**BEFORE THE**

**FEDERAL COMMUNICATIONS COMMISSION**

**WASHINGTON, D.C. 20554**

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| In the Matter of  Report on the Feasibility of Allowing Commercial Wireless Services, Licensed or Unlicensed, to Use or Share the Frequencies Between 3.7-4.2 GHz | **)**  **)**  **)**  **)**  **)**  **)**  **)** | GN Docket No. 18-122 |

**COMMENTS OF COMCAST CORPORATION AND NBCUNIVERSAL MEDIA, LLC**

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**COMMENTS OF COMCAST CORPORATION AND NBCUNIVERSAL MEDIA, LLC**

Comcast Corporation and NBCUniversal Media, LLC (collectively, “Comcast”) hereby files these comments in response to the Public Notice (“*Notice*”) in the above-captioned docket.[[1]](#footnote-1)

# **INTRODUCTION**

Comcast has long supported the Commission’s efforts to identify and allocate new spectrum to meet demand for both licensed and unlicensed wireless services. A critical input to a Commission analysis of the potential for sharing the 3.7 – 4.2 GHz C-Band spectrum, as directed by Congress, will be a complete understanding of how such spectrum is used today, and a plan for how it might be repurposed with minimal impact to existing licensees, users of the spectrum, and consumers.

Comcast and other stakeholders in the video industry, including programmers, broadcasters, and distributors, rely on C-Band spectrum for their video distribution operations. This has been the case for over 40 years even as the industry has migrated to digital service and deployed new and innovative video technologies like high-definition (“HD”) video and video‑on-demand (“VOD”). The existing video delivery architecture, of which C-Band spectrum is a central part, provides a high-quality video experience for hundreds of millions of Americans.

The C-Band is ideally suited for video distribution. It is ubiquitous – reaching all corners of the country, *including rural areas that can be hard to reach with fiber or other alternative distribution methods*. It is reliable, redundant, and affordable, which can be particularly important for smaller entities trying to reach large audiences. It has the capacity and capability to deliver high-quality, high-resolution video. And it is less susceptible than higher frequencies, such as the Ku-band, to rain fade and other atmospheric conditions that can affect video quality and link reliability. In light of the longstanding history and the substantial reliance interests that have developed around usage of the spectrum by programmers, broadcasters, multichannel video programming distributors (“MVPDs”), equipment vendors, and others, the Commission should carefully evaluate in its Report to Congress any potential impacts to these stakeholders and consumers.

Consistent with Congress’s direction in the MOBILE NOW Act, the Commission must carefully assess the feasibility of any potential changes to the existing C-Band framework, including the specific details of proposed changes and precise impacts on incumbent uses of the band; the feasibility of pursuing mitigation strategies to address interference and other operational issues; and the costs of migrating existing video distribution facilities to different spectrum or other distribution platforms.[[2]](#footnote-2) Absent this information, the Commission will not be able to make an informed judgment about whether the claimed benefits of any spectrum sharing or other proposed approach outweigh the costs to the video industry and, ultimately, consumers of video services.

# **BOTH COMCAST AND NBCUNIVERSAL ARE HEAVY USERS OF C-BAND SATELLITE LINKS**

C-Band plays a critical role in the distribution of video programming for Comcast, its affiliates, and countless other entities in the video programming marketplace. This includes the uplinking of programming to C-Band FSS satellites using the 5.925 – 6.425 GHz band and the downlinking of programming from those satellites to C-Band earth stations using the 3.7 – 4.2 GHz band. There is little question that C-Band satellites play a key role in the distribution of video content in the U.S., including for news, sports, and entertainment programming.

Comcast uses hundreds of C-Band receive earth stations as part of its video distribution operation. Indeed, a substantial amount of the video programming that Comcast carries on its cable systems is received from programmers who use C-Band satellites to deliver their programming. This includes linear and VOD programming downlinked from satellite transponders that are intensively used.

NBCUniversal is just one of many programmers that extensively use the C-Band for content distribution.  The NBC Network uses the C-Band to send video programming to affiliate locations in each of Nielsen’s 210 Designated Market Areas (“DMAs”), serving 114 million households.[[3]](#footnote-3)  Likewise, the Telemundo Network uses the C‑Band to send video programming to broadcast affiliates located in 80 DMAs, reaching approximately 72 million television households, including 14 million Hispanic households.  In 120 additional markets without an over-the-air broadcast affiliate, the Telemundo Network distributes its programming directly to cable systems via the C-band, reaching an additional 40 million households. And NBCUniversal’s cable networks rely on the C-Band to send video feeds to MVPD headends around the country, serving 100 million households.

