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Broadband Equity, Access, and Deployment in Nevada

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Abstract

The $45.45 billion Broadband, Equity, Access, and Deployment (BEAD) program's primary objective is to extend broadband service to all unserved and underserved locations in the U.S. and its territories. Several industry studies predict that the BEAD program can meet its goal of providing universal access to broadband service if eligible entities execute their grant programs well. My review of the BEAD program indicates that policy makers can enhance the likelihood of program success by designing competitive grant programs that give applicants the incentive to undercut the subsidies proposed by their rivals and provide applicants the flexibility to design networks that minimize the cost of delivering desired services. Eligible entities can encourage applicants to compete on the margins most important to them by providing clear statements about their objectives and detailed information about how reviewers will rank and score proposals. These steps will help reduce the cost of achieving desired outcomes and will free up resources for use in other programs, including broadband-adoption and digital-equity programs. Nevada is well positioned to take full advantage of the BEAD program. The Nevada Governor's Office of Science, Innovation, and Technology has worked diligently to close the state's digital divide by working with community partners to define the state's broadband priorities and by securing about $230 million in federal grants. These resources, coupled with the recently announced $416 million in BEAD funding and $37 million in proceeds from the Federal Communications Commission's rural broadband auctions, puts Nevada in the position to provide its residents universal access to high-speed broadband services in the next five years.

Introduction

The 2021 Infrastructure Investment Bill and American Jobs Act (IIJA) dedicated $65 billion to programs that will help close the digital divide. Closing the digital divide requires that all households have access to broadband service and that policy makers lower the barriers that impede vulnerable populations from adopting broadband services. The IIJA tackles both of these problems. The IIJA's Broadband, Equity, Access, and Deployment (BEAD) program will use its $42.45 billion budget to help ensure that every serviceable location in the U.S. and its territories has access to fast and reliable broadband service.[1] The $14.2 billion Affordable Connectivity Program (ACP) provides low-income households with discounts that lower the monthly cost of broadband services and subsidize computer purchases. The Digital Equity Act appropriates $2.75 billion to promote digital-inclusion efforts that address the inequities that impede vulnerable populations from adopting and effectively using broadband services.[2]

The IIJA's broadband provisions build on the Coronavirus Aid, Relief, and Economic Security Act (CARES Act), the American Rescue Plan Act (ARPA), and other legislation that, among other things, attempted to ensure that all households had access to reliable broadband services during the pandemic. The ARPA's Capital Projects Fund (CPF) provides resources that fund projects that enable "work, education, and health monitoring in response to the health emergency" (Tomer and George, 2021).[3] The IIJA and these emergency provisions supplement on-going efforts by the Federal Communications Commission (FCC), the Rural Utilities Service (RUS) of the United States Department of Agriculture (USDA), and the National Telecommunications and Information Administration (NTIA) to support broadband infrastructure and adoption.[4]

Several industry studies predict that the BEAD program can meet its goal of providing universal access to broadband service if eligible entities (i.e. State, Territorial, and Tribal governments) execute their grant programs well.[5] These analysts predict that the BEAD program does not have enough funds to provide end-to-end fiber services (i.e., fiber to the premises or FTTP) to every unserved and underserved location in the U.S., and policy makers will be forced to determine whether a particular location gains access to broadband networks using FTTP or some other technology.[6, 7] Data also show that many households in markets with physical access to broadband networks do not subscribe to fixed broadband services, and that about three times as many urban, compared to rural, households do not subscribe to fixed broadband services.[8] Closing the digital divide requires that policymakers extend broadband access to all unserved and underserved locations and that they implement effective digital-equity and affordability programs that lower the barriers to broadband adoption.

To help guide these decisions, this policy brief provides an overview of the economics of broadband expansion and its effect on productivity, economic growth, and the digital divide. It also presents the case for government subsidies and reviews the federal government's experiences managing broadband programs. My review of the BEAD program indicates that policy makers can enhance the likelihood of program success by designing competitive grant programs that give applicants the incentive to undercut the subsidies proposed by their rivals and provide applicants the flexibility to

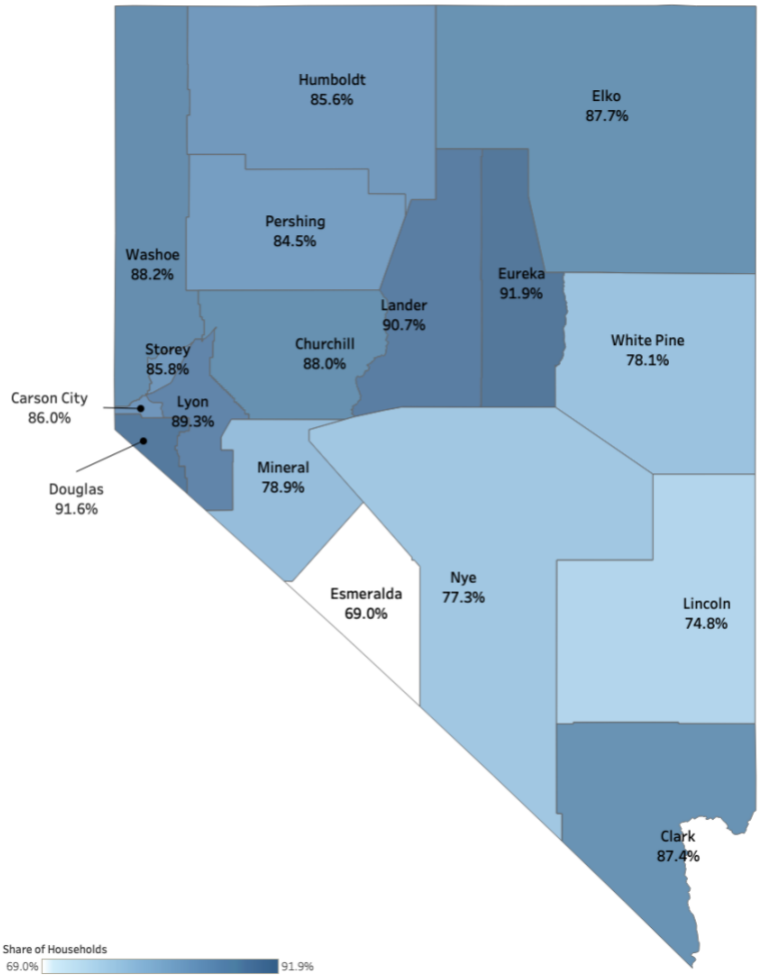
design networks that minimize the cost of delivering desired services. Eligible entities can encourage applicants to compete on the margins most important to them by providing clear statements about their objectives and detailed information about how reviewers will rank and score proposals. These steps will help reduce the cost of achieving desired outcomes and will free up resources for use in other programs, including broadband-adoption and digital-equity programs.[9] Well-run grant programs effectively evaluate the tradeoffs that must be made when policy makers face binding budget constraints.

The final section of the brief examines the state of broadband access and adoption in Nevada. The review indicates that the state is well positioned to take full advantage of the BEAD program. The Nevada Governor's Office of Science, Innovation and Technology (OSIT) has worked diligently with community leaders, local broadband providers, and other interested parties to develop a thoughtful broadband plan that uses funds from multiple sources to address the inequities in broadband access in Nevada's rural communities and among its vulnerable populations.[10] In total, I estimate that over $675 million in federal funds have been allocated to Nevada to help it meet its broadband goals.[11]

The Economics of Broadband and Broadband Subsidies

The Covid-19 pandemic compelled many businesses, public services, and schools to move to online environments to mitigate the spread of the virus. It also changed the trade-offs around tele-medicine, remote learning, online shopping, and online access to government services for many households, and increased the demands of marginal adopters (Mendez et al., 2021).[12] This dramatic shift in society's reliance on broadband services exacerbated the effects of discrepancies in the access and adoption of broadband services on the ability of household members to work, attend classes, receive medical treatment, access government services, and participate in everyday activities. Figure 1 maps broadband adoption rates in Nevada's counties. Consistent with national patterns, these data suggest lower adoption rates in more rural counties.

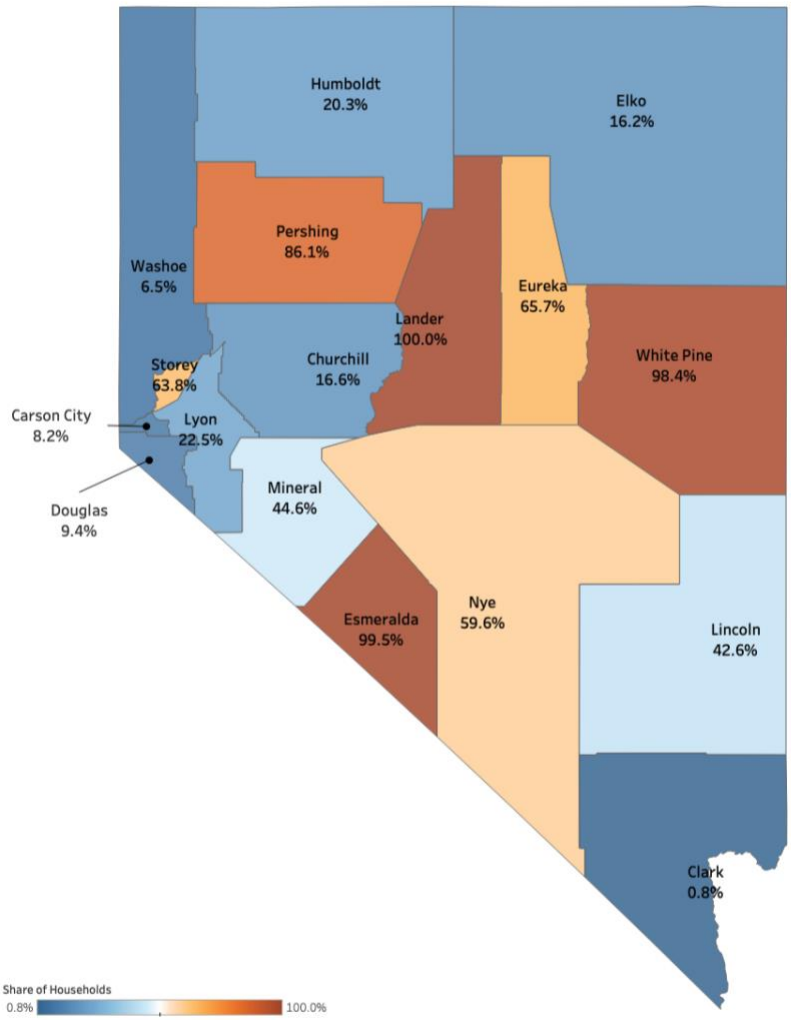
Figure 1: Broadband Adoption Rates by County, 2021



Source: 2021 American Community Survey 5-Year Estimates Subject Tables (S2801).
Notes: Values are share of households that connect to the Internet using Fiber, Cable, Copper (DSL), a Smartphone, or a Satellite.

