



October 31, 2022

The Honorable Alan Davidson  
Assistant Secretary of Commerce for Communications and Information  
National Telecommunications and Information Administration  
1401 Constitution Avenue NW  
Washington, DC 20230

Dear Assistant Secretary Davidson:

The Fiber Broadband Association (“FBA”) and NTCA – The Rural Broadband Association (“NTCA”) applaud the National Telecommunications and Information Administration (“NTIA”) for adopting a “fiber first” approach for the Broadband Equity, Access, and Deployment (“BEAD”) program. Consistent with the priority set forth by Congress in the law that created BEAD, we believe the program provides the best possible chance to bring robust, reliable all-fiber broadband service to the many millions of unserved and underserved locations throughout the country. That said, we understand that NTIA may be considering permitting States and Territories to award grants to applicants using other, less capable transmission technologies where the costs to deploy networks can be extremely high. While NTIA may believe there may be select instances where fiber deployment costs could be excessive, these should be viewed as the rare exceptions to the overall approach. If we as a nation could deploy an electric wire to a location decades ago, there is no reason we cannot deploy fiber to that same location today.

Regardless, even where an alternative technology may be considered, States and Territories should ensure that applications using such alternative technologies can actually perform as proposed. With millions of consumers and billions of dollars at stake, this is no time for placing bets on technologies that are not already widely available or are promising substantial leaps in performance based upon little more than vendor marketing collateral, test cases, or targeted deployments. If bad bets are placed on technological speculation or marketing hype, consumers at unserved and underserved locations will be “disserved.” To that end, in early 2021, FBA and NTCA commissioned Cartesian, a business consulting firm, to conduct an engineering analysis of the Starlink low-earth orbiting system’s potential to meet its proposed Rural Digital Opportunity Fund (“RDOF”) public interest obligations.<sup>1</sup> We recognize that SpaceX has since made certain adjustments to its deployment

---

<sup>1</sup> The analysis was no small task at that time given that: (a) SpaceX had provided limited information about its network and the performance capabilities; (b) SpaceX kept changing its network and the performance capabilities; and (c) actions by the Federal Communications Commission (the “FCC”) in pending and future proceedings were likely to cause Starlink’s plans to change.

strategies and efforts, and further that the FCC has since determined that SpaceX did not demonstrate that the provider should in fact receive funding for its Starlink service despite the initial award. Nonetheless, we believe the analysis performed by Cartesian remains instructive as to how SpaceX's capabilities should be evaluated and also highlights what kinds of potential constraints must be assessed going forward.

Based upon information that was publicly available in early 2021, Cartesian developed a model, which we attach, that illustrated the following, based on assumptions that accepted the timing and performance of Starlink's network as set forth in its public announcements:<sup>2</sup>

**If Starlink Served Only RDOF Locations, It Would Fail to Meet the RDOF Public Interest Requirements on a Nationwide Basis** – If Starlink were to engineer its network to serve only the requisite number of RDOF locations and then serve no other locations (*i.e.*, the network were engineered to serve 70% of 642,925 locations), Cartesian estimated that 56% of Starlink's RDOF locations in the low capacity case (average bandwidth usage of 15.3 Mbps per location) and 57% of locations in the high capacity case (average bandwidth usage of 20.8 Mbps per customer)<sup>3</sup> would experience service degradation during peak times and not meet the RDOF public interest requirements; further, Cartesian estimated that 25–29% of locations would receive an average of less than 10 Mbps of bandwidth during peak times.

---

<sup>2</sup> The base case of the model assumed Starlink is able to meet its goal of 12,000 satellites before the mandated RDOF completion date and that Starlink will optimize its satellite coverage by both prioritizing uplinks from ground stations to satellites to which few other users can connect and allocating capacity to attempt to satisfy RDOF requirements in all areas before distributing surplus capacity. The model also assumed all subscribers within range of a satellite can connect to that satellite, but it does not account for terrain and other serviceability considerations, which may limit performance. The model set throughput capacity of a single satellite at 20 Gbps per previous Starlink public statements (although other filings imply that the maximum capacity could be only 10 Gbps), and it assumed that all SpaceX satellites will be authorized to use its full licensed spectrum at all altitudes (although it is possible SpaceX may not gain approval for a certain portion of its satellites to be at a low enough altitude to support our assumed 500-km coverage radius).

The base case is consistent with the information provided in Starlink's February 3, 2021 FCC filing. See Petition of Starlink Services, LLC for Designation as an Eligible Telecommunications Carrier, WC Docket No. 09-197 (Feb. 3, 2021) ("Starlink ETC Petition").

