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BEAD Needs All Technologies to Succeed

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The administration should reform BEAD to stop favoring overly expensive fiber when LEO satellites could do the same job for less. Taking a technology-neutral approach to broadband deployment would save money that could be better spent on other causes of the digital divide.

KEY TAKEAWAYS

- The Broadband Equity, Access, and Deployment (BEAD) program is financially imperiled by a preference for deployment projects using fiber-optic cables.
- Other technologies, such as low Earth orbit (LEO) satellite broadband, are far more cost-effective options to connect unserved rural locations.
- While LEO satellites may have lacked the capability and scale to provide comprehensive coverage when BEAD was first established, the ecosystem has rapidly advanced in recent years.
- Money saved by using cost-effective technologies for deployment could be reallocated to programs addressing more prescient issues such as affordability.
- Lawmakers should leverage all available resources to expand the focus of U.S. broadband policy beyond just deployment to all causes of the digital divide.

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INTRODUCTION

The $42.45 billion Broadband Equity, Access, and Deployment (BEAD) program faces serious hurdles in its goal to "make sure that every American has access to reliable, affordable, high-speed Internet."[1] For one, traditional broadband is capital intensive, requiring large initial investments to deploy infrastructure.[2] Federal programs have repeatedly attempted piecemeal subsidies to get broadband deployment over the hump of high up-front deployment costs, but these efforts have often ended up being duplicative and unsuccessful.[3] The theory behind BEAD was that it would resolve this issue through a massive one-time lump-sum expenditure to deploy broadband infrastructure to every American.[4]

However, we are now three years removed from when BEAD legislation was passed, and it has become clear that technological advancements have outrun the program's regulatory guidelines. The main issue is that BEAD is not technology neutral. The National Telecommunications and Information Administration (NTIA) has designed the program to give it a strong preference for using expensive fiber-optic cables. The result is that the money funds more expensive infrastructure than is needed, which will ultimately limit BEAD's impact in bridging the digital divide. The lack of technology neutrality has been a shortcoming of NTIA's approach from the beginning.[5] But technological developments since BEAD's inception now make the current approach even more harmful to the ultimate goal of closing the digital divide.

These technological developments are the critical piece of the puzzle for ensuring that BEAD funds are spent most efficiently. Fixed wireless broadband (FWA), such as in-home 5G, has become a larger portion of the broadband ecosystem in recent years.[6] At the same time, low Earth orbit (LEO) satellite broadband service has made great progress in performance and scale. States could save tens of millions of dollars on their deployment efforts if BEAD could better incorporate cheaper yet still high-performing technologies such as FWA and satellite service. Those savings could then be used to address the other principal causes of the digital divide, including affordability for low-income households and digital literacy.[7]

The incoming administration has the opportunity to adjust BEAD to better include alternative technologies for lowering deployment costs.

A BRIEF OVERVIEW OF BEAD

The central first step in the BEAD program is universal broadband deployment. BEAD provides money to all 50 states, Washington D.C., and 5 U.S. territories.[8] These states, in turn, choose Internet service providers (ISPs) to take on deployment projects.[9] BEAD is supposed to prioritize getting broadband to every unserved location, identified by a back-and-forth process of government-produced deployment maps followed by challenges to those maps to correct over- or underestimates of deployment.[10] After a state completes universal deployment, it can use excess funds for nondeployment activities, such as affordability or digital inclusion programs.[11] The new NTIA under President Trump should require states to take the most cost-effective approach to deployment so that they can have funds remaining for nondeployment activities

By statute, BEAD funding should be allocated in a technology-neutral way.[12] States shouldn't give advantages or disadvantages to any particular broadband medium (e.g., fiber-optic cable, fixed-wireless access, or LEO satellite) when selecting bidders to deploy. Nevertheless, NTIA has

created a strong preference for end-to-end fiber networks, even if the high cost of such networks exhausts a state's funding before it reaches universal deployment, much less addresses other causes of the digital divide. Thus, the lack of tech neutrality is a major problem for hopes that BEAD will close the digital divide. Luckily, more economical technologies are available and growing in capabilities.

