS rules and help guide future reforms of those rules.

B. The Mobile Wireless Communications Marketplace

547. *Spectrum.* Incumbent service providers need additional spectrum to increase their coverage or capacity, while new entrants need access to spectrum to enter a geographic area. Further, average data usage per connection has increased in recent years, and this growth is expected to continue, stimulating service providers' need for additional spectrum. Creative approaches to spectrum policy are critical for next generation wireless networks. To incentivize greater investment in the mobile wireless industry, the Commission will continue to make available a significant amount of additional spectrum across a range of frequencies to ensure a competitive mobile wireless services marketplace. As noted above, however, the Commission's spectrum auction authority expired in March 2023.[1742] Without Congressional reauthorization, the Commission is unable to make new spectrum available through its historically successful auction process.[1743]

548. In August 2023, the Commission released a Notice of Inquiry exploring potential avenues to advance understanding of non-Federal spectrum usage through new data sources, technologies, and methods.[1744] Leveraging today's tools to understand tomorrow's commercial spectrum usage can help identify new opportunities to facilitate more efficient spectrum use, including new spectrum sharing techniques and approaches to enable co-existence among users and services. The Spectrum Usage Notice of Inquiry undertook a technical inquiry on how to obtain more sophisticated knowledge of non-Federal spectrum usage, and how the Commission could take advantage of modern capabilities for doing so in a cost-effective, accurate, scalable, and actionable manner.

549. In March 2024, WTB released a public notice seeking comment on broad approaches the Commission could use, in the absence of auction authority, to provide the public with access to its inventory of currently unassigned spectrum in bands previously licensed for wireless services through auctions.[1745] The Public Notice sought comment on providing access through dynamic spectrum sharing techniques, providing access through non-exclusive site-based licensing, and leasing spectrum inventory licenses.[1746]

550. In May 2024, Chairwoman Rosenworcel announced the establishment of the Spectrum Steering Team, which will lead the FCC's efforts to develop and implement forward-looking spectrum

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[1740] *Id.* at 314-16, paras. 613-16.

[1741] *See id.* at 298, para. 572.

[1742] 47 U.S.C. § 309(j)(11).

[1743] *See e.g.*, Press Release, FCC, On 30th Anniversary of FCC Spectrum Auctions, FCC Chairwoman Rosenworcel Calls for Congressional Renewal of Expired Authority (Aug. 10, 2023), https://www.fcc.gov/document/chairwoman-calls-renewal-expired-spectrum-auction-authority ("FCC spectrum auctions have fueled American growth for three decades. The agency has held 100 auctions and in the process raised more than $233 billion for the United States Treasury.")

[1744] *Advancing Understanding of Non-Federal Spectrum Usage*, WT Docket No. 23-232, Notice of Inquiry, 38 FCC Rcd 7216 (2023).

[1745] *Wireless Telecommunications Bureau Seeks Comment on Ways to Facilitate Access to Currently Unassigned Auction Inventory Spectrum for Wireless Radio Services in Light of the Ongoing Lapse of Auction Authority*, WT Docket No. 24-72, Public Notice, 39 FCC Rcd 2143 (WTB 2024), https://docs.fcc.gov/public/attachments/DA-24-215A1_Rcd.pdf.

[1746] *Id.* at 2144, para. 3.

policies and execute the National Spectrum Strategy. The Spectrum Steering Team brings together policy experts, economists, and engineers from across the Commission, including OEA, OET, SB, and WTB, to drive spectrum policy and planning efforts that will ensure U.S. wireless leadership. The Spectrum Steering Team will coordinate the FCC's National Spectrum Strategy implementation efforts, including active participation in the in-depth study of 2,786 megahertz of spectrum for repurposing across key bands, and collaborate with NTIA, federal agencies, and stakeholders. The Spectrum Steering Team seeks input from stakeholders on how the FCC can best support the National Spectrum Strategy implementation efforts.[1747]

551. *Infrastructure.* On August 29, 2024, the Commission adopted the *5G Fund Second Report and Order and Second Further Notice*, which will distribute up to $9 billion in Phase I in an upcoming multi-round reverse auction where providers will compete to provide service to an additional 14 million homes and businesses.[1748] The Commission also encouraged the voluntary inclusion of Open RAN technologies in deployment supported by the 5G Fund by allocating up to $900 million in additional universal service funds for such deployments.[1749] Given the unique challenges presented by extending 5G infrastructure in Alaska, the Commission has opened a separate proceeding regarding extending deployment of 5G infrastructure in that state.[1750] To meet the rapidly increasing demand for wireless services and prepare our national infrastructure for 5G, the Commission will continue to evaluate ways to help facilitate wireless infrastructure investment and deployment. Supporting the deployment of 5G and other next-generation wireless services through innovative infrastructure policy is critical.