The C-Band also plays an important role in the distribution of syndicated programming to broadcast stations.  For example, NBCUniversal uses the C-Band for distribution of syndicated programming to 11 NBC owned-and-operated stations, serving 32 million households.  In addition, the C-Band is used to deliver NBCUniversal’s outbound syndicated programming to stations located in each Nielsen DMA, serving 114 million households.

Beyond its retail cable and broadcast businesses, Comcast’s wholesale video distribution business, Comcast Technology Solutions (“CTS”), utilizes the C-Band for the uplinking and downlinking of content to distribution partners. In particular, CTS’s Headend-in-the-Sky (“HITS”) service aggregates and transmits digital video programming via satellite to cable operators, often small and mid‑sized providers in remote and rural areas that have no other means of receiving the programming, which in turn retransmit that content to their subscribers.[[4]](#footnote-4) The HITS service carries over 270 programming services from 39 different programming groups, and delivers content to approximately 300 different cable operators serving about 900,000 subscribers across 900 cable systems, including operators that serve some of the most rural parts of the country.

# **THE C-BAND IS IDEALLY SUITED TO ITS CURRENT USE AS AN IMPORTANT LINK IN THE VIDEO ECOSYSTEM**

The Commission authorized the first satellites for domestic communications services in 1973, and usage of the C-Band for video distribution grew rapidly over the ensuing decades.[[5]](#footnote-5) This spectrum was designed to meet the needs of source providers with carefully planned standardized frequencies to reduce the cost of manufacturing satellites. Technical parameters were developed to minimize co-satellite interference along with a projection for growth and expansion to account for increased capacity in the future.[[6]](#footnote-6) The C-Band is one of the Commission’s great success stories.

The C-Band spectrum is ideally suited for point-to-multipoint video distribution, which is why the marketplace has coalesced around using it for this purpose instead of other bands or transmission technologies. The C-Band not only offers efficient, ubiquitous coverage, including to rural and other areas that are difficult to serve using other technologies, but also has additional characteristics that help ensure the quality and reliability of satellite-delivered video. For example, C-Band spectrum exhibits immunity to rain fade and other types of atmospheric signal loss. As the International Telecommunications Union (“ITU”) explained in a 2015 report on the C-Band: “The low gaseous atmospheric absorption combined with lower attenuation due to rain enables highly reliable space-to-Earth communication links. This, taken together with the wide coverage beams possible in this band, has led to satellites in this band being an important part of the telecommunications infrastructure in many countries.”[[7]](#footnote-7)

In light of these characteristics, the C-Band is heavily utilized and relied on across the video ecosystem. The Commission has estimated that there are 4,700 earth stations using the 3.7 – 4.2 GHz Band,[[8]](#footnote-8) but the real number is likely much higher given that the Commission’s figure only includes receive-only earth stations that have been registered under the Commission’s optional registration procedures. The Commission is appropriately seeking more accurate information through its earth station registration window,[[9]](#footnote-9) but some estimate that the actual figure is over 33,000 earth stations.[[10]](#footnote-10) In this regard, the American Cable Association (“ACA”), which represents smaller cable systems in rural areas that rely heavily on C-Band to obtain their video programming, indicates that 90% of its members’ earth stations are unregistered.[[11]](#footnote-11)

Moreover, C-Band usage by cable providers and broadcasters continues to remain robust given the marketplace demand for more, and higher resolution, programming. When the cable industry first used the C-Band for video distribution in the 1970s and 1980s, cable systems were largely analog, and typically carried a few dozen channels. Over the ensuing decades, cable operators digitized their systems and vastly expanded the amount of programming carried on their systems. Starting in the 1990s, the number of linear channels carried on the typical digital cable system ran into the hundreds. And with the interactivity enabled by digital technology, cable systems also started carrying two-way services, like VOD. By the time cable systems started going all-digital in the 2000s, the typical cable system carried dozens of HD channels and hundreds of standard-definition (“SD”) digital channels, as well as thousands of VOD titles, the vast majority of which were and continue to be delivered via C-Band spectrum. Now the cable industry is in the initial stages of deploying next‑generation video formats, such as 4K and ultra‑high-definition (“UHD”) programming that also will rely on C-Band capabilities.

