Florida Department of Economic Opportunity

THE FLORIDA STRATEGIC PLAN FOR BROADBAND

Broadband Internet Infrastructure Strategies for a Connected Economy to Support Workforce Development, Education, and Healthier Floridians.

FASTER FLORIDA BROADBAND

Table of Contents

Overview

Executive Summary:

In its first two years of existence (2020-2022), the Florida Department of Economic Opportunity's (DEO or Department) Office of Broadband began laying the groundwork for broadband Internet expansion in Florida. The first steps in this effort are documented in Appendix E.

The **Florida Broadband Deployment Act of 2021** ("2021 Act"; Ch. 24, 2021 Fla. Laws, codified at §§ 288.9961-288.9963, Fla. Stat.) directed the Office of Broadband to complete the following tasks:

- Develop a map of broadband Internet service availability throughout the state;
- Review and verify public input regarding transmission speeds and availability of broadband Internet services throughout the state;
- Develop, market, and promote broadband Internet services in the state;
- Create a strategic plan to increase the use of broadband Internet services in the state;
- Build and facilitate Local Technology Planning Teams (LTPTs) or partnerships;
- Participate in the Federal Communications Commission (FCC) proceedings that are related to the geographic availability and deployment of broadband Internet in Florida; and
- Establish the Broadband Opportunity Program and rules for the program to award grants to applicants who seek to expand broadband Internet to unserved areas, subject to appropriations (§ 288.9961(4), Fla. Stat.).

The Florida Legislature directed the Florida Department of Economic Opportunity's Office of Broadband to develop a strategic plan to guide the State of Florida in broadband Internet expansion and improvement. Under the leadership of the Governor, the Department has undertaken this task with coordination, input, participation, and support from partners and Floridians across the state. This Strategic Plan lays out the vision of the Office of Broadband, the elements and steps of the strategic plan, the roles for state and local stakeholders, and the strategies to undertake as Florida works toward the expansion of broadband Internet.

Strategic Plan Vision for a Connected Economy:
DEO's mission and vision is to assist the Governor in advancing a connected economy in Florida by championing the state's economic development vision and by administering state and federal programs and initiatives, including broadband, to help visitors, citizens, businesses, and communities. DEO's role is to holistically focus on the state's workforce, economy, and community development and this is accomplished through workforce development and funding ready infrastructure, as well as by

strengthening the connections and partnerships between workforce investments, economic development, and strong communities.

The vision for this Strategic Plan and the future of the Broadband Program is to provide guidance to state decision makers about investments for the provision of high-speed, reliable broadband Internet service access to all Florida communities in support of telemedicine, education opportunities, workforce development, and community development. DEO's Office of Broadband is and will be actively providing such guidance and working with local and state government agencies, community organizations, and private businesses to increase the availability and effectiveness of broadband Internet throughout the state, specifically in small and rural communities.
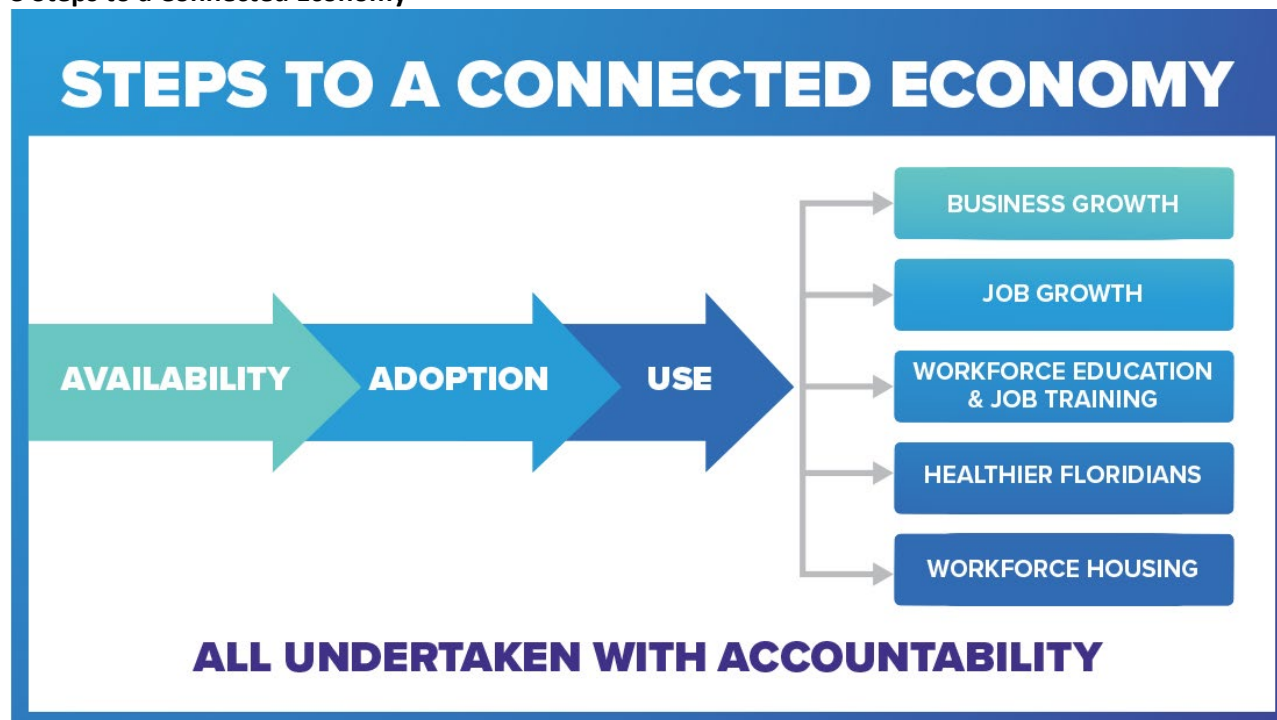
This vision comports with legislative findings in the Florida Broadband Deployment Act of 2021, "that the sustainable adoption of broadband Internet service is critical to the economic and business development of this state and is essential for all residents of this state, libraries, schools, colleges and universities, health care providers, and community organizations" (§ 288.9961(1), Fla. Stat.).

By building these partnerships, Florida will be a national leader in broadband Internet connectivity, infrastructure, and utilization to enhance workforce viability, education opportunities, and telehealth initiatives. To that end, Florida will pursue its goal of expanding the availability, as well as the adoption and use, of broadband Internet to unserved and underserved communities by identifying and leveraging funding opportunities and partnerships.[1]

Three Steps to a Connected Economy: This Strategic Plan provides a linear three-step approach to fully realize broadband Internet connectivity enhancing broadband Internet in Florida and reaching the goal of a Connected Economy bolstering the central tenants of supporting a robust workforce, educational opportunities, and health care access: 1) Availability; 2) Adoption, and 3) Use of digital content.

---

[1] "Unserved" in the 2021 Act means an area of the state where there is no provider of broadband Internet service having speeds over 25/3 Mbps. "Underserved" in the 2021 Act means an area of the state where there is no provider of broadband Internet service at speeds over 100/10 Mbps.

The three steps of Availability, Adoption, and Use, lead to a Connected Economy supporting development of Workforce, Education, and Health Care, and each step must be undertaken with a high level of Accountability to ensure positive impacts in Business Growth, Job Growth, development of Workforce Education and Job Training opportunities, Healthier Floridians, and connected Workforce Housing.

Outcomes for a Connected Economy and Accountability:

Of course, these three steps are meaningless without an intentional focus on outcomes for a connected economy:

Workforce Development: A connected economy is realized when robust workforce development initiatives result in the creation and sustainability of high-quality, high-paying jobs and career paths for residents, particularly in communities that are rural and/or underserved. For example, enhanced broadband connectivity in a community could help recruit manufacturing businesses to set up a headquarters or plant in that area, creating a need to hire locally. If the business entities in the area team up with local education institutions and create a program allowing students to enroll and obtain credentials necessary to apply for a position, this can create a pool of talent and job opportunities that would have not otherwise come to fruition.

Education: Greater access to educational opportunities and educational choice to students and families, while also promoting enhanced collaboration between education institutions and private-sector businesses to create successful career pathways for individuals. Beyond the workforce component, enhanced connectivity and access produces great choice for existing residents and prospective residents, helping rural and underserved communities grow and thrive.

Health Care: Availability of telehealth and public health services in typically undeserved communities to produce healthier Floridians and support their ability to be successful in all other facets of their lives. Much like education, connectivity resulting in health care access also helps in terms of recruiting talents for businesses, ensuring that residents, employers, and employees are able to thrive in their community.

Accountability is the foundation for success of the three steps: availability, adoption, and use of digital content, and expected outcomes for workforce development, educational access and choice, and healthier Floridians. An initiative without accountability, however well-intentioned it is, lacks longevity and the ability to meaningfully impact the lives of the Floridians who need it most. While each step must be undertaken with accountability, measuring the positive impacts on Floridians throughout the process and as a result of each grant award is paramount. Ensuring the connected economy outcomes of Business Growth, Job Growth, Workforce Education and Job Training, Healthier Floridians, and Workforce Housing requires accountability in measuring the results of each component. As such, all three steps build linearly to ensure a connected economy is supported by, and stands firmly upon, accountability, which is specifically addressed in Strategies 21 through 25.

Implementing Availability, Adoption, and to Reduce the Digital Divide and Foster a Connected Economy

This Strategic Plan will help Florida reduce the digital divide[2] that exists between areas that are fully equipped to realize the benefits of broadband Internet service and those that are not. Florida's diversity dictates the use of various methods, technologies, and configurations to ensure connectivity in a manner best suited to resident needs. Implementing the three steps of availability, adoption, and use will help ensure the workforce, education, health and housing sectors, as a whole, are strengthened.

Each of the three steps to creating a connected economy builds from the previous. There won't be broadband internet *use* without adoption of broadband internet service, and it cannot be *adopted* if it is not *available*. Availability, adoption, and the use of broadband Internet services throughout

---

[2] The gap between people who have access to broadband Internet services, have adopted it, and know how to use digital content (digital literacy), and those who do not.

Florida will allow the state's residents to reap benefits from a connected economy that fuels advancements and allows more Floridians to fully partake in available workforce, education, health and housing opportunities.

The Role of Florida's Communities

At its heart, this Strategic Plan is a community-based approach to ensure service needs are identified and met in unserved and underserved areas. The three steps to building a connected economy — availability, adoption, and use — support Florida's resiliency only if Florida's communities assume primary responsibility for contributing to this effort. In this way, Florida communities share the underlying theme of accountability with the Office of Broadband.

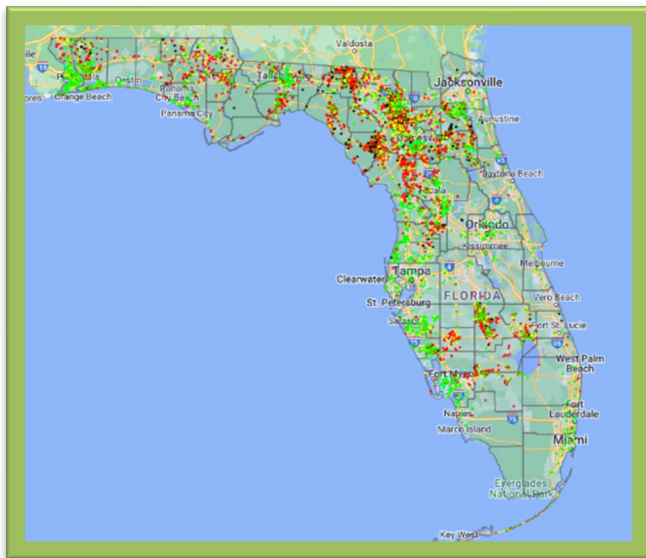*What are the communities' roles, and what must they decide?*

PARTNER WITH STAKEHOLDERS: *Who will their partners be?*

PLAN FOR BROADBAND INTERNET DEPLOYMENT: *What information and other data will partners need?*

PAY FOR BROADBAND INTERNET DEPLOYMENT: *What funds will be used?*

PROVIDE FOR BROADBAND INTERNET DEPLOYMENT: *Who will build and provide these services?*

PROMOTE ADOPTION AND USE: *How will this be done?*

The 2021 Act emphasizes the involvement of local and regional entities in planning for broadband Internet expansion in unserved and underserved areas of the state. The 2021 Act underscores the concept that local and regional entities are well-positioned to identify and respond to the broadband Internet needs of their residents. This approach is supported by charges to the LTPTs to "help the communities understand their current broadband availability, locate unserved and underserved businesses and residents, identify assets relevant to broadband deployment, build

"The most critical aspect of this comprehensive effort is a coordinated planning effort between Local Technology Planning Teams (LTPTs) and the Florida Office of Broadband" (Florida Office of Broadband, 2022a).

partnerships with broadband service providers, and identify… assets and reduce barriers to the deployment of broadband Internet services." (§ 288.9961(4)(b), Fla. Stat.).

Stakeholders from various industries are involved in LTPTs. Some communities focus on the involvement of a core group of large broadband Internet service users, while other communities involve all stakeholders, regardless of the scope of their needs. The rationale for the former is that a network is being developed to support all applications and broadband Internet users; therefore, it is not necessary to have every stakeholder at the table. The other perspective is that there is little downside to involving a wide range of stakeholders to ensure that all needs are considered.

The Role of the State

The state has a leadership role in accountably ensuring that broadband Internet availability, adoption, and use are sustainable in every community and rural area for a resilient Florida future. Therefore, the state will support and facilitate the actions of communities to achieve these goals. This Strategic Plan identifies how the state will support and facilitate the work communities have before them in identifying and planning how to meet their broadband Internet needs. Some of this work began before the development of this Strategic Plan, as evidenced by the creation of the office in 2020 and the further groundwork completed by the Legislature and DEO in 2021 and early 2022.

As broadband Internet is critical for many facets of economic development and an integral part of infrastructure, DEO is statutorily charged with overseeing broadband Internet expansion initiatives

(§ 288.9961(3), Fla. Stat.). This charge fits within DEO's mission to assist the Governor in advancing Florida's economy by championing the state's economic development vision and by administering state and federal programs and initiatives to help visitors, citizens, businesses, and communities. DEO's role is to holistically focus on the state's workforce, economic, and community development initiatives by strengthening the connections between workforce investments, economic development, and communities.

DEO's Office of Broadband was established in July 2020 to work with local and state government agencies, community organizations, and private businesses to increase the availability and effectiveness (adoption and use) of broadband Internet throughout the state, specifically in small and rural communities. Through these partnerships, Florida aspires to be a national leader in broadband Internet connectivity, infrastructure, and utilization to enhance workforce viability, education opportunities, and telehealth initiatives.

The 2021 Act outlines the state's lead role supporting broadband Internet expansion to all individuals and organizations:

> The Legislature finds that the sustainable adoption of broadband Internet service is critical to the economic and business development of this state and is essential for all residents of this state, libraries, schools, colleges and universities, health care providers, and community organizations. (§ 288.9961(1), Fla. Stat.).

Use of the defined term "sustainable adoption" in the findings implies that while public support may be important in the short term, the ultimate goal is for providers to be able to obtain "adoption and use levels" that allow the services to be offered without government subsidies. (§ 288.9961(2)(e), Fla. Stat.).

Two impediments to deploying broadband Internet expansion should be noted. The state's actions alone cannot eliminate the following impediments:

1. Unserved and underserved areas are currently difficult to identify due to a lack of detailed data. To complicate matters, providers are continually scheduling, deploying, or modifying broadband Internet infrastructure projects so that no dataset will capture the status of a network perfectly. The complexities of provider deployment, lack of demand, and cost of deployment over time makes the designation of unserved and underserved areas moving targets. Furthermore, the crucial identification of unserved and underserved areas, based on federal definitions, which may be supported through the use of federal funds available when this Strategic Plan is developed, will be determined by the FCC. The FCC is

expected to release its data and broadband Internet access maps in late 2022.[3] This FCC map may not be the final guidance on area eligibility as the federal government is supposed to establish a process by which individual states can challenge the FCC's data.

2. Federal statutory restrictions, in some instances, prevent use of funds from more than one federally funded, broadband Internet-related program in the same area. In addition to federal restrictions, Florida law prohibits the use of funding from the state's Broadband Opportunity Program in areas where federal funds have been awarded. (§ 288.9962(8)(a), Fla. Stat.). The interaction of federal and state laws may limit how funds can be used for infrastructure deployment.

Funding[4]

While maintainable, reliable adoption of broadband Internet service is the long-term goal, in some areas of the state, the cost of providing service is too high to be completely covered by customer charges—at least in the short term. The state has developed funding mechanisms and a plan to consider various federal funding streams with the goal of ensuring that broadband Internet services can be deployed in Florida communities. The state will consider other federal funds to support adoption and usage efforts and programs.

Each potential source of funding brings a set of guidelines that the Office of Broadband can utilize to create a robust program that interconnects separate funding sources to maximize the effectiveness of the whole. This should be done by leveraging each funding source into a primary focus and supporting activities. For example, the Capital Projects Fund may be best suited for projects directly strengthening the workforce by improving job training, community connectivity, and health and human services, while the Broadband Opportunity Program may be best suited to assist homeowners in last mile connectivity.

The Florida Legislature appropriated $400 million from the American Rescue Plan's State and Local Fiscal Recovery Fund for the Broadband Opportunity Program in Fiscal Year (FY) 2022-2023.

Funding in the amount of $366 million is available to Florida through the U.S. Treasury's Capital Projects Fund. The Executive Office of the Governor, in coordination with the Florida Legislature, has discretion as to how this funding will be used. Some funding may be used for broadband Internet: "A key priority of this program is to make funding available for reliable, affordable

---

[3] The FCC is in the process of updating its current broadband Internet maps with more detailed information on the availability of fixed and mobile broadband Internet services. The Broadband Data Collection program will give the FCC, industry, state, local and Tribal government entities, and consumers the tools to improve the accuracy of existing maps. See Broadband Deployment Accuracy and Technological Availability Act (P.L. No. 116-130).

[4] Compiled at the time of drafting this Strategic Plan; information as of June 30, 2022.

broadband infrastructure and other digital connectivity technology projects." (United States Department of the Treasury, 2022, para. 3).

In addition to the above funding opportunities the United States Department of the Treasury (U.S. Treasury) and the National Telecommunications and Information Administration (NTIA) in the U.S. Department of Commerce are two potential sources of funding via federal grants to the state. Several programs authorized by the 2021 Infrastructure Investment and Jobs Act (IIJA) are to be administered by NTIA. Other programs funded through IIJA appropriations and administered by other federal agencies include: the Affordable Connectivity Program by the FCC, the Broadband Loan Program, and the Reconnect Program by the U.S. Department of Agriculture.

Through the IIJA and NTIA, each applicable state will receive an initial $100 million for the Broadband Equity, Access, and Deployment (BEAD) program, including $5 million to support broadband Internet planning, building capacity in state broadband Internet offices, and outreach and coordination with local communities. The BEAD program will be the largest of the broadband Internet programs administered by NTIA. Priority for use of the funds is as follows:

1. Broadband Internet deployment in unserved locations (those below 25/3 Megabits per second or Mbps);[5]
2. Underserved locations (those below 100/20 Mbps); and
3. Community anchor institutions (school, library, health clinic, health center, hospital or other medical provider, public safety entity, institute of higher education, public housing organization, community support organization).

Each applicable state is required to submit a five-year action plan for the BEAD Program to the NTIA, which must be informed through a collaboration with local and regional entities. Funding to implement the action plan will be distributed based on a formula that considers the number of unserved and high-cost locations in the state, based on data displayed on maps to be published by the FCC in 2022.

These new federal programs add to long-standing broadband Internet funding programs developed and implemented by the FCC, such as the Connect America Fund (CAF) Phase II and Rural Digital Opportunity Fund (RDOF). These programs provide price discounts for low-income households, as well as funding for schools and libraries, to obtain broadband Internet and other advanced communications services; rural health care facilities to make broadband Internet more affordable; and primarily small broadband Internet providers in rural and high-cost areas.

---

[5] Broadband speeds: Speeds are expressed with two numbers, separated by a diagonal line "/", and a designation of the amount of data, such as "100/20 Mbps." The first number represents the amount of data users receive. The second number represents the amount of data users can send. Mbps: Megabits per second refers to millions of bits of binary information—zeros and ones—that are passed in a second. Gbps: Gigabits per second refers to the number of bits in billions.

Broadband Internet Strategies for a Connected Economy

Introduction

Reliable broadband Internet access is necessary for economic development in a modern economy, and it is increasingly becoming as critical to basic infrastructure needs as roads, water and wastewater services, and energy. Broadband Internet plays a central role in business development, jobs, education, health, housing and other publicly-desired services, as it is the communities' connection to future economic growth. Current lack of broadband Internet contributes to the digital divide for entire communities, and the expansion of broadband represents a tremendous opportunity particularly for rural and underserved communities across the sunshine state, including the ability to grow and recruit businesses and generate high-quality and sustainable jobs. The 2021 Act addresses the need for broadband expansion to enable availability and increased useful adoption. There are some areas of the state where Internet Service Providers (ISPs) may be unable to provide service at this time because the revenue streams from consumers are insufficient to cover the costs of traditional infrastructure deployment, ongoing operations, and maintenance to ensure reliable connectivity. In other areas of the state, broadband may be available, but customer demand may be insufficient for providers to justify upgrading the infrastructure to higher speeds.

Likewise, there are areas of the state where broadband Internet services are available, but the public does not purchase them. The 2021 Act makes it clear that public subsidies are a temporary mechanism. The desired result of the state's public policy regarding broadband is "sustainable adoption" of broadband services by all Floridians. The 2021 Act defines "sustainable adoption" in a way that acknowledges the objective of providing broadband service without a subsidy.[6] The need is to create resilient Florida communities free to thrive in a strong connected economy.

The 2021 Act created responsibilities at both the state and local levels to facilitate the expansion of broadband Internet service and help providers make the return on investment for sustainable adoption. At the state level, DEO is accountable as the lead agency to facilitate the expansion of broadband. (§ 288.9961(3), Fla. Stat.). The 2021 Act created a collaborative process between state and local communities. Through this initiative, the relationship between the state and local communities will vary depending on the goals, capabilities, and resources of each community. In some instances, local communities will take the initiative to identify unserved areas and take steps to expand broadband Internet infrastructure and service to those areas. In other instances, local communities may be less proactive, especially in fiscally constrained communities, and the state may have a more direct role in expansion initiatives. Thus, this Strategic Plan is based upon state and local entities' collaborative and complementary efforts.

---

[6] Sustainable adoption: The ability for communications service providers to offer broadband Internet services in all areas of this state by encouraging adoption and use levels that allow for these services to be offered in the free market absent the need for governmental subsidy. (§ 288.9961(2)(e), Fla. Stat.).

The complementary but distinct roles of state and local entities described in the 2021 Act raise two fundamental questions: 1) What is the state's role in providing broadband Internet service to the public?; and 2) What are the roles of local communities in providing broadband Internet service to the public? As you will see below, these are strategized in separate parts in Section I: Availability.