C. The Satellite Marketplace

552. In the future, the Commission will likely consider further action on ISAM activities. On February 15, 2024, the Commission adopted a Notice of Proposed Rulemaking that put forward a framework for licensing ISAM.[1751] ISAM refers to a set of capabilities used on-orbit, on the surface of space objects and celestial bodies, and in transit. As the ISAM industry continues to develop, the Commission envisions taking additional steps as needed to foster innovation and growth in this field.

553. In addition, the Commission will continue to seek to improve and clarify its rules regarding orbital debris mitigation requirements. Further action will take into account the Commission's experience gained in the satellite licensing process, improvements in mitigation guidelines and practices, and marketplace developments. To that end, SB released a Public Notice seeking to refresh the record on rule changes pertaining to orbital debris mitigation previously proposed in 2020 to ensure that the

[1747] *See* Press Release, FCC, FCC Chairwoman Announces the Launch of Spectrum Steering Team; Named Leadership of Agency's Spectrum Policy Modernization and National Spectrum Strategy *Efforts*, (May 14, 2024), https://docs.fcc.gov/public/attachments/DOC-402541A1.pdf; *Information Sought on Sharing in the Lower 37 GHz Band in Connection with the National Spectrum Strategy Implementation Plan*, WT Docket No. 24-243, Public Notice, DA 24-789 (Aug. 9, 2024); *The Space Bureau, the Wireless Telecommunications Bureau, the Office of International Affairs, and the Office of Engineering and Technology Seek Information on Sharing in the 18 GHz Band in Connection with the National Spectrum Strategy Implementation Plan*, GN Docket No. 24-248, Public Notice, DA 24-815 (Aug. 16, 2024).

[1748] *5G Fund Second Report and Order and Second Further Notice* at 35, para. 61.

[1749] *Id.* at 71-72, para. 139.

[1750] *See Connect America Fund; Alaska Connect Fund et al.*, WC Docket Nos. 10-90, 23-328 et al., Notice of Proposed Rulemaking and Report and Order, 38 FCC Rcd 9982 (2023) (seeking comment on extending 5G mobile service to remote Alaska).

[1751] *ISAM NPRM*, 39 FCC Rcd at 1864-65, para. 1.

Commission has the benefit of current information, including any developments relating to these issues since the release of the 2020 Further Notice.[1752]

554. Further, with the Commission's SCS framework in place, the Commission expects to continue to receive and review Part 25 applications to provide services under this framework.[1753] Commission staff will continue to work through these applications, which often include unique varieties of commercial arrangements.

555. Finally, the Commission will continue to consider proposals to further improve its processing of space and earth station applications.[1754] The proposals include elimination of the procedural burden of printing and maintaining a paper copy of a license, changing the default status of space and earth station proceedings to permit-but-disclose, and a question of whether a process can be implemented for operators of non-U.S. licensed space stations that is similar to STA.[1755] The Commission sought comment on other updates to our processes for STA applications, whether to consider a "Permitted List" type of process for NGSO operators, and whether to expand the window for operators to file renewal applications for existing licenses.[1756] The Commission also sought further comment about establishing timeframes or shot clocks for action on the merits of applications.[1757] Additionally, the Commission sought comment on updating processes to avoid potentially duplicative coordination procedures and whether the Commission can expand the new auto-granted process for adding satellite points of communication to earth station licenses.[1758]