# **THE COMMISSION’S REPORT TO CONGRESS SHOULD FULLY ADDRESS THE MANY QUESTIONS ASSOCIATED WITH PROPOSALS TO REPACK OR RELOCATE CURRENT C-BAND OPERATIONS OR TO REPLACE THOSE OPERATIONS WITH FIBER**

Comcast welcomes Congress’s directive in the MOBILE NOW Act that the Commission evaluate “the feasibility of allowing commercial wireless services, licensed or unlicensed, to use or share use of” C-Band spectrum, including interference and other harmful impacts on existing users of the spectrum.[[12]](#footnote-12) The Commission, in its Report to Congress, should establish a complete record and fully evaluate the myriad factors implicated in any repacking and/or sharing proposals to avoid disruptions to the video delivery ecosystem on which hundreds of millions of Americans and many U.S. businesses currently rely.

## **Repacking Proposals**

Several entities have proposed repacking schemes that would have the effect of converting a portion of C-Band spectrum to alternative uses.[[13]](#footnote-13) As directed by Congress in the MOBILE NOW Act, the Commission needs to assess in this proceeding “the operations and possible impacts of sharing” and how any potential sharing could occur “without causing harmful interference to Federal and non-Federal users already operating in this band, and in which parts of the band [] such sharing [would] be feasible.”[[14]](#footnote-14)

*Interference:* Among other things, the Commission’s Report to Congress will need to evaluate how repacking proposals, which would entail increased channel occupancy and power spectral density, would increase the risk of interference at earth stations from adjacent satellite links. Because of receiving earth stations’ sensitivity, signal quality degradation of even a few tenths of a dB can increase transmission errors by orders of magnitude. The innovative modulation and encoding schemes needed to accommodate advanced video features like HD and UHD are even more sensitive to interference, requiring higher signal-to-noise ratios to meet bit error rate (“BER”) requirements. Moreover, under any repacking plan, instances of multiple channels sharing a single transponder would have to increase.[[15]](#footnote-15) This, in turn, would increase the risk of intermodulation interference or require additional transponder input back-offs, and also raise operational complexity. The Report to Congress should explain:

* How will these repacking-related interference risks be mitigated, and what evidence have proponents of repacking provided that any mitigation strategies will be effective?
* How would any mitigation strategy accommodate changes in video technology, such as the introduction of new modulation and compression methods for UHD or 4K video?
* What steps would need to be taken to ensure that C-Band earth stations would not experience harmful interference from mobile devices?
* Would exclusion zones be required to protect C-Band earth stations? If so, how large would they need to be, and how would those zones be managed?
* Would repacking have any interference or other impacts on international users of C-Band spectrum?

Without a careful analysis of how repacking will address these concerns, millions of Americans and many U.S. businesses could be subjected to the negative impacts of harmful interference, ranging from periodic freeze framing, audio drop outs and chirps, to complete frozen video with no audio, or even a black screen.

*Resiliency and Reliability:* The Report to Congress also should consider how repacking would impact the resiliency and reliability of video distribution networks. Under the existing full-band, full-arc approach, video distribution networks can adapt to unexpected satellite failures. Programmers and MVPDs can quickly restore service using alternate arrangements on different C-Band transponders or satellites, thereby minimizing blackouts.[[16]](#footnote-16) These are not theoretical considerations. Satellite failures can occur due a wide range of issues, including power bus failures, loss of telemetry, damage caused by solar flares, and battery and solar panel failures, among other things. In each case, video providers have had to make alternative arrangements for satellite delivery, which typically requires full-band, full-arc access to the C‑Band. SES recently recounted an example of this type of situation requiring alternative delivery arrangements when one of its satellites:

experienced a severe and unexpected anomaly . . . . A C-Band customer had been using the satellite to distribute video programming to more than one hundred affiliates nationwide, and restoring service to that customer required repointing each of those affiliates’ receive antennas. Absent the regulatory flexibility to use the full C-Band spectrum and reorient the antennas as needed toward the designated follow-on satellite, reestablishing service to that customer on a timely basis would have been impossible.[[17]](#footnote-17)