Organization Of The Strategies For Implementing This Strategic Plan

This strategic plan is presented in three sections that follow:

- I. **Availability**
    - A. **State Role in Availability**
    - B. **Local Role in Availability**
- II. **Adoption and Use**
- III. **Accountability**

The state of Florida prioritizes the long-term resiliency and growth of each community and Florida as a whole; therefore, adoption without use will not meet the vision or intent of this Strategic Plan. It follows that steps two (adoption) and three (use) for creating a connected economy have been combined in Section II: Adoption and Use. It is vital for the state to create an accountable program to provide Floridians with opportunities to access education, telehealth, and workforce training and engagement through broadband Internet expansion. As such, accountability encompasses the third section of the strategies for implementing this plan, discussed in Section III: Accountability.

There are strategies and action steps suggested in each Section which, when considered together, will assist the state with accomplishing its goals of increasing the availability, adoption, and use of broadband Internet throughout the state.

I. Availability

A. State Role in Availability

I.1. Develop local and regional partnerships to meet broadband Internet goals and coordinate with those partners to effectively use federal broadband Internet expansion funds in unserved and underserved areas

> **Strategy 1**: Continue to build and engage Local Technology Planning Teams (LTPT) where possible. In areas where previously organized entities may be able to act as LTPTs, designate them as such if they are willing to take on the LTPT role.

Explanation: LTPTs were authorized by the 2021 Act to identify "current broadband availability, locate unserved and underserved [areas], identify assets relevant to broadband deployment, build partnerships with broadband service providers and identify opportunities to leverage assets and reduce barriers to the deployment of broadband Internet Services in the community." (§ 288.9961(4)(b), Fla. Stat.). Specifically, this work is to be conducted with rural communities. The statutes' focus on both the rural areas and the LTPTs' work in "fiscally constrained" counties suggests that partnerships will help provide the capacity necessary to ensure successful broadband Internet projects.

Action Steps:
a. Identify areas where LTPTs have not been formed and develop alternative means (such as surveys, direct outreach, or inclusion in a regional planning team) of engaging communities in the broadband Internet planning process.
b. Through outreach, toolkit materials, and guidance, encourage the development of regional LTPTs, especially where neighboring counties have similar broadband Internet needs.
c. Design and conduct workshops to train LTPTs to perform the necessary needs assessments, collect data, and plan for broadband Internet expansion in their communities.
d. Publish and/or make available information about the development, progress, and best practices employed by LTPTs and other local entities to identify and create plans for addressing the broadband Internet needs of their respective communities.
e. Continue to encourage LTPTs and communities to engage in broadband internet service planning and document that engagement.

Strategy 2: Guide, encourage, and where necessary direct, local communities to coordinate infrastructure projects, such as roads and broadband Internet, to reduce overall costs.

Explanation: Ready infrastructure is the gateway to business growth and job creation. Maximizing the efficiency of the infrastructure preparation to increase the effectiveness of the infrastructure improvement, will lead to better opportunities to attract new businesses, enhance existing businesses, provide training to potential workforce, and deliver more methods for critical interconnectivity such as telemedicine.

Failure to coordinate planning for infrastructure projects could result in land or rights-of-way being dug up more than once when broadband Internet providers install fiber after lines and conduits have been installed as part of roadway construction projects. Such duplication of effort can be costly to the community in terms of traffic disruptions and reduced road life (Wilde et al., 2002).

Dig Once, involving coordination, has been identified by the U. S. Government Accountability Office as a means of reducing the overall cost of infrastructure installation with opportunities for joint trenching and sharing of overhead such as maintenance of traffic, staging construction activity, and restoration expenses (Fleming, 2012).

Action Step: From a state level of best practices and methods, ensure infrastructure construction and improvement activities are coordinated and reported to the Department. Guide, encourage, and if necessary, direct, local communities to coordinate infrastructure projects in overlapping physical areas regardless of municipal boundaries.

I.2. Collect, maintain, and analyze up-to-date, reliable, detailed data with which to identify unserved and underserved areas of the state

Strategy 3: Develop an ongoing program to enhance the state broadband Internet dataset. Leverage other broadband Internet data resources, including data collected by LTPTs and local and regional organizations. Ensure the Office of Broadband collects and maintains data through its grant activity.

Explanation: Continued coordination of LTPTs, as well as local and statewide workshops, will raise awareness of the importance of local involvement in the information-gathering process and of broadband Internet expansion constraints imposed by state and federal law. Obtaining the necessary data with which to identify unserved and underserved areas is key to meeting reliable and sustainable broadband Internet service needs of those areas. Local entities developing broadband Internet plans will be most effective in gathering necessary broadband Internet availability and use information from residents and businesses. Such information may be derived from surveys or other methods that will identify broadband Internet service gaps.

Data collected by LTPTs and other grant applicants can be provided to the Office of Broadband in local plans or grant applications for the Office of Broadband's use to support the allocation of federal and state funds to expand broadband Internet infrastructure and service.

The 2021 Act states that "the [strategic] plan must include a process to review and verify public input regarding transmission speeds and availability of broadband Internet service throughout this state." (§ 288.9961(4)(a), Fla. Stat.). Among the types of public input that might be relevant are crowdsourced data, commonly collected via online speed tests, such as the one on the Office of Broadband's website. The need for verification of crowdsourced data is supported by analyses that have shown online speed test results to understate availability and perhaps speeds (PURC, 2022). DEO's Office of Broadband should consider actively maintaining the publicly accessible speed test and map to capture real-time data

and display real-time improvement results, but utilize multiple data sources to verify reported speed test results and calibrate the data as necessary.

Action Steps:
   a. Conduct workshops for LTPTs and other regional groups to share best practices related to data collection and management.
   b. Provide technical assistance, guidance materials, toolkits, and coordination among LTPTs to facilitate sharing best practices to help LTPTs identify local broadband Internet service needs.
   c. Recommend through guidance, policy, and possibly rulemaking for the LTPTs and regional organizations to conduct surveys and use survey responses to identify unserved and underserved areas.
   d. Assemble locally collected data submitted in local broadband Internet plans and grant applications.
   e. Review and verify the Florida crowdsourced[7] and other publicly obtained data regarding broadband Internet availability in Florida to determine its validity and predictive power. Analyze such data in conjunction with data obtained from other public sources, including the FCC, the U.S. Census Bureau, Ookla, Microsoft, and the Technology Policy Institute.

I.3. Identify areas of data and methods by which data is used to facilitate and document service expansion plans

Strategy 4: Use data to identify areas at a more granular level where federal broadband Internet expansion funds have been used or will be used to ensure compliance with state and federal law and to identify unserved and underserved areas.

Explanation: Detailed data are needed to pinpoint the locations of unserved and underserved areas. Florida historically relied on FCC maps developed several years ago and annually updated. These maps tend to overstate broadband Internet connectivity because if one household has connectivity in a census block, the entire block is counted as having connectivity. In rural areas, a single census block could constitute many square miles (PURC, 2022).

The FCC is updating and expanding its mapping efforts, and information from the updated map will be used by the federal government to determine unserved and underserved areas for the purposes of some federal programs. However, states will be allowed to challenge the FCC's updated maps. To do so, Florida will need to gather and analyze accurate data

---

[7] Crowdsourcing, in this context, is online collection of Internet speed data from Floridians who voluntarily take part in speed tests with their own Internet-accessible devices, such as personal computers, tablets, or smartphones.

and identify instances where the FCC's map appears to be flawed. Moreover, challenging FCC data may be necessary to maximize federal funds flowing to the state.

The same data required for the release of federal funds for broadband Internet expansion may be necessary to ensure compliance with state law and implement the Broadband Opportunity Program. The challenge process in state law, as well as the state's responsibility for appropriate use of federal and state funds for broadband Internet projects, will necessitate the collection of data going forward (§ 288.9962 (6)(c) (1-3), Fla. Stat.).

As noted previously, some unserved and underserved areas may not benefit from federal funding from the federal IIJA (P.L. 117-58) for broadband Internet expansion and connectivity due to restrictions in DEO's Broadband Opportunity Program and possibly federal programs such as the FCC's Rural Digital Opportunity Fund (RDOF) and Connect America Fund II (CAF II) and the U.S. Department of Agriculture's ReConnect Loan and Grant Program.

Action Steps:
a. Compile available information about areas that have broadband Internet service and areas that providers have committed to serve using federal broadband Internet expansion funds. In addition, collect the anticipated duration of any expansion commitments to the extent known.
b. Develop a process to collect and monitor any such data at least annually.

Strategy 5: Develop and implement a method by which to acquire information about Internet service providers' broadband Internet expansion plans to understand where, how, and when various Internet service providers will initiate or improve service in unserved or underserved areas.

Explanation: An aspect of data gathering and management relates to information about where, how, and when various Internet service providers will initiate or improve service in unserved or underserved areas. However, providers may be reluctant to share information they consider to be competitively sensitive. Therefore, there will be an asymmetry of information between the Internet service providers and the state regarding the providers' commitment to service in specific areas. Efforts to obtain that information from providers could be a challenge.

Regular meetings between DEO's Office of Broadband and Internet service providers may facilitate information-sharing regarding expansion plans; however, the Office of Broadband, and providers that are direct grantees of the state, will need to exercise caution in participating in any such meetings to avoid a conflict of interest.

Action Steps:

    a. Have the Office of Broadband meet regularly with Internet service providers to learn about their observations regarding the viability of conducting business in unserved areas and upgrading service in underserved areas.

    b. Create legal pathways for sharing sensitive or confidential business information such as entering into data share agreements with providers, as necessary, to obtain more information about their not-yet-disclosed-commitments for expanding broadband Internet services.

I.4. The overarching economic challenge for making broadband Internet available

Strategy 6: Develop an approach to identify locations where sustainable broadband Internet expansion or improvement will not be economically feasible for providers in the foreseeable future due to low adoption levels or geographic barriers.

Explanation: Sustainable broadband Internet adoption is not currently feasible in some areas of the state because the costs of providing services in those areas exceed customers' willingness or ability to pay for the services. In these areas, there may be greater opportunities for alternative solutions[8] to play a larger role in providing broadband Internet services.

Action Steps:

    a. Establish methods for leveraging state and local resources, including the map(s) on the Florida Office of Broadband website, to identify unserved and underserved areas in the state.

    b. Continue to collect and maintain information about unserved and underserved areas in the state's broadband Internet datasets.[9]

    c. Continue to engage with technology and equipment companies to understand the methods by which broadband Internet service may be provided to an area.

    d. Through the LTPT initiative, grant application process, and rulemaking, encourage planning efforts to maintain updated estimates on both the potential costs to provide service as well as the potentially available technologies to provide that service and what speeds this would bring to the areas.

---

[8] See Appendix F, section VI, "Programs to Increase Broadband Access" for further information.
[9] Discussion of datasets is included in the "Managing Data" section below.

I.5. Positioning to undertake statewide broadband improvement

Strategy 7: Evaluate all aspects of state and federal funding program requirements and determine the need for and best use of consultants to implement a grant-making process.

Explanation: DEO administers various grant programs, such as the Small Cities Community Development Block Grant and nearly $2.5 billion through the Community Development Block Grant - Disaster Recovery and Community Development Block Grant - Mitigation programs through its Office of Long-Term Resiliency to facilitate recovery efforts in response to Hurricane Hermine and Matthew (2016), Hurricane Irma (2017), Hurricane Michael (2018), and Hurricane Sally (2020), as well as mitigation and resiliency efforts. DEO's experience with the administration of these programs will inform the development of broadband Internet expansion grant administration.

Additional specialized expertise may be required to implement a suitable grant administration process. Supplementing the state-level capacity with contracted services can help accomplish the tasks associated with this large funding project without making long-term staffing commitments, which may not be necessary.

Action Steps:
   a. Leverage capacity within DEO to design and manage grant processes that will meet the scope and requirements of the state and federal programs that fund the state's broadband Internet expansion.
   b. If third parties are needed, develop criteria for consultant selection and coordinate input into the process of selecting third parties to complete selection as quickly as possible. Depending on the projects for which third parties are needed, they will need to have the following requirements:
      1. Analytic skills such as mapping and data analysis (including take rates, affordability, etc.) necessary to identify where services are needed and how much it will cost to serve these areas;
      2. An understanding of cost analysis based on geographic and technology differences across the state and an understanding of the revenue needs of providers to derive estimates of funding necessary to ensure broadband Internet deployment in unserved and underserved areas;
      3. Knowledge of grant administration processes and management;
      4. Experience working in a number of states;
      5. Detailed knowledge of relevant federal funding programs and their requirements; and,
      6. Demonstrated ability to adhere to a complex timeline.

I.6. Implement grant development administration processes for providers

Strategy 8: Implement the most effective and efficient means of using broadband Internet grant funds to reach unserved and underserved areas and incorporate that approach into the grant processes for providers.[10]

Explanation: Grant qualification, evaluation, and application processes can present obstacles to providers and serve as a barrier to broadband Internet expansion. To attract the largest number of applications for broadband Internet grants, and therefore increase the possibility that unserved and underserved communities will be reached, the entry hurdles need to be streamlined without sacrificing robustness. That is, every step in the process must be designed to ensure that the most qualified applicants have the possibility of receiving project funding to provide broadband Internet service[11] to those communities in Florida which are the most needy. In terms of optimizing the use of federal funding, an option might be to award competitive grants for most of the state and establish a grant specifically for unserved areas within the state that have not yet received funding or any response to earlier competitive grant opportunities.

DEO's Office of Broadband should ensure the projects' grant applications are the best fit under the separate potential sources of funding to minimize challenges or hurdles posed with each project, as some funding opportunities will contain different constraints that may or may not readily fit within the existing project plan.

Action Steps:
a. Develop an approach to attract multiple broadband Internet service providers as competitors for financial assistance to be used in unserved and underserved areas under state or local assistance programs.
b. Analyze each state and federal funding stream to determine priorities for projects, restrictions on the use of funds, time limitations on the use of funds, and match requirements, along with any other stipulations.
c. Create a plan for maximizing the use of state and federal funds available to support broadband Internet projects in the least served areas of the state.
d. Determine which of the various available competitive grant processes should be used for the purposes for which grants may be made under the state and federal program requirements.

---

[10] Grant in this context, means the funding provided by the federal, state, or local government. Grant agreements take different forms including partial project funding (i.e., requiring a match) and are contracts between the granting entity and the grantee.

[11] Section 288.9961(2)(a), Florida Statutes. "Broadband Internet service" means a service that offers a connection to the Internet with a capacity for transmission at a consistent speed of at least 25 megabits per second downstream and 3 megabits per second upstream.

e. Implement specific rounds of grant cycles targeted to meet identified community needs.

Strategy 9: In order to avoid situations where the lowest-bid proposal wins award without regard to likelihood of completion of project, long-term viability of service, or scalability of service for future proofing, design a competitive selection process in compliance with state and federal requirements that will enable DEO to identify the most suitable Internet service provider or providers to meet the broadband Internet needs of the unserved and underserved areas of the state.

Explanation:
An approach for selecting grantees could include:
- Developing rigorous standards for business experience, financial health, and technical expertise for entities seeking funding;
- Holding competitions for funding for multiple areas and, at the same time, allowing entities seeking funding to choose which areas they would seek to serve;
- Developing well-defined obligations for funding recipients and a uniform, objective scoring method for comparing offers;
- Holding multiple rounds of offers in which competitors seek to beat the offers of others; and
- Conditioning the release of funds on the successful completion and deployment of the required broadband services.

In addition to this process, there are other competitive funding mechanisms that may be used such as a Notice of Funding Availability, Funding Opportunity Announcement, or similar instrument. Other competitive grant award processes include those based on the merit of the proposal or application, for example – an assessment of the applicant's ability to complete specified tasks within budget and time constraints.

Some competitive processes are better than others to identify the most effective bidder for a well-known project. Other processes may be better when the area's needs cannot be articulated. The Office of Broadband should work with LTPTs to identify which processes are best suited for individual situations.

Action Steps:
a. Develop and implement competitive processes to identify the recipient of financial support that is best able to meet the needs of unserved and underserved areas.
b. Ensure that the competitive grant process accommodates proposals from providers to expand broadband Internet service in multiple unserved and underserved areas, where applicable.

c. Establish grant eligibility and scoring criteria that incorporate an assessment of whether Floridians can access networks that are comparable on such dimensions as speed, latency, reliability, and functionality.

d. Design and use application qualification criteria to ensure that grantees can and will complete the scope of work required.

Strategy 10: In the instance where an area failed to receive competitive bids and the state considers a process to target those unrepresented areas for award, design a negotiated provider-selection process in compliance with state and federal requirements for aspects of the broadband Internet expansion effort. Through this process the state may be able to ensure a particular area or type of area receives consideration for award. This process may be utilized in situations for which there was only a single bidder offering to deploy broadband Internet in an unserved and underserved area or for which there was no bidder.

Explanation: After funds have been allocated through the competitive grant process, there may be unserved and underserved areas for which no provider was identified. An alternative provider selection process may be required to ensure those areas are served under a broadband Internet expansion program.[12]

Action Steps:
a. After competitive selection processes are completed, inventory those unserved areas where there was no acceptable competitive bid and that were not included in the service area of any grantee.

b. Develop specifications for grantees to serve those areas in compliance with state and federal funding requirements.

c. Negotiate with qualified applicants to provide services to the unserved areas.

d. Prepare for and develop contingency plan(s) for the potential outcome where a negotiated agreement with a provider to serve a given area does not come about. The contingency plan(s) should be based on data collected during the initial grant award phase and the ongoing efforts to refine data regarding unserved and underserved areas. The local technology planning teams as well as private stakeholders from the broadband Internet industry should be consulted in the event a contingency plan is needed.

I.7. Need for skilled and specialized workers a critical component of deployment of broadband Internet infrastructure projects

---

[12] An example is North Carolina's Broadband Stop Gap Solutions Program, which is to be launched in late fall 2022, following awards from two other competitive grant programs. See The Broadband Stop Gap Solutions Program at NCDIT "Stop-Gap Grant."

Strategy 11: Prepare the workforce for the jobs that will emerge from the national deployment of federal and state infrastructure projects to ensure continuity of operations.

Explanation: In addition to the need for construction and installation expertise for broadband Internet infrastructure projects all over the country, there will be an ongoing need for broadband Internet infrastructure maintenance after the grant funding ends. Florida is preparing, and must continue to prepare the Florida workforce to not only meet the immediate construction needs but also undertake the long-term maintenance for continued reliability and growth. Workforce development planning and initiatives, which is a statewide function, will continue to be necessary to meet those needs.

In 2021, the Reimagining Education and Career Help (REACH) Act was unanimously passed by the Florida Legislature and signed into law by Governor DeSantis. The REACH Act provides a blueprint for bringing together the various workforce development partners into a coherent system that better serves job seekers and businesses and is accountable to the citizens of Florida. REACH partners include agencies and organizations that provide education and training, placement services and public assistance. (Executive Office of the Governor, Department of Economic Opportunity, Department of Education, Department of Children and Families, CareerSource Florida, and Enterprise Florida) The structure developed within the REACH Act will facilitate solutions to any skilled worker shortages and place Florida at a competitive edge against the emerging need for these skilled workers nationwide.

Action Steps:
a. DEO will work with the REACH partners on an inventory of workforce development programs that prepare the state's workforce for jobs in broadband Internet-related infrastructure construction, telecommunications technology, and consumer technology industries.
b. REACH partners will ensure that their work is aligned with Florida's Strategic Plan for Broadband and encourage workforce development agencies and educational institutions to train more students in technology-related fields and address the need for alternative and related skills to enable infrastructure installation and construction workers to transition to more stable positions.
c. Maintain awareness and research of Florida's competitive edge as compared to other states and their progress in these programs. Look for best practices wherever available and engage with private industry whenever necessary to determine ways Florida can continue to meet this growing need.

"Unlike industries with infrastructure mostly built out, the Broadband Industry faces unique challenges due to the volume of new and upgraded infrastructure to be deployed. In many cases, Broadband Industry workers must be on-call, on the road, and face unpredictable (uneven) demand for their skills. In addition, where climate and weather limit deployment in certain seasons, affected Broadband Industry positions may have a stigma that they provide a lower level of 'job security' for some. Many Broadband Industry workers or potential workers might view the job security issue differently if alternative Industry career options, and upskilling and other training programs, were available during the periods when the peak demand is over.

Furthermore, many Industry positions, such as tower climbers, require working at heights. Many workers are not interested in the risk such jobs entail" (Broadband Infrastructure Deployment Job Skills and Training Opportunities Working Group, 2020, p. 10).

B. Local Role in Availability

I.8. Capacity for communities to effectively pursue federal and state funding opportunities to support broadband Internet expansion

Strategy 12: Continue to provide technical assistance based on community requests to assist with organizing LTPTs.

Explanation: Local entities often face challenges in assessing their broadband Internet availability, identifying unserved and underserved residents and businesses, identifying assets available to leverage federal funding, and filling out applications for federal broadband Internet funding. In addition, communities in Florida have little experience convening to pursue objectives for broadband Internet expansion. These objectives may include those community members who comprise LTPT membership: "libraries, K-12 education, colleges and universities, local health care providers, private businesses, community organizations, economic development organizations, local governments, tourism, parks and recreation, and agriculture." (§ 288.9961(4)(b), Fla. Stat.).

Additionally, there are several programs under which broadband Internet expansion has been an allowable use and continues to be encouraged by the Department. Including the Rural Infrastructure Fund (RIF), the Community Development Block Grant (CDBG) and the Florida Job Growth Grant Fund. Other programs may have a broadband Internet component within an application. The RIF program currently allows for and encourages planning and technical assistance grants, the CDBG Small Cities grant will be undergoing rulemaking in first quarter of state fiscal year 2022-2023 to better align the scoring matrix to encourage planning and technical assistance grants.

The Broadband Planning Toolkit (Toolkit) provides fundamental resources and guidance using a nine-step planning process to help each LTPT identify the availability of broadband Internet services in its county or region. The Toolkit also provides a template for a community and business survey that should be updated to fit the team's needs, circulated, collected, and provided to the Office of Broadband for statistical analysis vital to broadband Internet expansion.

The intended result from this effort is "diverse community industry sectors working together to develop measurable goals, objectives, and benchmarks that will keep Florida's broadband adoption and expansion efforts on track at every level of government in subsequent years" (Florida Office of Broadband, 2022a).

In addition, LTPTs are provided with:

- Support from the Office of Broadband, including assistance with meeting facilitation and verification of speed test data.
- Contact information for other LTPTs around the state to share discussions and planning strategies.
- Links to planning resources, research, and other materials available on the Office of Broadband's webpage. Available resources include maps, statewide survey results, the regional broadband Internet workshop summary and recordings, funding opportunities, and partnership information.
- A comprehensive broadband availability map from the NTIA.
- Guides on broadband Internet 101; Broadband planning processes; broadband planning inventories; strengths, weaknesses, opportunities, and challenges analysis; sample questions for meetings/discussions; and, community and business survey distribution practices (Florida Office of Broadband, 2022a).