D. The Video and Audio Communications Marketplaces

556. *Cable Operator and DBS Provider Billing Practices*. In December 2023, the Commission initiated a proceeding to examine certain junk fee billing practices that may prevent subscribers from choosing the video services they want or result in consumers paying fees for video services they do not choose to receive.[1759] Specifically, the Commission proposed to adopt customer service protections that prohibit cable operators and DBS service providers from imposing ETFs and BCFs.[1760] ETFs require subscribers to pay a fee for terminating a video services contract prior to its expiration date, making it costly for consumers to switch services during the contract term.[1761] BCFs require video service subscribers to pay for a complete billing cycle even if the subscriber terminates service prior to the end of that billing cycle, penalizing consumers for terminating service by requiring them to pay for services they choose not to receive. [1762]

[1752] *Space Bureau Seeks to Refresh the Record on Proposed Rules Pertaining to Orbital Debris Mitigation*, IB Docket Nos. 18-313 and 22-271, Public Notice, DA 24-412, at 1-2 (SB May 2, 2024).

[1753] *Supplemental Coverage from Space Report and Order*.

[1754] *Expedited Initial Application Processing R&O and FNPRM*, 38 FCC Rcd at 8876, para. 88.

[1755] *Id*. at 8878-79, 8885-86, paras. 92-94, 111-12.

[1756] *Id*. at 8879-80, 8882, paras. 95-97, 101. The earth station applicants would use the Permitted List to specify that they will communicate with certain authorized NGSO systems. *Id*. at 8882, para. 101.

[1757] *Id*. at 8880-8881, paras. 98-99.

[1758] *Id*. at 8881-82, 8884, paras. 100, 107-108.

[1759] *Promoting Competition in the American Economy: Cable Operator and DBS Provider Billing Practices*, MB Docket No. 23-405, Notice of Proposed Rulemaking, 38 FCC Rcd 12219, 12219, para. 1 (2023).

[1760] *Id.* at 12219-20, para. 1.

[1761] *Id.* at 12220, para. 2.

[1762] *Id.* at 12220, para. 3.

557. *Television Blackout Reporting and Rebate*. In December 2023, the Commission adopted a Notice of Proposed Rulemaking seeking to require notification whenever a blackout of a broadcast television station, or stations, occurs on a video programming service offered by an MVPD and lasts for 24 hours or more due to a breakdown in retransmission consent negotiations between broadcasters and MVPDs.[1763] The proposed reporting framework would require MVPDs to report retransmission consent blackouts within 48 hours and update those reports within two business days of a resolution.[1764] The blackout notifications would be publicly available in a centralized, Commission-hosted database, except for any commercially sensitive information regarding subscribers.[1765] The Commission expects that the proposed reporting requirements, if adopted, will ensure that the Commission and the public receive prompt and accurate information about MVPD service disruptions involving broadcast stations when they occur.[1766]

558. Also, in January 2024, the Commission initiated a proceeding to determine whether to require certain MVPDs—namely cable operators and DBS providers—to give their subscribers rebates when those subscribers are deprived of video programming they expect to receive during programming blackouts that result from failed retransmission consent or program carriage negotiations.[1767] The Commission found that subscribers may not see any adjustment to their bills during the carriage dispute when the MVPD does not carry the broadcast television station or network, even though many MVPDs charge a fee on subscribers' bills that purportedly pays programmers for subscriber access to the broadcast signal or network.[1768] The proceeding seeks comment on whether and how the Commission should address this customer service shortcoming while also examining how the video programming marketplace addresses this issue currently.[1769]

559. *Independent Programming*. One of the Commission's primary statutory objectives with respect to multichannel video programming is to foster a diverse, robust, and competitive marketplace for the delivery of such programming.[1770] Stakeholders continue to raise concerns that certain marketplace practices by distributors may hinder independent video programmers from reaching consumers and deprive consumers of access to their choice of diverse programming.[1771] Independent programmers contend that their ability to reach consumers today depends on their ability to negotiate and secure carriage on MVPDs or OVDs.[1772] They also assert that certain practices by incumbent MVPDs impede their ability to reach consumers across all video platforms, leading to less competition for viewers and fewer consumer choices, despite the growing number of platforms available to video consumers.[1773]

[1763] *Reporting Requirements for Commercial Television Broadcast Station Blackouts*, MB Docket No. 23-427, Notice of Proposed Rulemaking, 38 FCC Rcd 12717, 12717, para. 1 (2023).

[1764] *Id.* at 12721, para. 10.

[1765] *Id.* at 12723, para. 17.