The Digital Divide. The digital divide refers to the gap between those Americans who have access to information communication technologies and those who do not. In the case of broadband, households located in rural areas and Tribal communities may lack physical access to broadband networks because high average costs and small customer bases make the provision of wireline-based access (e.g., fiber, coaxial cable, and copper wires) unprofitable. de Sa (2015) notes that the highest-cost locations account for a disproportionate share of the cost required to deploy FTTP to the nation's remaining unserved locations.[13] Deployment costs rise steeply for the 1.3 million highest-cost locations and increase dramatically for the last 650,000 locations (Conlow, 2023).[14] The FCC estimates that about 8.3 million of the nation's 114 million broadband serviceable locations (7.28 percent) do not currently have physical access to a NTIA-defined reliable broadband service (Rosenworcel, 2023).[15] Figure 2 maps the share of unserved households in Nevada's counties.

Figure 2: Share of Unserved Households by County, 2021

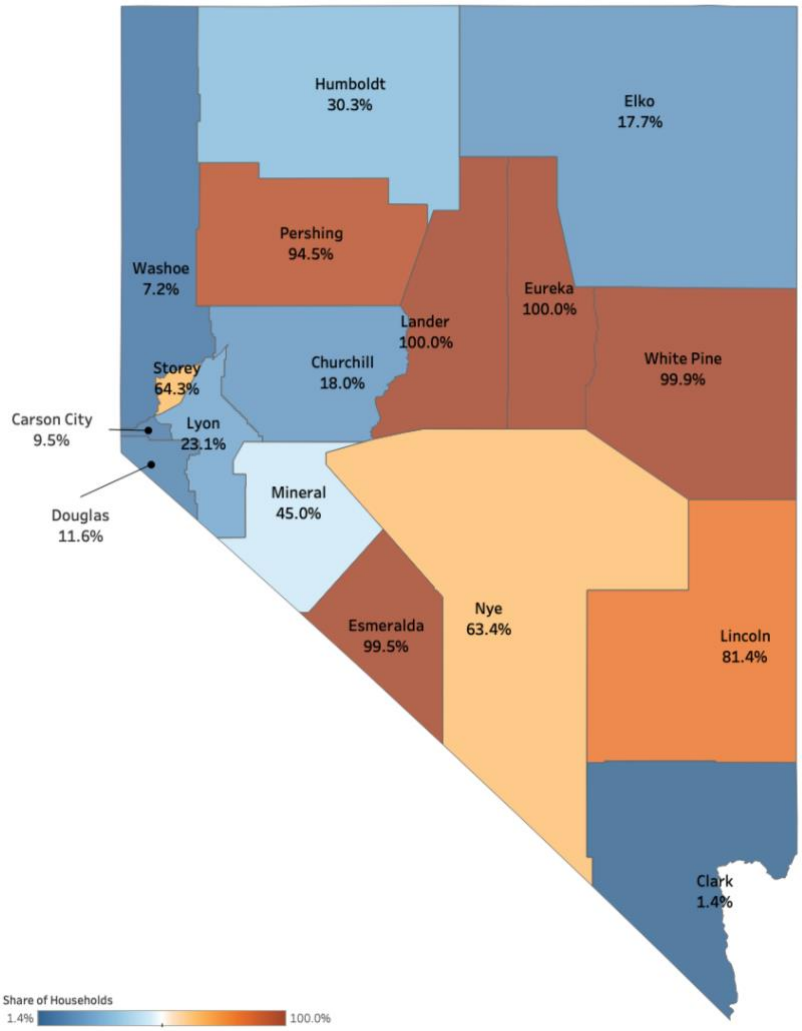


Source: National Broadband Map (https://broadbandmap.fcc.gov/. downloaded August 3, 2023.).
Notes: Values are share of households without access to a reliable 25/3 Mbps broadband service. The National Telecommunications and Information Administration defines reliable broadband services as services delivered using fiber, cable, a digital subscriber line technology, or a terrestrial wireless technology using licensed spectrum.

Digital Equity. Problems associated with digital literacy, affordability, up-front costs, and other barriers impede vulnerable populations from adopting broadband services and contribute to the digital divide. About 40 percent of adults in households with annual incomes below $30,000 in 2021 did not subscribe to a fixed broadband service; this rate falls to about seven percent for adults in households with annual incomes above $100,000 (Pew Research Center, 2021).[16] The $14.2 billion ACP provides low-income households subsidies that reduce the monthly cost of broadband services by $30, and subsidizes the purchase of laptop, desktop, and tablet computers. Qualifying households on Tribal lands are eligible for $75 monthly discounts. Households with incomes at or below 200 percent of the Federal Poverty Guidelines, or include members who participate in approved federal

assistance programs, such as the Supplemental Nutrition Assistance Program, are eligible for ACP subsidies (FCC, 2022). Figure 3 maps the share of unserved and underserved households in Nevada's counties.

Figure 3: Share of Unserved and Underserved Households by County, 2021



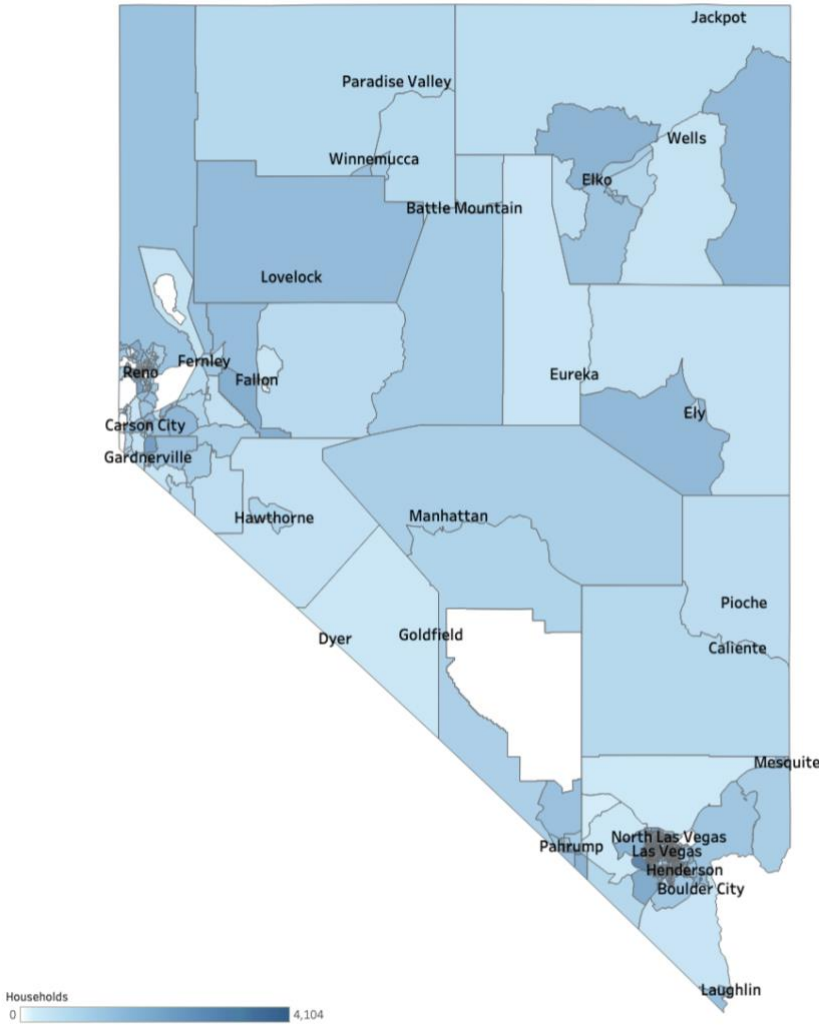
Source: National Broadband Map (https://broadbandmap.fcc.gov/. downloaded August 3, 2023.).
Notes: Values are share of households without access to a reliable 100/20 Mbps (or 25/3 Mbps) broadband service. The National Telecommunications and Information Administration defines reliable broadband services as services delivered using fiber, cable, a digital subscriber line technology, or a terrestrial wireless technology using licensed spectrum.

Broadband Investment Subsidies. The BEAD program's primary objective is to extend the deployment of broadband infrastructure to all unserved and underserved locations.[17] The rationale for public funding relies on the argument that the total benefits generated by broadband adoptions exceed the service's total cost. Investment subsidies up to the amount of broadband benefits not captured by ISPs, which include regional spillovers, consumer surplus, and other social benefits, can

improve social welfare when the revenue generated by the broadband service does not cover the service's total cost (Boik, 2017; de Sa 2017; and Briglauer, Dürr, and Guglar, 2021).[18]

Recent advances in wireless technologies (e.g., terrestrial fixed wireless and satellite services) have reduced the cost of extending broadband networks to rural and geographically remote communities.[19] For example, many of the winning bidders in the recently completed FCC rural broadband auction will deploy gigabit broadband services using a combination of FTTP and terrestrial fixed wireless (hereafter, fixed wireless) technologies that use unlicensed spectrum.[20] Fixed wireless networks use a home antenna to communicate with towers much like a cell phone and can be operational in six to nine months.[21] A wireless solution is often the low-cost solution in rural and remote locations because it avoids the cost of the building the last-mile facilities that connect customer premises to the Internet.[22] Figure 4 maps the number of households in Nevada's Census tracts.

Figure 4: Number of Households by Census Tract, 2021



Source: 2021 American Community Survey 5-Year Estimates Data Profiles (DP02).

Thus, while the NTIA's preference for FTTP is likely the appropriate policy in areas with high population density and low costs, policy makers must determine whether the benefits generated from deploying FTTP, instead of a lower-cost solution, justify the additional expenditures needed to build FTTP networks in relatively high-cost areas. Deploying a FTTP network can improve social welfare when the value created by the FTTP network outweighs the value that would be created if policy makers deployed a lower-cost solution and used the savings to fund other projects. Effective programs allocate resources to their highest-valued use.

For example, Garnett (2023) estimates that the ACP will run out of money in June, 2024 and recommends that state broadband programs allocate a portion of federal broadband funds to extend

the ACP.[23] This policy proposal illustrates the tradeoffs that policy makers must make when their budgets are limited and they are concerned about both broadband access in rural areas and the affordability of Internet services. These constraints require that policy makers account for the effects of broadband-deployment decisions on the size of the ACP's budget and the ACP's ability to provide low-income households affordable Internet access when making broadband-deployment decisions.[24] Well-run grant programs effectively evaluate the tradeoffs that must be made when policy makers face binding budget constraints.