The Toolkit for LTPTs names nine steps for a planning process and provides steps and a timeline for completing each one:
Step 1 - Engage Stakeholders
Step 2 - Assemble a Team
Step 3 - Identify Community Priorities
Step 4 - Harness the Data
Step 5 - Consider Digital Inclusion
Step 6 - Assess Resources and Infrastructure
Step 7 - Engage Local Internet Service Providers
Step 8 - Evaluate Solutions
Step 9 - Develop & Execute Solutions
(DEO, 2021)

Action Steps:
a. Use the Toolkit and any other relevant training materials as the basis for educating and organizing LTPTs.
b. Provide technical assistance on the use of the state's broadband Internet availability map and other publicly available broadband Internet databases.
c. Provide information about the strengths and weaknesses of various broadband Internet technologies so that local entities can make informed decisions about

the technologies or technology requirements that will best meet the needs of their unserved and underserved areas.

d. Continue to implement an outreach and communication campaign to ensure that stakeholders across the state are aware of the local planning efforts underway.

e. Continue to provide information on the Office of Broadband webpage about any technical assistance available through federal funding opportunities.

f. Develop best practices and other resources for LTPTs to use to lower costs of providing broadband Internet service to unserved and underserved areas.

g. Identify philanthropic organizations that could assist by providing technical assistance or funding to LTPTs or communities working to expand broadband Internet in their areas.

Strategy 13: Provide technical assistance to grant applicants that request such assistance.

Explanation: An experienced staff person or contractor with community needs assessment techniques and grant application preparation at the local government level could be engaged to provide technical assistance to ensure applicants are supported throughout the planning process.[13]

Action Steps:
a. Determine which technical support needs can be provided either through staff or a contractor to ensure that all applicants' needs are met and that applicants are treated fairly.

b. If technical assistance is outsourced, consider models such as those used by the Illinois and Minnesota broadband Internet offices for empowering local communities to identify unserved and underserved areas, identify needs for broadband Internet services, and assist in developing grant applications.

c. If resources are available, provide opportunities to pursue planning grants such as under the Rural Infrastructure Fund or the Community Development Block Grant to each eligible local entity functioning as an LTPT. Such grants may be useful for local entities to obtain necessary technical expertise.

---

[13] For example, the Benton Foundation and the Blandin Institute use the same individual to provide technical training to communities. With respect to the Benton Institute program in Illinois, 30 hours of expert consultation to facilitate community-driven broadband Internet planning is offered. The Blandin Institute similarly provides consultation to rural communities in Minnesota that are starting their planning for broadband Internet expansion. This consultation guides them through the steps in preparation for conducting a feasibility study and organizing for the subsequent steps. Communities get a 'grant' of up to 35 hours of the consultant's time (Blandin Foundation, 2022; Illinois Department of Commerce & Economic Opportunity, n.d.).

I.9. Attract providers to serve rural, low population density areas

Strategy 14: Develop an approach to increase communities' purchasing power by attracting multiple providers to deploy broadband Internet in rural, unserved, and underserved areas in those communities.

Explanation: Providing broadband Internet to low-population density rural areas may require government subsidies to offset provider costs, thus making service to rural customers commercially attractive. Individually, low-population density areas may be unable to attract interested providers due to the cost of developing proposals and high project risk relative to potential profits. However, when aggregated, they might be able to attract more than one provider. For local areas that aggregate their service needs, state contracts may be available through which to obtain the necessary services. The objective of aggregating or using state contracts would be to reduce procurement-related overhead costs to the local subdivisions and overall project costs.

This strategy may overcome two factors that might limit counties' success in engaging providers of broadband Internet service for unserved and underserved areas: 1. County-specific procurement processes that may include unique requirements related to areas where revenue potential is limited; and 2. Conducting the procurement process itself is a barrier for resource-limited rural counties.

Several rural counties have implemented procurement processes that include grants. A more expansive inventory of Florida county procurement efforts may reveal best practices that might be applicable more broadly.

Action Steps:
  a. Identify areas that are unable to attract a provider, but that when aggregated with other areas, might attract one or more providers.
  b. Facilitate local communities or regions to jointly determine the technical services needed for grant management.
  c. Following state, federal, and local procurement requirements, the procuring entity (be it state or local) should select a vendor or vendors that will provide services to all participating communities or regions.
  d. Catalog best practices used by counties to procure broadband Internet services, paying special attention to practices used by counties with the lowest population density.
  e. Post best practices for procurement on DEO's website and periodically update them to be used as a resource for counties to promote broadband Internet expansion.
  f. Facilitate local communities or regions' in conducting business case studies to determine the economic feasibility of providing various scalable levels of broadband internet service.

I.10. Coordinate infrastructure installation projects

Strategy 15: Encourage local communities to coordinate infrastructure projects, such as roads and broadband Internet, to reduce overall costs.

Explanation: Failure to coordinate planning for infrastructure projects could result in land or rights of way being dug up more than once when broadband Internet providers install fiber after lines and conduits have been installed as part of roadway construction projects. Such duplication of effort can be costly to the community in terms of traffic disruptions and reduced road life (Wilde et al., 2002).

Dig Once, involving coordination, has been identified by the U. S. Government Accountability Office as a means of reducing the overall cost of infrastructure installation with opportunities for joint trenching and sharing of overhead such as maintenance of traffic, staging construction activity, and restoration expenses (Fleming, 2012).

A new rule authorizes federal highway projects to permit the sharing of conduit for that purpose (Federal Highway Administration, 2021). This same rule requires the state to designate a utility coordinator with responsibility for facilitating the broadband Internet infrastructure right-of-way efforts in the state.

Action Step: Readily provide information through toolkits, outreach, and website availability, about the use of "Dig Once Policies" defined in the Broadband Planning Toolkit as "the installation of accessible, buried conduits during various infrastructure projects to enable providers to affordably install fiber with ease by running it through available conduits at a later time" (DEO, 2021a, p. 25). Engage with state agencies such as the Florida Department of Transportation for best practices methods in planning infrastructure construction projects which co-locate resources, utilities, or services, disseminate this information to all interested parties, and make it available by request or conveniently online.

II.   Adoption and Use

For broadband Internet providers to recover their investment in broadband Internet-related capital outlay over the long term, revenue streams from consumers must be adequate to offset costs. The provisions of the 2021 Act underscore the need for adoption as a means of sustaining broadband Internet services. The defined term "sustainable adoption" implies that while public financial support may be important in the short term, the end goal is for providers to be able to obtain "adoption and use levels" that allow services to be offered without government subsidies. (§ 288.9961(2)(e), Fla. Stat.).

The 2021 Act recognizes the importance of adoption of broadband Internet service by requiring the Office of Broadband to "encourage the use of broadband Internet service, especially in the rural, unserved, or underserved communities… through grant programs." (§ 288.9961(4)(d), Fla. Stat.).

Furthermore, the Broadband Opportunity Program prioritizes the use of grant funding to spur adoption by actively promoting adoption, having wide support from the community, and providing access to broadband Internet service to the greatest number of households and businesses. (§ 288.9962(7)(a), Fla. Stat.).

> **ADOPTION** occurs when consumers — residents or businesses — subscribe to high-speed Internet service. Digital literacy is the ability to use a variety of broadband-enabled devices for engagement in online services. Adoption and digital literacy strategies work hand in hand. The strategies for adoption involve identifying local barriers to broadband adoption and developing methods for overcoming them at the local level. These strategies also address the state facilitating, and assisting with, local efforts, including efforts to obtain funding. In addition, the strategies address methods to overcome the identified digital divide, ensure that anchor institutions obtain the broadband they need, and provide technical assistance to local communities.

It is difficult to predict the long-term availability of public subsidies supporting adoption of broadband Internet service. Large federal infusions of funding may be time limited, e.g., the emergency connectivity subsidy was extended to June 2023, but evidence shows that adoption challenges persist and may be difficult to overcome (Manlove & Whitacre, 2019a, 2019b; Perrin, 2021; Perrin & Atske, 2021; Vogels, 2021, 2021b). Therefore, organizations charged with stimulating demand for broadband Internet may need to be involved in adoption activities over the long term.

II.1. Bridging the adoption digital divide

Strategy 16: Expand policymakers' and other stakeholders' knowledge of ways to bridge the adoption digital divide between urban and rural communities.

"The shape of the digital divide is different in each community. Affordability, infrastructure, lack of devices or skills, and low awareness of the internet's benefits can all be factors. To best respond to community needs, local leaders must have a complete picture of their current broadband landscape. Identifying gaps by conducting a needs assessment is the first step in creating effective solutions to close the digital divide" (De Leon & Sanchez, 2020).

Explanation: The existence of an urban-rural divide in broadband Internet availability and adoption is documented in *The Status of Broadband in Florida* report (PURC, 2022) that lays part of the foundation for this Strategic Plan.

Adoption is at the heart of Florida's broadband Internet policies. "The sustainable adoption of broadband Internet service is critical to the economic and business development of this state and is essential for all residents of this state, libraries, schools, colleges and universities, health care providers, and community organizations." (§ 288.9961(1), Fla. Stat.).

Yet, the challenge of spurring broadband Internet adoption and meaningful use has persisted for decades. In some instances, availability has been a primary barrier to adoption. In other instances, the cost of connectivity and end-user devices will continue to affect some segments of the population, and, in many instances, potential customers have not seen the value of adopting broadband Internet, regardless of the price.

The mechanisms that might spur adoption are currently not yet fully understood, making it difficult to identify precisely the most effective actions at either the state or local level (Beard et al., 2022). Discussions during Office of Broadband workshops conducted in early 2021 pointed to reliability being more of a barrier than cost (DEO, 2021b). Barriers to adoption must be identified and understood to craft the appropriate public sector responses. The use of broadband Internet services for addressing peoples' needs with respect to job training, the workplace, education, health and housing has been impeded by limitations with respect to end-user technology.

Action Steps:
  a. Identify gaps in broadband Internet adoption that may not be filled absent financial assistance to consumers.
  b. Identify broadband Internet adoption gaps that will persist despite there being adequate financial assistance.
  c. Identify and publicize best practices for providing information about and availability of needed financial assistance for broadband Internet adoption

through cooperation with and partnerships between providers, government, and regional leaders, with emphasis on unserved and underserved communities.

d. Collaborate with providers on studies of why some potential broadband Internet customers choose to not purchase the service for reasons other than affordability as well as potential strategies and/or recommendations to address this issue.

e. Provide guidance, coordination, and support for LTPTs and other regional entities as they establish goals for broadband Internet adoption in their respective communities to ensure that the needs of all communities and residents within those communities are considered, including the need for appropriate end-user technology.

f. Use relevant data from state and national sources to identify where adoption lags state averages.

g. Utilize public speed-testing (crowdsourcing) and other techniques to identify unserved and underserved locations.

Strategy 17: Assemble and analyze information gathered by Internet Service Providers, LTPTs, and other regional entities to identify gaps in adoption. Overlay these identified areas with other state data indicating economic and community development indicators to determine potential correlation and use this analysis to better refine knowledge of gaps in adoption and meaningful use of broadband internet service.

Explanation: Whenever possible the Office should work with all relevant stakeholders to maximize usage of gathered data. Leveraging multiple sources of data will strengthen the statewide perspective of the Department. Placing particular emphasis on determining gaps in Broadband adoption and the related data source showing that gap can help identify both areas of need and potential correlations to reasons those areas remain of need.

Action Steps:
a. Collaborate with broadband Internet providers in studies of customer use and potential customers' reasons for non-adoption as well as potential strategies and/or recommendations to address this issue.

b. Provide technical assistance to LTPTs and other local and regional organizations with designing and conducting surveys of end residents and businesses in various settings such as educational institutions, libraries, community centers, senior centers and other venues to find out more about their use of broadband Internet services to ensure that community surveys collect sufficient demographic data to make results useful.

c. Analyze data collected at the local level to identify statewide patterns and use findings as the basis for further training and technical assistance for LTPTs and other regional entities, including schools and libraries supporting broadband Internet adoption.

II.2. Insufficient local technical support may limit adoption of broadband Internet-supported services

Strategy 18: Prepare people for emerging information technology jobs and business opportunities and identify ways of using existing positions or volunteers to meet increased end-user needs related to adoption and use of broadband Internet services.

Explanation: This strategy is related to strategy 10: *Prepare the workforce for the jobs that will emerge from the federal infrastructure programs*. As broadband Internet becomes more available across the state, additional opportunities for business creation and expansion, as well as a growing need for skilled workers to provide end-users with technology support and to improve the use of digital content or digital literacy, may become available.

Citizens and businesses without access to technical support may need assistance in keeping software and hardware safe, secure, and up to date (e.g., updates, security patches, use of antivirus applications and VPNs, especially for education and medical applications, but also for job searches and for submitting taxes and other interactions with government agencies). The U.S. Bureau of Labor Statistics estimates published in 2021, show that there were approximately 42,000 employees in computer support technical positions in Florida. Those data also show that in many areas of Florida, especially non-metropolitan areas, employment of people in support specialist positions is below the national average (United States Bureau of Labor Statistics, 2021).

Support for end-users can come from community members who are not exclusively dedicated to computer technology support. Positions in existing businesses and organizations may be repurposed to provide assistance to residents with technology and application questions. An example is the Digital Navigator Grant Program in Illinois where Digital Navigators[14] assist community organizations and residents with digital literacy skills (Illinois Department of Commerce & Economic Opportunity, n.d.).

Action Steps:
  a. Inventory workforce development programs that prepare people for jobs in information technology and consumer technology occupations.
  b. Develop programs that recognize achievements in information technology workforce and business development. Recognition could

---

[14] "Digital navigators are trusted guides who assist community members in internet adoption and the use of computing devices. Digital navigation services include ongoing assistance with affordable internet access, device acquisition, technical skills, and application support" (NDIA, n.d.).

range from verbally during coordination opportunities to formal certificate of recognition award programs.

    c. Work directly with workforce development agencies and educational institutions to increase the number of technology-trained individuals in the workforce with a focus on workforce and training provisions related to the use of federal funds.

    d. Work with LTPTs and other local organizations to identify opportunities to develop "digital navigators" who could provide technical support to end-users.

II.3. Coordinate funding programs with components meant to address adoption and use of broadband internet service.

Strategy 19: Focus at least a portion of state-level digital equity grant administration efforts on broadband Internet education and training programs, raising awareness of broadband Internet-based applications, and providing equipment to schools, libraries, colleges and universities, health care points of access, housing providers, and community support organizations to assist with digital literacy efforts.

Explanation: The monitoring effort directed toward optimizing the use of digital literacy funds should include functions that both evaluate and track any new money coming into the state and measure effectiveness in increasing broadband Internet adoption.

In terms of digital literacy funds that are known to be available, the NTIA has made $2.75 billion available nationwide for three Digital Equity Act Programs. Those funds are to be used to "ensure that all individuals and communities have the opportunity to acquire the same skills, technology, and capacity needed to engage in the Nation's digital economy" (NTIA, 2022b, para. 7). For grant application purposes, state and local datasets should include demographic information that federal agencies will seek, such as the racial or ethnic characteristics of the people surveyed and residence information with which to identify whether they live in urban or rural areas.

While further guidance is forthcoming, at this time, funds available through the Digital Equity Act will be allocated as follows:
- State Digital Equity Planning Grant Program, to be used by states and territories to create digital equity plans. (Planning only).
- State Digital Equity Capacity Grant Program, to be used by states and territories for implementing digital equity projects and support for implementing digital equity plans. (Planning and Implementation).
- Digital Equity Competitive Grant Program to implement digital equity projects. (Implementation).

The Planning Grant and Capacity Grant program funds will be allocated to the states through a formula.

Action Steps:
    a. Assess methods to utilize information and the needs for information from the LTPTs or other local entities. Utilize any information collected by LTPTs and other local entities about the need for programs that will encourage broadband Internet service adoption and use.

    b. Request and recommend LTPTs and other local entities collect and provide to the Office of Broadband datasets that can be used to identify the broadband Internet adoption needs of those who are low income, incarcerated, elderly, and veterans. In addition, such local datasets should include information about the broadband Internet adoption needs of individuals with limited English language proficiency and persons with disabilities.

    c. Dependent upon staffing and resources available at DEO, work with LTPTs and regional entities to coordinate securing grants for local digital equity programs.

    d. Dependent upon staffing and resources available at DEO, provide technical assistance to entities working to reduce the digital divide to help them maximize funding for their programs.

    e. Directly coordinate with state agencies through the broadband coordination efforts as well as the Rural Economic Development Initiative to assist rural communities by waiving financial match requirements to the extent allowed by law (if a match requirement is determined to be a barrier to the local unit).

    f. Work with philanthropic organizations to raise awareness and ensure they consider their ability to contribute funding for ongoing adoption-related efforts.

    g. Position the state to maximize funding available for adoption:
- Identify and monitor potential public and private funding sources for broadband Internet adoption projects.
- Establish a portfolio of documents frequently required for state and local grant applications to prepare for submissions.
- Work with local communities and Internet service providers to identify a means of lowering the cost of broadband Internet service plans through the coordination of various support mechanisms.

II.4. Ongoing state-specific, adoption-related data collection

Strategy 20: Develop processes for the ongoing collection of data with which to identify emerging barriers to sustainable broadband Internet adoption in rural, unserved, and underserved communities.

Explanation: No ongoing data collection funding is currently provided by the state beyond the initial data/mapping that is to be completed by June 30, 2022. The U.S. Census Bureau's American Community Survey collects data on household adoption, but the data is high-level, aggregated, and collected from a small sample. The Pew Research Center also reports on broadband Internet adoption, but the reports are not state-specific. The Technology Policy Institute, which uses all publicly available data on its website, has information about Florida.

Action Steps:
   a. Collaborate with the NTIA, FCC, and other states to analyze and collect data that identify where broadband Internet adoption is absent or inadequate, what customers find most valuable about broadband Internet services, and why potential customers are not buying broadband Internet services. This collaborative effort should include the evaluation of the performance of broadband Internet programs and subsidies that the federal government and states are creating and implementing.
   b. Implement a system for informing Floridians of opportunities to continue contributing information about their broadband Internet service and use through the Office of Broadband's website, as well as partnerships with other entities.
   c. Structure the state's data collection efforts related to broadband Internet adoption to meet the requirements of the various federal funding programs and to meet the state's need for data with which to evaluate those programs.

III. Accountability

Introduction: Accountability means ensuring each grant award and activity delivers results in business growth, job growth, workforce education and job training, healthier Floridians, and workforce housing. These results are what make a connected economy effective and enhance the communities of Florida and the lives of Floridians.

Accountability must be built into the process of developing grant programs from the beginning, along with procedures for oversight of grantees. That approach should reduce

the risk of grantees not fulfilling their obligations and increase the likelihood that unserved and underserved areas will be provided with sustainable broadband Internet services on a timely basis. The need for accountability also requires mechanisms in grant agreements for imposing binding penalties for grantee non-compliance or non-performance.

Two types of accountability requirements are framed in state law, and they are intended to inform different audiences. In the first type, requirements are included expressly in statute. In the context of the 2021 Act, the Office of Broadband is responsible for keeping the Governor, the Legislature, and the public informed about activities undertaken pursuant to the 2021 Act. (§ 288.9962(10), Fla. Stat.).

The second type of accountability applies to grantees and will be established in the Department's rules and grant development procedures. In the context of the 2021 Act, DEO is to promulgate rules and address accountability in grant agreements, including conditions of performance and mechanisms for imposing binding penalties for grantee noncompliance or nonperformance. In addition, federal funding programs for broadband Internet expansion, adoption, and related work may come with additional accountability requirements.

III.1. Appropriate methods and capacity to ensure that the state's broadband Internet goals are met by grant recipients

Strategy 21: Ensure the goals of this Strategic Plan – enhancing Business and Job Growth, Workforce Housing, Education, and Job Training, and Healthier Floridians – are being achieved as a result of the Program's activities.

Explanation: This Strategic Plan guides the state in implementing the Office of Broadband and its mission. Compliance with this Strategic Plan is a requirement for grant applicants. The underlying purpose to the Office of Broadband's activities to reduce unserved and underserved areas and increase connectivity is to achieve the results of enhancing Business and Job Growth, Workforce Housing, Education, and Job Training, and Healthier Floridians.

Action Steps:
    a. Actively design data collection and reporting methods for the Program and grant recipient agreements to report responsive data regarding completion of the goals listed above.
    b. Design internal procedures and methods to collect, track, and report on data collected under above action step a.

Strategy 22: Develop robust contracts and funding requirements that ensure grant recipients have clear, measurable service commitments to promote accountability.

Explanation: Clear, measurable commitments will ensure accountability and transparency in the spending of public funds and through the contracting process between the state and other entities. Confirming accountability is a foundational component of planning and implementing a rigorous program that will benefit the citizens and communities of Florida as that accountability sets grantees up for successful sustainable projects.

Action Steps:
   a. Determine which accountability mechanisms and requirements are best suited to being disseminated as agency rules and which are best suited for inclusion in grant agreements, and develop rules and contracts/grant agreements accordingly.
   b. Develop and utilize grant funding agreement instruments that include provisions for recipients, providing specific and verifiable data needed to ensure that they are meeting their commitments.
   c. Establish grant criteria that include deadlines for the installation of infrastructure to ensure that customers have a usable service within time limits established by law.
   d. Incorporate incentives for recipients to fulfill their commitments, including commitments to provide required data. For example, receipt of funding could be conditioned upon fulfillment of commitments. Alternatively, in situations where funding is provided before performance, impose binding financial penalties for failure to fulfill the requirement.
   e. Ensure that grant criteria recognizes and rewards collaboration at the local level that will spur economic and workforce development, job creation, and overall quality of life for residents and visitors.

Strategy 23: Make receipt of funding contingent upon fulfilling reporting requirements and commitments.

Explanation: To determine whether grant funding programs have achieved the articulated goals, absent independent sources of information, the grant development administration processes must include a means of obtaining the necessary data. That is to say, accountability for the use of public funds must be built into the process from the beginning. Potential grantees must be vetted through a rigorous review process to ensure that, if selected, the awardee will have the capacity to complete the project on time and within budget.

Grant applications should include sufficiently detailed data, aggregated and anonymized appropriately, that is useful for the Office of Broadband's planning efforts as well as for evaluation of the service area proposed for the funded project. The funding application

scoring system must include weighting factors that will result in selection of grantees most likely to achieve the specific program goals. The Office of Broadband must have sufficient contract management expertise to monitor providers' progress toward fulfillment of grant requirements during and upon completion of projects. Such monitoring needs include field verification of work in progress and upon completion. Agreements need to include provisions for regular reporting to the Office of Broadband of data necessary to track project progress and evaluate the extent to which identified goals are met as a result of the project.