[1766] *Id.* at 12717, para. 1.

[1767] *See generally Customer Rebates for Undelivered Video Programming During Blackouts*, MB Docket No. 24-20, Notice of Proposed Rulemaking, 39 FCC Rcd 492, 493-94, para. 4 (2024).

[1768] *Id.* at 493, para. 3.

[1769] *See id.* at 493-500, paras. 4-18.

[1770] *Fostering Independent and Diverse Sources of Video Programming*, MB Docket No. 24-115, Notice of Proposed Rulemaking, FCC 24-44, at 1, para. 2 (Apr. 19, 2024).

[1771] *Id.* at 2, para. 2.

[1772] *Id.*

[1773] *Id.* at 2-3, para. 2.

560. In April 2024, the Commission initiated a proceeding to examine the current state of the marketplace for diverse and independent programming.[1774] The Notice of Proposed Rulemaking seeks comment on the obstacles faced by independent programmers seeking MVPD or OVD carriage, how these obstacles impact consumers, and current program bundling practices.[1775] The Commission also proposes to prohibit two types of contractual provisions in program carriage agreements between independent programmers and MVPDs to alleviate marketplace obstacles that may hinder independent programmers from reaching consumers: MFN provisions and unreasonable ADM provisions.[1776] An MFN provision entitles an MVPD to more favorable economic or non-economic contract terms that a video programming vendor has provided to another video programming distributor, while an ADM provision generally prohibits or restricts a video programming vendor from exhibiting its programming on OVDs, often for a specified period of time following the programming's original linear airing, or until certain conditions are met.[1777]

561. *Local Journalism*. As part of broadcasters' fundamental public service obligations, stations must provide programming that is responsive to the needs and interests of its community of license (COL).[1778] The provision of locally originated programming has been an important element of a station's service obligations from the time location requirements for AM, FM, and television broadcast stations were first adopted in 1946.[1779] Such programming is especially important for certain communities, such as those in rural or Tribal areas, that may be underserved by other sources of media whose content is more nationally or regionally focused. In January 2024, to provide an additional incentive for stations to broadcast content responsive to the needs of the local community, particularly news and information, the Commission issued a Notice of Proposed Rulemaking proposing a change to the Media Bureau's application processing procedures that would benefit radio and television broadcasters that certify that they provide locally originated content.[1780] Specifically, when reviewing applications for renewal, transfer, or assignment of license, the Commission would prioritize evaluation of those applications filed by stations that certify that they provide locally originated programming.[1781] The prioritization would mean that those applications are the first to be reviewed, which is expected to result in quicker action and, if the application is granted, quicker approval of those applications.[1782] The Notice of Proposed Rulemaking also invited comment on how to define "locally originated" programming for this purpose.[1783]

562. *Structural Ownership Rules*. The 2022 Quadrennial Media Ownership Review is proceeding.[1784] As with the previous quadrennial review, the 2022 review is examining whether the three

[1774] *Id.* at 3, para. 3.

[1775] *Id.*

[1776] *Id.*

[1777] *Id.* at 3-4, para. 4.

[1778] *Priority Application Review for Broadcast Stations that Provide Local Journalism or Other Locally Originated Programming*, MB Docket No. 24-14, Notice of Proposed Rulemaking, 39 FCC Rcd 468, 469, para. 2 (2024).

[1779] *Id.* at 469-70, para. 3 (citing *Amendment of Sections 73.1125 and 73.1130 of the Commission's Rules, the Main Studio and Program Origination Rules for Radio and Television Broadcast Stations*, Report and Order, 2 FCC Rcd 3215, 3217-18, para. 29, Public Service Responsibility of Broadcast Licensees (Mar. 7, 1946) (the "Blue Book")).

[1780] *Id.* at 471, para. 7.

[1781] *Id.*

[1782] *Id.*

[1783] *Id.* at 474-75, paras. 15-16.