A BRIEF OVERVIEW OF SATELLITE BROADBAND

Satellite Internet works by having a "constellation" of thousands of satellites in the sky that can send and receive data between themselves and a terminal set up at a customer's residence. The terminal fills a similar role to a modem and router in a wireline Internet connection. As long as the terminal is plugged into an electrical outlet and has an unobstructed view of the sky, customers can access high-speed Internet just like with fiber or FWA. The only difference is that, instead of the infrastructure on or in the ground, the key component is radio waves that go to and from satellites floating just a few hundred miles overhead in orbit around the Earth.[13] While the extremely high altitude, over 22,000 miles, of older broadband satellites gave them a reputation for slow and laggy service, today's LEO constellations operate around just 300 miles in the air, which enables a comparable user experience to terrestrial broadband technologies.

Satellite broadband is an effective and affordable option for Americans who have yet to be connected through terrestrial technologies.

The current largest constellation is Starlink. Amazon also has plans to launch a constellation called Project Kuiper this year.[14] As the constellations grow, the larger number of satellites will lead to greater service capabilities since having more satellites increases the amount of data available to each user.[15] As shown ahead, the evolution is already underway at a rapid pace, making LEOs an effective and affordable option for Americans who have yet to get connected by terrestrial technologies.

COMPARING BROADBAND SERVICE OPTIONS

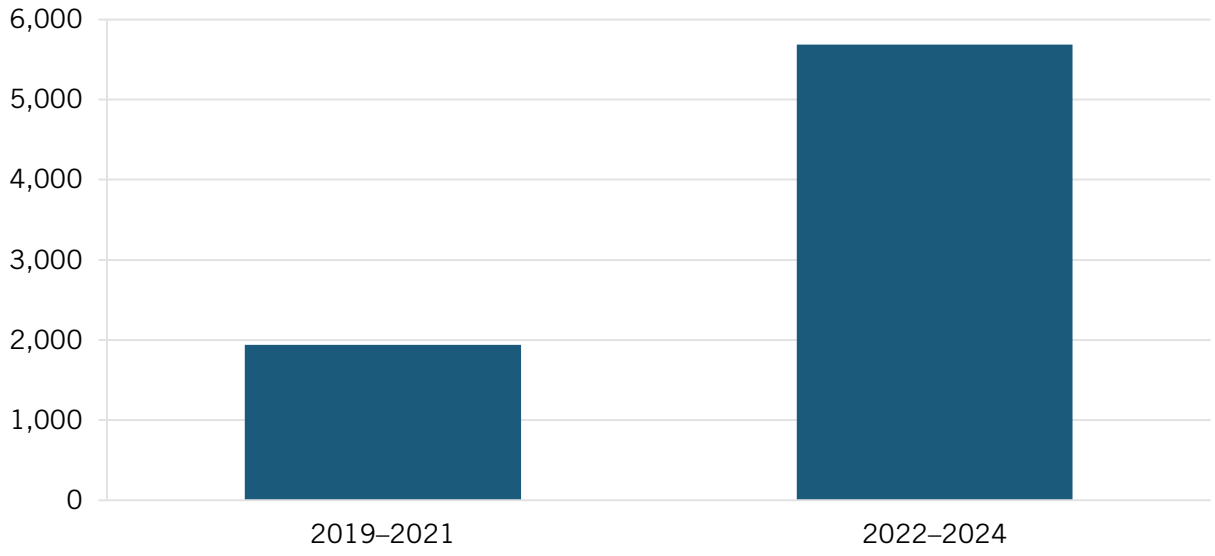
Performance Metrics

Both the Federal Communications Commission (FCC) and the BEAD program consider the benchmark for high-speed broadband to be 100 megabits per second (Mbps) download and 20 Mbps upload (100/20 Mbps).[16] Starlink can already provide the required service speed and latency in most of the United States.[17] Project Kuiper expects to roll out service of comparable or better speeds later this year.[18] Moreover, as LEO constellations continue to grow, their service capabilities will increase. More satellites comprising the entire network means a larger overall capacity and, therefore, more throughput per user. BEAD's guidelines require ISPs to begin providing service within four years of their subgrantee application being approved.[19] Given the current rate of growth for satellite constellations, providers should have no problem hitting that milestone and will likely be able to start providing service before fiber initiatives that have to organize and carry out substantial construction projects before consumers can use their networks.