Action Steps:
a. Base grant funding on accomplishment of measurable objectives within a specified timeframe, such as the number of households able to adopt service by the end of 2023, the number that do adopt service, and the quality of the service at the time of adoption.
b. Monitor grant recipient performance against those objectives.

III.2. State-level coordination among state agencies using federal funds for broadband Internet expansion activities.

Strategy 24: Enhance state-level capacity to implement broadband Internet expansion and adoption through program governance and agency structure.

Explanation: Federal and state funds for broadband Internet expansion are or will become available to the private sector, several state agencies, and counties, cities, and anchor institutions. The existence of a variety of funding streams raises the risk of a lack of coordination in optimizing the use of these funds. With such a critical component of community development, any risk of a lack of coordination can prove inefficient.

Action Steps:
a. With DEO as lead, establish routine communication between DEO and representatives from the Florida Department of Education, Florida Department of Transportation, Florida Department of State, Florida Department of Management Services, Florida Public Service Commission, Florida Department of Health, Florida Department of Children and Families, Florida Department of Environmental Protection, Florida Department of Agriculture and Consumer Services, Florida's REACH Office, and other state agencies involved with developing state infrastructure or applications that rely upon broadband Internet technology. The 2021 Act directs DEO to "work collaboratively with private businesses and receive staffing support and other resources from Enterprise Florida," among other entities. (§ 288.9961(3), Fla. Stat.).

b. Clearly identify roles for all agencies involved in the expansion and adoption of broadband Internet as well as the program(s) within each agency that have overlapping interests regarding broadband Internet, including what data sharing should be regularly conducted.

c. Share ideas about how to best enable Floridians in rural areas to make use of broadband Internet applications such as telemedicine, e-learning, and telework as well as broadband Internet related funding opportunities.

d. Collaborate with other agencies to engage with and/or advise the Office of Broadband on key decisions and activities within their purview, including public investments and project prioritization, that directly or indirectly impact broadband Internet services.

e. Conduct an annual meeting with ISPs, LTPTs, and stakeholders to examine and gain perspectives on the state's progress toward expanding sustainable adoption in unserved and underserved areas.

f. Share information with the Office of Broadband on federal programs that may inform or affect its activities.

g. Jointly monitor relevant federal proceedings.

Strategy 25: Ensure state programmatic framework considers and adapts from other recent programs to avoid pitfalls and achieve efficiency in state program effectiveness.

Explanation: Federal and state funds for broadband Internet expansion have been utilized across the country (and world) under various broadband Internet-related programs. These programs have had many different methods to achieve the same underlying purpose: enhance availability and use of broadband Internet services. Over time, some methods of programs have appeared to have achieved more effective results. See Appendix F, Literature Review, particularly in Section VI, Programs to Increase Broadband Access, for further detailed information and study. Different market conditions play a role in the effectiveness of a broadband Internet program, and many of these conditions operate as barriers to entry. As Florida enhances the state broadband program(s), it is critical the state does so with deliberate planning and intentional goals to maximize the effectiveness of the grant programs as a whole and ensure these program efforts are undertaken accountably.

Action Steps:
a. Actively weigh program methodology options such as Facilities-Based Competition[15] versus Services-Based Competition[16] or Municipal Provision,[17]

---

[15] The term facilities-based (or infrastructure-based, or inter-platform) competition is used in the telecommunications industry to describe competition between providers of the same or similar services where the service is delivered by different or proprietary means or network.

[16] Service-based (or intra-platform) competition refers to when new entrants compete with incumbents by leasing facilities such as local access networks from incumbents.

[17] Municipal broadband Internet provision is broadband Internet access provided by local governments.

particularly under the circumstances where studies and programs have demonstrated the conditions under which Facilities-Based Competition far out performs Services-Based Competition for effectiveness in providing new broadband Internet availability and use.

b. In public rulemaking, seek public input on these different methodologies and incorporate as appropriate.

c. With the LTPT, actively lead discussion and research of these different methodologies.

d. Continue to monitor relevant federal and other state programs' implementation and successes.

e. Actively build upon this Strategic Plan and the legislatively-required biennial updates with any new studies, program successes, program pitfalls, or known aspects of effectiveness, to continue to advance broadband Internet in the state of Florida.

Glossary

2021 Act: See the Glossary entry for Florida Broadband Deployment Act of 2021.

Adoption: The subscription of consumers — residents or businesses — to high-speed Internet service.

Anchor institutions or community anchor institutions: Industrial, commercial and office park worksites, schools, libraries, medical and health care points of access, housing providers, public safety entities, institutes of higher education, and other community support organizations that provide outreach, access, equipment, and support services to facilitate greater use of broadband Internet service by the entire population and local governments.

Availability: Whether or not an internet connection point exists and in what manner. A precondition for connecting to the Internet, but the availability of a connection alone does not guarantee Internet use, nor sufficiency of the internet available.

Broadband: High-speed Internet access.

Broadband Internet service (sometimes referred to as "broadband service"): A service that offers a connection to the Internet with a capacity for transmission at a consistent speed of at least 25 megabits per second downstream and 3 megabits per second upstream. (§ 288.9961(2)(a), Fla. Stat. and § 288.9963(2)(b), Fla. Stat.).

Broadband speeds: Speeds expressed with two numbers separated by a diagonal line "/" and a designation of the amount of data, such as "100/20 Mbps." The first number represents the amount of data users receive (download), and the second number represents the amount of data users can send (upload).

> **Mbps**: Megabits per second refers to millions of bits of binary information—zeros and ones—that are passed in a second.

> **Gbps**: Gigabits per second refers to the number of bits in billions.

Crowdsourcing: The online collection of data. In this document, specifically Internet speed data.

Digital divide: The gap between people who have access to broadband services, have adopted it, and know how to use digital content (digital literacy) and those who do not.

Digital equity: The condition in which individuals and communities have the information technology capacity needed for full participation in the society and economy of the United States (Infrastructure Investment and Jobs Act, Title III, Digital Equity Act of 2021).

Digital literacy: The ability to use a variety of broadband Internet-enabled devices to engage in online services. One formal definition is "[t]he ability to leverage current technologies, such as smartphones and laptops, and Internet access to perform research, create content and interact with the world" (NTIA, 2016, p. 5).

Download: To copy (data) from one computer system to another, typically over the Internet.

Florida Broadband Deployment Act of 2021 "2021 Act": Ch. 24, 2021 Fla. Laws, codified at §§ 288.9961-288.9963, Fla. Stat.

Funding Opportunity Announcement: A document used by federal agencies to announce the availability of grant funds to the public.

Gbps: Gigabits per second refers to the number of bits in billions.

Grant: The funding provided by the federal, state, or local government. Grant agreements take different forms, including partial project funding (i.e., requiring a match), and are contracts between the granting entity and the grantee.

Last Mile: The final leg of a network that provides service to the home, business, or community institution.

Local Technology Planning Team: Local teams built and facilitated by the Office of Broadband and composed of members representing cross-sections of the communities in which they are formed. Local Technology Planning Teams (LTPTs) work with rural communities to help them understand their current broadband Internet availability, locate unserved and underserved businesses and residents, identify assets relevant to broadband Internet deployment, build partnerships with broadband Internet service providers, and identify opportunities to leverage assets and reduce barriers to the deployment of broadband Internet service in the community. LTPTs must be proactive in fiscally constrained counties in identifying and providing assistance with applying for federal grants for broadband Internet service.

Middle Mile: The middle mile is the physical mid-section of the infrastructure required to enable internet connectivity for homes, businesses, and community institutions. The middle mile is made up of high-capacity fiber lines that carry large amounts of data at high speeds over long distances between local networks and global internet networks.

Mbps: Megabits per second refers to millions of bits of binary information — zeros and ones — that are passed in a second.

Notice of Funding Availability: Also referred to as a Notice of Funding Opportunity (NOFO), is the document used by federal agencies to announce the availability of grant funds to the public.

Office of Broadband: The Florida Office of Broadband established within the Division of Community Development in the Department of Economic Opportunity in 2020. (§ 288.9961(4), Fla. Stat.).

Premises Passed: the number of end user locations, residential homes or otherwise, passed when installing fiber technology.

Request for Quotes: An oral, electronic, or written request for written pricing or services information from a state term contract vendor for commodities or contractual services available on a state term contract from that vendor. (§ 287.012(24), Fla. Stat.).

Request for Proposal (RFP): A written or electronically posted solicitation for competitive sealed proposals. (§ 287.012(23), Fla. Stat.).

Sustainable adoption: The ability for communications service providers to offer broadband Internet services in all areas of this state by encouraging adoption and use levels that allow for these services to be offered in the free market absent the need for governmental subsidy. (§ 288.9961(2)(e), Fla. Stat.).

Underserved: A geographic area of this state in which there is no provider of broadband Internet service that offers a connection to the Internet with a capacity for transmission at a consistent speed of at least 100 megabits per second downstream and at least 10 megabits per second upstream. (§ 288.9961(2)(f), Fla. Stat.).

Unserved: 1. A geographic area of Florida in which there is no provider of broadband Internet service. (§ 288.9961(2)(g), Fla. Stat.); or 2. In the context of Attachment of Broadband Facilities to municipal electric poles, no retail access to the Internet at speeds of at least 10 megabits per second for downloading and 1 megabit per second for uploading. (§ 288.9963(e), Fla. Stat.).

Upload: To transfer (data) from one computer to another, typically over to one that is larger or remote from the user or functioning as a server.

Acronyms and Abbreviations

ADSL – Asymmetric Digital Subscriber Line

BEAD – Broadband Equity, Access, and Deployment

BIP – Broadband Initiatives Program

BTOP – Broadband Technology Opportunities Program

CAF – Connect America Fund

CBRS – Citizens Broadband Radio Service

CLEC – Competitive Local Exchange Carriers

CPF – Capital Projects Fund

CTC – Community Technology Centers

DBO – Design-Build-Own

DEO – Department of Economic Opportunity

DOCSIS – Data Over Cable Service Interface Specifications

DSL – Digital Subscriber Line

FCC – Federal Communications Commission

Gbps – Gigabits per second

HFC – Hybrid Fiber-Coax

IIJA – Infrastructure Investment and Jobs Act

IOU – Investor-owned utility

ISP – Internet service provider

LTPT – Local Technology Planning Team

Mbps – Megabits per second

NTIA – National Telecommunications and Information Administration

PCC – Public Computer Centers

PSC – Florida Public Service Commission

PURC – Public Utility Research Center in the Warrington College of Business of the University of Florida

RAO – Rural Areas of Opportunity

RDOF – Rural Digital Opportunity Fund

REC – Rural electric cooperative

RFP – Request for Proposal

WISP – Wireless Internet Service Provider

Acknowledgements

References

Bauer, J. M. (2014). Platforms, systems competition, and innovation: Reassessing the foundations of communications policy. *Telecommunications Policy*, *38*(8-9), 662–673. https://doi.org/10.1016/j.telpol.2014.04.008

Bauer, J. M. (2015). Governing the mobile broadband ecosystem. *International Telecommunications Policy Review*, *22*(2), 1–26. https://ssrn.com/abstract=2635950

Bauer, J. M., & Tsai, H. S. (2014). *Effects of public policy on fixed and mobile broadband infrastructure quality*. TPRC 42nd Research Conference on Communication, Information and Internet Policy. https://doi.org/10.2139/ssrn.2418794

Beard, T. R., Ford, G. S., & Stern, M. (2020). *Bridging the digital divide: What has not worked but just might* (Paper No. 56). Phoenix Center for Advanced Legal and Economic Public Policy Studies. https://doi.org/10.2139/ssrn.3689051

Beard, T. R., Ford, G. S., and Stern, M. *(2022). Bridging the Digital Divide: An empirical analysis of public programs to increase broadband adoption. Telematics and Informatics, 67(2022), 101754. https://doi.org/10.1016/j.tele.2021.101754*

Benton Institute for Broadband & Society. (2021, November 6). *The largest U.S. investment in broadband deployment ever*. https://www.benton.org/blog/largest-us-investment-broadband-deployment-ever

Biedny, C., Whitacre, B., & Gallardo, R. (2021). *Do 'dig once' and permitting policies improve fiber availability?* https://doi.org/10.2139/ssrn.3895985

Blandin Foundation. (2022). *Blandin Broadband Communities Program*. https://blandinfoundation.org/programs/broadband/blandin-broadband-communities-program

Brevitz, D., Cash, H., Galligan, M., Holt, L., Kury., T., & Jamison, M. (2011). *Strategic planning for Florida governmental broadband capabilities* (vols. 1 and 2). Public Utility Research Center. https://bear.warrington.ufl.edu/centers/purc/docs/papers/1111_Brevitz_Strategic_Planning_for.pdf

Broadband for the Rural North. (n.d.). *The world's fastest rural broadband*. https://b4rn.org.uk

Broadband Infrastructure Deployment Job Skills and Training Opportunities Working Group. (2020, October 29–30). *Broadband Infrastructure Deployment Job Skills and Training*

Opportunities Working Group [Presentation to the Broadband Deployment Advisory Committee of the Federal Communications Commission]. Federal Communications Commission. https://www.fcc.gov/sites/default/files/bdac-job-skills-training-opportunities-approved-rec-10292020.pdf

Chang, J. (2021). Broadband technology opportunities program public computer center grants and residential broadband adoption. *Telecommunications Policy*, *45*(8), 1–19. https://doi.org/10.1016/j.telpol.2021.102147

Chaudhuri, A., & Flamm, K. (2005). *The market structure of Internet service provision*. TPRC 35th Conference on Communication, Information, and Internet Policy. https://ssrn.com/abstract=2119738

Clements, M. E., & Abramowitz, A. (2006). *The deployment and adoption of broadband service: A household-level analysis*. https://ssrn.com/abstract=2118320

Comcast. (2022). *xfinity Internet essentials*. https://internetessentials.com

Connect Kentucky. (2009). *Expanding technology access to rural America*. https://peerta.acf.hhs.gov/sites/default/files/public/uploaded_files/Connect%20Kentucky.pdf

Connected Nation. (2022). *Current broadband funding*. www.connectednation.org

Connected North. (2022). *What is Connected North*? https://www.connectednorth.org

Connolly, M. (2019). *The economic impact of Section 224 Exemption of Municipal and Cooperative Poles*. NCTA. https://www.ncta.com/sites/default/files/2019-07/NCTA%20Muni%20and%20Coop%20Poles%20Connolly%20Paper%20Ex%20Parte%20Filing%207-22-19.pdf

De Leon, M., & Sanchez, S. (2020, September 14). *How can you close the digital divide in your community? Start with a needs assessment*. Federal Reserve Bank of Dallas. https://www.dallasfed.org/cd/communities/2020/0914.aspx

Denni, M., & Gruber, H. (2007). The diffusion of broadband telecommunications: The role of different forms of competition. *Communications and Strategies*, *68*, 139–157. https://ssrn.com/abstract=1353007

de Sa, P. (2017). *Improving the nation's digital infrastructure*. Federal Communications Commission. https://www.fcc.gov/document/improving-nations-digital-infrastructure

Detroit Community Technology Project. (n.d.). *Technology rooted in community needs*. https://detroitcommunitytech.org

Distaso, W., Lupi, P., & Manenti, F. M. (2006). Platform competition and broadband uptake: Theory and empirical evidence from the European Union. *Information Economics and Policy*, *18*(1), 87–106. https://doi.org/10.1016/j.infoecopol.2005.07.002

The Economist. (2021). *The Inclusive Internet Index*. https://theinclusiveinternet.eiu.com

Edwards, G., & Waverman, L. (2006). The effects of public ownership and regulatory independence on regulatory outcomes. *Journal of Regulatory Economics*, *29*(1), 23–67. https://doi.org/10.1007/s11149-005-5125-x

Eisenach, J. A., & Caves, K. W. (2011). *Evaluating the cost-effectiveness of RUS broadband subsidies: Three case studies*. Navigant Economics. https://www.heartland.org/_template-assets/documents/publications/29770.pdf

European Parliament. (2021). *Competition policy*. https://www.europarl.europa.eu/factsheets/en/sheet/82/competition-policy

Federal Communications Commission. (2010). *American Recovery and Reinvestment Act of 2009*. https://www.fcc.gov/general/american-recovery-and-reinvestment-act-2009

Federal Communications Commission. (2016). *Rural broadband experiments*. https://www.fcc.gov/general/rural-broadband-experiments

Federal Communications Commission. (2017). *Connect America Fund (CAF)*. https://www.fcc.gov/general/connect-america-fund-caf

Federal Communications Commission. (2021a). *2.5 GHz rural tribal window*. https://www.fcc.gov/25-ghz-rural-tribal-window

Federal Communications Commission. (2021b). *E-Rate: Universal service program for schools and libraries*. https://www.fcc.gov/consumers/guides/universal-service-program-schools-and-libraries-e-rate

Federal Communications Commission. (2022a). *Emergency broadband benefit*. https://www.fcc.gov/broadbandbenefit

Federal Communications Commission. (2022b). *Emergency Connectivity Fund*. https://www.fcc.gov/emergency-connectivity-fund

Federal Communications Commission. (2022c). *Rural health care program*. https://www.fcc.gov/general/rural-health-care-program

Federal Highway Administration (2021, December 3). *Broadband infrastructure deployment*. U.S. Department of Transportation. https://www.federalregister.gov/documents/2021/12/03/2021-26231/broadband-infrastructure-deployment

Flamm, K. (2015). *Federal subsidies and broadband competition*. TPRC 43rd Research Conference on Communication, Information and Internet Policy. https://doi.org/10.2139/ssrn.2587353

Fleming, S. (2012, June 27). *Planning and flexibility are key to effectively deploying broadband conduit through federal highway projects* [Letter to Representatives Waxman, Eshoo, and Markey]. U.S. Government Accountability Office. https://www.gao.gov/assets/gao-12-687r.pdf

Florida Department of Economic Opportunity. (n.d.). *Office of Broadband http://www.floridajobs.org/community-planning-and-development/broadband/office-of-broadband*

Florida Department of Economic Opportunity. (2021a). *Broadband planning toolkit: A guide to establishing local technology planning teams*. https://floridajobs.org/docs/default-source/2015-community-development/ocp/broadband-planning-toolkit_finalc59932a4cbbb61cbb02aff01004f56df.pdf?sfvrsn=8b2253b0_0

Florida Department of Economic Opportunity. (2021b). *Division of Community Development Office of Broadband workshop summary*. https://floridajobs.org/docs/default-source/2015-community-development/ocp/obworkshopsummaryfinal5f1c2da4cbbb61cbb02aff01004f56df.pdf?sfvrsn=a0a14cb0_10

Florida Office of Broadband. (2022a, March 30). *LTPT Information: Communication from Katie Smith, Florida Office of Broadband to Mark Jamison, PURC* [e-mail]. Tallahassee, Florida, United States.

Florida Office of Broadband. (2022b, March 30)*. Federal Funding Dollars Flowing Through DEO: Communication from Katie Smith, Florida Office of Broadband to Mark Jamison, PURC* [e-mail]. Tallahassee, Florida, USA.

Florida Public Service Commission. (2004). 25-6.1351: Cost Allocation and Affiliate Transactions - Florida Administrative Rules, Law, Code, Register - FAC, FAR, eRulemaking. https://www.flrules.org/gateway/RuleNo.asp?ID=25-6.1351

Fortunato, M. W., Bridger, J. C., Alter, T. R., Emmerling, G. M., Ortbal, K. J., Schwartz, M., & Shuffstall, W. (2013). Promoting fair local organizing for broadband delivery: Suggestions for

community-level action in persistently underserved communities. *Journal of Information Policy*, *3*, 158–180. https://doi.org/10.5325/jinfopoli.3.2013.0158

Friederiszick, H. W., Grajek, M., & Röller, L.-H. (2008). *Analysing the relationship between regulation and investment in the telecom sector* (ESMT White Paper WP-108-01).

Gerli, P., & Whalley, J. (2018). *Fibre to the countryside: A comparison of public and community initiatives in the UK*. TPRC 46th Research Conference on Communication, Information and Internet Policy 2018. https://doi.org/10.2139/ssrn.3137164

Gerli, P., & Whalley, J. (2020, February 17–19). *Public-private partnerships for broadband diffusion: A comparison of EU case studies* [Virtual conference session]. TPRC48: 48th Research Conference on Communication, Information and Internet Policy. https://doi.org/10.2139/ssrn.3749495

Gillett, S. E., Lehr, W. H., & Osorio, C. (2004). Local government broadband initiatives. *Telecommunications Policy*, *28*(7-8), 537–558. https://doi.org/10.1016/j.telpol.2004.05.001

Goolsbee, A., & Guryan, J. (2006). The impact of Internet subsidies in public schools. *Review of Economics and Statistics*, *88*(2), 336–347. https://doi.org/10.1162/rest.88.2.336

Grajek, M., & Röller, L. H. (2012). Regulation and investment in network industries: Evidence from European telecoms. *Journal of Law and Economics*, *55*(1), 189–216. https://doi.org/10.1086/661196

Great Nonprofits. (n.d.). *Community Technology Centers' Network, Inc. (Ctcnet)*. https://greatnonprofits.org/org/community-technology-centers-network-inc-ctcnet

Gruber, H., & Denni, M. (2005). The Diffusion of Broadband Telecommunications: The Role of Competition. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=829504

Hauge, J. A., Jamison, M. A., & Gentry, R. J. (2008). Bureaucrats as entrepreneurs: Do municipal telecommunications providers hinder private entrepreneurs? *Information Economics and Policy*, *20*(1), 89–102. https://ssrn.com/abstract=1082823

Hauge, J. A., Jamison, M. A., & Jewell, R. T. (2009). A consideration of telecommunications market structure in the presence of municipal provision: The case of US cities. *Review of Industrial Organization*, *34*(2), 135–152. https://doi.org/10.1007/s11151-009-9205-4

Hauge, J. A., & Prieger, J. E. (2015). Evaluating the impact of the American Recovery and Reinvestment Act's BTOP on broadband adoption. *Applied Economics*, *47*(60), 1–27. https://doi.org/10.1080/00036846.2015.1080810

Hausman, J. A. (2001). Regulation by TSLRIC: Economic effects on investment and innovation. In J. Sidak, C. Engel, & G. Knieps (Eds.), *Competition and regulation in telecommunications: Examining Germany and America* (pp. 51–68). Kluwer Academic.

Hausman, J. A. (2002). Internet related services: The results of asymmetric regulation. In R. W. Crandall & J. H. Alleman (Eds.), Broadband: Should we regulate high-speed Internet access? (pp. 129–156). Brookings Institute Press.