Federal Broadband Programs

In 2009, the American Recovery and Reinvestment Act (ARRA) directed the NTIA to create and manage the $4.7 billion Broadband Technology Opportunities Program (BTOP).[25] The BTOP's primary objective was to increase broadband adoption rates among populations under-represented with respect to broadband usage (Hauge and Prieger, 2015).[26] The ARRA also directed the FCC to develop a National Broadband Plan to ensure that every American has "access to broadband capability."[27] This directive required the that FCC reform its Universal Service Fund (USF) and begin supporting the provision of broadband services to households and small businesses in high-cost areas.[28]

The BTOP. The NTIA used an administrative process to review grant applications and distributed over $4 billion in BTOP funds to 289 recipients in 2010.[29] Project selection was based on scores assigned by reviewers who read and evaluated applications using quantitative and qualitative criteria. Reviews were conducted by 40 civil servants and volunteers from private and non-profit sectors who read thousands of lengthy application files (Oh Lam, 2022).[30] Research examining the BTOP selection process and the effects of BTOP grants on broadband adoption finds that BTOP spending had no effect on broadband adoption rates (Hauge and Prieger, 2015).[31] Other studies observe that the NTIA did not place great weight on the cost effectiveness of proposed projects when ranking BTOP proposals.[32]

FCC Rural Broadband Auctions. In 2011, the FCC announced that it would use cost models and reverse auctions to determine support for the delivery of broadband services in unserved areas.[33] Public and private organizations use reverse auctions to procure inputs, hire contractors, and subsidize the supply of desired services. In general, bidders in reverse subsidy auctions compete by bidding subsidies down and the bidder that commits to providing the desired service for the smallest subsidy wins the auction.[34] In more complex cases, policy makers can pursue multiple objectives by adjusting auction rules. For example, the FCC, in its rural broadband auctions, incorporated its preference for high-speed services by penalizing bids that promised to deliver services with relatively slow speeds.[35] These rules were technologically neutral because they were based on service characteristics and the subsidies bid, not the technology used to deliver services.[36]

The FCC conducted rural broadband auctions in 2018 and 2020. In 2018, the FCC's CAF II auction awarded $1.49 billion in subsidies, paid out over ten years, to 103 winning bidders that agreed to

deploy voice and fixed broadband services to over 700,000 unserved locations. More than half of the winning bids supported download speeds of at least 100 megabits per second (Mbps) and upload speeds of at least 20 Mbps (100/20 Mbps), 19 percent of the winners promised to deliver services with gigabit speeds (1,000 Mbps). In 2020, the FCC completed phase I of its Rural Digital Opportunity Fund (RDOF) auction. To date, the FCC has authorized about $6 billion in RDOF winning bids from 462 bidders that agreed to deploy broadband services to over 3.45 million unserved locations (FCC, 2023).[37] Most RDOF winners will deploy services with gigabit speeds and have been authorized to use FTTP or a combination of FTTP and fixed wireless technologies using unlicensed spectrum to deliver high-speed services.[38,39]

While the FCC initially reported that the RDOF auction was a major success, it rejected the RDOF applications submitted by two of the auction's biggest winners in 2022 because it concluded that the ISPs failed to demonstrate that they could deliver the services promised. Several months later, another major winner defaulted on its bids.[40] The FCC's failure to effectively screen auction participants contributed to at least 1.25 million locations not receiving broadband services because winning bidders either defaulted on their bids or had their bids rejected by the FCC.[41]

Observations. This review of federal programs produces two general observations. First, the processes used to evaluate applications and distribute subsidies can have significant effects on a grant program's cost and effectiveness. Second, policy makers must effectively screen all program participants to ensure that the participants have the financial means to meet their obligations and that their plans for delivering services are technologically feasible.

The finding that the BTOP had no significant effect on broadband adoption rates demonstrates the challenges policy makers must overcome when they use administrative processes to distribute grants.[42] The qualitative nature of grant applications makes it difficult to compare projects and to ensure that bidders receive only the minimum subsidies needed to achieve policy goals. These difficulties are compounded in cases where there is no head-to-head competition for subsidies. While policy makers can never be certain that subsidized investments would not have occurred without program support, the processes and mechanisms used to distribute funds can significantly affect program outcomes.[43]

Glass and Tardiff (2019) find that the CAF II auction lowered the cost of the FCC's broadband-subsidy program, attracted new providers, and increased the speed of federally supported broadband services.[44] Reverse auctions reduce program cost by driving subsidies toward the minimum subsidy needed to supply the desired services profitably. They also identify efficient providers, encourage providers to contribute their own money to projects, and produce outcomes that reflect the tradeoffs policy makers are willing to make when choosing between technologies with different costs, speeds and other characteristics.[45] Despite the RDOF auction's problems with defaults and rejected bids, the competitive-bidding process appears to have increased ISP contributions by driving subsidies toward the minimum subsidy needed for winners to deliver broadband services profitably; transferring funds from subsidized ISPs to taxpayers. For example, Charter Communications won

$1.22 billion in the RDOF subsidies and plans to spend about $5 billion on its RDOF build (Engebretson, 2023).[46]

The BEAD Program

The BEAD program's primary objective is to ensure that broadband service is extended to all unserved and underserved locations in the U.S. and its territories.[47] It also recognizes that monthly charges, up-front costs, digital literacy, and other barriers impede vulnerable populations from adopting broadband service. As a result, eligible entities are encouraged to ensure that their community anchor institutions (CAIs) (e.g., libraries, schools, and community centers) are connected to the Internet by gigabit-speed services, and that any remaining BEAD resources are used to fund adoption- and equity-related programs (NTIA, pg. 7).[48]

On May 30, 2023, the FCC released the latest version of its National Broadband Map. The map estimates that 8.3 million of the map's 114 million locations are unserved (i.e., do not have access to a reliable broadband service that delivers at least 25/3 Mbps).[49] The NTIA defines reliable services as services delivered using fiber, coaxial cables, digital subscriber line (DSL) technologies, or fixed wireless services using licensed spectrum. Locations served by satellites or fixed wireless services using unlicensed spectrum are not categorized as reliable (NTIA, 2022).[50] Locations that have access to reliable services with speeds between 25/3 Mbps and 100/20 Mbps are considered underserved. A study by ACA Connects and Cartesian (2023) (ACA/Cartesian) estimates that, after accounting for the extension of broadband networks funded by other federal and state programs, such as the RUS's ReConnect program and the ARPA's CPF, and unfunded ISP deployments, [51] about 4.7 million of the remaining 8.3 million unserved locations will be eligible for BEAD funding.[52]

While the NTIA (2002) requires that eligible entities prioritize projects that use FTTP to deliver broadband service,[53] it recognizes that while the BEAD program's budget is large, it cannot support the deployment of FTTP to every remaining unserved household. The NTIA addresses this shortfall by allowing eligible entities to select and fund projects that use technologies other than FTTP, including those not categorized as reliable, to deliver broadband services to locations in extremely high-cost areas. Locations are classified as extremely high cost when the cost of providing broadband services using FTTP exceeds the "Extremely High Cost Per Location Threshold" set by eligible entities.[54] The BEAD program also requires that grant recipients, eligible entities, or grant recipients in conjunction with eligible entities must provide matching funds of not less than 25 percent of the project's cost to receive BEAD funding.[55]

ACA/Cartesian estimates that eligible entities can meet the program's deployment goal of universal access to broadband services with at least 100/20 Mbps if they deploy fixed wireless services in extremely high-cost locations and that grant recipients make significant contributions to project costs.[56] Eligible entities can encourage significant contributions by designing competitive grant programs that give applicants have the ability and the incentive to undercut the subsidies proposed by their rivals. Because the NTIA only allows ISPs that use fixed wireless, and other relatively low-

cost technologies, to compete for subsidies in extremely high-cost locations, decreasing the extremely high-cost location threshold should increase competition and ISP contributions; including contributions made by ISPs that use FTTP to deliver broadband services.[57] Eligible entities can ensure that their preferences for speed, reliability, and other characteristics are reflected in project outcomes by penalizing applications made by ISPs that include services that are inconsistent with the eligible entity's preferences. Increasing the competition for grants lowers the program's cost, provides information about the cost of deploying broadband services, and frees up resources for use in other programs.

Recommendations. Based on my review of the BEAD program and the federal government's recent experiences managing broadband programs, I offer four recommendations about the BEAD program and broadband programs in general.

Recommendation #1

Eligible entities can encourage applicants to compete on the margins most important to them by providing clear statements about their objectives and detailed information about how reviewers will rank and score proposals.

Reverse auctions and other forms of competitive bidding generally require that auctioneers define how winning bids will be selected before the auction begins. Policy makers who use administrative procedures to review applications can take a similar approach by clearly defining the criteria they will use to evaluate proposals before applicants submit project proposals.[58] As shown by the FCC auctions, grant reviews can be adaptable and can incorporate a wide range of policy concerns by, for example, offering bidding credits to small or local businesses or by penalizing bids submitted by providers whose proposals include relatively low-quality services.[59] Making the review process adaptable requires that policy makers quantify how they value the tradeoffs that must be made when scoring and ranking relatively complex proposals. In the context of broadband, policy makers must determine how they will evaluate tradeoffs when choosing between technologies that differ in terms of speed, cost, reliability, time to service, and other important factors. Well-designed grant programs limit the use of ambiguous criteria, such as requiring that bids are in the "public interest," when scoring applications because this reduces the likelihood of arbitrary and inconsistent decisions (71 Concerned Economists, 2009).[60] Eligible entities can encourage applicants to compete on the margins most important to them by providing clear statements about their objectives and detailed information about how proposals will be ranked and scored.

Recommendation #2

Substantial cost savings may be found by giving potential providers the flexibility to decide how to upgrade and or extend networks to serve areas with extremely high-cost locations.

The FCC, when designing its CAF II auction, found that extremely high-cost locations are often interspersed among high-cost areas and concluded that including both high-cost and extremely high-cost areas in the competitive-bidding process allows parties to build integrated networks that

effectively serve areas where costs vary.[61] This flexible approach, coupled with advances in fixed wireless technologies, resulted in providers using combinations of fixed wireless technologies and FTTP to provide gigabit services for relatively low subsidies in the RDOF auction.

Recommendation #3

Programs that increase adoption rates complement supply-side programs.

Investment subsidies are needed to make the provision of broadband service profitable when the provider's expected revenue falls below the expected cost of service. Programs that boost adoption rates and increase expected revenue reduce the subsidies needed to make broadband service profitable. Increased adoption rates increase the benefits generated by supply-side programs and can decrease the cost of these programs.

Recommendation #4

Effective screening of prospective applicants and transparency facilitate the timely deployment of high-speed broadband services.