This technological environment is significantly different from when BEAD was enacted. Looking just at the number of Starlink satellite launches in recent years paints the picture of satellite

broadband's evolution. Figure 1 shows that before BEAD was first created, there were less than 2,000 Starlink satellites put into orbit, and since then, the number has more than doubled.[20] In November 2024, there were 6,714 active Starlink satellites in orbit, with plans for thousands more to be launched.[21]

Figure 1: Starlink satellite launches before and after BEAD was established



Satellites are more than capable of providing the required capacity for broadband service.

It is worth noting that while LEOs can now hit BEAD's required performance metrics, some fiber proponents will respond that fiber can provide even faster service, such as gigabit speeds. While technically true, the high throughput of fiber is no reason to prioritize it at extreme cost. The vast majority of broadband use doesn't require anywhere near gigabit speed. Take, for example, the required speed for high-bandwidth activities that customers might engage in. For a quality Zoom conference call, one only needs download speeds of around 2 to 5 Mbps.[22] Even full-HD, 60-frames-per-second Twitch streaming requires less than 10 Mbps.[23] So unless a family of 10 is hosting a virtual family reunion on their own individual devices all in the same house or is frequently having three or more people live streaming on Twitch at the same time, satellites are more than capable of providing the required capacity for broadband service.

Deployment and Service Costs

In addition to having the performance capabilities required for BEAD, satellite broadband will often have far more reasonable deployment costs.[24] Some early BEAD awards propose spending tens of thousands of dollars for each location served with fiber.[25] FWA deployments, on the other hand, are typically around $1,000 per subscriber.[26] The highest price of a Starlink terminal is $600 (prices vary by location), making it by far the cheapest option for deployment.[27] The costs of wireless options are also less dependent on topography. For LEO terminals, in particular, it does not matter how rugged or remote the terrain is as long as there is a view of the sky. Fiber, on the other hand, must incur the cost of traversing that terrain, sometimes even tunneling through or going over mountains to reach remote households.

When it comes to the monthly cost of Internet service in remote areas, all technologies can be expensive, but policymakers should consider their costs on a level playing field. For example, many rural ISPs operating with wireline technologies receive federal subsidies for their operating expenses, through the Universal Service Fund's High-Cost program for example, which help keep consumer prices down. But if those subsidies were removed for everyone (or given to LEOs as well), LEOs would actually be cheaper.

A recent survey finds that traditional technologies would cost current rural consumers $165 per month without ongoing OpEx subsidies. LEO service, which does not receive those subsidies, is currently priced at or below $120 per month.[28] Far from being an overly expensive option, the monthly charge for LEO service is, in real terms, cheaper than traditional technologies today. We expect LEO prices to fall even further as their capacity increases. Perhaps these prices are still unaffordable for certain households, but, as explained ahead, spending less on deployment also enables better affordability policy.

In short, LEO satellites are often the most economical way to get high-speed broadband to rural areas, even when accounting for monthly service charges. With the LEO option on the table, there is no reason to press forward with far more expensive fiber projects.

LESS MONEY TOWARD DEPLOYMENT MEANS MORE FOR AFFORDABILITY

A smaller price tag to finish the job on broadband deployment is not just about reducing unnecessary federal spending. Closing the digital divide requires more than just universal access to infrastructure. Indeed, lack of access to broadband has accounted for only a tiny portion of the digital divide for years (and none of it when satellites are included). NTIA data shows that a lack of need or interest in the Internet and affordability account for almost all of the digital divide.[29] Therefore, addressing these problems should be the core of federal broadband policy. Every dollar spent on redundant or overly expensive deployment is not addressing the digital divide.

States should aim to spend as little as possible on deployment precisely so they can move on to nondeployment activities.[30] Such activities could include programs that identify households for which broadband is available but not affordable. Affordability is a significant remaining cause of the digital divide that should be focused on independently of deployment. A targeted voucher program would address real barriers to closing the digital divide in a way that spending the same money on fiber instead of LEO deployment would not. Likewise, states could leverage their local knowledge to craft digital literacy programs that might cut into the proportion of the digital divide driven by an inability to realize the benefits of connectivity.

NTIA data shows that a lack of need or interest in the Internet and affordability are the leading causes of the digital divide.

Alternatively, the federal government could reclaim unspent BEAD money and use it to fund effective national-level affordability programs, such as the one proposed by the Information Technology and Innovation Foundation (ITIF).[31] This program would be a renewed, targeted voucher program styled after the Affordable Connectivity Program, and it should be the central federal broadband funding priority.