NAB has noted similar issues in the broadcast industry, where broadcast stations “routinely need to access programming from different network feeds or other sources, which may be on almost any transponder or satellite.”[[18]](#footnote-18) To address these concerns, the Commission needs to examine:

* How would repacking affect the resiliency and reliability of video distribution networks?
* What alternative arrangements would be available to replace C-Band capabilities, and at what cost?
* Since downlink channels are linked with uplink channels in C-Band distribution, would changes to the amount of downlink spectrum impose new requirements on uplink spectrum? Would repacking result in underutilization of uplink spectrum? What would be the financial and operational impacts to uplink users, and how could those impacts be mitigated?
* If the reallocation of cleared spectrum is handled through private market transactions, what framework would be instituted to maximize the utility of the spectrum, to ensure fair and nondiscriminatory access, and to safeguard the investments of incumbent satellite users and mobile users?

*Itinerant Uses:* Eliminating full-band, full-arc C-Band access also would affect the use of the C-Band to meet itinerant programming needs. For example, in order to cover live sports or breaking news events, the NBC network or NBC stations may require portable uplink/downlink facilities at locations that often cannot be known in advance.[[19]](#footnote-19) Such special event programming often must be distributed using alternate channels, transponders, or even satellites due to scheduling conflicts or other needs.[[20]](#footnote-20) Full-band, full-arc access is essential to such flexibility. The Commission’s Report to Congress should examine:

* Whether and how itinerant uses can be maintained if current full-band, full-arc access to the C-Band is curtailed due to repacking?
* Whether there are any feasible alternatives to the C-Band for these functions?

## **Relocation Proposals**

Some wireless commenters have suggested that C-Band operations could be moved into alternative spectrum bands.[[21]](#footnote-21) The Commission’s Report to Congress should address a number of issues related to these relocation proposals.

*Ku/Ka-Bands:* A threshold issue is where those operations would or could go. As detailed above, the C-Band is ideally suited for ubiquitous video distribution. The Ku- and Ka‑bands have been mentioned as possible alternatives, but the Report to Congress should assess the adequacy of these claims and whether the Ku- and Ka-bands could replicate the reliability that video distribution demands and C-Band provides. A further issue is whether Ku- and Ka‑band satellites have the requisite idle capacity to replace C-Band use. SIA has pointed out that “[b]oth Ku- and Ka-band satellites are in active use and have very little idle capacity,” and that “any usable unoccupied bandwidth is nowhere near enough to replace the hundreds of transponders on dozens of satellites that are used today for C-Band content delivery alone.”[[22]](#footnote-22) Among other things, the Commission’s Report to Congress should address the following:

* Would the existing Ku- and Ka-band systems have to be augmented to overcome inherently greater atmospheric losses such that they would provide equivalent reliability as replacements for C-band services?[[23]](#footnote-23)
* Is there, in fact, idle capacity in the Ku- and Ka-bands?
* Is any such idle capacity sufficient to meet the video distribution needs currently being provided by the C-Band?
* How is that capacity projected to change over time and will it be adequate to meet future video distribution needs?

*Relocation Costs:* Beyond these questions about the availability and adequacy of alternative spectrum, the Report to Congress should examine the costs associated with moving existing C-Band operations to other bands. The Commission should seek detailed information on the following:

* What would the costs be for a cable operator or other MVPD to move headends to a new location to receive satellite signals from non-C-Band sources? What would be the costs to broadcasters? Who would bear those costs?
* Would new earth stations have to be installed or modified to receive such signals, and at what cost? Would there be adequate space at headends to accommodate these new facilities?
* What technically‑trained crews would be required perform these installations or modifications, and are there sufficient resources to conduct this work for all impacted existing users?
* What additional costs would be incurred from abandoning existing C-Band operations, and who would bear those costs?

Any cost-benefit analysis on relocation proposals as part of the Report to Congress should account for these and other costs.

## **Fiber Proposals**

Some also have suggested replacing existing C-band operations with fiber delivery. The Commission’s Report to Congress should address a number of issues related to such an approach, including the efficiency costs of moving from a point-to-multipoint model to a point‑to‑point model.