Screening prospective applicants to verify their ability to deliver the proposed services is an important step in all procurement procedures. The FCC's failure to effectively screen all auction participants before the start of the RDOF auction substantially reduced the number of locations that gained access to broadband service. Providing eligible entities information about the efficacy of technologies and network designs authorized by the FCC in the RDOF auction could expedite the screening process and increase the likelihood that the BEAD program avoids the difficulties experienced in the RDOF auction. It is also apparent that the processes used to score and rank proposals should be as transparent as possible. Information about winning proposals, as well as information about the proposals not selected, should be available to interested parties, provided the information disclosed does not violate any confidentiality rights protected by state, territory or federal laws and regulations.[62]

Broadband in Nevada

On June 26, 2023, the NTIA announced that Nevada will receive $416 million in BEAD-program funds.[63] These funds will be used to address the inequities in broadband access in Nevada's rural communities and among its vulnerable populations. According to the American Community Survey (ACS), about 13 percent of Nevada's households do not currently subscribe to a broadband service, and that while the share of households without service is higher in rural areas (14 percent vs. 12.5 percent),[64] the total number of households without service in metropolitan markets exceeds the number of households without service in rural areas by more than eight to one.[65] Conlow (2023) estimates that about 45,000 of Nevada's estimated 983,570 broadband serviceable locations (4.6 percent) are currently unserved.[66] Households and small businesses that receive broadband access from satellite providers or fixed wireless ISPs using unlicensed spectrum are classified as unserved by the NTIA and Conlow.

Federal Broadband Grants. Over the last five years, the Governor's OSIT has worked with community leaders, local broadband providers, and other interested parties to develop Nevada's High-Speed Initiative. This plan uses funds from multiple sources to meet the state's broadband goals.[67] Funds from the RUS's ReConnect program, the ARPA's CPF, and the NTIA's Middle-Mile Grant Program will be used to construct a middle-mile network that connects rural local networks to Internet exchange facilities and the Internet backbone.[68] Money from the ReConnect program and the NTIA will be used to connect unserved households to the Internet using FTTP,[69] and the Governor's OSIT will use CPF dollars to fund a low-income program that will bring reliable high-speed broadband services to about 40,000 households located in tax-subsidized multiple dwelling units (MDUs) with inferior broadband connections.[70] Funds from the BEAD program will be used to connect unserved households and small business to the Internet. They will also be used to lower the barriers that impede vulnerable populations from adopting and using broadband services. In total, I estimate that over $675 million in federal funds have been allocated to Nevada to help it meet its broadband goals.[71]

Nevada Middle-Mile Network. Nevada is a geographically large state where nearly 90 percent of its population lives in Clark and Washoe Counties. Its rural communities are generally located in geographically isolated areas with low population density and, in many cases, difficult terrain.[72] Low population density increases the average cost of broadband services because it limits the ability of customers to share infrastructure costs. Low population counts decrease ISP revenue opportunities. Geographic isolation increases costs when ISPs must transport data long distances before they can interconnect to the Internet backbone.[73] Difficult terrain increases the cost of installing broadband infrastructure. Freddoso and Mitchell (n.d.) report that more than 50 miles lie between most of the communities located along Nevada's major rural corridors, and that while important fiber routes follow I-80, I-15, US 50, US 95 and US 6, ISPs have a difficult time gaining access to these routes because they often lack sufficient interconnect facilities.[74]

Low-quality middle-mile facilities are bottlenecks that degrade service quality when providers cannot transport local data at high speeds to and from the Internet backbone. Mark Fest, the CEO of Churchill County Communications (CC Communications), notes that obtaining the backhaul needed to connect local networks to the Internet backbone is the most important factor limiting the delivery of high-speed Internet services to rural communities in Nevada (Northern Nevada Business Weekly, 2017).[75]

The Governor's OSIT has made expanding the state's middle-mile network a priority and have secured federal grants to expand broadband options along the I-80 corridor, extend fiber services to rural communities, and increase the number of interconnect points along US-50, US-95 and US-395 (Freddoso and Mitchell, n.d.).[76] Nevada's OSIT will use funds from the ReConnect Program, the NTIA,[77] and CPF to construct a statewide fiber ring that will provide local networks access to redundant and resilient middle-mile facilities.[78] The construction of an extensive middle-mile network lowers the cost of ISP entry, improves the quality of broadband services,[79] and has the potential to increase the competition for both broadband customers and BEAD-program subsidies.

Affordable open access to middle-mile facilities should also affect the quality of wireless services, including high-speed 5G broadband services.

Access to Reliable Broadband Services. Table A.I presents an overview of the state's access to NTIA-defined reliable broadband services on December 31, 2022, as reported by the FCC's National Broadband Map (2023).[80] The first set of data includes information on counties located in one of the state's two metropolitan statistical areas; the second set presents data for the state's non-metropolitan counties. Columns two and three, respectively, present estimates of each county's share of residential locations that have access to a reliable broadband service delivered at speeds of at least 25/3 Mbps and 100/20 Mbps. Overall, 5.3 percent of the state's residential locations are unserved (i.e., do not have access to a reliable service that meets the 25/3 Mbps standard). The share of unserved households drops to 2.1 percent in metropolitan counties and equals 31.7 percent in non-metropolitan counties. In general, the share of residential locations with access to a reliable service with at least 100/20 Mbps is only slightly lower than the share of locations with service speeds of at least 25/3 Mbps.

Over 88 percent of the state's residential locations have access to broadband services provided by cable companies. By contrast, only about 22 percent of the state's residential locations have access to high-speed fiber networks. Somewhat surprisingly, the share of locations with fiber access is highest in Elko and Churchill Counties where access shares equal about 48 and 65 percent, respectively. Fewer than 30 percent of residential locations in Clark and Washoe Counties have access to broadband services delivered using FTTP. ISPs using fixed wireless and licensed spectrum provide access to about 44 percent of the state's residential locations.

A closer look at fiber deployment in Churchill and Elko Counties shows the importance of coordination and collaboration among providers when deploying network infrastructure. In the early 2010's Switch Communications built a high-speed fiber network that connected its facilities in Las Vegas to its operations in Reno and other west-coast locations. As part of this project, Switch collaborated with several Nevada utilities, including CC Communications, to bring high-speed Internet service to rural Nevada. Switch Communications improved rural access to high-speed Internet services by connecting rural local networks to the backhaul facilities needed to transport data between local networks and the Internet backbone. Access to these facilities reduced the cost of ISP entry and appears to have facilitated meaningful competition in Churchill County. Churchill County has the highest rate of fiber access in the state (about 65 percent), and is arguably the one of the state's most competitive market.[81]

Residents of Elko County will benefit from a grant provided by the NTIA's Broadband Infrastructure Program (BIP) and a public-private partnership between Anthem Broadband (formerly Safelink Internet) and Nevada Gold Mines. In 2021, Nevada Gold Mines announced that the company's I-80 Fund would lend Anthem Broadband, an RDOF auction winner in Elko County, $10 million to bring broadband Internet services using FTTP to locations in Elko, Spring Creek, and Lamoille.[82] In 2022, the NTIA announced that Elko County's broadband partnership with CC Communications had

secured a $7.35 million grant from the NTIA's BIP to bring high-speed broadband service to 5,758 locations in Spring Creek using FTTP that supports 1,000/1,000 Mbps speeds.[83]

The Nevada Governor's OSIT worked closely with several local communities to secure three additional federal grants. Beehive Telephone received two USDA ReConnect grants totaling about $5 million to bring high-speed broadband service to over 300 locations in Elko and White Pines Counties using a combination of fixed wireless and FTTP.[84] The OSIT also worked with Pershing County to secure a $27 million grant from the USDA's ReConnect program. Uprise Fiber will use the grant to deploy FTTP broadband to 1,423 locations in Pershing County.[85] Sam Sanders, the CEO of Uprise Fiber, notes that its ReConnect grant will help Uprise Fiber deploy 40 miles of fiber-optic cables along I-80 to connect Lovelock to the nearest high-speed fiber network.[86]

The Governor's OSIT also worked closely with the Inter-Tribal Council of Nevada (ITCN) to help secure $20.9 million in NTIA grants to bring FTTP broadband to about 1,000 locations in 15 Tribal communities.[87] In addition to federal grants, CAF II and RDOF auctions contributed about $37 million in funds that have been, or will be, used to deploy broadband access to about 20,000 unserved locations in Nevada. Winning bidders in the CAF II auction are required to complete their deployments by the end of 2025.[88] RDOF winners have a six-year window from the date when the FCC authorized winning bids to complete their deployments.[89]

Federally Funded Deployments and Unlicensed Wireless*.* Table A.II presents county data on the share of unserved and underserved residential locations in Nevada (also see Figures 2 and 3). It also includes data on the number of locations funded by the ReConnect and BIP Programs, as well as the locations covered by the RDOF and CAF II auctions. The CAF II data show that the FCC authorized Commnet Wireless to deploy 25/3 Mbps broadband service using fixed wireless networks and unlicensed spectrum to bring broadband access to 12,844 Nevada locations.[90] The data in Table A.II indicate that most of the counties where CAF II funds were distributed have access to 25/3 Mbps broadband services from fixed wireless providers using unlicensed spectrum. For example, over 80 percent of the households in Lander and Esmeralda counties have access to a 25/3 Mbps service that uses this technology.

The NTIA's decision to categorize services that use unlicensed spectrum as not reliable had a significant impact on the number of NTIA-defined unserved locations in Nevada. While these locations are considered unserved by the NTIA,[91] the FCC will continue to distribute CAF II subsidies to Commnet until at least 2028, ten years after the CAF II auction closed. It is not clear how NTIA-defined unserved locations served by subsidized competitors will be treated by the BEAD program.[92] In general, the presence of a subsidized competitor decreases the expected profit from market entry, and increases the size of subsidies needed to make entry profitable.