[1784] *Media Bureau Opens Docket and Seeks Comment for 2022 Quadrennial Review of Media Ownership Rules*, MB Docket No. 22-459, Public Notice, 37 FCC Rcd 15097 (MB 2022).

remaining ownership rules (the Local Radio Ownership Rule, the Local Television Ownership Rule, and the Dual Network Rule) remain necessary in the public interest as the result of competition.[1785] The 2022 review will collect and analyze information regarding ongoing trends or developments in the media marketplace with a focus on the impact of the rules on the American public as consumers.[1786] The review will also pay close attention to the rules' function and objectives as they relate to broadcasters' public interest obligations.[1787] The 2022 review will continue to examine how barriers to minority and female ownership of broadcast stations could be addressed by changes to the structural ownership rules.[1788]

563. *LPTV Online Public File and Enhancement*. Given the growth and maturation of LPTV service, the Commission sought comment in June 2024 on whether its approach and regulation of the LPTV service should be updated.[1789] The Commission created the LPTV service in 1982 to bring local television service to viewers otherwise not served by existing FPTV.[1790] The viability of LPTV had not been established, and LPTV thus was exempted from certain obligations applicable to other broadcasters, including certain recordkeeping and operating obligations.[1791] LPTV stations today are an established component of the American television system, delivering television to millions of viewers in rural and discrete urban communities.[1792] In some instances, LPTV stations have affiliations with major broadcast networks (i.e., ABC, CBS, NBC and FOX), are part of large broadcast station ownership groups, and attract requests to air political advertising or carry sponsored programming pursuant to time brokerage agreements.[1793] In some areas unserved by any other television station, an LPTV station may be the only television station providing local news, weather, and public affairs programming.[1794]

564. In June 2024, the Commission sought comment on whether LPTV stations that have an affiliation with a Big 4 broadcast network (i.e., ABC, CBS, NBC and FOX) or other national network should be required to maintain an online public file to inform the public of a station's operations and facilitate community engagement.[1795] Alternatively, the Commission sought comment on whether LPTV stations that are among the top-four ranked stations in audience share in each market should be required to maintain an OPIF, regardless of their affiliation with a network.[1796] The Commission also proposed other updates and amendments to its technical and operational rules for LPTV and TV translator stations to address advances in the LPTV service generally, update its existing rules to provide clarifications and resolve inconsistencies, prevent abuse of licensing processes, [1797] and create an equal playing field.[1798]

[1785] *Id.* at 15099.

[1786] *Id.*

[1787] *Id.*

[1788] *Id.* at 15099-15600.

[1789] *Political Programming and Online Public File Requirements for Low Power Television Stations; Amendment of the Commission's Rules to Advance the Low Power Television, TV Translator and Class A Television Service*, MB Docket Nos. 24-147 and 24-148, Notice of Proposed Rulemaking, FCC 24-65 (June 10, 2024) (*2024 LPTV NPRM*).

[1790] *See Inquiry Into the Future Role of Low Power Television Broadcasting and Television Translators in the National Telecommunications System*, Notice of Proposed Rulemaking, 45 FR 69178, para. 1 (Oct. 17, 1980); *Low Power Television Service*, 51 RR 2d 476 (1982) (*LPTV Order*), *reconsideration granted in part*, 48 Fed. Reg. 21478 (1983).

[1791] *See LPTV Order*, 51 RR 2d at 478 and 487, paras. 14 and 77.

[1792] *2024 LPTV NPRM* at 2, para. 1.

[1793] *Id.* at 4-5, para. 6.

[1794] *Id.* at 5, para. 6.

[1795] *Id.* at 11-12, para. 15.

[1796] *Id.*

These updates and amendments are intended to ensure that LPTV and television translator stations can utilize fully the country's limited spectrum resources to provide television services.[1799]

565. *Digital FM Technical Rules*. The Commission has proposed to modify the DAB technical rules to improve the terrestrial digital FM broadcast radio service.[1800] As discussed earlier, the rule changes allow a digital FM station to operate with asymmetric power on the digital sidebands.[1801] The Commission also proposed to permit additional FM stations to increase FM hybrid digital effective radiated power (FM Digital ERP) beyond the existing levels without the need for individual Commission authorization.[1802] After receiving comments from the airline, aeronautical, and aircraft instrumentation industries concerning whether increasing digital sideband power at the top of the FM broadcast band (Channel 300, or a center frequency of 107.9 MHz) would interfere with the lower end of the Aeronautical Radio Navigation Spectrum (108.0-117.95 MHz), stakeholders agreed to conduct testing before the Commission proceeds with the proposed rule modification regarding increased FM Digital ERP.[1803]

VIII. PROCEDURAL MATTERS

566. This Communications Marketplace Report is issued pursuant to section 401 of the Repack Airwaves Yielding Better Access for Users of Modern Services Act of 2018 (codified at 47 U.S.C. § 163), section 103(b) of the Broadband Data Improvement Act (codified at 47 U.S.C. § 1303(b)), and section 623(k) of the Communications Act of 1934, as amended (codified at 47 U.S.C. § 543(k)).