*New Fiber Deployments:* To make up for lost C-Band access, new fiber would have to be deployed, particularly in rural and other hard-to-reach areas with little or no fiber today. Moreover, to recreate C-Band-like redundancy and reliability, companies would have to undertake the expense of running not just one but at least two separate fiber links, each taking different routes, to any headend. In light of the forgoing, to the extent the Commission considers replacing existing C-Band operations with fiber delivery, the Commission’s Report to Congress should address the following questions, including:

* What costs would be associated with deploying fiber to areas currently served by the C-Band, and how do those costs vary by geography or topography? Who would bear such costs?
* How would those costs increase to add redundancy and backup capabilities to address potential loss of service on an operator’s primary fiber line?
* How do these costs compare to the costs of installing earth stations and paying for satellite delivery of video to headends?

*Fiber Backups:* Many companies that already use fiber nonetheless rely on C‑Band as a backup for situations in which fiber is cut or damaged, including during natural disasters.[[24]](#footnote-24) For example, conditions on the ground or interference concerns often require programmers to switch to backup satellites or frequencies to maintain continuity of service during natural disasters.[[25]](#footnote-25) Furthermore, as discussed above, programmers also rely on the C-Band for itinerant uses, such as reporting of live and breaking news from locations that are not known in advance. These considerations raise a number of questions that the Report to Congress should address:

* Can fiber provide adequate redundancy, particularly during national emergencies, natural disasters, or severe weather events?
* Would fiber backup require handoffs from multiple fiber network vendors and how would such handoffs affect service quality and reliability issues?
* How does the expense of fiber backup compare to existing C-Band?
* Can fiber replace the C-Band for itinerant uses and, if so, at what cost, and who would bear those costs?

# **CONCLUSION**

C-Band spectrum has played an integral role in the evolution of the video industry over the last four decades, and remains critically important to the transmission, reception, and distribution of high-value, high-quality video to hundreds of millions of Americans. To fulfill Congress’s charge to address the feasibility of any potential changes to the existing C-band framework without negatively impacting existing C-Band users and consumers, Comcast urges the Commission to develop a full record that analyzes the critical interference, cost, reliability, redundancy, and other issues and questions highlighted herein, and carefully evaluate potential sharing approaches as informed by this record. Without a full record addressing these serious issues, the Commission will be unable to make an informed judgment about whether the claimed benefits of any spectrum sharing or other proposed approach outweigh the potentially significant costs to the video industry and, ultimately, consumers of video services.