Winning bidders from the RDOF auction have been authorized to deploy 1,000/500 Mbps broadband services using FTTP and unlicensed fixed wireless services to 6,433 unserved locations in Nevada.[93] Fulfillment of these obligations may substantially affect the number of unserved locations in Lander, Lyon, and Elko Counties. A similar result holds for Pershing and Elko Counties, where the ReConnect

program and the BIP will bring gigabit service to several thousand unserved locations. The locations that gain reliable broadband access as a result of federal programs in 2023 and beyond reduce the number of unserved and underserved locations that are eligible for the BEAD program.[94] ACA/Cartesian estimates that about 34,500 unserved, and 7,800 underserved, locations in Nevada will be eligible for BEAD-program grants.[95]

Broadband Adoption Rates. Table A.III presents data on broadband adoption rates in Nevada using data from the American Community Survey's (ACS) 2021 5-year sample (also see Figure 1). The ACS is an ongoing survey that covers a broad range of topics, including data on broadband Internet penetration rates. The 2021 5-year ACS sample includes data gathered from 2017 to 2021.[96] The second column in Table A.III presents estimates of broadband adoption rates in Nevada and each of its counties. The ACS's definition of broadband includes services that use smartphones, wireline connections (i.e., Cable, Fiber, and DSL) and satellites to deliver Internet services.[97]

The ACS estimates that 85.7 percent of the households in Nevada subscribe to some type of broadband service and an estimated 73.6 percent of all households subscribe to a wireline broadband service. A comparison of broadband adoption rates in metropolitan and non-metropolitan counties produces a relatively narrow gap in adoption rates (87.5 percent vs. 86 percent). This gap widens substantially when the comparison is based on wireline services (74.7 percent vs. 63.2 percent). Wireline adoption rates in Esmeralda (47.9 percent), Eureka (49.5 percent), Lander (43.6 percent), and Pershing (38 percent) Counties are consistent with the data from Table A.I, where over 50 percent of residential locations in these counties are considered unserved by the NTIA. The data on broadband adoption rates show that demand for broadband services is relatively robust in unserved areas. For example, the ACS broadband adoption rate equals 90.7 percent in Lander County, where the lack of wireline options lead residents to rely on wireless services. Thirty-five percent of the households in Lander County rely on smartphones for broadband service and 14.6 percent receive service from a satellite-based provider.

The data presented in Table A.IV demonstrate that while adoption rates are relatively lower in non-metropolitan counties, the total number of households without broadband service is substantially higher in metropolitan counties. Nearly 130,000 households located in metropolitan counties do not subscribe to an ACS-defined broadband service. This number falls to about 16,000 in non-metropolitan counties. The estimated number of unconnected households increases to 260,290 and 41,180, respectively, in metropolitan and non-metropolitan counties when the number of households with wireline broadband service is used as the measure of broadband adoption.[98]

Table A.V provides information about the effect of income on the likelihood households adopt broadband services. About 30 percent of Nevada households with annual incomes below $30,000 do not adopt broadband services. This number falls to around five percent for households with annual incomes that exceed $75,000. Despite policymaker efforts to extend broadband access and reduce the cost of broadband services, many urban and rural households that have physical access to broadband networks do not subscribe to broadband service.

Affordable Connectivity in Nevada. Low-income households in Nevada can receive high-speed broadband service with download speeds of up to 100 Mbps without paying monthly fees when they enroll in the ACP and subscribe to a low-income plan developed for ACP-eligible households.[99, 100] These offerings complement federal programs that subsidize broadband investments by increasing broadband adoption rates. Because a large portion of broadband investments are shared by customers, programs that increase broadband adoption rates reduce the size of subsidies needed to make the provision of broadband service profitable in high-cost areas. The ACP also complements Nevada's $55 million Low-Income MDU Connectivity Program.[101] Digital-equity programs that help Nevadans enroll in the ACP and provide them with the tools and skills needed to use broadband resources effectively enhance the value created by the BEAD program and other supply-side programs.

Conclusion

The $45.45 billion BEAD program's primary objective is to deploy broadband service to all unserved and underserved locations in the U.S and its territories. It also recognizes that the digital divide cannot be closed until the barriers that impede vulnerable populations from adopting broadband services are removed. Several industry studies predict that the BEAD program can meet its goal of providing universal access to broadband service if eligible entities execute their grant programs well. My review of the BEAD program indicates that policy makers can enhance the likelihood of success by designing competitive grant programs that give applicants the incentive to undercut subsidies proposed by their rivals and provide applicants the flexibility to design networks that minimize the cost of providing desired services. Eligible entities can encourage applicants to compete on the margins most important to them by providing clear statements about their objectives and detailed information about how reviewers will rank and score proposals. These steps will help reduce the cost of achieving desired outcomes and will free up resources for use in other programs, including broadband-adoption and digital-equity programs.

Well-run programs effectively evaluate the tradeoffs that must be made when policy makers face binding budget constraints. For example, proper evaluation of Garnett's (2023) proposal that state broadband programs allocate a portion of federal broadband funds to extend the ACP requires that policy makers evaluate the effects of broadband-deployment decisions on the size of the ACP's budget and the ACP's ability to provide low-income households affordable access to the Internet. Overall, Nevada is well positioned to take full advantage of the BEAD program. The construction of a redundant and resilient middle-mile network lowers the cost of ISP entry, improves the quality of broadband services, and has the potential to increase competition for both broadband customers and BEAD-program subsidies. It should also improve the quality of wireless services in rural locations. The state continues to make progress toward its goal of universal broadband access by extending broadband services to rural communities and by implementing programs that remove the barriers that impede vulnerable populations from adopting broadband services.

Appendix

Table A.I: Share of Residential Locations with Reliable Broadband Access

		Reliable Broadband Services*										
		All Reliable		Fiber		Cable		Copper (DSL)		Licensed FWS		
Metro County	Households**	25/3 Mbps	100/20 Mbps	25/3 Mbps	100/20 Mbps	25/3 Mbps	100/20 Mbps	25/3 Mbps	100/20 Mbps	25/3 Mbps	100/20 Mbps	Housing Density**
Carson City	23,191	91.8%	90.5%	3.1%	3.1%	89.6%	89.6%	33.3%	6.3%	14.3%	4.9%	160.5
Clark County	816,296	99.2%	98.6%	21.4%	21.4%	93.7%	93.4%	25.0%	2.0%	49.6%	10.5%	103.4
Storey County	1,611	36.2%	35.6%	0.1%	0.1%	34.1%	34.1%	0.1%	0.0%	22.7%	21.4%	6.1
Washoe County	188,878	93.5%	92.7%	26.4%	26.4%	91.0%	91.0%	35.9%	6.7%	35.3%	11.4%	29.9
Metro Total	1,029,976	97.9%	97.3%	21.9%	21.8%	93.0%	92.7%	27.1%	3.0%	46.1%	10.6%	70.5
Non-Metro County												
Churchill County	9,753	83.4%	82.0%	64.6%	64.6%	67.5%	67.5%	0.7%	0.0%	17.6%	5.9%	2.0
Douglas County	20,911	90.6%	88.4%	6.3%	6.3%	84.6%	84.6%	6.6%	0.9%	9.5%	2.7%	29.4
Elko County	18,614	83.8%	82.3%	47.8%	47.8%	42.8%	42.8%	13.7%	1.5%	72.9%	71.7%	1.1
Esmeralda County	484	0.5%	0.5%	0.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1
Eureka County	555	34.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	34.3%	0.0%	0.1
Humboldt County	6,804	79.7%	69.7%	0.7%	0.7%	65.0%	65.0%	2.8%	0.0%	75.8%	55.7%	0.7
Lander County	2,298	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4
Lincoln County	1,728	57.4%	18.6%	12.0%	12.0%	0.0%	0.0%	51.2%	7.1%	0.0%	0.0%	0.2
Lyon County	22,342	77.5%	76.9%	12.1%	12.1%	76.4%	76.4%	2.4%	0.2%	19.7%	4.2%	11.2
Mineral County	1,737	55.4%	54.9%	0.0%	0.0%	54.6%	54.6%	0.0%	0.0%	51.5%	25.4%	0.5
Nye County	21,411	40.5%	36.7%	14.1%	14.1%	27.0%	27.0%	0.9%	0.2%	3.1%	0.0%	1.2
Pershing County	1,857	13.9%	5.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.9%	5.5%	0.3
White Pine County	3,482	1.7%	0.2%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.4
Non-Metro Total	111,976	68.3%	65.2%	20.1%	20.1%	54.0%	54.0%	5.2%	0.6%	25.8%	17.6%	1.2
State Total	1,141,952	94.7%	93.8%	21.7%	21.7%	88.7%	88.5%	24.8%	2.7%	44.1%	11.4%	10.4

*_Source_: National Broadband Map (https://broadbandmap.fcc.gov/. downloaded August 3, 2023.)

**_Source_: American Community Survey, 2021, 5-year sample. (https://data.census.gov/table?q=internet&tid=ACSST5Y2021.S2801)

Notes: 25/3 Mbps (100/20 Mbps) includes data on the share of locations with access to services that supports at least 25/3 Mbps (100/20 Mbps).

The NTIA categorizes services provided using wireline broadband (Fiber, Cable, DSL) and fixed wireless services (FWS) using licensed spectrum as "reliable" services. All Reliable includes locations with access to a broadband service delivered by Fiber, Cable, DSL and fixed wireless services (FWS) using licensed spectrum; 25/3 Mbps equals share of locations with access to service speed equal to at least 25/3 Mbps; 100/20 Mbps equals share of locations with access to service speed equal to at least 100/20 Mbps. Counties located in one of Nevada's two metropolitan statistical areas are consider a Metro County.

Table A.II: Unserved and Underserved Locations, Unlicensed FWS, and Federal Programs

				Unlicensed FWS*			Locations Funded by Federal Programs				
							RDOF**	ReConnect	BIP	CAF II***	
Metro County	Households+	Unserved	Underserved	25/3 Mbps	100/20 Mbps	Housing Density+	1000/50 0 Mbps	1,000/1,000 Mbps	1,000/1,000 Mbps	25/3 Mbps	100/20 Mbps
Carson City	23,191	8.2%	1.3%	99.6%	99.6%	160.5	0	0	0	0	0
Clark County	816,296	0.8%	0.6%	98.9%	7.1%	103.4	560	0	0	145	256
Storey County	1,611	63.8%	0.5%	92.0%	91.2%	6.1	59	0	0	0	97
Washoe County	188,878	6.5%	0.7%	86.2%	86.2%	29.9	0	0	0	1,997	0
Metro Total	1,029,976	2.1%	0.6%	96.5%	23.8%	70.5	619	0	0	2,142	353
Non-Metro County											
Churchill County	9,753	16.6%	1.4%	0.8%	0.4%	2.0	0	0	0	0	0
Douglas County	20,911	9.4%	2.2%	95.5%	95.1%	29.4	69	0	0	0	116
Elko County	18,614	16.2%	1.5%	86.6%	84.3%	1.1	1,244	170	5,758	148	0
Esmeralda County	484	99.5%	0.0%	81.4%	0.0%	0.1	0	0	0	274	0
Eureka County	555	65.7%	34.3%	76.6%	76.6%	0.1	0	0	0	660	0
Humboldt County	6,804	20.3%	10.0%	41.8%	37.5%	0.7	267	0	0	1,699	0
Lander County	2,298	100.0%	0.0%	90.8%	90.4%	0.4	1,659	0	0	979	0
Lincoln County	1,728	42.6%	38.8%	42.2%	23.6%	0.2	0	0	0	0	0
Lyon County	22,342	22.5%	0.6%	98.6%	98.3%	11.2	2,158	0	0	1,248	454
Mineral County	1,737	44.6%	0.4%	0.0%	0.0%	0.5	0	0	0	870	0
Nye County	21,411	59.6%	3.8%	96.3%	63.0%	1.2	0	0	0	2,798	0
Pershing County	1,857	86.1%	8.4%	16.4%	15.6%	0.3	153	1,423	0	804	0
White Pine County	3,482	98.4%	1.5%	16.8%	0.0%	0.4	264	144	0	1,375	0
Non-Metro Total	111,976	31.7%	3.2%	77.0%	68.6%	1.2	5,814	1,737	5,758	10,855	570
State Total	1,141,952	5.3%	0.9%	94.7%	93.8%	10.4	6,433	1,737	5,758	12,997	923