<sup>3</sup> Cartesian used two scenarios for anticipated growth in average peak demand per subscriber based on Openvault, Cisco, and Cartesian estimates: a conservative low case with a 20% CAGR; and a high case using Cisco's 30% CAGR, reducing this by 1.5% points each year. The model adds 25% headroom to accommodate spikes in demand. By 2030, the capacity required is 22.0 – 28.6 Mbps per subscriber. SpaceX's 6-year build period is likely to be concluded by 2028; Cartesian estimates that capacity required in 2028 to be between 15.3 and 20.8 Mbps. This average peak demand accounts for users not online in the busy hour.

**If Starlink Served Only RDOF Locations, It Would Fail by a Substantial Degree to Meet the RDOF Public Interest Requirements in the Eastern Region, but Could Meet the Requirements in the Mountain and Midwest Regions** – If Starlink were to engineer its network to serve only the requisite number of RDOF locations and then serve no other locations, Cartesian estimated that it would not meet the RDOF public interest requirements during peak demand in over half of locations, concentrated in the Eastern region, which is where the density of its RDOF locations is the greatest. By contrast, in the Mountain and Midwest regions, if Starlink devoted all of its capacity only to RDOF Locations and served no other customers, Cartesian estimated that Starlink would meet its public interest obligations for those locations due to the low population density and the higher satellite density in northern latitudes.

**If Starlink Served Both RDOF Locations and a Reasonable Number of Non-RDOF Rural Locations,<sup>4</sup> the Shortfall in the Eastern Region Would Increase Materially, and Congestion Would Occur for Locations in the Mountain and Midwest Regions** -- If Starlink also were to serve non-RDOF locations in relatively rural areas, Cartesian estimated that the shortfall in the Eastern region increases materially with just an uptake of 10% of the locations in these areas (high capacity case). In the Mountain and Midwest regions, Cartesian estimated that congestion at peak usage begins to increase at a 10% uptake and increases materially at 20% uptake (high capacity case).

**If Starlink Served Both RDOF Locations and Allocated 50% of its Capacity to Non-RDOF Locations,<sup>5</sup> Congestion at RDOF Locations Would Increase Dramatically** -- Cartesian did not model other kinds of potential customers for Starlink beyond those noted above. From Starlink’s public announcements, however, it appears that the company is providing service for US defense applications and various industries (*e.g.*, oil and gas exploration) and we know since early 2021 that the service is being offered in other venues and to other customers as well. In the scenario where it is generally assumed that only 50% of average satellite capacity is allocated to RDOF locations, Cartesian estimated that only 5-8% of those RDOF locations would receive sufficient bandwidth allocation during peak hours.

**Because of Starlink’s Unique Network Configuration and Operations, Oversight of Starlink’s Compliance with Deployment and Network Performance Requirements Presents Unique Challenges** – Starlink’s satellites are equipped with multiple phased array antennae, which allow the fleet to dynamically allocate satellite capacity as needed. For example, capacity can be steered towards areas of greatest demand and may be reassigned temporarily. Moreover,

---

<sup>4</sup> These are “rural” locations (generously defined as having fewer than 500 people per square mile) that have access to broadband service at download speeds between 25-50 Mbps.

<sup>5</sup> See Starlink ETC Petition at 4 (“Over 10,000 users in the United States and abroad are using the service today.”).

capacity may be reconfigured on a more permanent basis. As a result of these factors, any agency providing funding to support such deployment would need to closely examine Starlink’s performance to ensure that the requisite deployment is achieved despite not aligning with geopolitical boundaries and high expected oversubscription. In addition, a performance testing regime such as that developed by the FCC – which has been constructed largely based upon the notion of testing a fixed amount of capacity deployed and devoted to a fixed location – would need adjustment to account for the dynamic nature of the Starlink network, i.e. testing a small sample may be inadequate to reveal capacity constraints (and service degradation) elsewhere on the network.

As you know, on August 10, 2022, the FCC’s Wireline Competition Bureau rejected Starlink’s RDOF long-form application because it did not believe the system was capable of carrying out its public interest obligations. The FBA and NTCA find much to admire in the Starlink network. It is a great feat of engineering, especially in providing broadband connectivity in the most remote areas. But, its limitations also are apparent – and the goals and priorities of BEAD are to connect consumers in a reliable manner that will have lasting impact. Before BEAD program funds are used to award grants any alternative technology, we urge caution and careful analysis. Unserved consumers have waited too long for robust, reliable broadband service to be left out of the BEAD program’s priorities and thus miss out on the BEAD program’s opportunities.

\* \* \*

Respectfully,



Shirley Bloomfield  
CEO  
NTCA–The Rural Broadband Association  
4121 Wilson Boulevard, Suite 1000  
Arlington, VA 22203  
(703) 351-2030



Gary Bolton  
President and CEO  
Fiber Broadband Association  
2001 K Street NW, 3rd Floor North  
Washington, DC 20006  
(202) 524-9550