Any affordability program should be flexible, allowing beneficiaries to use it to defray the monthly cost of whatever broadband service they want, regardless of the technology that delivers it. Revising the BEAD program to encourage using all available broadband technologies to connect every American would be an impactful first step toward shifting policy priorities from deployment to other prescient issues.

HOW TO ADJUST THE BEAD GUIDELINES

So far, we have seen that a technology-neutral approach to BEAD can complete universal broadband deployment far more quickly and cheaply than NTIA's current fiber preference can. And we have seen that spending less on deployment is essential to addressing the remaining causes of the digital divide, especially affordability. The next question is how to adjust BEAD to reflect these realities. There are a couple options: NTIA could take the lead by changing its alternative technology guidance, and states themselves could resolve the problem through their ISP selection process.

Alternative Technology Definition

The first approach to resolve the problems created by fiber preference is for NTIA to change BEAD's technology categorizations. The current guidelines define satellite Internet as an "alternative technology," which is put in a tertiary position for broadband options behind the "priority" fiber projects and "reliable" technologies, including cable and FWA.[32] NTIA took a step in the right direction by easing rules for states to choose LEO-based proposals, but this approach still privileges fiber until the costs per location exceeds a state-set threshold.[33] Removing the "priority" status of fiber and placing LEOs in the "reliable" tier would enable states to prioritize cost effectiveness for projects over arbitrary favoritism for a specific technology. Prioritizing less-costly deployment projects, regardless of the technology that is utilized, is critical to maximizing BEAD's ability to close the digital divide. States should be aiming to have leftover BEAD funds to address issues such as affordability, which will only be possible if LEOs and FWA are treated on level footing with fiber.

Changing the technology categorizations is indicative of the fact that universal LEO technology strains the traditional distinctions between "served" and "unserved." Since LEO technology could be deployed virtually anywhere in the United States today, there are no more unserved locations. However, for the purposes of BEAD, locations that could get LEO service but don't yet have a terminal should still be considered "unserved." This policy would treat the terminal as infrastructure in the same way fiber-optic cable would be. NTIA should simply clarify that, given the choice to serve a location for a few hundred dollars or many thousands of dollars, states should be agnostic about the technology and pick the cheapest option.

Extremely High Cost per Location Threshold

Alternatively, or in parallel, states and NTIA should leverage the Extremely High Cost per Location Threshold (EHCPLT) to create opportunities for satellite Internet in the most remote and difficult-to-reach locations. The EHCPLT is an amount set by each state, above which it may "decline to select a proposal" if an alternative technology would be less expensive.[34] Let's take Louisiana as an example since it was the first of just three states to release its final plan for public comment in 2024.[35] Louisiana's plan, if accomplished, would get every unserved Louisianian broadband access within the allotted funding amount.[36] This is no small feat, to be

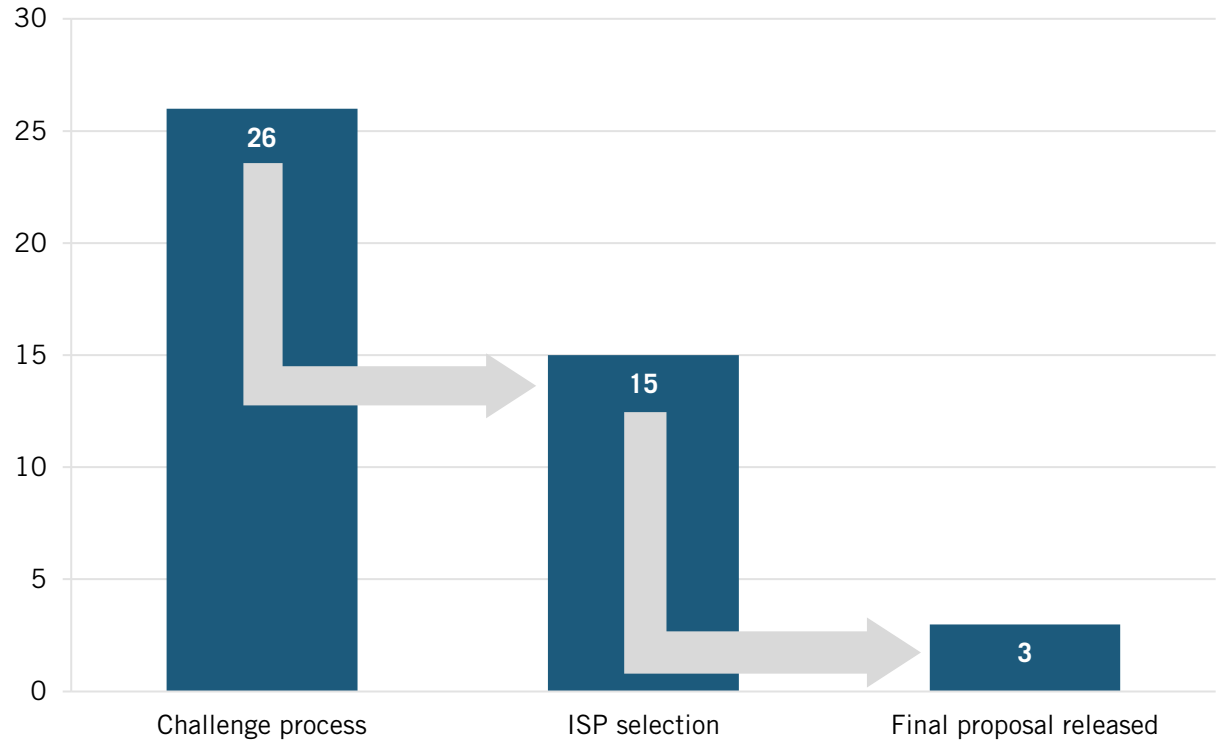
sure, but the key point here is that getting everyone connected is not the same as closing the digital divide. The state could get everyone connected for even less than it currently plans to and use excess funds to address affordability and digital inclusion.