567. **IT IS ORDERED** that this Communications Marketplace Report shall be published on the website of the Federal Communications Commission and that the Office of Legislative Affairs shall submit copies of this Communications Marketplace Report to the Committee on Energy and Commerce of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate.

568. **IT IS FURTHER ORDERED** that the proceeding in GN Docket No. 24-119 is **TERMINATED**.

FEDERAL COMMUNICATIONS COMMISSION

(Continued from previous page)

[1797] *2024 LPTV NPRM* at 23-24, para. 38. Because Class A and LPTV/TV translator stations are not included in the Table of TV Allotments and are not assigned a COL when licensed, using a station's COL as a reference point can be subject to abuse. Although licensees may input a COL for their station in LMS, Commission rules do not currently have a procedure governing how Class A and LPTV/TV translator station may select a COL. As a result, a licensee can change the COL for their station in LMS at any time, and theoretically could specify a COL that has no association with the actual location of the station's facilities. *Id.*

[1798] *Id.* at 5-6, para. 7.

[1799] *Id.*

[1800] *Modifying Rules for FM Terrestrial Digital Audio Broadcasting Systems*, MB Docket No. 22-405, Order and Notice of Proposed Rulemaking, 38 FCC Rcd 7158, 7158-59, paras. 1-2 (2023) (*Modifying Rules for FM Order and NPRM*).

[1801] *See supra* section VI.D.

[1802] *Modifying Rules for FM Order and NPRM*, 38 FCC Rcd at 7158, para. 1.

[1803] *Modifying Rules for FM First R&*O at 2, para. 3.

Marlene H. Dortch
Secretary

DISSENTING STATEMENT OF COMMISSIONER BRENDAN CARR

Re: *Communications Marketplace Report*, GN Docket No. 24-119

In 2018, Congress tasked the FCC with preparing a biennial Communications Marketplace Report that assesses the state of competition across the communications sector. As I have indicated in my statements on the last two Reports, I have been concerned that the agency's approach misses the mark.[1804] For instance, instead of providing an accurate assessment of the converged market for communications services, the Commission continues to use a decades-old approach that looks at each broadband technology—including mobile, fixed, and satellite—as services that compete only in distinct and separate silos. That is not at all a reflection of the dynamics at play in the real world today.

Where the FCC does conduct a limited cross-technology competitive analysis in today's Report, it picks winners and losers, declaring that the availability of certain technologies is overstated in the FCC's own broadband map. This approach is counterproductive to the FCC's broader objectives of closing the digital divide and ensuring Americans have access to competitive, high-speed services. Today's Report also expands its scope into various "equity" considerations, rather than remaining focused on the competitive indicators identified by Congress.

At this point, I cannot support the current Commission's approach to this Report. But the good news is that there will soon be an opportunity to correct course. I look forward to working on the next Communications Marketplace Report in 2026.

[1804] *Communications Marketplace Report*, GN Docket No. 20-60, Report, 36 FCC Rcd 2945 (2020) (Statement of Commissioner Carr, Approving in Part and Concurring in Part); *Communications Marketplace Report*, GN Docket No. 22-203, 37 FCC Rcd 15514 (2022) (Statement of Commissioner Carr, Approving in Part and Concurring in Part).

DISSENTING STATEMENT OF
COMMISSIONER NATHAN SIMINGTON

Re: *Communications Marketplace Report*, GN Docket No. 24-119

'Broadband' is high speed internet connectivity, whatever its modality of delivery (and, at this point, we have a few). Similarly, 'media' is audio or visual content, whatever its modality of delivery (and, at this point, we have more than a few). It is time for the Commission to modernize its understanding of the communications marketplace along several axes, and I look forward to working with my colleagues in the future to help create, and implement, that new understanding.