Hazlett, T. W. (2016, August 23). *Obama's misguided plan to connect schools to the Internet*. Politico. https://www.politico.com/agenda/story/2016/08/stop-spending-money-connecting-schools-to-the-internet-000191/

Hazlett, T. W., Schwall, B., & Wallsten, S. (2016). *The educational impact of broadband subsidies for schools under E-Rate*. https://doi.org/10.2139/ssrn.2796048

Hollman, A., Obermier, T., Burger, P., & Spanier, A. (2020). *Rural measures: A quantitative study of the rural digital divide*. TPRC 48th Research Conference on Communication, Information and Internet Policy. https://doi.org/10.2139/ssrn.3757477

Illinois Department of Commerce & Economic Opportunity. (n.d.). *Digital navigators*. https://www2.illinois.gov/dceo/ConnectIllinois/Documents/Digital%20Navigator%20Summary.pdf

Illinois Department of Commerce & Economic Opportunity. (2022). *Accelerate Illinois.* https://www2.illinois.gov/dceo/ConnectIllinois/Pages/Accelerate-Illinois.aspx

Infante, J., Oliver, M., & Macian, C. (2007). *Which way to a (judicious) municipal wireless network? An assessment of the different alternatives for municipal participation in wireless local networks*. TPRC 35th Conference on Communication, Information and Internet Policy. https://ssrn.com/abstract=2102923

International Telecommunication Union. (2020). *Measuring digital development: ICT price trends* 2019. https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2019/ITU_ICTpriceTrends_2019.pdf

Jamison, M. A., & Sichter, J. (2010). Business separation in telecommunications: Lessons from the U.S. experience. *Review of Network Economics*, *9*(1), 1–25. https://doi.org/10.2202/1446-9022.1204

LaRose, R., Gregg, J. L., Strover, S., Straubhaar, J., & Carpenter, S. (2007). Closing the rural broadband gap: Promoting adoption of the Internet in rural America. *Telecommunications Policy*, *31*(6-7), 359–373. https://doi.org/10.1016/j.telpol.2007.04.004

Lee, S., & Brown, J. S. (2008). Examining broadband adoption factors: An empirical analysis between countries. *Info*, *10*(1), 25–39. https://doi.org/10.1108/14636690810850148

Manlove, J., & Whitacre, B. (2019a). An evaluation of the Connected Nation broadband adoption program. *Telecommunications Policy*, *43*(7), 1–11. https://doi.org/10.1016/j.telpol.2019.02.003

Manlove, J., & Whitacre, B. (2019b). Understanding the trend to mobile-only connections for Internet access: A decomposition analysis. *Telecommunications Policy*, *43*(1), 76–87. https://doi.org/10.1016/j.telpol.2018.03.012

McAfee, R. P., Mialon, H. M., & Williams, M. A. (2004). What is a barrier to entry? *The American Economic Review*, *94*(2), 461–465. https://doi.org/10.1257/0002828041302235

Middleton, C. (2007). *A framework for investigating the value of public wireless networks*. TPRC 35th Conference on Communication, Information and Internet Policy. https://ssrn.com/abstract=2118153

National Telecommunications and Information Administration. (n.d.). *BTOP / SBI Archived Grant Program*. https://www2.ntia.doc.gov

National Telecommunications and Information Administration. (2010). *Broadband Technology Opportunities Program (BTOP) quarterly program status report*. https://btopsbi.ntia.doc.gov/files/btop_report04.pdf

National Telecommunications and Information Administration. (2016). *Broadband glossary*. https://broadbandusa.ntia.doc.gov/sites/default/files/publication-pdfs/bbusa_broadband_glossary.pdf

National Telecommunications and Information Administration. (2022a). *Infrastructure Investment and Jobs Act: Bead Program*. https://broadbandusa.ntia.doc.gov/sites/default/files/2022-02/FINAL%20PRESENTATION_Listening%20Session%20%233%20NTIA%20IIJA%20-%20BEAD%20overview.pdf

National Telecommunications and Information Administration. (2022b). *NTIA's role in implementing the broadband provisions of the 2021 Infrastructure Investment and Jobs Act*. https://broadbandusa.ntia.doc.gov/news/latest-news/ntias-role-implementing-broadband-provisions-2021-infrastructure-investment-and

New Oxford American Dictionary. (2021). www.oxfordreference.com

NYC Mesh. (2021). *Join our community network!* https://www.nycmesh.net

OMG Center for Collaborative Learning. (2008). *Digital inclusion program: Final report of the rapid assessment*. https://www.ntia.doc.gov/legacy/broadbandgrants/comments/6E3B.pdf

Ovington, T., Smith, R., Santamaría, J., & Stammati, L. (2017). The impact of intra-platform competition on broadband penetration. *Telecommunications Policy*, *41*(3), 185–196. https://doi.org/10.1016/j.telpol.2017.01.002

Perrin, A. (2021, June 3). *Mobile technology and home broadband 2021*. Pew Research Center. https://www.pewresearch.org/internet/2021/06/03/mobile-technology-and-home-broadband-2021

Perrin, A., & Atske, S. (2021, April 2). *7% of Americans don't use the Internet. Who are they?* Pew Research Center. https://www.pewresearch.org/fact-tank/2021/04/02/7-of-americans-dont-use-the-internet-who-are-they

Perrin, A., & Bertoni, N. (2017, December 1). First-time internet users: Who they are and what they do when they get online. *Pew Research Center.* https://www.pewresearch.org/fact-tank/2017/12/01/first-time-internet-users-who-they-are-and-what-they-do-when-they-get-online

Personal Telco Project. (2020). *Introducing Personal Telco*. https://personaltelco.net

Potter, A., & Clement, A. (2007). *A desiderata for wireless broadband networks in the public interest*. TPRC 35th Conference on Communication, Information, and Internet Policy. https://ssrn.com/abstract=2111594

Powell, A., Bryne, A., & Dailey, D. (2010). The essential internet: Digital exclusion in low-income American communities. *Policy & Internet*, *2*(2), 161–192. https://doi.org/10.2202/1944-2866.1058

Prieger, J. E. (2001a). Telecommunications regulation and new services: A case study at the state level. *Journal of Regulatory Economics*, 20(3), 285–305. https://doi.org/10.1023/A:1011119126828

Prieger, J. E. (2001b). *The supply side of the digital divide: Is there redlining in the broadband Internet access market?* https://doi.org/10.2139/ssrn.297499

Prieger, J. E. (2003). The supply side of the digital divide: Is there equal availability in the broadband Internet access market? *Economic Inquiry*, *41*(2), 346–363. https://doi.org/10.1093/ei/cbg013

Prieger, J. E. (2007). Regulatory delay and the timing of product innovation. *International Journal of Industrial Organization*, *25*(2), 219–236. https://doi.org/10.1016/j.ijindorg.2006.05.001

Prieger, J. E., & Hu, W. (2008). The broadband digital divide and the nexus of race, competition, and quality. *Information Economics and Policy*, *20*, 150–167. https://doi.org/10.1016/j.infoecopol.2008.01.001

Prieger, J. E., Savage, S., & Molnar, G. (2014). *Quality competition in the broadband service provision industry*. https://ssrn.com/abstract=2418676

The Professional Staff of the Committee on Appropriations. (2022, March 22). Bill Analysis and Fiscal Impact Statement, CS/CS/SB 1800. Florida Senate. https://www.flsenate.gov/Session/Bill/2022/1800/Analyses/2022s01800.ap.PDF

Public Utility Research Center. (2022). *The status of broadband in Florida*. University of Florida.

Rosston, G. L., & Wallsten, S. J. (2020). *Increasing low-income broadband adoption through private incentives* (White paper No. 20-001). Stanford Institute for Economic Policy Research. https://siepr.stanford.edu/publications/working-paper/increasing-low-income-broadband-adoption-through-private-incentives

Rural Digital Opportunity Fund. (2020). *What is RDOF?* https://rdof.com/rdof

Shaffer, G. (2017). *Common sense: An examination of three Los Angeles community WiFi projects that privileged public funding over commons-based infrastructure management*. https://doi.org/10.2139/ssrn.2941920

Silva, S., Badasyan, N., & Busby, M. (2018). Diversity and digital divide: Using the National Broadband Map to identify the non-adopters of broadband. *Telecommunications Policy*, *42*(5), 361–373. https://doi.org/10.1016/j.telpol.2018.02.008

Skorup, B., & Kotrous, M. (2020). *The FCC's high-cost programs, rural broadband penetration & rural broadband service quality*. TPRC 48th Research Conference on Communication, Information and Internet Policy. https://doi.org/10.2139/ssrn.3748769

State of Florida. (2021). 2021 Florida Statutes. http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0200-0299/0288/Sections/0288.9961.html

United States Bureau of Labor Statistics. (2021). *Occupational employment and wage statistics, May 2021: 15-1232 computer user support specialists* [Data file]. https://www.bls.gov/oes/current/oes151232.htm#st

United States Department of Agriculture. (2019). *ReConnect Loan and Grant Program.* https://www.usda.gov/reconnect

United States Department of Agriculture. (2022, February 10). *ReConnect Program: Frequently asked questions, eligibility inquiries for Round 3 funding opportunities*. https://www.usda.gov/sites/default/files/documents/reconnect-program-faqs-eligibility.pdf

United States Department of Energy. (2021). *Infrastructure Investment and Jobs Act of 2021*. https://afdc.energy.gov/laws/infrastructure-investment-jobs-act

United States Department of the Treasury. (2022). *Capital Projects Fund*. https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/capital-projects-fund

United States Senate. (2009). *Broadband Initiatives Program (BIP) guide*. https://www.sbc.senate.gov/public/_cache/files/f/0/f0fc95ef-18ef-4f1b-a1cc-0cab31394b1c/11824FA937892AEF65A916A2803681F3.bip-grant-guide.pdf

Universal Service Administration. (2017). *Instructions for completing Connect American Fund–Broadband loop support mechanism*. https://docs.fcc.gov/public/attachments/DOC-346867A1.pdf

Universal Service Administration. (2022). *ACAM*. https://www.usac.org/high-cost/funds/acam

Universal Service Administration. (2022). *Rural Digital Opportunity Fund*. https://www.usac.org/high-cost/funds/rural-digital-opportunity-fund

Vogels, E. A. (2021a, June 22). *Lower-income Americans still less likely to have home broadband, smartphone*. Pew Research Center. https://www.pewresearch.org/fact-tank/2021/06/22/digital-divide-persists-even-as-americans-with-lower-incomes-make-gains-in-tech-adoption

Vogels, E. A. (2021b, August 19). *Some digital divides persist between rural, urban and suburban America*. Pew Research Center. https://www.pewresearch.org/fact-tank/2021/08/19/some-digital-divides-persist-between-rural-urban-and-suburban-america

Wallsten, S. (2005). *Broadband penetration: An empirical analysis of state and federal policies* (Working paper No. 05-12). AEI-Brookings Joint Center for Regulatory Studies. https://www.heartland.org/_template-assets/documents/publications/17468.pdf

Wallsten, S. (2016). *Learning from the FCC's Lifeline broadband pilot projects*. TPRC 44th Research Conference on Communication, Information and Internet Policy. https://doi.org/10.2139/ssrn.2757149

Ward, M. R. (2005). *Rationalizing the E-Rate: The effects of subsidizing IT in education* (Working paper No. 05-25). NET Institute. https://doi.org/10.2139/ssrn.851447

Weiner, M. D., Puniello, O. T., Noland, R. B., Ciemnecki, D., & Turakhia, C. (2012). Consider the non-adopter: Developing a prediction model for the adoption of household-level broadband access. *Socio-Economic Planning Sciences*, *46*(3), 183–193. https://doi.org/10.1016/j.seps.2012.04.001

Whitacre, B., & Gallardo, R. (2020). State broadband policy: Impacts on availability. *Telecommunications Policy*, *44*(9), 1–17. https://doi.org/10.1016/j.telpol.2020.102025

Whitacre, B., & Rhinesmith, C. (2015). Public libraries and residential broadband adoption: Do more computers lead to higher rates? *Government Information Quarterly*, *32*(2), 164–171. https://doi.org/10.1016/j.giq.2015.02.007

Whitacre, B., Strover, S., & Gallardo, R. (2015). How much does broadband infrastructure matter? Decomposing the metro–non-metro adoption gap with the help of the National Broadband Map. *Government Information Quarterly*, *32*(3), 261–269. https://doi.org/10.1016/j.giq.2015.03.002

Wilde, W. J., Grant, C. A., & Nelson, P. K. (2002). *Manual for controlling and the reducing the frequency of pavement utility cuts* (Report No. DTFH61-01-C-00024). Federal Highway Administration. https://www.fhwa.dot.gov/utilities/utilitycuts/manual.pdf

Wright, J. D., & Hazlett, T. W. (2017). *The effect of regulation on broadband markets: Evaluating the empirical evidence in the FCC's 2015 'Open Internet' Order*. *Review of Industrial Organization*, *50*(4), 16–41. https://doi.org/10.2139/ssrn.2859570

Yoo, C. S. (2014). *U.S. vs. European broadband deployment: What do the data say?* (Research Paper No. 14-35). University of Pennsylvania Institute for Law & Economics. https://ssrn.com/abstract=2510854

Yoo, C. S., & Pfenninger, T. (2017). *A financial assessment of municipal fiber in the U.S.* (Wharton Public Policy Initiative Issue Briefs. No. 45). https://repository.upenn.edu/pennwhartonppi/45

Yoo, C. S., & Pfenninger, T. (2018). *Municipal fiber in the United States: An empirical assessment of financial performance*. University of Pennsylvania Law School, Center for Technology, Innovation and Competition. www.law.upenn.edu/live/files/6611-report-municipal-fiber-inthe-united-states-an10.2139/ssrn.2944137

Yoo, C. S., Lambert, J., & Pfenninger, T. P. (2022). *Municipal fiber in the United States: A financial assessment*. University of Pennsylvania Carey Law School. https://scholarship.law.upenn.edu/faculty_scholarship/2445

Appendices

A. Areas for Further Research
    I. Pole Attachments
    II. Suggested Further Action for Pole Attachments
    III. Municipal Broadband
    IV. Suggested Further Action for Municipal Broadband

B. Strengths and Weaknesses of Various Technologies
    I. Cable Modem
    II. Fiber Optic Cable/Fiber to the Home
    III. Wireless/Radio Frequency (RF) Technology
    IV. Fixed Wireless
    V. Mobile Wireless
    VI. Satellite Connections
    VII. Broadband Performance Metrics and Benchmarks
    VIII. Broadband Technology Trends and Characteristics

C. Interviews with the Miccosukee and Seminole Tribes of Florida

D. Methodology and List of Interviewees
    I. Interviews

E. Office of Broadband Activities and Outreach

F. Literature Review
    I. Access Studies
    II. Adoption Studies
    III. Rural Access and Adoption Studies
    IV. Regulatory Framework Studies
    V. Missing in the Literature
    VI. Programs to Increase Broadband Access
        a. Subsidies for Provision
        b. Barriers to Provider Entry
        c. Promoting Facilities-Based Competition (versus Service-Based Competition)
        d. Municipal Provision
        e. Public-Private Partnerships
        f. E-Rate Program (established in 1996)

g. Public Computing Centers
VII. Programs to Increase Broadband Adoption
    a. Programs Addressing Price as a Barrier to Adoption
    b. Programs Addressing Lack of Computer Ownership
    c. Programs Addressing Digital Illiteracy
    d. Other Programs Aimed at Increasing Adoption
VIII. Rural Access and Adoption
IX. Supply-Side Factors that Affect and May Increase Broadband Adoption
X. Regulatory Framework Considerations

G. Federal and State Funds Available for Broadband Expansion and Support

Appendix A
Areas for Further Research

PURC identified two policy topics that may impact the implementation of this Strategic Plan and achievement of the goals of the Broadband Deployment Act of 2021 ("2021 Act"; Ch. 24, 2021 Fla. Laws, codified at §§ 288.9961-288.9963, Fla. Stat), but for which further research is needed. Analysis of the impact of existing policies and potential policy changes will be required to ascertain whether Florida law in these should be changed to support efforts undertaken to implement the 2021 Act. Those policy areas are:

I. Pole Attachments
II. Suggested Further Action For Pole Attachments
III. Municipal Broadband Internet
IV. Suggested Further Action For Municipal Broadband Internet

Each is discussed briefly in the sections that follow.

I. Pole Attachments

Pole attachment prices. Florida Statutes provide that "a broadband provider shall receive a promotional rate of $1 per wireline attachment per pole per year for any new attachment necessary to make broadband service available to an unserved or underserved end user within a municipal electric utility service territory for the time period specified in this subsection." (§ 288.9963(3), Fla. Stat. (2021)). Otherwise, municipal utility pole attachment prices are unregulated in Florida, except by their city boards or other governmental bodies. Pole attachment prices for rural electric co-ops are also unregulated, except by their co-op boards.

Regarding prices charged for pole attachments, the questions for policymakers are:
- What do research findings suggest with respect to the impact of unregulated pole attachment prices on broadband Internet deployment?
- What does research suggest about the impact of the regulatory framework on such prices?

Mode of regulation. In response to the first question, there appear to be no studies finding a statistically significant connection between unregulated pole attachment prices and rural broadband deployment, and there appears to be no research on whether such prices create barriers to entry. At the time of writing, the rural co-ops themselves do not appear to be developing broadband businesses, and existing pole attachment rates will be a cost for broadband providers to do business. Furthermore, as is described in the next section titled "Municipal Broadband," municipalities are only rarely involved in providing broadband services in Florida. As such, the attachment prices will be included in the amount of subsidy providers demand for deploying services in rural areas.

In response to the second question, broadband providers bear certain costs for attaching broadband equipment to existing poles, and those costs are passed on to their retail customers. The hypothesis here is that the cost to customers may be affected by the mode of regulation. Utilities are regulated in different manners depending on whether they are investor-owned utilities (IOUs), co-ops, or municipal utilities. The IOUs are rate regulated in Florida by the Florida Public Service Commission (PSC), rural electric cooperatives (RECs) are rate regulated by their boards, and municipal utilities are rate regulated by their respective city commissions.

At least one study appeared to find a difference in the impact depending upon type of regulation. Connolly (2019) found that prices paid to IOUs are about 56 percent lower than prices paid to co-ops and about 54 percent lower than prices paid to municipally owned electric utilities on a nationwide basis. Connolly found that co-op pole attachment prices are about 31 percent lower in states that regulate the prices. Connolly also found the average price difference between co-ops and IOUs is about 60 percent in Florida. If this nationwide difference, on a percent average basis, were applied to Florida, co-op pole attachment prices would be about $6.30 per pole per year lower than the $20.64 price Connolly found for Florida co-ops.

Connolly (2019) is but one study, however, so one cannot draw any definitive conclusion that the type of rate regulation, as it applies to broadband equipment attachment on existing poles, affects rates paid by retail customers. Connolly falls short of estimating effects on broadband deployment or retail broadband prices.

In some instances, broadband providers have struggled to obtain clear information from rural electric co-ops on pole availability. The challenge is more about the processes of obtaining the information and not a lack of cooperation from the co-ops. Broadband Internet providers appeared to be unaware that the PSC gathers extensive information on poles as part of its work on storm hardening and storm preparedness.

II.   Suggested Further Action For Pole Attachments

Monitor availability and prices of pole attachments for broadband deployment.

1. Work with the PSC to make available to broadband Internet providers information on utility poles that the PSC collects as part of its storm hardening and storm preparedness processes.
2. Monitor pole attachment prices charged by municipalities and RECs and, if the prices appear to rise faster than prices for IOUs, or if the municipal or REC prices appear to result in less competition for broadband financial support in municipally-served or coop-served rural areas relative to IOU-served rural areas, conduct an analysis on the effects on broadband and identify appropriate policy responses.
3. Monitor pole attachment progress to determine whether pole replacement costs are hindering broadband development.

Florida pole replacement legislation. It is worth noting that the issue of pole replacement costs was considered by, but did not pass, the 2022 Florida Legislature in the form of SB 1800. If passed, the bill would have created the Broadband Pole Replacement Program to be administered by DEO's Office of Broadband. The program would provide reimbursement to eligible broadband Internet providers for costs they incur when removing and replacing utility poles in unserved areas. The bill would have taken effect July 1, 2022 (The Professional Staff of the Committee on Appropriations, 2022). The *Bill Analysis and Fiscal Impact Statement* contains a summary of the issues and background including information about current pole replacement laws in Florida and the federal broadband Internet infrastructure funds. That document is accessible from the Florida Senate website.

III.   Municipal Broadband

PURC Discussion: Florida Statutes effectively prohibit municipalities from providing broadband services unless a private provider is unwilling to serve the area in question. (§§ 125.421, 166.047, 196.012, 199.183, 212.08, and 350.81, Fla. Stat.). As a result, municipalities are rarely involved in providing broadband Internet services in Florida. There are important reasons for restricting a government from competing against private businesses, but some evidence suggests that different restriction policies might improve broadband Internet adoption.

The research findings below suggest that municipal provision of broadband can have positive impacts in terms of increased broadband adoption, but also that municipal broadband is rarely financially viable and that governments distort markets when they are owners of competitive telecommunications providers. These findings imply that competitive safeguards may be needed to ensure that the net effects of the municipal provision of broadband would be positive.

Broadband coverage. Whitacre and Gallardo (2020) studied the effects of state laws restricting municipal broadband. They found that states with such restrictions have lower broadband penetration. They estimated that a county in a state with such restrictions and with a broadband penetration rate of 71.5 percent could increase its penetration rate to 74.7 percent if the restrictions were removed.

Broadband provider competition. An improvement in penetration, as found in Whitacre and Gallardo (2020), would not be without costs. Hauge et al. (2008) and Hauge et al. (2009) examined municipal provision of telecommunications, only some of which was broadband[1]. These studies

---

The economics and provisioning of non-broadband telecommunications and broadband telecommunications to make the results applicable. The primary technical difference between traditional telecommunications and broadband is that the traditional service was circuit switched whereas broadband is packet switched. Circuit switching means that when a communication channel is opened for use by a subscriber, that channel remains in the exclusive use for that subscriber's call until the subscriber disconnects the call. With packet switching, the subscriber is given capacity for communication only as needed. Otherwise, the two modes of electronic communications share the same needs for

found that municipalities provided telecommunications services primarily in areas where low population density or other economic factors make it difficult for more than one private provider to offer service. They also found that in instances where two or more private providers could economically provide service, a municipal provider providing service replaces one of the potential private providers in the market.

Broadband project financial viability. Yoo and Pfenninger (2017) and Yoo et al. (2022) examined every municipal fiber optic project they could locate in the United States from 2010 through 2019. They found 88 projects, but only 20 reported sufficient information to assess financial performance. Yoo and Pfenninger restricted their analyses to those 20 projects. The study found that it was rare for a municipal fiber project that reports financial results to be cash positive. Indeed, the 2022 study found no projects that would remain financially viable without obtaining additional funding or debt relief, and nearly 90 percent were not generating enough cash to achieve long-run solvency.

Yoo and Pfenninger (2017) and Yoo et al. (2022) identified instances where cities choose to give preferential treatment to benefit their own broadband providers through the use of subsidies. Governments have other ways to take advantage of their own enterprises relative to privately-owned rivals. For example, Edwards and Waverman (2006) found that European telecommunications regulations favored service providers in which the governments had at least partial ownership.