**Source*: National Broadband Map (https://broadbandmap.fcc.gov/. downloaded August 3, 2023.)

***Source*: Auction 904: Rural Digital Opportunity Fund, Results tab, Federal Communications Commission.

****Source*: Federal Communication Commission, Connect American Fund, Phase II Auction (Auction 903), Data Tab, Authorized Auction 903 Long-Form Applications, (updated April 4, 2023) https://www.fcc.gov/auction/903

+ *Source*: American Community Survey, 2021, 5-year sample. (https://data.census.gov/table?q=internet&tid=ACSST5Y2021.S2801)

Notes: The NTIA categorizes services provided using wireline broadband (Fiber, Cable, DSL) and fixed wireless services (FWS) using licensed spectrum as "reliable" services. Unserved equals the share of residential locations that do not have access to a reliable 25/3 Mbps broadband services. Underserved locations have access to reliable broadband services with speeds between 25/3 Mbps and 100/20 Mbps. RDOF equals the number locations that received winning bids in the FCC's RDOF auction. ReConnect equals the number of locations funded by the USDA's ReConnect program. BIP equals the number of locations funded by the NTIA's Broadband Infrastructure Program. CAF II equals the number locations that received winning bids in the FCC's CAF II auction. Counties located in one of Nevada's two metropolitan statistical areas are consider a Metro County.

Table A.III: Broadband Adoption Rates*

Metro County	Households	Broadband	Smartphone	Wireline	Satellite	No Broadband	No Wireline	Household Density
Carson City	23,191	86.0%	10.0%	72.6%	6.9%	14.0%	27.4%	160.5
Clark County	816,296	87.4%	10.5%	74.5%	6.8%	12.6%	25.5%	103.4
Storey County	1,611	85.8%	8.1%	56.5%	27.2%	14.2%	43.5%	6.1
Washoe County	188,878	88.2%	8.8%	76.2%	8.5%	11.8%	23.8%	29.9
Metro Total	1,029,976	87.5%	10.2%	74.7%	7.1%	12.5%	25.3%	70.5
Non-Metro County								
Churchill County	9,753	88.0%	8.4%	75.7%	5.4%	12.0%	24.3%	2.0
Douglas County	20,911	91.6%	7.7%	79.8%	7.7%	8.4%	20.2%	29.4
Elko County	18,614	87.7%	18.3%	60.9%	10.7%	12.3%	39.1%	1.1
Esmeralda County	484	69.0%	6.6%	47.9%	13.6%	31.0%	52.1%	0.1
Eureka County	555	91.9%	28.1%	49.5%	14.2%	8.1%	50.5%	0.1
Humboldt County	6,804	85.6%	25.5%	47.7%	11.3%	14.4%	52.3%	0.7
Lander County	2,298	90.7%	35.0%	43.6%	14.6%	9.3%	56.4%	0.4
Lincoln County	1,728	74.8%	9.5%	63.7%	3.4%	25.2%	36.3%	0.2
Lyon County	22,342	89.3%	13.6%	66.9%	12.3%	10.7%	33.1%	11.2
Mineral County	1,737	78.9%	10.5%	62.3%	7.9%	21.1%	37.7%	0.5
Nye County	21,411	77.3%	11.7%	52.1%	19.1%	22.7%	47.9%	1.2
Pershing County	1,857	84.5%	33.2%	38.0%	14.0%	15.5%	62.0%	0.3
White Pine County	3,482	78.1%	16.6%	47.5%	15.0%	21.9%	52.5%	0.4
Non-Metro Total	111,976	86.0%	14.0%	63.2%	11.8%	14.0%	36.8%	1.2
State Total	1,141,952	87.3%	10.6%	73.6%	7.6%	12.7%	26.4%	10.4

*_Source_: American Community Survey, 2021, 5-year sample. (https://data.census.gov/table?q=internet&g=040XX00US32$0500000&tid=ACSST5Y2021.S2801)
Notes: Broadband equals the share of households that connect to the Internet using Fiber, Cable, Copper (DSL), a Smartphones, or a Satellite. Smartphone equals the share of households that only use their Smartphones to connect to the Internet. Wireline equals the share of households that subscribe to a broadband service such as fiber, cable, or DSL. Satellite equals the share of households that subscribe to a satellite broadband service. No Broadband and No Wireline equal the share of households that do not subscribe to a Broadband or Wireline Internet service, as defined above. Counties located in one of Nevada's two metropolitan statistical areas are classified as Metro Counties.

Table A.IV: ACS Broadband Adoptions*

Metro County	Households	Broadband	Smartphone	Wireline	Satellite	No Broadband	No Wireline	Household Density
Carson City	23,191	19,946	2,309	16,842	1,600	3,245	6,349	160.5
Clark County	816,296	713,127	85,887	607,920	55,186	103,169	208,376	103.4
Storey County	1,611	1,383	130	910	438	228	701	6.1
Washoe County	188,878	166,497	16,576	144,014	16,090	22,381	44,864	29.9
Metro Total	1,029,976	900,953	104,902	769,686	73,314	129,023	260,290	70.5
Non-Metro County								
Churchill County	9,753	8,582	819	7,384	525	1,171	2,369	2.0
Douglas County	20,911	19,161	1,618	16,697	1,611	1,750	4,214	29.4
Elko County	18,614	16,332	3,401	11,336	1,993	2,282	7,278	1.1
Esmeralda County	484	334	32	232	66	150	252	0.1
Eureka County	555	510	156	275	79	45	280	0.1
Humboldt County	6,804	5,823	1,738	3,243	766	981	3,561	0.7
Lander County	2,298	2,084	805	1,003	335	214	1,295	0.4
Lincoln County	1,728	1,292	164	1,101	58	436	627	0.2
Lyon County	22,342	19,942	3,038	14,937	2,742	2,400	7,405	11.2
Mineral County	1,737	1,370	182	1,082	138	367	655	0.5
Nye County	21,411	16,546	2,503	11,147	4,081	4,865	10,264	1.2
Pershing County	1,857	1,570	616	706	260	287	1,151	0.3
White Pine County	3,482	2,721	579	1,653	524	761	1,829	0.4
Non-Metro Total	111,976	96,267	15,651	70,796	13,178	15,709	41,180	1.2
State Total	1,141,952	997,220	120,553	840,482	86,492	144,732	301,470	10.4

*_Source_: American Community Survey, 2021, 5-year sample. (https://data.census.gov/table?q=internet&g=040XX00US32$0500000&tid=ACSST5Y2021.S2801)
Notes: Broadband equals the share of households that connect to the Internet using Fiber, Cable, Copper (DSL), a Smartphones, or a Satellite. Smartphone equals the share of households that only use their Smartphones to connect to the Internet. Wireline equals the number of households that subscribe to broadband such as fiber, cable, or DSL service. Satellite equals the share of households that subscribe to a satellite broadband service. No Broadband and No Wireline equal the number of households that do not subscribe to a Broadband or Wireline Internet service, as defined above. Counties located in one of Nevada's two metropolitan statistical areas are classified as Metro Counties.

Table A.V: Income and Households without Broadband*

Income	Below $20,000		$20,000 to $74,999		$75,000 and Above	
Metro County	Households	No Broadband	Households	No Broadband	Households	No Broadband
Carson City	2,804	36.3%	10,838	14.3%	9,549	5.1%
Clark County	108,730	29.2%	358,733	14.2%	348,833	5.5%
Storey County	234	29.1%	670	17.8%	707	2.3%
Washoe County	19,799	31.8%	75,506	15.1%	93,573	4.6%
Metro Total	131,567	29.8%	445,747	14.3%	452,662	5.3%
Non-Metro County						
Churchill County	1,276	37.0%	4,435	12.6%	4,042	3.1%
Douglas County	1,919	25.4%	8,460	10.8%	10,532	3.0%
Elko County	1,819	44.2%	6,418	13.1%	10,377	5.5%
Esmeralda County	146	15.8%	231	51.9%	107	6.5%
Eureka County	99	35.4%	211	0.0%	245	4.1%
Humboldt County	1,003	29.2%	2,784	19.6%	3,017	4.7%
Lander County	311	17.7%	680	8.5%	1,307	6.3%
Lincoln County	170	46.5%	823	25.6%	735	15.4%
Lyon County	2,682	26.0%	10,153	13.6%	9,507	3.0%
Mineral County	464	33.4%	829	21.2%	444	8.1%
Nye County	3,431	41.4%	11,071	23.6%	6,909	11.4%
Pershing County	224	40.6%	884	17.5%	749	5.1%
White Pine County	524	50.8%	1,523	20.1%	1,435	12.3%
Non-Metro Total	14,068	34.7%	48,502	16.3%	49,406	5.4%
Total	145,635	30.3%	494,249	14.5%	502,068	5.4%

*_Source_: American Community Survey, 2021, 5-year sample. (https://data.census.gov/table?q=internet&g=040XX00US32$0500000&tid=ACSST5Y2021.S2801)

Notes: Broadband equals the share of households that connect to the Internet using Fiber, Cable, Copper (DSL), a Smartphones, or a Satellite. No Broadband equals the share of households that do not subscribe to a Broadband service. Counties located in one of Nevada's two metropolitan statistical areas are classified as Metro Counties.

References

[1] Locations include stand-alone housing units, multiple dwelling units, and buildings that house businesses.

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[3] Tomer, A. and C. George. "The American Rescue Plan is the broadband down payment the Country Needs," Brookings, (June 1, 2021) https://www.brookings.edu/research/the-american-rescue-plan-is-the-broadband-down-payment-the-country-needs/.

[4] Rachfal, C.L. "The Digital Divide: What Is It, Where Is It, and Federal Assistance Programs," Congressional Research Service Report R46613 (2021) https://crsreports.congress.gov/product/pdf/R/R46613.