Louisiana's draft final proposal set the EHCPLT at an astoundingly high $100,000—and 43 locations, just 4 percent of total broadband-serviceable locations (i.e., households) in the state, surpassed that cost.[37] The better use of the EHCPLT is to set it much lower—no more than $1,200—enough to cover the highest price of a Starlink terminal, and provide a $25 discount on service for two years. Setting $1,200 as the threshold recognizes the reality that LEO service is an option for every location. If the cost to serve a location with fiber is already twice the cost to serve it with satellite, spending more is an extremely high cost, and the state should choose a satellite option for that location. Louisiana's choice to pursue fiber, even if it costs up to $100,000 per location, is a poor one. Spending more than necessary on deployment shortchanges funding to address the main causes of the digital divide.

NTIA should approve no state plans that would allow the cost of serving a household to exceed $1,200. No state is too far along in the BEAD process to make changes that would set a more realistic EHCPLT to make their deployment plans more affordable.

There is still time to make these changes. Every state should adopt a $1,200 EHCPLT, including the three that have released their final proposals, as they could apply it as a hard cap to any future grants. Furthermore, NTIA shouldn't approve any state plans that would allow the cost of serving a household to exceed $1,200. No state is too far along in the BEAD process to make changes that set a more realistic EHCPLT to make their deployment plans more affordable.[38]

Figure 2: Number of states that have completed each stage of the BEAD program



CONCLUSION

The BEAD program can fully address the broadband deployment gap in America using a technology-neutral approach. This change would help states save BEAD money that could be put to other, more pressing causes of the digital divide, such as affordability. LEO satellite Internet has the capabilities and the scale required to connect every U.S. citizen across the country at a fraction of the cost of terrestrial technologies, in effect eliminating the deployment gap that has been the focus of BEAD to date This transformation is already under way. Policymakers and industry leaders are taking stock of the importance of tech neutrality for deployment and are considering the role that LEO satellites will play in connecting America.

Some states are already moving in the direction of satellite to rapidly serve their residents with high-quality broadband. The Maine Connectivity Authority, through its Working Internet ASAP program, is going to provide Starlink terminals to around 9,000 unserved residents.[39] New Mexico is working on securing funding to service 95,000 locations with Starlink and Project Kuiper.[40] These examples show that spending tens of thousands of dollars per location is not necessary in order to serve remote areas.

The preference for terrestrial technologies leads to exorbitant spending, even for a program as massive as BEAD, and some states have indicated that their allocated BEAD funds may not be enough to achieve the program's goals.[41] That is unconscionable given the unprecedented size of BEAD. The incoming administration has the opportunity to adjust BEAD to serve all Americans with broadband, regardless of the technology that delivers it—and, in turn, take more seriously the full slate of causes of the digital divide.

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