Finally, Yoo and Pfenninger (2017) and Yoo et al. (2022) provided a possible explanation for the Whitacre and Gallardo (2020) results, namely that the municipalities in the Whitacre and Gallardo study were effectively subsidizing broadband development (which is contrary to the 2021 Act's intent for "sustainable adoption"). This could result in increased penetration, although not necessarily because government-owned businesses do not respond in the same ways as private businesses to financial incentives that would normally lead businesses to expand output if their production costs are subsidized (Brevitz et al., 2011).

IV. Suggested Further Action For Municipal Broadband

Monitor broadband development across the state and identify the locations of unserved rural areas that persist even with financial support provided under state and federal subsidy programs.

Competitive safeguards might be considered in the future, such as accounting separations. Based on the Yoo and Pfenninger (2017) and Yoo et al. (2022) findings of poor financial performance, accounting separations could help ensure that the municipal providers are not receiving anti-competitive subsidies. Then, based on the Edwards and Waverman's (2006) findings that government owners sometimes act on incentives to discriminate against rivals, competitive safeguards might include requirements for equal access to essential resources and greater

---

rights of way, poles, and conduit, permitting, facility construction, etc., and have network effects and connectivity challenges.

transparency in permitting. Accounting separations might be similar to those imposed by the PSC on IOUs that enter nonutility lines of business (PSC, 2004). Equal access and transparency requirements were imposed by the FCC and state telecommunications regulators on incumbent local telephone companies under the Telecommunications Act of 1996 to safeguard competition (Jamison & Sichter, 2010).

Appendix B
Strengths and Weaknesses of Various Technologies

Broadband Technologies

The term "broadband" contrasts with "narrowband" communications service (e.g., lower speed dial-up connections over copper telephone lines using modems).[1] Consumers now associate broadband Internet connection with the "always on" high-speed Internet connections available using various telecommunications technologies, which continue to evolve and advance.

Broadband Internet connections are provided over <u>wired</u> (fiber optic cable or copper wire) or <u>wireless</u> (radio spectrum) transmission media. These wired or wireless technologies are used for "last mile" connections of the customer's premise (home or business) to the first point of aggregation for the Internet (i.e., the telephone company or cable TV company switch). In addition, the customer will have inside wiring and Wi-Fi equipment on the premise to connect computers and other devices — the configuration of which will also affect transmission speed and performance.[2]

Digital Subscriber Line (DSL)

DSL is provided over traditional telephone (copper) lines with added electronic equipment at each end of the line (DSLAM at the telephone company switch and DSL Modem at the customer premise). The availability of DSL service is limited by distance from the telephone company's central office — availability and speed depend on how far away the premise is from the central office or remote terminal. The signal reduces as distance increases, resulting in slower speeds. In general, DSL is not available beyond 18,000 feet.

DSL is becoming obsolete in the United States. For example, AT&T stopped accepting new orders for traditional DSL in 2020 and is phasing out traditional DSL service in favor of AT&T Fiber services.[3] Verizon is also phasing out the copper network that supported DSL where it has deployed its FiOS fiber optic network. However, DSL technologies are still common in rural areas and fiber-to-the-node versions of DSL (for example, AT&T's Internet Protocol Broadband (IPBB) are being offered.

---

[1] Note that there are other technical differences between broadband and narrowband. See, "Narrowband vs. Broadband: Terms Explained;" https://rockymtnruby.com/narrowband-vs-broadband/ Last Updated: March 11, 2022.

[2] See for example, Understanding Internet Speeds, AT&T: https://www.att.com/support/article/dsl-high-speed/KM1010095/.

[3] Pegoraro, R. (October 3, 2020). AT&T shelving DSL may leave hundreds of thousands hanging by a phone line. *USA Today*. Also see "AT&T no longer offers DSL service." https://www.att.com/internet/dsl/.

Asymmetric DSL

Asymmetric DSL means the download and upload speeds are not the same. Thus, they are "asymmetric." Download speeds range from 5 to 35 Mbps while uploads range from 1 to 10 Mbps.[4]

Other DSL Types

Other types of DSL service have evolved which offer greater speeds than ADSL. These types include ADSL2+, VDSL2, and G.Fast and are delivered using hybrid fiber optic/copper wire facilities. AT&T uses these technologies for its IPBB offering with "expected speeds" up to 100/20 and 500/100 Mbps.[5]

I.   Cable Modem

Cable TV programming was originally delivered over coaxial cable which is a solid copper wire surrounded by insulating materials. Using successive generations of DOCSIS standards[6], cable TV companies modified their networks by adding fiber optic cable to an optical node and then using existing coaxial cable for the remaining distance to provide high-speed Internet cable modem service. This network architecture is known as a hybrid fiber-coax network (HFC).[7] "HFC networks are predominantly fiber …. The remaining portion of the HFC network is coaxial cable. The coaxial network is connected to the optical fiber network at a 'fiber node,' where the (fiber) optical signals are converted to radio frequency electrical signals for transmission over the coaxial network to the subscriber's home."[8]

- **DOCSIS 3.0** supports maximum download speeds of 1 Gbps and 100 Mbps upload.
- **DOCSIS 3.1** supports maximum download speeds of 10 Gbps and maximum upload speeds of 2 Gbps.[9] DOCSIS 3.1 is widely deployed but "real-world implementations of DOCSIS 3.1 often max out at 940 Mbps down and 35 Mbps up."[10]
- **DOCSIS 4.0** when deployed will provide the capability for symmetrical multigigabit broadband service.[11]

---

[4] DSL vs. Cable vs. Fiber: Which Internet Option is the Best? https://broadbandnow.com/guides/dsl-vs-cable-vs-fiber Last Updated: March 14, 2022.

[5] Understanding Internet Speeds. https://www.att.com/support/article/dsl-high-speed/KM1010095/.

[6] Data over Cable Service Interface Specifications or DOCSIS as maintained by CableLabs.

[7] Hybrid Fiber-Coaxial Networks, CableLabs. https://www.cablelabs.com/hfc-networks.

[8] A "101" on DOCSIS Technology: The Heart of Cable Broadband, CableLabs. October 14, 2020. https://www.cablelabs.com/blog/a-101-on-docsis-technology-the-heart-of-cable-broadband.

[9] DOCSIS 3.0 vs. 3.1: What's the difference between the two cable modems? By David Anders, CNET, December 16, 2021.

[10] CableLabs sticks a fork into DOCSIS 4.0 specification, by Mike Robuck, Fierce Telecom, March 26, 2020. https://www.fiercetelecom.com/telecom/cablelabs-sticks-a-fork-into-docsis-4-0-specification

[11] A "101" on DOCSIS Technology: The Heart of Cable Broadband, CableLabs.

II.   Fiber Optic Cable/Fiber to the Home

Fiber optic cable contains at its center a very thin ultra-pure glass strand about the thickness of human hair over which data is transmitted using light sent by laser electronics.[12] These strands are bundled into multi-fiber cables of various sizes (e.g., 288 fibers). Broadband speeds vary depending on several factors, including the optical networking gear used and how the service provider configures the service. Fiber has the capability to provide very high speeds which are symmetrical. For example, AT&T Fiber offers symmetrical speed tiers ranging from 5 Mbps to 5 Gbps.[13] Also, Frontier recently announced a network-wide launch of 2 Gig fiber service.[14] Fiber is also the most expensive broadband Internet technology to deploy since it uses dedicated fiber optic cable to each premise served.

III.   Wireless/Radio Frequency (RF) Technology

There is a common misperception that "wireless service" means it is wireless all the way from the user's smartphone to the other end of the communication, whether a voice call to another person, browsing a website, or streaming video. This is not the case. The wireless portion of the communication is typically relatively short, from the smartphone to the antenna, which is supporting the communication (either a "5G" small cell antenna on a pole or streetlight, a "4G" antenna on a taller tower, a fixed wireless receiver on a premise, or a Wi-Fi connection). The rest of the data transmission from the antenna or Wi-Fi connection occurs over the landline network, typically via fiber.

Radio spectrum in the United States is allocated and assigned by the FCC among specific uses and users, including mobile wireless, fixed wireless, and satellite services.

IV.   Fixed Wireless

Fixed wireless access provides broadband Internet connection between two stationary points using radio signals, such as from a building or tower (access point) to a receiver located at the customer premise. The tower is typically connected to the Internet via fiber optic lines. Fixed wireless services depend on a line of sight between the tower and receiver with a range of up to 10 miles. Connectivity is a function of physics where lower frequencies can penetrate objects or clutter and other designs can go around corners or obstructions.[15]

---

[12] Frontier Communications. https://blog.frontier.com/2021/01/what-is-fiber-optic-internet/.

[13] How it Works – Optical Fiber, Corning Glass https://www.corning.com/worldwide/en/innovation/the-glass-age/science-of-glass/how-it-works-optical-fiber.html. Also see, Understanding Internet Speeds. https://www.att.com/support/article/dsl-high-speed/KM1010095/.

[14] Frontier heavily promotes network-wide 2 Gig fiber service launch, by Matt Vincent, Broadband Technology Report. February 22, 2022. https://www.broadbandtechreport.com/fiber/article/14234391/frontier-trumpets-networkwide-2gig-fiber-service

[15] Fixed Wireless Access Solutions: Tomorrow's Internet Today, page 7, WISPA.org, 2022.

Citizens Broadband Radio Service (CBRS) refers to a spectrum recently authorized by the FCC for shared use including general use on an unlicensed basis.[16] CBRS can be used to deliver fixed wireless access and is expected to outperform Wi-Fi for in-building use. It is also anticipated that CBRS will be used to extend 5G wireless service.

Fixed wireless service is provided by Wireless Internet Service Providers (WISPs), predominantly serving rural markets.

V.   Mobile Wireless

5G is the fifth generation of mobile wireless technology driving evolution of the wireless communications technology platform. First generation, 2G and 3G wireless service was provided beginning in the 1980s and 1990s using large towers, and 4G was characterized by the development of "apps" that needed sustained reliable connectivity, which in turn drove antenna densification, while 5G relies upon even more closely spaced, small antennas. 5G uses low-power transmitters with coverage radius of approximately 400 feet. 5G thus requires closer spacing of antennas and more of them. Small cells bring the network "closer" to wireless service users to deliver increased data capacity, faster connectivity speeds, and an overall better wireless service.

5G networks operate on frequencies in three bands[17] using millimeter wavelengths — the highest of which is anticipated to offer download/upload speeds of 1 Gbps. The actual speed and range the consumer receives depends on a variety of factors, including what frequency is being used by the service provider: low-band, mid-band, or high-band. There are tradeoffs among the different bands, between speed and distance/coverage. General observations:

- Low-band frequencies work well across long distances and in rural areas; speeds are greater than 4G but slower than other 5G frequencies.
- Mid-band frequencies are currently sought after since they permit greater speeds while covering relatively large areas.
- High-band frequencies provide the fastest speeds but in more limited circumstances, such as close to the antenna and in areas without physical obstructions (i.e., windows, buildings, walls). Thus, high band will work well in dense areas where antennas can be placed every few hundred feet. This spectrum delivers the high speeds that are commonly associated with 5G.
- 5G networking will be a combination of low, mid, and high-band frequencies.
- Using 5G service requires using a 5G-ready device.

---

[16] What is CBRS? By Linda Hardesty, Fierce Wireless June 23, 2020. https://www.fiercewireless.com/private-wireless/what-cbrs

[17] When is 5G coming to you? The definitive guide to the 5G network rollout, by Tom's Guide Staff, April 29, 2021. https://www.tomsguide.com/special-report/when-is-5g-coming-to-you-the-definitive-guide-to-the-5g-network-rollout

VI. Satellite Connections

Satellite technology provides near ubiquitous geographic coverage for the United States. Satellite Internet has vastly improved from its inception in the 1990s; however, it has been viewed as a solution primarily for rural and underserved areas. Like other Internet services using radio spectrum, satellite Internet service is affected by line-of-sight considerations such that trees and mountains interfere with access as does weather conditions such as rain or snow.[18]

Satellites in **"high earth orbit"** are 22,230 miles high. This distance creates the highest latency across all technology types according to measurements by the FCC (628 ms).[19] Satellites launched by HughesNet and ViaSat can offer speeds up to 25 Mbps or greater, with speeds up to 100 Mbps promised for coming years.[20] While satellite coverage is ubiquitous, the adoption rate for 10/1 service is 1 percent (residential subscriptions divided by deployed households).[21]

"Low earth orbit" satellites "circle the planet at only around 300 miles above the surface. The shortened distance can drastically improve the Internet speeds while also reducing latency."[22] Starlink can deliver up to 150 Mbps Internet service.[23] Amazon also plans deployment of satellite Internet service ("Project Kuiper").[24]

VII. Broadband Performance Metrics and Benchmarks

The typical consumer considers performance of broadband transmission media measured primarily by <u>speed</u> (upload and download) and <u>latency</u> (duration of the end to end "round trip" communication).

---

[18] See for example, "HughesNet is available coast to coast in the U.S. All you need is a clear view of the southern sky." https://internet.hughesnet.com/order-online/product-selection/. Also, "Viasat Internet is available in all 50 states and covers much of the U.S. population in remote and rural areas where other internet companies offer slower service, or no service at all." https://www.viasat.com/satellite-internet/faq/

[19] *Id.*

[20] Satellite Internet in the USA, by Tyler Cooper, BroadbandNow. October 26, 2021. https://broadbandnow.com/Satellite

[21] Fourteenth Broadband Deployment Report; In the Matter of Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion; GN Docket No. 20-269; Before the Federal Communications Commission, FCC 21-18, Released January 19, 2021, at footnote 121. (The "Fourteenth Broadband Deployment Report"). https://www.fcc.gov/reports-research/reports/broadband-progress-reports/fourteenth-broadband-deployment-report

[22] "What is Starlink? SpaceX's Much-Hyped Satellite Internet Service Explained, by Michael Kan, February 10, 2022. PC Magazine. https://www.pcmag.com/how-to/what-is-starlink-spacex-satellite-internet-service-explained

[23] *Id*.

[24] Amazon Sets the Stage for Five Years of Project Kuiper Satellite Internet Launches, by Ry Christ, CNET. April 5, 2022. https://www.cnet.com/news/amazon-sets-the-stage-for-five-years-of-project-kuiper-satellite-internet-launches/.

Speeds are measured in Megabits per second or "Mbps." One Mbps represents the capacity to transmit 1 million bits of data each second. Download and upload speeds are measured separately. Important speed thresholds affecting infrastructure funding:

- The **FCC threshold** for "broadband service" is 25 Mbps download and 3 Mbps upload. This definition is reviewed annually by the FCC, considering what "typical" users do with their broadband connection. The FCC is regularly urged to increase the speed threshold[25] and make the speeds "symmetrical" (identical download and upload speeds). Increasing the broadband threshold speeds would among other things increase the cost of FCC broadband support programs funded through the Universal Service Fund.
- The **IIJA threshold** for "broadband service" is 100 Mbps download and 20 Mbps upload.
- The FCC's **RDOF** relies on reverse auction bids using four performance tiers: Minimum (25/3 Mbps); Baseline (50/5 Mbps); Above Baseline (100/20 Mbps); and Gigabit (1 Gbps/500 Mbps).
- Florida Statutes defines "Broadband Internet service" as one "that offers a connection to the Internet with a capacity for transmission at a consistent speed of at least 25 [Mbps] downstream and 3 [Mbps] upstream" (25/3 Mbps). (§ 288.9961(2)(a), Fla. Stat.).

Latency is measured in milliseconds and is the time it takes for a data packet to travel across a network from one point on the network to another — the request-response time.[26] "Physical distances, number of network hops, routing protocols, and network equipment are generally more significant factors" contributing to latency.[27] The FCC's RDOF defines "low latency" as less than or equal to 100 milliseconds, and "high latency" as less than or equal to 750 milliseconds.[28]

VIII. Broadband Technology Trends and Characteristics

1. The customer's location will be the biggest factor in determining broadband technology options. Rural areas will tend to have fewer options.
2. DSL has become obsolete due to distance limitations (availability limited to locations 18,000 feet or less from the switch) and speed limitations. DSL download speeds typically do not exceed 6 Mbps, which is one-quarter of the FCC's benchmark for broadband: 25 Mbps.
3. DSL is often found in areas where cable or fiber Internet is not available. It is often cheaper than satellite or other services.

---

[25] Broadband: FCC Should Analyze Small Business Speed Needs, Report to Congressional Addressees, United States Government Accountability Office, GAO-21-494, July 2021.
[26] Eleventh Measuring Fixed Broadband Report, at page 10.
[27] Cable Broadband Technology Gigabit Evolution, CableLabs, Fall 2016, at page 16.
[28] RDOF Report and Order, at paragraph 32. See also, Auction 904: Rural Digital Opportunity Fund, https://www.fcc.gov/auction/904/factsheet#technology.

4. Fixed wireline Internet connections presently offer higher speeds and greater reliability since they are not affected by weather or line-of-sight factors that affect wireless radio transmissions, although deployment of 5G wireless service allows significantly higher speeds.
5. "Fixed broadband services… tend to offer higher speeds with greater reliability and higher usage allowances than mobile services, which can make fixed broadband services more suitable for, among other things, large file transfers, long-form video, desktop schoolwork, and sharing the same connection with multiple devices and users within the same home."
6. Fiber optic Internet access is considered to support the highest speeds and reliability, as compared to satellite, fixed wireless and cable modem hybrid fiber/coax.
7. The higher costs associated with connecting fiber optic cable to each premise have limited unsubsidized deployments to urban and suburban areas which are more densely populated.
8. Cable internet is more widely accessible than fiber optic Internet.
9. Fixed wireless provides advantages where terrain, distance, or low density preclude placement of fiber optic or other wired technology. Fixed wireless is deployed in Florida serving previously unserved areas, for example in Hardee County.
10. Fixed wireless and satellite services require the installation of properly located external fixed receivers or antennas/satellite dish.
11. Wireless Mobile speeds vary even over small local areas.
12. 4G and 5G wireless services rely on the landline network to connect towers and antennas. These connections increasingly use fiber optic cable. Also, Wi-Fi coverage is supported by a fixed broadband connection. Similarly, Starlink relies on Google's private fiber-optic network for connections.[29]
13. Speeds can decrease significantly with increased usage of shared facilities/capacity due to contention for capacity (network congestion). Examples include when many users contend for wireless capacity at a sporting or entertainment event, or in the evening when many cable Internet users contend for capacity for streaming video applications such as Netflix.
14. The FCC is optimistic that "increased deployment of 5G may allow mobile services to serve as an alternative to fixed services."[30] The FCC is expanding access to the spectrum to facilitate broadband deployment in the future.[31] "The Commission has made available significant amounts of spectrum in the low-, mid-, and high-frequency bands for mobile providers to develop and deploy new technologies like 5G and to support existing 4G LTE networks."

---

[29] Google wins cloud deal from Elon Musk's SpaceX for Starlink Internet connectivity, by Jordan Novet, CNBC. May 13, 2021.
[30] Fourteenth Broadband Deployment Report, at page 6. However, the FCC has not concluded that "consumers will treat mobile 5G as a substitute for fixed services."
[31] Fourteenth Broadband Deployment Report, at page 4 and page 43, "Access to Spectrum."

15. Wireless providers are beginning to use 5G to provide home internet connections, including T-Mobile 5G Home Internet,[32] Verizon's 5G Ultra-Wideband[33] and Starry (various plans). Prices range from $30 to $80 per month, and maximum download speeds range from 35 Mbps to 1 Gbps without data caps.[34]

16. Pricing for some service providers and offerings include data caps or limitations/added costs on data usage. Satellite services, wireless services, and fixed wireless services can include extra charges for data usage above a set level, or slow download speeds at a set level for the rest of the billing period. Data caps for fiber optic and cable internet are less prevalent.

17. Prices for SpaceX's Starlink satellite service have increased. The monthly charge for broadband Internet access increased from $99 to $110. The one-time charge for the user installation kit increased from $499 to $549.[35]

18. The scalability and viability of low earth orbit satellites for broadband Internet is not yet proven, and there are other concerns stemming from the volume of satellites to be placed into low earth orbit and their potential impact on astronomy.

Sources for Further Information

5G speed: 5G vs. 4G performance compared, by Tom's Guide Staff, June 1, 2021. https://www.tomsguide.com/features/5g-vs-4g

Eleventh Measuring Broadband America Fixed Broadband Report: A Report on Consumer Fixed Broadband Performance in the United States. Office of Engineering and Technology, Federal Communications Commission. ("Eleventh Measuring Fixed Broadband Report"). https://data.fcc.gov/download/measuring-broadband-america/2021/2021-Fixed-Measuring-Broadband-America-Report.pdf

Report and Order In the Matter of Rural Digital Opportunity Fund, WC Docket No. 19-126; Before the Federal Communications Commission; FCC 20-5, Released February 7, 2020 ("RDOF Report and Order").

Auction 904: Rural Digital Opportunity Fund, https://www.fcc.gov/auction/904/factsheet#technology

Wireless Internet Service Providers Association (WISPA). https://www.wispa.org/

Understanding Internet Speeds, AT&T: https://www.att.com/support/article/dsl-high-speed/KM1010095/

---

[32] https://www.t-mobile.com/news/offers/t-mobile-launches-5g-home-internet-in-metro-by-t-mobile-stores
[33] https://www.verizon.com/5g/?kpid=go_cmp-2036930567_adg-78854198304_ad-572787342178_kwd-520668201555_dev-c_ext-_prd-_sig-Cj0KCQjwl7qSBhD-ARIsACvV1X1eYK3UoByrLY4I2WIdqR1yUKLiXLFFb-AdezW8IF0mLF3Si5KqgRsaAnpMEALw_wcB&cmp=KNC-C-5GNetwork-NON-R-BPLU-NONE-NONE-2K0VZ0-COE-GAW-3006&gclid=Cj0KCQjwl7qSBhD-ARIsACvV1X1eYK3UoByrLY4I2WIdqR1yUKLiXLFFb-AdezW8IF0mLF3Si5KqgRsaAnpMEALw_wcB
[34] Could 5G Home Internet Be the Solution to Your Broadband Needs? By Trey Paul, CNET. March 6, 2022. https://www.cnet.com/home/internet/what-is-5g-home-internet/
[35] Maidenberg, M. (March 25, 2022). Inflation Boosts SpaceX Prices. *The Wall Street Journal*. p. B4.