[5] Goovaerts, D. "Editor's Corner: $42.5B Won't be Enough to Close the U.S. Broadband Gap." Fierce Telecom, (November 18, 2022) https://www.fiercetelecom.com/broadband/editors-corner-425b-wont-be-enough-close-us-broadband-gap. Cartesian and ACA Connects concludes that BEAD program funding should be sufficient to funds to make broadband service available to an estimated 8 million unserved and underserved locations, provided eligible entities adopt a reasonable "extremely high-cost threshold" and use technologies other than fiber to the premises to serve the higher-cost locations. In many cases, Cartesian and ACA Connects concludes, eligible entities will have funds available to for affordability and other eligible programs. ACA Connects and Cartesian. "BEAD Program: A Framework to Allocate Funding for Broadband Availability. National Overview, (July, 2023). https://acaconnects.org/bead-program-framework/

[6] The NTIA's Notice of Funding Opportunity defines a location as unserved if it does not have access to a broadband service that delivers at least 25 Megabits of data per second ("Mbps") downstream and 3 Mbps upstream ("25/3 Mbps"). Once a state certifies that it will reach all its unserved areas, it is can address the quality of services offered in underserved areas. A location is considered underserved if it does not have access to a service that provides at least 100 Mbps downstream and 20 Mbps upstream ("100/20 Mbps"). National Telecommunications and Information Administration, U.S. Department of Commerce. Notice of Funding Opportunity; Broadband Equity Access, and Deployment Program, (2022). https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf.

[7] Mike Conlow reports that deployment costs rise steeply for the costliest 1.3 million locations and "really hockey stick" for the last 650,000 locations and notes while the locations are interesting, no state is going to build fiber to them because the BEAD program allows states to use other technologies in the highest-cost locations. See Engebretson, J. "Dueling Cost Analyses: Are BEAD Fiber Goals Too Ambitious? Telecompetitor. (April 26, 2023). https://www.telecompetitor.com/dueling-cost-analyses-are-bead-fiber-goals-too-ambitious/

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[10] State of Nevada, Office of Science, Innovation and Technology. "Capital Projects Fund 2023 Performance Report." 2023. https://osit.nv.gov/uploadedFiles/ositnvgov/Content/Broadband/cpfAnnualPerformanceReport_NV.pdf.

[11] This includes funds allocated by FCC rural broadband auctions. My estimate is based on an extensive online search to identify federal grants awarded to Nevada. Interested parties should contact the Nevada Governor's OSIT for a complete list of broadband subsidies.

[12] Mendez, S., G. Molnar, and S.J. Savage. "The Impacts of the Lifeline Subsidy on High-Speed Internet Access," *Journal of Law and Economics.* 64(4) (2021), pp. 745-782.

[13] de Sa, P., "Improving the Nation's Digital Infrastructure," FCC Office of Strategic Planning and Policy Analysis, (2017).

[14] Engebretson attributes the "hockey stick" quote to Mike Conlow. Engebretson, J. "Dueling Cost Analysis: Are BEAD Fiber Goals Too Ambitious?" *Telecompetitor*, (April 26, 2023). https://www.telecompetitor.com/dueling-cost-analyses-are-bead-fiber-goals-too-ambitious/.

[15] The NTIA defines reliable broadband services as services delivered using fiber, cable, a digital subscriber line technology, or a terrestrial wireless technology using licensed spectrum. The services download speed must be at least 25 megabits per second (Mbps)

and the upload speed must be at least 3 Mbps. Rosenworcel, J. "National Broadband Map: It Keeps Getting Better," *Notes from the FCC*, (May 30, 2023). https://www.fcc.gov/national-broadband-map-it-keeps-getting-better.

[16] Pew Research Center. "Internet/Broadband Fact Sheet," (April 7, 2021). https://www.pewresearch.org/internet/fact-sheet/internet-broadband/

[17] The NTIA defines an unserved location as a location without access to reliable broadband services that offer minimum speeds of 25 megabits per second (Mbps) downstream and 3 Mbps upstream (25 Mbps/3 Mbps). An underserved location is defined as a location without access to broadband services offering 100 Mbps/20 Mbps. National Telecommunications and Information Administration, U.S. Department of Commerce. Notice of Funding Opportunity; Broadband Equity Access, and Deployment Program, (2022) https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf

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[20] Engebretson, J."Big RDOF Winner Resound Receives Final Authorization for Gigabit/FWA Plans." Telecompetitor, (January 13, 2023). https://www.telecompetitor.com/big-rdof-winner-resound-receives-final-authorization-for-gigabit-fwa-plans/. See also, Engebretson, Joan. "RDOF Gigabit Fixed Wireless Winners Lean on Tarana Technology." Telecompetitor, (September 29, 2022). https://www.telecompetitor.com/rdof-gigabit-fixed-wireless-winners-lean-on-tarana-technology/

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[22] The NTIA (2022, page 7) notes that "(w)ith respect to the deployment of last-mile broadband infrastructure, the Program prioritizes projects designed to provide fiber connectivity directly to the end user" (NTIA, 2022, page 7). National Telecommunications and Information Administration, U.S. Department of Commerce. Notice of Funding Opportunity; Broadband Equity Access, and Deployment Program, (2022). https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf.

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[24] In this setting, the cost of deploying FTTP, instead of the lower-cost alternative, can be measured by the number of low-income households that lose access to broadband services because policy makers subsidized a FTTP network instead of the lower-cost alternative.

[25] The BTOP was part of the American Recovery and Reinvestment Act. This Act also created the $2.5 billion Broadband Investment Program and provided funding to create a national broadband map.

[26] Hauge, J. A. and J. E. Prieger. "Evaluating the Impact of the American Recovery and Reinvestment Act's BTOP Program on Broadband Adoption," Applied Economics 47(60), (2015), pp. 1-27.

[27] This directive was included in the American Recovery and Reinvestment Act. *Connecting America: The National Broadband Plan*, (March 17, 2010). https://www.fcc.gov/general/national-broadband-plan

[28] FCC's E-rate and rural health programs subsidized the deployment of telecommunication and broadband services to schools, libraries and rural health-care facilities. The FCC's USF did not directly support the provision of broadband to households and small businesses in 2009.

[29] See LaRose, R., J.M. Bauer, K. DeMaagd, H.W. Chew, W. Ma, and Y. Jung. "Public Broadband Investment Priorities in the United States: An Analysis of the Broadband Technology Opportunities Program." *Government Information Quarterly*, 31, (2014), pp. 53-64; Rosston, G.L. and S.J. Wallsten. "The Broadband Stimulus: A Rural Boondoggle and Missed Opportunity." *A Journal of Law and Policy for the Information Society*, Vol 9(3), (2013), pp. 453 - 470.; Jayakar, K. and Park, E. Funding Public Computing Centers: Balancing Broadband Availability and Expected Demand, *Government Information Quarterly*, 29, (2012), pp. 50–59.

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[33] Glass, V. and T. Tardiff. "The Federal Communications Commission's rural infrastructure auction: What is hidden in the weeds?," *Telecommunications Policy*, (2019), vol. 43(8), pp. 1-15.

[34] The winners of reverse auctions typically receive a subsidy equal to the second-lowest bid. Ibid.

[35] Specifically, the CAF II auction imposed a 70 percent penalty on bidders that proposed to deploy baseline services (25/3 Mbps) with high latency but did not penalize bidders that proposed to deploy gigabit services (1,000 /500 Mbps) with low latency. Under this weighting scheme, gigabit bidders would receive a $100 monthly subsidy when they bid $100, but baseline bidders would receive only $30 per month for the same $100 bid. This scheme favored the deployment of FTTP in areas with relatively low costs and use of satellites and fixed wireless in relatively high-cost areas. Federal Communications Commission. "Comments sought on competitive bidding procedures and certain program requirements for the connect America fund phase II auction", AU Docket No. 17-182 and WC Docket No. 10-90, public Notice, (August 4, 2017) (para. 76 – 79) https://apps.fcc.gov/edocs_public/attachmatch/FCC-17-101A1.pdf. Glass and Tardiff (2019) provide a complete description of the FCC's CAF II reverse auction. Glass, V. and T. Tardiff. "The Federal Communications Commission's rural infrastructure auction: What is hidden in the weeds?," *Telecommunications Policy*, (2019), vol. 43(8), pp. 1-15.

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[38] Engebretson, J. "Big RDOF Winner Resound Receives Final Authorization for Gigabit/FWA Plans." *Telecompetitor*, (January 13, 2023). https://www.telecompetitor.com/big-rdof-winner-resound-receives-final-authorization-for-gigabit-fwa-plans/.

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[40] In August 2022, the FCC rejected the RDOF applications submitted by LTD Broadband and Space Exploration Technologies Corporation (Starlink) because it concluded that these ISPs failed to demonstrate that they could deliver the services promised. RDOF auction rules require that winning bidders must demonstrate that they have the financial means to meet their obligations and that their plans for delivering services are technologically feasible before the FCC would distribute support payments to winning bidders. LTD broadband, a relatively small fixed wireless provider, won over $1.32 billion in subsidies and Starlink, a satellite operator won over $885 million in subsidies. Starry Internet, another relatively small fixed wireless provider, defaulted on $269 million in winning bids. Federal Communications Commission, Wireline Competition Bureau. "FCC Rejects LTD Broadband, Starlink Bids for Broadband Subsidies," New Release, (August 10, 2022). See also, Ferraro, N. "Starry to default on all RDOF bids – FCC," *LightReading*. (October 12, 2022). https://www.lightreading.com/broadband/fixed-wireless-access-(fwa)/starry-to-default-on-all-rdof-bids---fcc/d/d-id/781028.

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[43] Seventy-One (71) Concerned Economists. Using Procurement Auctions to Allocate Broadband Stimulus Grants: Comments Submitted to The National Telecommunications Information Agency and Rural Utility Services, April 13. (2009) available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1377523.

[44] For example, the subsidies won by Wilkes Telephone, the CAF II auction's biggest gigabit-speed winner, equal 71.6 percent of the subsidy the FCC estimated was required to deliver profitable FTTP broadband services. Glass, V. and T. Tardiff. "The Federal Communications Commission's rural infrastructure auction: What is hidden in the weeds?," *Telecommunications Policy*, (2019), vol. 43(8), pp. 1-15.

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[48] Ibid.

[49] Rosenworcel, J. "National Broadband Map: It Keeps Getting Better," Notes from the FCC, (May 30, 2023). https://www.fcc.gov/national-broadband-map-it-keeps-getting-better.

[50]National Telecommunications and Information Administration, U.S. Department of Commerce. Notice of Funding Opportunity; Broadband Equity Access, and Deployment Program, (2022) https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf.