Respectfully submitted,

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1. *Office of Engineering and Technology, International, and Wireless Telecommunications Bureau Seek Comment for Report on the Feasibility of Allowing Commercial Wireless Services, Licensed or Unlicensed, to Use or Share Use of the Frequencies Between 3.7-4.2 GHz*, Public Notice, GN Dkt. No. 18-122, DA 18-446 (May 1, 2018) (“*Notice*”). [↑](#footnote-ref-1)
2. *See* Consolidated Appropriations Act, 2018, Pub. L. No. 115-141, § 605(b)-(c), 132 Stat. 348, 1100 (2018). [↑](#footnote-ref-2)
3. For historical reasons, NBC uses Ku-band satellites as the primary means of distributing NBC Network programming to affiliates, but it also relies on C-Band satellites on a 24/7 basis, due to its greater reliability, for redundancy to ensure reception of the network programming. [↑](#footnote-ref-3)
4. Fact Sheet, Comcast Technology Solutions, *HITS: Optimize Bandwidth and Maximize Your Investments*, *available at* https://www.comcasttechnologysolutions.com/sites/default/files/2017-01/HITS%20One%20Sheet.pdf (last visited May 25, 2018). [↑](#footnote-ref-4)
5. *See Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations*, Notice of Inquiry and Proposed Rulemaking, 88 F.C.C.2d 318 ¶¶ 1-2 (1981). [↑](#footnote-ref-5)
6. Some of the earliest technical requirements were established in the early 1970s, *see, e.g.,* *Establishment of Domestic Communication-Satellite Facilities by Nongovernmental Entities*, Report and Order, 18 R.R.2d 1631 (1970), and modified as the satellite industry grew over the subsequent decades. *See,* *e.g.*, *Satellite Orbital* Spacing, Report and Order, 54 R.R.2d 577 (1983) (establishing two degree orbital separation in the C-Band); *Amendment of Part 25 of the Commission’s Rules and Regulations to Reduce Alien Carrier Interference Between Fixed-Satellites at Reduced Orbital Spacings and to Revise Application Processing Procedures for Satellite Communication Services*, Second Report and Order and Further Notice of Proposed Rulemaking, 8 FCC Rcd. 1316 (1993) (“*1993 Part 25 Order*”) (amending technical requirements for C-Band services)**.** [↑](#footnote-ref-6)
7. Int’l Telecomm. Union, *Sharing studies between International Mobile Telecommunication-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3.400-4 200 MHz and 4 500-4 800 MHz frequency bands in the WRC study cycle leading to WRC-15*, Report ITU-R S.2368-0, at 5 (June 2015), *available at* https://www.itu.int/dms\_pub/itu-r/opb/rep/R-REP-S.2368-2015-PDF-E.pdf; *see also* SES Americom, Inc. (“SES”) Comments, GN Dkt. No. 17-183, at 3 (Oct. 2, 2017) (“SES Comments”) (“Only C-Band satellite frequencies are capable of providing the high availability levels that video distribution customers demand. Rain fade can materially affect satellite operations in higher frequency bands. Viewers, however, expect to receive the same picture quality whatever the weather outside.”). [↑](#footnote-ref-7)
8. *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd. 6373 ¶ 14 (2017). [↑](#footnote-ref-8)
9. *See Temporary Freeze on Applications for new or Modified Fixed Satellite Service Earth Stations and Fixed Microwave Stations in the 3.7-4.2 GHz Band; 90-Day Window to File Applications for Earth Stations Currently Operating in the 3.7-4.2 GHz Band*, Public Notice, GN Dkt. Nos. 17-183, 18-122, DA 18-398 (Apr. 18, 2018). [↑](#footnote-ref-9)
10. Satellite Industry Association (“SIA”) Reply Comments, GN Dkt. No. 17-183, at 10-11, 16, 23 (Nov. 15, 2017) (“SIA Reply Comments”). [↑](#footnote-ref-10)
11. ACA Comments, GN Dkt. No. 17-183, at 4 n.6 (Oct. 2, 2017) (“ACA Comments”). [↑](#footnote-ref-11)
12. *See* Consolidated Appropriations Act, 2018, Pub. L. No. 115-141, §§ 605(b)-(c), 132 Stat. 348, 1100. [↑](#footnote-ref-12)
13. *See* Letter from Karis A. Hastings, Counsel for SES Americom, Inc., to Marlene H. Dortch, Secretary, FCC, GN Dkt. No. 17-183, at 4-5 (Feb. 9, 2018); *see also* CTIA Comments, GN Dkt. No. 17-183, at 12-15 (Oct. 2, 2017) (“CTIA Comments”); Qualcomm Comments, GN Dkt. No. 17-183, at 4-6 (Oct. 2, 2017); Verizon Comments, GN Dkt. No. 17-183, at 17-19 (Oct. 2, 2017) (“Verizon Comments”). [↑](#footnote-ref-13)
14. *Notice* at 2. [↑](#footnote-ref-14)
15. *See* CTIA Comments at 12; Reply Comments of NCTA – The Internet & Television Ass’n (“NCTA”), GN Dkt. No. 17-183, at 6 (Nov. 15, 2017) (“NCTA Reply Comments”). [↑](#footnote-ref-15)
16. SES Comments, GN Dkt. No. 17-183, at 4 (Oct. 2, 2017); *see also FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service That Share Terrestrial Spectrum*, Noticed of Proposed Rulemaking, 15 FCC Rcd. 23127 ¶ 40 (2000) (noting that the full-band, full-arc licensing model “provid[es] earth station licensees the needed flexibility to change transponders or satellites on short notice . . . to meet changing operational requirements” and “provides all earth station operators the ability to conform to the constraints placed on satellite operators and the flexibility to change channels to access available transponder capacity within a satellite network and available capacity on other networks”). [↑](#footnote-ref-16)