Getting Connected to Broadband, Federal Communications Commission: https://www.fcc.gov/connected

Getting Broadband Q&A, Federal Communications Commission:
https://www.fcc.gov/sites/default/files/getting_broadband_qa.pdf

Satellite Internet in the USA, by Tyler Cooper, BroadbandNow. https://broadbandnow.com/Satellite

Broadband Technology Report: Fiber https://www.broadbandtechreport.com/fiber

Cable, fiber, 5G and more: the different internet connection types and how they work, by David Anders and Sean Jackson, CNET. September 13, 2021. https://www.cnet.com/home/internet/internet-connection-types/

Appendix C
Interviews with the Miccosukee and Seminole Tribes of Florida

PURC interviewed Tribal representatives in Florida regarding their broadband Internet needs and plans, talking with both the Seminole Tribe and the Miccosukee Tribe. PURC spoke with Foo Giacobbe, who leads information technology services for the Seminole Tribe. PURC also spoke with Curtis Osceola, who is the Chief of Staff for the Miccosukee Tribe. The interviews are summarized below.

The Seminole Tribe decided two to three years ago that broadband Internet development should be a priority, and launched a broadband Internet development program. In the first phase of the program, the Tribe is establishing towers for expanding cellular service, emphasizing fourth generation (4G) cellular technology known as Long-Term Evolution (LTE). Consultants were engaged for the planning of these towers, and the Tribe is currently in the construction phase. These towers will be available to AT&T, Verizon, and T-Mobile to provide LTE services in the area. The tower expansion includes the construction of fiber optic cabling to connect the towers. Phases two through four of the Tribe's broadband Internet program will include the expansion of dark fiber across Tribal lands and to members' homes, interconnecting all Tribal areas throughout the state, and the development of a Tribe-owned internet and television services provider. These phases could result in the Tribe's network replacing the broadband Internet networks provided by legacy telephone companies in Tribal areas. The Tribe is exploring whether to launch the Tribe-owned provider as a new enterprise or to purchase an existing broadband Internet provider and use it to provide service within the Tribal areas.

PURC's research for the Office of Broadband found that greater proportions of Native Americans in a geographic area are significantly associated with lower broadband Internet availability and less broadband Internet adoption, more so than for any other ethnic or racial group. For the Seminole Tribe, this negative correlation between broadband Internet and the presence of Seminole Tribe members apparently resulted from the Tribe lacking interest in broadband Internet and having a strong interest in maintaining its privacy. The strong interest in privacy remains, but the Tribe believes that broadband Internet should now be a priority. The Seminole also believes that its broadband Internet strategy will continue to protect privacy for the Tribe and its members. Broadband Internet affordability is not an issue for Tribal members.

The Seminole Tribe's primary challenges for deploying broadband Internet are land clearing, bird migration, and endangered species. Network deployment must take into consideration the Tribe's ties to the land and to nature. Once the necessary considerations are addressed, the Seminole Tribe's control of its land enables it to act quickly. The Tribe does not believe that it wants or needs state help at this time as it has its plans in place, is executing these plans, and has the necessary funding. The Seminole Tribe is willing to stay engaged with the state and to engage with other tribes to pass along the lessons it has learned from its broadband Internet program.

The Miccosukee Tribe is in a different situation than the Seminole Tribe. The Miccosukee Tribal leaders only recently determined that broadband Internet should be a priority and have not taken many steps toward broadband Internet expansion. At present, there are fiber optic cables surrounding the reservation, but fiber optics do not have much of a presence on reservation lands.

A primary interest of the Tribe is expanding broadband Internet for educational purposes. Schools have fiber optics. However, students learning from home lack broadband Internet, so there will be a desire to expand home access.

One of the challenges for the Miccosukee Tribe is the lack of a central authority to address barriers to network deployment, such as the need to work around other utility services, primarily water services. Regarding utility services, the Tribe has its own water utility and is installing a new system. Florida Power & Light provides electricity, and its lines are above ground. Comcast has run some fiber optics on the reservation, but most houses that have broadband Internet have DSL service, which is a legacy telephone company technology. Cellular coverage is good on Tribal lands. The Miccosukee Tribe has cellular towers that it leases to AT&T, Verizon, and T-Mobile. There are very few dead zones.

Broadband Internet affordability is not a problem for either Tribe. Also as with the Seminole Tribe, the Miccosukee Tribe's lack of broadband Internet has resulted from a lack of interest among Tribal leaders and members. However, now there is demand for broadband Internet, and the Tribe is ready to move forward. There are some independent camps on the reservation. People in these camps are descendants of Miccosukee people but are not Tribal members. The camps are remote and are likely to need satellite service for broadband Internet. The Miccosukee Tribe is interested in working with the state to develop Broadband Internet development on the Tribe's lands. This would include helping to develop grant applications and facilitating a Local Technology Planning Team.

In summary, while the Seminole Tribe and Miccosukee Tribe are in different situations with respect to broadband Internet development, the difference can reasonably be attributed to timing: The Seminole Tribe established broadband as a priority sooner than did the Miccosukee Tribe, and therefore, is farther along. There may be other reasons for the differences, but those are not obvious from the interviews. The Seminole Tribe wants to continue to work independently of the state. The Miccosukee Tribe is ready and willing to engage with the state to expand broadband Internet on reservation lands.

Appendix D
Methodology and List of Interviewees

The Office of Broadband contracted with PURC at the University of Florida to assist with the development of Florida's Strategic Plan for Broadband. The methodology used to develop this Strategic Plan included interviews with a variety of stakeholders in Florida. In addition, this Strategic Plan is informed by reviews of other states' broadband Internet plans, pertinent state and federal laws, regulations, funding guidance documents, PURC's report, *The Status of Broadband in Florida* (2022, February 28), a literature review (Appendix D), information about broadband Internet technologies (Appendix B), and a table on state and federal funding programs (Appendix E).

I.   Interviews

Interviews informed much of the strategy development. Interviews with various stakeholder groups included broadband ISPs and individuals who work for or are affiliated with: local governments, local communities and regional economic development organizations, state government agencies, emergency management and internet security entities, other states' broadband offices, think tanks, consulting groups, foundations, federal agencies, and organizations representing consumer groups. Representatives from the following entities were interviewed:

Industry – Company or Association		
AT&T	Florida Electric Cooperatives Association	Nokia
Charter Communications, Inc.	Florida Internet and Television	T-Mobile
Conexon	FPL (Florida Power and Light)	
Crown Castle	Gainesville Regional Utilities/ GRUCom	

Florida State Government and Associated State Entities		
Enterprise Florida, Inc.	Florida Department of Management Services, Division of Telecommunications	Florida Public Service Commission
Florida Department of Economic Opportunity	Florida Department of State, Division of Library and Innovation Services	Florida Division of Emergency Management

Florida State Government and Associated State Entities		
Florida Department of Education, Division of Public Schools and Division of Technology & Innovation	Florida Department of State, Division of Library and Innovation Services	Heartland Education Consortium
Florida Department of Health, Office of Rural Health	Florida Department of Transportation, Office of Policy and Planning	University of Florida, Institute of Food and Agricultural Sciences

U. S. Government	
Federal Communications Commission	U.S. Department of Treasury
National Telecommunications and Information Administration	

Local Government		
Alachua County Public Schools	Florida Municipal Electric Association	Levy County Library District
Calhoun County	Florida Regional Councils Association	Okeechobee County Commission
Central Florida Regional Planning Council	Florida Small County Coalition	Wakulla County Commission
Florida Association of Counties	Gainesville Regional Authority	Walton County, Clerk of County and County Administration
Florida Rural Electric Cooperative Association	Hardee County, Economic Development Council	City of Winter Haven, Chief Information Officer

Think Tanks, Consultants, and Other Organizations		
The American Association of Retired Persons (AARP)	Boston Consulting Group	Pew Charitable Trusts

American Enterprise Institute	Brookings Institute	VisionFirst Advisors (for Weyerhaeuser)
Benton Institute	Ernst & Young	
Blandin Foundation	KPMG	

State Broadband Offices		
Arizona Commerce Authority	Hawaii Broadband and Digital Equity Office	North Carolina Division of Broadband and Equity, Department of Information Technology
Colorado Office of Information Technology	Illinois Office of Broadband	
Connect ME (Maine)	Minnesota Office of Broadband Development	

Appendix E
Office of Broadband Activities and Outreach

The Office of Broadband has been directed to perform the following duties:
- Create a strategic plan to increase the use of broadband internet service in Florida. The plan must include a process to review and verify public input on the broadband Internet transmission speeds and availability, federal broadband activities, and funding sources.
- Build and facilitate local technology planning teams, especially with community members from the areas of education, health care access, business, tourism, agriculture, economic development, and local government. The planning teams shall work closely with communities to understand current broadband availability, identify assets for broadband deployment, build partnerships with service providers, identify underserved and unserved residents and businesses, identify funding opportunities, and provide assistance with applying for federal grants for broadband internet service.
- Provide technical and planning assistance to communities.
- Establish the Broadband Opportunity Program to award grants, subject to appropriations, to applicants who seek to expand broadband to unserved areas and apply for federal funds.
- Develop a map of broadband Internet service availability throughout the state consistent with the Federal Communications Commission's (FCC) Digital Opportunity Data Collection program. The map must identify where broadband-capable networks exist, service is available to end users, gaps in rural areas, and download and upload transmission speeds. DEO must receive and verify public input to identify locations in which broadband internet service is not available, including locations with transmission speeds below FCC standard of 25 megabits per second downstream and 3 megabits per second upstream. The map must be completed by June 30, 2022.
- Encourage public use of Internet service through broadband grant programs.
- Monitor, participate in, and provide input on FCC proceedings that are related to the geographic availability and deployment of broadband internet in Florida.
- Act as a repository for the attachment of broadband facilities to municipal electric utility poles.

The Office of Broadband is preparing for federal funding opportunities with the following in mind:
- Following the Governor's priorities, building the state workforce, transportation, and housing sectors will involve building out the broadband infrastructure throughout the state, specifically in unserved and underserved communities.
- Ensuring each of the funding programs, the Broadband Opportunity Program, the Capital Projects Fund, and the Infrastructure Investment and Jobs Act, provide the end user with access to minimum scalable speeds of 100mbps download and 10mbps upload.
- Connecting un/underserved areas and communities with these speeds will be an important driver for future economic development, workforce growth and stability, education, health care points of access, and housing opportunities for all residents and businesses in the area.

DEO Local Technology Planning Teams:

- Rolled out the Local Technology Planning Teams initiative and toolkit. The goal of the statutory initiative is to build out teams involving industry sector leaders in each county to identify locations in which broadband internet is not available, how broadband expansion will impact the community's education, workforce, and telehealth initiatives, and prepare potential broadband expansion projects for the community. The LTPTs are provided with direction on timeframes of the meetings, identifying participants from the areas of education, health care points of access, housing, business, tourism, agriculture, economic development, and local government. The planning teams work closely with rural communities in their county to better understand current broadband availability, identify assets for broadband deployment, build partnerships with service providers, identify underserved and unserved residents and businesses, identify funding opportunities, and provide assistance with applying for federal grants for broadband internet service. As of June 1, all 67 counties have identified leaders, and 27 counties have established teams, with 21 teams actively meeting. There is also one active regional team consisting of four counties. The Office of Broadband hosts a monthly call with all counties to discuss status of the meetings, answer questions, and share best practices. The culmination of this effort will be diverse community industry sectors working together to develop measurable goals, objectives, and benchmarks that will keep Florida's broadband adoption and expansion efforts on track at every level of government in subsequent years.

Outreach to National Partners:

- Reached out to NTIA for information on mapping projects in other states.
- Participate in the NTIA's State Broadband Leaders Network meetings and summits.
- Reached out to other state broadband offices in search of best practices pertaining to grant programs and mapping data.
- Partnered with the United States Department of Treasury on the Capital Projects Funding.
- Partnered with The Pew Charitable Trusts' broadband education and training initiative (BETI).
- Continual review of FCC meeting agendas for broadband topics.
- Spoke with SpaceX regarding its broadband expansion plans.
- Corresponded with U.S. Congressman Darren Soto, who serves on the subcommittee for Communications and Technology, regarding Office of Broadband funding applications.

Outreach to State Partners:

- Hosted a call with state agencies to discuss upcoming opportunities related to broadband Internet expansion and collaboration with other broadband related programs.
- Spoke with the Seminole and Miccosukee Tribes of Florida on potential funding opportunities for broadband expansion.
- Spoke with Florida Department of Management Services (DMS) on E-Rate and other broadband related programs.
- Met with Small Counties Coalition and the Florida Association of Counties to discuss Office of Broadband initiatives, partnering, and planning.
- Spoke with Florida Department of Education on the Career, Technical, and Adult Education program for potential partnership opportunities with the Florida Office of Broadband.

- Spoke with the Florida Municipal Broadband Alliance on directives of the Florida Office of Broadband and upcoming partnership opportunities.
- Spoke with statewide Internet Service Providers (ISP) regarding their partnership with the Florida Office of Broadband.
- Spoke with the Office of Rural Health at DOH regarding partnerships.
- Met with the Allapattah Collaborative about broadband expansion in the South Florida neighborhood.
- Met with the Communications Workers of America to discuss their union efforts.
- Met with the Florida League of Cities to discuss future partnerships.
- Spoke with the Department of State, Division of Libraries, on future partnerships and needs.

Conversations with Management Consultants and Service Providers:
- Spoke with various management consultants and Internet service providers around the nation on broadband best practices, grant program considerations, strategic planning discussions, and mapping insights.

DEO Website:
- Posted the Faster Florida Broadband Availability Map and link to speed test.
- Posted information on the Local Technology Planning Teams and the Broadband Planning Toolkit.
- Continuously update the website with federal and state funding opportunities.
- Posted a survey on broadband accessibility for public input and inclusion in the Florida Strategic Plan for Broadband.
- Provided sign-up option for interested parties to receive communications from the Office of Broadband.

DEO Broadband Workshops, Survey and Florida Strategic Plan for Broadband:
- Partnered with the Florida Regional Councils Association to host and facilitate ten regional workshops with industry sector leaders and statewide partners in February 2021. The information gathered from these workshops continues to help design state programs and resources for broadband adoption, deployment, expansion, and resiliency, as well as provide guidance for the Florida Strategic Plan for Broadband.
- Conducted a statewide survey on the availability and accessibility of broadband Internet in March 2021 to collect input from the public. Responses continue to help the office identify the status of broadband Internet and understand how the public defines broadband expansion in communities across the state.
- Received a Department of Commerce, Economic Development Administration (EDA), grant for $1,000,000. The grant allowed the Office to partner with the University of Florida Public Utilities Research Center (PURC) to develop a statewide broadband study and Florida Strategic Plan for Broadband, due to the Governor and Florida Legislature on June 30, 2022. PURC developed both the Status of Broadband in Florida study and the Florida Strategic Plan for Broadband.

DEO Broadband Availability and Speed Test Map:
- The Office contracted with GEO Partners, LLC, to develop the Florida Broadband Availability and Speed Test Map to show broadband Internet service availability throughout the state. This is a geospatial map that identifies where broadband capable networks exist, where service is available to end users, gaps in rural areas, and download and upload transmission speeds.
- The Office also contracted with Strategic Digital Services (SDS) on a statewide "Faster Florida Broadband" marketing campaign to encourage citizens and businesses to take a speed test. These speed tests provide valuable public feedback on Internet availability and speed in locations throughout Florida, helping the Office identify unserved and underserved locations around the state. This marketing campaign compliments and supports the data provided in the GEO Partners, LLC, map.
- Office of Broadband - FloridaJobs.org

DEO Faster Florida Broadband Map:
- The Office coordinated resources within the Department as well as partnering with the State Geographic Information Officer, Kimberly Jackson, to organize multiple usable layers that can be added to over time.
- Office of Broadband - FloridaJobs.org

Appendix F
Literature Review

This literature review is designed to offer insight into programs that have been empirically analyzed and that address federal, state, local, and private initiatives to increase broadband Internet access and adoption rates. The following sections provide results of various supply-side and demand-side programs that have been studied.

I. Access Studies

- **Subsidies to encourage broadband Internet provision** have not been shown to increase access or adoption. Studies are limited; one study found either no relationship or a negative relationship between high-cost support, cable speeds, and availability.

- Empirical studies of **programs to eliminate barriers to provider entry** (i.e., supply-side barriers) are sparse; however, it has been shown that state-level policies are ineffective (universal service programs targeted at underserved areas do not boost penetration). Guaranteed rights of way by ISPs is strongly correlated with increased penetration, as are some forms of unbundling regulations. A positive correlation has also been found between diffusion and the presence of a broadband Internet office at the state level and state-level funding.

- **Facilities-based competition** has been shown to be more successful than service-based competition in improving access, quality, and speed and decreasing price.

- **Municipal broadband Internet provision** has been shown to be financially unsuccessful, therefore, generally non-viable.

- With respect to **public-private partnerships**, we found no statistical studies of public-private partnerships employed to promote broadband Internet diffusion or adoption, although several case studies concluded that, while programs had success with respect to broadband Internet deployment, adoption goals were not met.

- The **E-Rate program** has not been shown to affect academic outcomes or have any bearing on spurring provider competition in broadband Internet markets.

- **Public Computing Centers** were not found to have any effect on home broadband Internet adoption, economic outcomes, or academic achievement.

II.   Adoption Studies

- Studies of programs addressing **price as a barrier to adoption** generally have been based on survey respondents rather than empirical analysis; we did not find any recent empirical studies that determine price to be a significant barrier to adoption for most unconnected households.

- Studies of programs addressing **lack of computer ownership** have concluded that providing computers (or subsidized computers) does not increase broadband Internet adoption; however, one study shows that specific groups were more likely to be adopters of mobile-only Internet access. While we did not find empirical evidence on the success of such programs, they appear to have the possibility of successfully increasing adoption rates.

- Empirical analyses of **digital literacy** programs are sparse. Limited results show that prior experience with the Internet directly promoted broadband Internet adoption and that libraries and other community organizations may compensate for shortages in digital skills that otherwise act as barriers to adoption. Studies conclude that precursors of broadband Internet adoption are individuals' perceived benefits of the Internet, the ability to acquire those benefits, and a perception of value in using the Internet.

- While there exist numerous studies that describe characteristics of non-adopters, few offer evidence as to why various groups do not adopt.

III.   Rural Access and Adoption Studies

- The Federal Rural Health Care Program was shown to have a positive impact in stimulating entry of broadband ISPs into rural areas. A key finding was that if rural broadband Internet availability were to increase to 100 percent, the adoption rate would increase by 6.12 percent. A cost benefit analysis would need to be undertaken to determine if this goal is optimal.

IV.   Regulatory Framework Studies

- The most significant positive effect on quality and quality improvements results from competition. Studies show evidence that regulatory interventions, such as unbundling or open access provision, positively impacted markets with limited competition. Stricter regulation negatively impacted infrastructure investment by entrants but had no effect on investments by incumbent providers.

V.   Missing in the literature

- Cost-benefit analyses
- Goals of programs being evaluated
- Rigorous empirical analyses
- Understanding of data necessary for any evaluation (state of affairs or program)
- Use of appropriate statistical methods

By seeking data from and results of various programs and policies, this review should prove useful to those responsible for implementing Florida's Strategic Plan for Broadband.

VI. Programs to Increase Broadband Access

A. Subsidies for Provision

Chaudhuri and Flamm (2005) concluded that high levels of inter- and intra-modal competition already effectively impose price discipline and that price subsidies arguably may promote Internet penetration at the household level, but would most likely be both redundant and extravagant. Currently, the U.S. government is spending $42.45 billion for the BEAD program, which offers ISPs subsidies to locate in unserved and underserved areas; most of this funding is to go to the states for their own projects.[1] There have been no studies (to our knowledge) of the potential impact of this program.

Among programs to subsidize provision is the CAF, established in 2012. CAF focused on providing funding for price cap carriers to begin broadband Internet buildout.[2] The program was established by the FCC and funded by the Universal Service Fund (USF).[3]

Phase I had a budget of $4.5 billion over six years. All existing high-cost support to price cap carriers were frozen, and an additional $300 million in CAF funding was made available. The prior (now frozen) support was then subject to the goal of achieving universal availability of voice and broadband, and subject to obligations to build and operate broadband Internet -capable networks in unserved areas. Phase II of the program included a budget of $1.98 billion over 10 years. Deployment was to be complete by end of 2020.

On September 15, 2015, the FCC authorized 10 telecommunications carriers to receive $9 billion in support for rural broadband Internet development. These awards are referenced on government websites and reports, but there is no indication of which 10 carriers received the money.

An empirical evaluation of High-Cost Support Programs (Skorup & Kotrous, 2020) attempted to determine their effectiveness in increasing broadband Internet availability and improving service quality. The data includes active programs in the 48 continuous U.S. states between 2014 and 2017. The authors observe fund disbursements to each of the four subprograms: the Connect America

---

[1] See Benton Institute for Broadband & Society.
[2] Price cap carriers are large telephone companies that are subject to FCC rate regulation that is in the form of price caps rather than rate of return regulation.
[3] See the FCC *Connect American Fund*.

Fund, Alternative Connect America Model,[4] Connect American Fund Broadband Loop Support,[5] and Rural Broadband Experiments.[6] They state, "with the exception of the Rural Broadband Experiments, we find that High-Cost Support has no relationship or is negatively related with cable speeds and availability."[7] The authors note that there are "inexplicably" large disparities in subsidies granted across the states. For example, "in 2018, rural providers in Alaska received over $2,000 in High-Cost Support per rural household in the state. In contrast, by way of example, Texas has the most rural households in the country, and 2018 subsidies amounted to about $211 per rural household."[8]

With respect to the cost of subsidies estimated to be required to connect remaining households to broadband Internet, de Sa (2017) predicted that connecting the remaining percent of unconnected U.S. households to fiber would require $40 billion in initial public funding, and $2 billion annually to support ISPs' operational costs.

B. Barriers to Provider Entry

Barriers to entry protect incumbent firms and inhibit new entry into a market. Barriers to entry exist in many industries, in particular those characterized by high fixed costs of entry due to infrastructure costs, licensing and permit requirements, and regulatory rules, among others. A classification of entry barriers not specific to broadband Internet is provided by McAfee et al. (2004).[9] In Table 1 below, economic barriers are differentiated from antitrust barriers; however, each is able to negatively impact a competitive market. An economic barrier is a fixed cost that must be incurred by an entrant to participate in the market, and that benefits incumbent firms. By contrast, an antitrust barrier is a cost that delays entry, and therefore, reduces social welfare relative to immediate entry but does not necessarily benefit the incumbent. A primary barrier constitutes the barrier to entry on its own. An ancillary barrier is a cost that does not constitute a barrier to entry on its own but reinforces other existing barriers. Structural barriers come from basic industry characteristics that relate to the structure of the market (for example with respect to broadband Internet infrastructure costs). Strategic barriers are essentially strategic entry deterrence actions taken by an incumbent firm, for example, loyalty programs that include customer discounts to maintain a company's customer base and market share.

---

[4] Established in 2016 by the Rate-of-Return Reform Order, the model provides funding to rate-of-return carriers that elect to transition to a new cost model for calculating high-cost support in exchange for meeting defined broadband build-out obligations. See Universal Service Administration, *ACAM*.