[51] The estimate includes subsidies funded by, among others, the RDOF and CAF II auctions, federal universal service programs that support small incumbent carriers, the CARES Act, RUS's ReConnect program, NTIA's Broadband Infrastructure Program, the American Rescue Plan Act's (ARPA) Capital Projects Fund (CPF), and many state programs. ACA Connects and Cartesian. "BEAD Program: A Framework to Allocate Funding for Broadband Availability. National Overview." (July, 2023) https://acaconnects.org/bead-program-framework/ .

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[54] Ibid.

[55] The NTIA waives this requirement for high-cost areas, which it defines as an unserved area where the cost of building out broadband service is higher, as compared with the average cost of building out broadband service in unserved areas in the United States (as determined by the Assistant Secretary, in consultation with the Commission), incorporating factors that affect the location's cost and its demand for broadband services (NTIA, NOFO page 13). Ibid.

[56]ACA Connects and Cartesian. "BEAD Program: A Framework to Allocate Funding for Broadband Availability. National Overview." (July, 2023) https://acaconnects.org/bead-program-framework/ .

[57] Lowering the extremely high-cost threshold allows more participants to compete for subsidies. Increasing the competition for subsidies, even when the grant administrator penalizes some participant offers, can reduce the size of the subsidies awarded.

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[61] Federal Communications Commission. Connect America fund, WC Docket No. 10-90, Universal service reform – mobility fund, WT Docket No. 10-208, ETC annual reports and certifications, WC Docket No. 14-58, Establishing just and reasonable rates for local exchange carriers, WC Docket No. 07-135, Developing an unified intercarrier compensation regime, CC Docket No. 01-92, report and order, Declaratory ruling, order, memorandum opinion and order, seventh order on reconsideration, and further Notice of proposed rulemaking, June 10, 2014, (June 10, 2014) https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-54A1_Rcd.pdf.

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[65] See Table A.3 and Table A.4 for details. These Table provide ACS estimates based on a five-year sample (2017-2021). These tables provide county and state estimates, as well as estimates for metropolitan (urban) and non-metropolitan (rural) counties. Counties located in one of the state's two metropolitan statistical areas are classified as metropolitan. https://data.census.gov/table?q=internet&g=040XX00US32$0500000&tid=ACSST5Y2021.S2801

[66] Conlow, M. "[Mostly minor] Correction to Unserved locations and allocation estimates," Mike's Newsletter, (June 2, 2023). https://mikeconlow.substack.com/p/mostly-minor-correction-to-unserved

[67] State of Nevada, Office of Science, Innovation and Technology. "Capital Projects Fund 2023 Performance Report." 2023. https://osit.nv.gov/uploadedFiles/ositnvgov/Content/Broadband/cpfAnnualPerformanceReport_NV.pdf.

[68] Nevada received over $43 million from the NTIA's Enabling Middle Mile Broadband Infrastructure program to build a 431-mil open-access, middle-mile fiber optic network that runs along US 93. https://broadbandusa.ntia.gov/funding-programs/enabling-middle-mile-broadband-infrastructure-program/funding-recipients. The U.S. Department of the Treasury approved Nevada's plan to invest $73.7 million of CPF funding to deploy middle-mile broadband infrastructure that expands access to reliable broadband service to rural areas of the state and increase the number of new and improved last-mile connection with affordable Internet. https://home.treasury.gov/system/files/136/NV_Fact_Sheet_2.pdf

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[70] https://osit.nv.gov/Broadband/Capital_Projects_Fund/

[71] This includes funds allocated by FCC rural broadband auctions. My estimate is based on an extensive online search to identify federal grants awarded to Nevada. Interested parties should contact the Nevada Governor's OSIT for a complete list of broadband subsidies.

[72] J. Fredosso and B. Mitchell. "Nevada State Broadband Connectivity Strategy" Nevada Governor's Office of Science, Innovation and Technology. (n.d.). https://crescentvalley.community/docs/NV%20State%20Comprehensive%20Broadband%20Connectivity%20Strategy-%20Final.pdf

[73] The internet backbone transports data between major exchanges. ISPs use middle-mile networks (i.e., backhaul facilities) to transport data to and from local aggregation points to these major exchanges. See, Fredosso, J. and B. Mitchell. "Nevada State Broadband Connectivity Strategy" Nevada Governor's Office of Science, Innovation and Technology. (n.d.). https://crescentvalley.community/docs/NV%20State%20Comprehensive%20Broadband%20Connectivity%20Strategy-%20Final.pdf

[74] Ibid.

[75] Northern Nevada Business Weekly, "Churchill County Utilities Join with Switch to Provide Fiber-Optic Communications to Remote Nevada," (March 15, 2017), https://www.nnbw.com/news/2017/mar/15/churchill-county-utilities-join-with-switch-to-pro/ .

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[77] "Rosen, King Introduce Middle Mile Broaband Deployment Act." Jacky Rosen, U.S. Senator for Nevada, (July 27, 2021), https://www.rosen.senate.gov/2021/07/27/rosen-king-introduce-middle-mile-broadband-deployment-act/.

[78] Broadband USA. Funding Programs, Enabling Middle Mile Broadband Infrastructure, Funding Recipients, "State of Nevada." https://broadbandusa.ntia.gov/funding-programs/enabling-middle-mile-broadband-infrastructure-program/funding-recipients

[79] Open access to reliable and high-speed middle-mile networks may allow ISPs in unserved and underserved markets to upgrade their networks and increase the speed and quality of their Internet services. Northern Nevada Business Weekly, "Churchill County Utilities Join with Switch to Provide Fiber-Optic Communications to Remote Nevada," (March 15, 2017), https://www.nnbw.com/news/2017/mar/15/churchill-county-utilities-join-with-switch-to-pro/ .

[80] https://broadbandmap.fcc.gov/home; https://home.treasury.gov/system/files/136/NV_Fact_Sheet_2.pdf.

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[83] NTIA Broadband Infrastructure Program Awards (n.d.)
https://broadbandusa.maps.arcgis.com/apps/dashboards/65ea4236491b497998b6b28e8115d26e

[84] "USDA Invests $10.6 million in Rural Broadband," Feed and Grain, (November 30, 2020) https://www.feedandgrain.com/business-markets/legislative-news/news/15388754/usda-invests-106m-in-rural-broadband;The Ely Times "$2.3 Million in Broadband for Rural Eastern Nevada," The Ely Times, (March 2, 2020) https://elynews.com/2020/03/02/2-3-million-in-broadband-for-rural-eastern-nevada/.

[85] U.S. Department of Agriculture. "ReConnect Program FY 2022 Funding Opportunity Announcement Awardees," (n.d.) https://www.usda.gov/reconnect/round-three-awardees

[86] Brey, J. "Rural Areas in Nevada See Broadband as Key to Progress." Governing: The Future of States and Localities, (August 31, 2022). https://www.governing.com/now/rural-areas-in-nevada-see-broadband-as-key-to-progress

[87] The NTIA grant will also be used to provide access to households located in a remote area near Summit Lake. The OSIT and the ITCN initially use Starlink's satellite service to access the Internet while a feasibility study is conducted to determine the best technology available for these households. Meghin Delaney. "Governor Sisolak, Inter-Tribal Council of Nevada announces $18 million award to expand Internet Access to Nevada Tribal Communities," Nevada Governor Joe Lombardo, (August 26, 2022) https://gov.nv.gov/layouts/full_page.aspx?id=364225

[88] Universal Service Administrative Company. "CAF Phase II Auction," (n.d.) https://www.usac.org/high-cost/funds/caf-phase-ii-auction/

[89] Universal Service Administrative Company. "Rural Digital Opportunity Fund," (n.d.) https://www.usac.org/high-cost/funds/rural-digital-opportunity-fund/

[90] Federal Communication Commission, Connect American Fund, Phase II Auction (Auction 903), Data Tab, Authorized Auction 903 Long-Form Applications, (updated April 4, 2023) https://www.fcc.gov/auction/903. Valley Communications was authorized to deploy 25/3 Mbps to 153 locations in Clark and Nye Counties. Commnet accounts for the remaining 25/3 Mbps locations from the CAF II auction.

[91] This may not be the case if the locations are determined to be extremely high-cost locations.

[92] The speed of Commnet's service falls below the 100/20 Mbps standard for being considered underserved and will be eligible for BEAD funding even if regulators categorize Commnet's subsidized service as reliable. Depending on a number of factors, including Commnet's current and future access to reliable middle-mile facilities, Commnet may have the incentive to increase the speed of its service and the size of its customer base to block competitive entry. The level of the Nevada's extremely high-cost threshold will also affect whether Commnet's service is reliable and Commnet's ability to compete for BEAD subsidies.

[93] Federal Communications Commission. Auction 904: Rural Digital Opportunity Fund, Results tab https://www.fcc.gov/auction/904.

[94] In addition to the programs discussed, five small incumbent telephone companies in Nevada are obligated to deploy broadband services to 5,740 locations and will continue to receive nearly $5 million in annual support through FCC universal-service programs for

small carriers. Universal Service Administrative Company. "Rate-of-Return Reform," (n.d.) https://www.usac.org/high-cost/resources/rules-orders/rate-of-return-reform-order/ , ACAM, ACAM II and CAF BLS Buildout Requirements.

[95] ACA Connects and Cartesian. BEAD Program: A Framework to Allocate Funding for Broadband Availability. State Broadband Report: Nevada. (July, 2023) https://acaconnects.org/bead-program-framework/ .

[96] Aggregating data from a five-year period increases the sample size, increases the statistical reliability of data gathered from less populated areas and includes information on Nevada's rural counties.

[97] It is not clear how the ACS categorized fixed wireless services using licensed and unlicensed spectrum.

[98] Wireline broadband services are similar to the NTIA's definition of a reliable broadband service. The ACS does mention fixed wireless services in its discussion of broadband services.

[99] Cox Cable's ConnectAssist plan offers up to 100 Mbps, free WiFi rental, free installation, and no term agreement for ACP-eligible households. https://www.cox.com/residential/internet/low-cost-internet-plans.html , see also https://www.cox.com/residential/articles/things-to-know-about-affordable-internet.html for information on the ACP and other low-income programs offered by Cox.

[100] The White House Briefing Room. "FACT SHEET: President Biden and Vice President Harris Reduce High-Speed Internet Costs for Millions of Americans," (May 9, 2022). https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/09/fact-sheet-president-biden-and-vice-president-harris-reduce-high-speed-internet-costs-for-millions-of-americans/

[101] Nevada received a $55 million grant from the Treasury Department's CFP to improve last-mile facilities in low-income tax-subsidized housing units in multiple-dwelling units. Nevada Governor's Office of Science, Innovation and Technology, Capital Funds Project. (n.d.) https://osit.nv.gov/Broadband/Capital_Projects_Fund/.

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