17. SES Comments at 4. [↑](#footnote-ref-17)
18. Nat’l Ass’n of Broad. (“NAB”) Comments, GN Dkt. No. 17-183, at 5 (Oct. 2, 2017). For example, “sun outages” can render signals temporarily unavailable, requiring access to alternative C-band satellite sources. *Id.* [↑](#footnote-ref-18)
19. *See* NCTA Reply Comments at 5. [↑](#footnote-ref-19)
20. *See* North American Broad. Ass’n Comments, GN Dkt. No. 17-183, at 5 (Sept. 9, 2017). The Ku-band is sometimes also used for satellite news gathering, but that band’s susceptibility to rain fade has made the more reliable C-Band the preferred transmission method for special events coverage. *See* Content Companies Comments, GN Dkt. No. 17-183, at 4 n.7 (Oct. 2, 2017) (“Content Companies Comments”). [↑](#footnote-ref-20)
21. *See*, *e.g.*, CTIA Comments at 10-11; Ericsson Comments, GN Dkt. No. 17-183, at 7-8 (Oct. 2, 2017); Verizon Comments at 17-18. [↑](#footnote-ref-21)
22. SIA Reply Comments at 20; *see also* SES Reply Comments, GN Dkt. No. 17-183,at 13 (Nov. 15, 2017) (“SES Reply Comments”) (“[O]perating satellites equipped with Ku- and Ka-band frequencies were built and launched in response to demand for space segment in that spectrum and are actively used by customers providing a wide range of services, including commercial VSAT networks, aeronautical services, and consumer and enterprise broadband connectivity. Any unused capacity on Ku- and Ka-band spacecraft with U.S. coverage is nowhere near enough to replace the hundreds of C-Band transponders that currently serve the U.S.”); ACA Comments at 16 n.30 (“ACA understands that all Ku-band transponders are full, with demand exceeding supply.”). [↑](#footnote-ref-22)
23. “Among available satellite bands, C-Band is particularly prized for cable and IP video transmission, since signal quality and uptime are critical issues,” and the fact that “[w]eather impacts, such as fog, particulates and rain, cause signal fade in the Ku-Band, and make the C-Band a better choice for these types of applications.” AT&T Comments, GN Dkt. No. 17-183, at 7 (Oct. 2, 2017). Some have suggested that the use of adaptive coding and modulation or high throughput satellites would allow C-Band operations to overcome atmospheric interference issues and facilitate a shift of C-Band activity into other frequency bands. The Commission needs to investigate these claims in light of comments by the satellite industry that these solutions are not workable for the video delivery services that use the C-Band. *See* SIA Reply Comments at 21-22; SES Reply Comments at 13-14. [↑](#footnote-ref-23)
24. The Commission has underscored the importance of service redundancy and reliability in prior C-Band-related orders. *See 1993 Part 25 Order* ¶ 11 n.20 (observing, in connection with a requirement that C-Band satellites be “capable of switching polarization sense upon ground command,” that “[t]he probability of failure of the polarization switch will be no greater than any other satellite mechanical component,” and “[a]s with any other component, the probability can be reduced with redundancy”); *cf. Amendment of the Commission’s Rules with Regard to Commercial Operation in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd. 3959 ¶ 292 (2015) (noting that “FSS providers value the C-Band because its propagation characteristics allow for greater service reliability compared to other bands, especially in adverse weather conditions”). More generally, the Commission has long considered redundancy and path diversity as important factors in the licensing of satellite-based communications services. *See* *Policy to Be Followed in Future Licensing of Facilities for Overseas Commc’ns.*, Statement of Policy and Guidelines, 30 F.C.C.2d 571, 572 ¶ 7 (1971) (adopting policies for licensing of overseas communications by satellite and submarine cable based on four criteria, including “that we authorize the most modern and effective facilities available via both cable and satellite technology with due regard for efficiency, economy, diversity and redundancy”); *Policy to Be Followed in Future Licensing of Facilities for Overseas Commc'ns*, Report, Order and Third Statement of Policy and Guidelines, 67 F.C.C.2d 358, 363 ¶ 13 (1977) (adopting plan for additional satellite capacity rather than submarine cable capacity based, in part, on finding that “continued reliance must be placed on the speed of restoration using redundant capacity in alternative facilities and network management techniques together with reasonable diversity to minimize the adverse effects of a major facility outage”). [↑](#footnote-ref-24)
25. *See* Content Companies Comments at 3. [↑](#footnote-ref-25)