[5] The CAF-BLS provides funding to smaller phone companies to build broadband to a specific number of fixed locations in eligible areas. See Universal Service Administration *Instructions for Completing Connect American Fund-Broadband Loop Support Mechanism*.

[6] In 2014 the FCC established a $100 million budget for the rural broadband experiments fund. The goal of the program is to provide funding for experiments in price-cap areas to bring broadband networks to residential and small business locations in rural communities. See the FCC's *Rural Broadband Experiments*.

[7] The cable speeds were broadband speeds offered by traditional cable television companies. Likewise, availability is the availability of broadband by these companies (Skorup & Kotrous, p. 33).

[8] Skorup and Kotrous, p. 7.

[9] Park and Taylor, p. 8.

Table 1

Classification of Entry Barriers

		Economic barriers to entry		Antitrust barriers to entry	
		Standalone	Ancillary	Standalone	Ancillary
Structural barriers to entry	Economies of scale				O
	Switching costs			O	
	Brand loyalty	O		O	
	Capital costs				O
	Absolute cost advantages	O		O	
	Informational advantages				O
	Organizational advantages		O		O
	Asset specificity		O	O	
Strategic barriers to entry	Intense advertising			O	
	Contracts to block distribution			O	
	Excess capacity		O	O	
	Price discrimination	O		O	
	Leave-only marketing		O	O	
	Tying	O		O	
	Collective product proliferation				O
	Lobbying to raise entrant's cost	O		O	
	Exclusive patent cross-licensing		O	O	

Note. From McAfee et al. (2004).

Two statistical studies of factors affecting entry, and therefore broadband Internet diffusion, are from Prieger (2003) and Clements and Abramowitz (2006). Prieger (2003) estimated a model in which broadband Internet deployment is a function of various independent variables, including demographic composition, commuting and business patterns, market size, cost factors, and competition. He finds that larger markets, greater competition, and long commutes are associated with broadband Internet deployment.

Clements and Abramowitz (2006) found that population, income, and education level in an area, as well as cost-related factors, influence broadband Internet diffusion.

Empirical studies of programs to alleviate supply-side barriers to entry are sparse; however, Wallsten (2005) provided one such early investigation in which he examines government policies to improve broadband Internet availability, including streamlining rights-of-way laws, unbundling regulations, subsidies, and municipal provision. He finds that most state-level policies are ineffective: universal service programs targeted at underserved areas do not boost penetration and may even slow it by giving an artificial advantage to a given provider. Tax incentives appear to have no impact. However, guaranteed access to rights-of-way by broadband Internet providers is strongly correlated with increased penetration, and unbundling regulations affect diffusion in

mixed ways as unbundled network element (UNE) lines are negatively correlated with penetration,[10] while resale of telephone lines by CLECs increased penetration.

A more recent study by Whitacre and Gallardo (2020) used a county-level panel dataset, from 2012 to 2018, to analyze the impact of the availability of state-level funding, the existence of a state-level broadband Internet office, and the existence of restrictions on municipal broadband Internet provision on broadband diffusion. They find a small positive effect on broadband Internet diffusion from state-level funding and the presence of a broadband Internet office, and a negative impact of restrictions on municipal provision. For example, for a county with an average rural broadband Internet availability rate of 71.5 percent in 2018, the presence of a state-level funding program would be expected to raise availability to 73.3 percent; removing municipal broadband Internet restrictions would result in a similar small increase.[11]

C. Promoting Facilities-Based Competition (versus Service-Based competition)

The term facilities-based (or infrastructure-based, or inter-platform) competition is used in the telecommunications industry to describe **competition between providers of the same or similar services** where the service is delivered by different or proprietary means or network. By contrast, service-based (or intra-platform) competition refers to when new entrants compete with incumbents by leasing facilities such as local access networks from incumbents. In an effort to increase broadband Internet diffusion, some countries have instituted various policies supporting one form of competition over the other. The European Union has tended to promote service-based competition, while facilities-based competition has been supported in the U.S.[12]

Gruber and Denni (2005) and Denni and Gruber (2007) studied the extent to which inter- and intra-platform competition facilitate broadband Internet diffusion. Using empirical evidence from the FCC and the Bureau of Economic Analysis from 1999 to 2004, they find that with intra-platform competition on cable TV platforms, initially competition had a positive impact on speed of broadband Internet diffusion, but this effect decreased over time. For intra-competition over DSL lines, initial telecommunication density was positively correlated with increased diffusion; however, the diffusion speed was negatively impacted. Inter-platform competition was shown to have a strong positive impact on diffusion speed. In states with inter-platform competition, initial availability was low but in the longer-term infrastructure competition was shown to be conducive to driving penetration.

Distaso et al. (2006) examined inter- and intra-platform competition on broadband Internet diffusion. His data represented 14 European countries; among those countries, he found that only inter-platform competition facilitated broadband Internet adoption. More recent work by Yoo (2014) compared service-based competition with facilities-based competition. Yoo used statistics and case studies to identify the best policies for increasing the deployment of high-speed broadband Internet by questioning the claim that the European model of service-based

---

[10] A UNE is a part of a telecommunications network that is required by the Telecommunications Act of 1996 to be offered to other providers to avoid duplicate infrastructure.

[11] Whitacre and Gallardo, p. 25.

[12] The European Union's competition policy is summarized in European Parliament (2021); the information includes competition policy tools, enforcement, and the role of the European Parliament.

competition had outperformed the facilities-based competition underlying the U.S. approach. Using data on cable coverage and DSL provision by new entrants along with country-specific demographic data, he found that facilities-based competition had a statistically significant positive effect, while service-based competition had a statistically significant negative impact on next generation network (25 Mbps) coverage. There also was disparity between the speeds advertised and delivered by broadband Internet providers in the U.S. and Europe. During peak hours, U.S. actual download speeds were 96 percent of advertised speeds, compared to Europe where consumers received 74 percent of advertised download speeds. With respect to upload speeds, data indicated U.S. providers offered actual upload speeds that averaged 107 percent of advertised speeds, while European ISPs provided 88 percent of their advertised speeds.

With respect to price associated with the contrasting competition policies, data show that U.S. broadband Internet prices were lower than European prices for all service tiers up to 12 Mbps. For speeds greater than 30 Mbps U.S. prices were significantly higher (Yoo notes that the average U.S. user consumes 50 percent more capacity than the average European user, which likely is reflected in the pricing and coincides with the difference in monthly household bandwidth usage (60 GB in the U.S. vs. 40 GB in Western Europe).[13]

To determine which form of competition may better support investments in broadband Internet upgrades, Yoo included case studies of eight European countries (Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden, and the United Kingdom). He again found facilities-based competition to be more effective and adds that countries that emphasized use of differing technologies achieved higher coverage rates than those relying on Fiber to the Premises (FTTP).[14]

Bauer and Tsai (2014) conducted a similar study that assessed the quality of broadband Internet access given various forms of market competition. They used data from Ookla (Ookla assesses Internet and network performance around the world) and Akamai (a content delivery network as well as providing Internet security) to empirically analyze the degree to which public policy decisions impacted quality and quality upgrades. Their research found that competition was the most important positive factor in providing quality. With respect to the form of competition, the authors found that broadband Internet penetration increased more strongly with the intensity of facilities-based competition than with intra-platform competition.

Prieger et al. (2014) offered increased detail regarding competition in the broadband Internet market. The authors conducted an empirical analysis of quality competition among broadband ISPs. They used the National Broadband Map data for California for 2011 through 2013 to examine how incumbent firms responded to competition from competitive local exchange carriers (CLECs) and cable modem providers. They observed that incumbent providers improved their ADSL[15] quality when faced with a cable entrant and when cable operators offer increased speeds; however, incumbent providers did not raise their quality when CLECs competed via ADSL—they did when CLECs deployed fiber.

---

[13] Yoo (2014), p. 21.
[14] Yoo (2014), p. 51.
[15] ADSL is the abbreviation for asymmetric (or asynchronous) digital subscriber line, which is a method of routing digital data over copper telephone wires to allow both broadband Internet and voice communication simultaneously.

D. Municipal Provision

Municipal broadband Internet provision is broadband Internet access provided by local governments. Those supporting the municipal provision assert that quality and price are better for customers when provided by their cities rather than ISPs, and that in the absence of such provision, some households will not have any service options. Opponents contend that public entities are poorly equipped to maintain commercial broadband Internet networks and that government entry into the private sector constitutes unfair competition for the private sector providers.

To address these competing views, Hauge et al. (2008) examined the effect of municipal telecom provision on the presence of competitive local exchange carriers (CLECs) that formed to compete with incumbents. They conducted a nationwide empirical study of 51,148 cities with CLECS and/or municipal telecom providers and found that municipal providers tended to serve markets that CLECs did not. They also discovered that the presence of a municipal provider in a market did not affect the probability that a CLEC also served that market if there were multiple CLECs. In smaller markets that could support only one competitor to the incumbent, the presence of a municipal supplier decreased the probability of having a privately-owned competitor. A subsequent work by Hauge et al. (2009) confirmed the prior result and showed that the effect of municipal competition on private provision was largely concentrated on the first entrant. This suggests that municipalities initially entered telecommunications markets with demand too low to support competition from commercial providers.[16] While useful for understanding what may drive entry, these papers only address the impact of municipal provision on privately-owned competitors; they do not address factors that may make municipal provision successful.

More recently, Yoo and Pfenninger (2017) conducted an empirical study including every municipal fiber project in the U.S. Of the 88 municipal fiber projects, 20 reported the financial results of their broadband Internet operations separately from the financial results of their electric power operations. The authors used data from these 20 municipal fiber providers over the period from 2010 to 2014 and ascertained that 11 of the 20 generated negative cash flow. Of the nine projects that were cash-flow positive, seven would require more than 60 years to break even. Only two generated sufficient cash to be on track to pay off the debt incurred within the estimated useful life of a broadband Internet network, which is typically projected to be 30 to 40 years. The authors noted, "To date, assessments of municipal fiber programs…have been long on rhetoric and anecdotes and short on systematic empirical analysis."[17]

In 2022, Yoo et al. followed the 2017 work, and utilized municipalities' official reports to empirically analyze the financial performance of every municipal fiber project in the U.S. operating in 2010 through 2019. They found that none of the projects generated sufficient nominal cash flow to remain financially viable without additional funding or debt relief, and 87 percent had not generated sufficient nominal cash flow to achieve long-run solvency. 73 percent generated negative nominal cash flow over the prior three fiscal years. The authors stated that analysis of the projects' performance revealed that revenue generation likely plays a more important role in generating cash flow than efficiency in construction costs or operating efficiency.

---

[16] This is consistent with Yoo and Pfenninger (2017) and Yoo et al. (2022), which found that municipal providers were rarely commercially viable, implying that they often constitute subsidized provision of broadband.

[17] Yoo and Pfenninger, p. 2.

Municipal Wi-Fi Provision

A subset of research on municipal provision focuses on such provision of Wi-Fi networks (see Gillett et al., 2004; Infante et al., 2007; Middleton, 2007; Potter & Clement, 2007; Shaffer, 2017). Wi-Fi networks do not require an FCC license for the radio spectrum they use; Wi-Fi providers need not pay the government for the use of the airspace. For this reason, some municipalities are turning to this option for broadband Internet provision to households in their areas; however, statistical analysis of the effectiveness of such programs is sparse. For example, the Detroit Community Technology Project[18], the Personal Telco Project in Portland, Oregon[19], and NYC Mesh in New York City[20] each have been operational for over five years, yet no statistical analyses have been undertaken to determine their level of success in terms of adoption or achieved outcomes from the supply of such networks.

E. Public-Private Partnerships

Public-private partnerships typically involve private capital financing of government projects. The private companies then earn profits over the course of the partnership contract. Such partnerships primarily are used for infrastructure projects that require significant initial investment that a municipality is unable to amass. No statistical studies of public-private partnerships to promote broadband Internet diffusion or adoption were found, although several case studies exist.

Gerli and Whalley (2018) focused on two projects deploying fixed broadband Internet networks in rural U.K.: Broadband for the Rural North and Connecting Cumbria. The former is a cooperative fiber-to-the-home network financed and built by residents in northwest England. As of 2022, Broadband for the Rural North remains in operation with a network of dark fiber cable and apparently successful connections (Broadband for the Rural North, n.d.), however, Gerli and Whalley (2018) offered no statistics on the program's performance.[21] The latter project is a public-private partnership between British Telecom and Cumbria County Council to provide fiber in unserved areas. Despite achieving the set deployment goals, Connecting Cumbria frustrated rural communities who were unsatisfied with the speed or unable to access fast broadband Internet.

Gerli and Whalley (2020) followed up their 2018 study with an examination of private design-build-own (DBO) initiatives, where the public entity subsidizes the provision of infrastructure that is designed, built, managed and owned by the private partner. Using case study data, they found that the private DBOs achieved and sometimes exceeded their targets (programmatic success) but failed to engage with their stakeholders and lacked support at a local level (process deficiency).

A similar study was conducted by Fortunato et al. (2012), who analyzed municipal and public-private partnerships in Maine, Pennsylvania, and Wisconsin to determine community-level factors that either encouraged or inhibited local broadband Internet network development in persistently

---

[18] See the Detroit Community Technology Project.
[19] See the Personal Telco Project.
[20] See NYC Mesh.
[21] Dark fiber cable refers to excess capacity of unused fiber-optic cable that has been laid by a company but is not needed. It then can be leased to other companies to establish connections among their own locations.

underserved communities. They acquired evidence suggesting that local organizing for high-speed broadband Internet access is similar to other community development problems unrelated to technology. Although the authors have data from the U.S. Census American Community Survey (ACS) (2010) and the Bureau of Economic Analysis Regional Municipal P3 Maine Hermon Washington County Pennsylvania Kutztown Cambria County Wisconsin Reedsburg Kenosha County Economic Information System (REIS) Regional Profiles (2010) (including population growth, migration patterns, income and education levels, and the mix of industries found in the area), no statistical analysis was pursued.

F. E-Rate Program (established in 1996)

E-Rate is a U.S. federal funding program administered by the Universal Service Administrative Company (USAC) under the direction of the FCC. The program provides discounts for telecommunications, Internet access, and internal networking costs for schools and libraries. Services include voice, data, video, and wireless services, as well as Internet access and the cost of installing and maintaining network infrastructure. The primary goal of the E-rate program is to promote equity across urban and rural areas, high and lower-income areas, and served and underserved areas by providing discounts of 20 percent to 90 percent of the cost of relevant connection services (not for computers or other devices that would then be connected). The discount offered is based on the poverty level of the school as given by the percentage of area students eligible for subsidized lunches, so that schools with more students from disadvantaged households receive higher discounts. [Rural schools and libraries also may receive a higher discount.][22]

The program is comprised of two categories. The first includes discounts for telecommunications services, such as wired and wireless data links and ISP connections. These funds are to bring Internet access to the school or library. The second category includes costs associated with internal wiring necessary to distribute connections to classrooms and other facilities within the school or library and includes wireless local area network services such as Wi-Fi.

To receive E-Rate funding, an eligible school or library must submit to the USAC a request for competitive bids for providing telecommunications and Internet goods or services. The USAC posts the requests for vendors to bid to provide the service. The school or library chooses the vendor it prefers, and then applies to the USAC for approval to commission that provider. A school can apply to the USAC by itself or as part of a district. If the latter, the discount rate is calculated as a weighted average of the schools listed on the application.

In 2014, the FCC's Second E-Rate Modernization Order increased the funding cap for the program to $3.9 billion, indexed to inflation going forward (the cap in 2021 was $4.276 billion).

Several studies address the successfulness of the E-rate program in various states. An early study by Ward (2005) found that program subsidies did not have any effect on academic outcomes of students in schools awarded E-rate discounts. Similarly, Goolsbee and Guryan (2006) concluded, "Using a variety of test score results, however, we do not find significant effects of the E-Rate

---

[22] See the FCC *E-Rate Program*.

program, at least so far, on student performance."[23] Their program evaluation (limited to schools in California) used detailed data on public schools including students' achievement test scores and the demographics of their communities. The authors found that the program subsidies did lead schools to spend more on telecommunications technology; however, test scores in math, reading and science showed no evidence of any effect on academic outcomes.

More recently, Hazlett et al. (2016) conducted an empirical study using data from 374 North Carolina public high schools from 2000 to 2013, and found no improvement in student test results associated with E-rate subsidies. In fact, they found that a 1 percent increase in E-Rate spending per student in the district decreased the average math score for a school. The authors also used SAT scores to gauge educational improvement and found that increasing the amount of E-Rate funding that schools received had no impact on SAT scores. Lastly, they calculated how E-rate funding affected the ratio of students per Internet-connected computer since subsidies pay a percentage of the school's computer and Internet expenditures and found that decreasing the number of computers connected to the Internet would improve math scores.

Hazlett et al. (2016) stated the following:

The disappointment in the lack of a return is intensified by two additional reasons. First, the subsidies are the result of 18.2 percent tax on certain telephone charges. In addition to the economic distortion created by the tax, this tax is worse than most due to its regressive nature—everyone pays the same percentage regardless of their means. Given that our results show that increasing E-Rate funding has no impact on SAT scores, it seems logical that the money could be better spent on other educational reforms that might improve student performance…as there is no evidence that E-Rate spending improves any performance measure for students. (p. 14)[24]

In a complementary magazine article, Hazlett (2016) noted that the Department of Education found that 98 percent of schools had broadband and 94 precent of classrooms were wired for high-speed connections by 2008 so that the goal of bringing Internet to schools was completed long ago.

E-Rate's effectiveness in increasing broadband Internet diffusion by spurring competition also was analyzed. Flamm (2015) used U.S. zip-code level data to examine whether the program had an identifiable and statistically significant impact on broadband Internet competition over the period of 2005-2008. He compared E-rate outcomes with outcomes from the smaller and more targeted Universal Service Fund's Rural Health Center program and found that the more highly-focused USF funding has had a statistically and economically significant impact on numbers of local broadband Internet service providers, while the E-Rate program generally did not in most areas. The latter was found to have no bearing on the number of competitors in most of the areas in which fund recipients were located and a slightly negative and statistically significant effect on broadband Internet provision in the majority of zip codes. In only the indigent or most rural areas was there any evidence that the E-Rate program had a statistically significant impact in stimulating greater competition in broadband Internet service provision, and when found, it was small.

---

[23] Goolsbee and Guryan, p. 336.
[24] Haslett et al., p. 14.

G. Public Computing Centers

Public computer centers (PCCs) to improve broadband Internet supply was promoted first with the American Recovery and Reinvestment Act of 2009 (ARRA).[25] This Act mandated the National Broadband Plan, the goal of which was to ensure all Americans have access to broadband Internet. Broadband Internet provisions in the plan amounted to $7.2 billion primarily for broadband Internet grant programs. The funds were distributed through two separate and partially overlapping programs—the Broadband Initiatives Program (BIP), administered by the Rural Utilities Service (RUS), and the Broadband Technology Opportunities Program (BTOP), run by the NTIA.[26] The ARRA provided $2.5 billion for BIP and $4.7 billion for BTOP, with the goals of construction and deployment of broadband Internet infrastructure to improve access and adoption, particularly in rural and lower-income areas.

Empirical results of studying all BTOP programs show little evidence of success in terms of economic outcomes, academic achievement, or household adoption resulting from funded grant programs (Beard et al., 2020; Hauge & Prieger, 2015).

BTOP grants included three types of projects: infrastructure in unserved and underserved areas, enhanced broadband Internet capacity at PCCs, and promoting sustainable broadband Internet adoption. $50 million was allocated for PCC grants. The stated goal of the BTOP program was to ensure affordable access to at least 1 gigabit per second for schools, hospitals, and government buildings. The expectation was that the recipients would provide digital literacy and job training along with continuing education and entrepreneurship programs. A February 2010 BTOP report stated that $22.8 million in grants had been awarded to PCC projects as of February 16, 2010.[27] While evidence shows that PCCs were established, there are few studies addressing whether those PCCs had any impact on adoption in the community or any other positive benefits for the communities in which they were established.

Chang (2021) used data on PCC grants and public library surveys to examine whether residential broadband Internet adoption rates had increased in counties in which libraries received grants and had successfully increased the number of Internet-connected computers available for use. The data was from 2009 to 2014. Chang found no evidence of increased broadband Internet adoption rates in those counties despite an increased number of Internet-connected computers.

Similarly, Whitacre and Rhinesmith (2015) examined the relationship between library and household broadband Internet adoption rates in rural areas of the U.S. They found that while library access and household adoption rates are correlated, statistical analyses revealed no evidence that counties with libraries that had increased Internet-accessible computers between 2008 and 2012 measurably impacted rates of adoption.

Similar to PCCs are community technology centers (CTCs). CTCNet was established as a national network of over 1,000 CTCs with the goal of providing access to communications services and

---

[25] See the FCC's *American Recovery and Reinvestment Act of 2009*.

[26] See the United States Department of Commerce National Telecommunications and Information Administration *BTOP / SBI Archived Grant Program*.

[27] See the NTIA's *Quarterly Program Status Report*.

technology infrastructure in economically disadvantaged areas. In 2006, CTCNet established the Connections for All program, which was formed to help CTCs make their programs and facilities more inviting and accessible to all.[28] To our knowledge, there are no studies on the impact of CTCs or the Connections for All program on access or adoption.

Recently the American Rescue Plan Act of 2021, funded the Emergency Broadband Connectivity Fund (administered by the USAC). The Act establishes a $7.17 billion program aimed at helping communities provide infrastructure, materials, and services to schools and libraries for remote learning during the pandemic.[29] Schools and libraries could receive Wi-Fi hotspots, modems, routers, and connected devices. To date, while data is available on implementation of the program, we have found no statistical studies analyzing program outcomes.

VII.   Programs to Increase Broadband Adoption

A.   Programs Addressing Price as a Barrier to Adoption

Price historically has been reported to inhibit household broadband Internet adoption, with some arguing that price is the key barrier to adoption and that prices are prohibitively high due to lack of competition or market power of incumbent providers. Broadband Internet prices are difficult to study as different performance tiers, options, and availability of bundles significantly affect advertised prices, and it is equally (if not more) difficult to determine a household's willingness to pay for a service they have not yet obtained. That said, there do exist numerous reports that reference survey respondents' assertions that price bars them from connecting. Prieger and Hu (2008) generated estimates of income elasticity of demand for DSL broadband Internet and found that demand increased with household income; however, their study lacks data from cable modem service and the data is from early years of broadband Internet development.

In May 2021, the FCC opened enrollment in its Emergency Broadband Benefit Program offering up to $50 per month in broadband Internet subsidies for low-income U.S. households or for those who lost income during the pandemic.[30] Over 825 ISPs are participating in providing service, with the full list of available ISPs in each state showing that subsidies should be available in most areas that currently have home Internet access. The FCC stated that the program would continue until the $3.2 billion in federal funding was exhausted, or six months after the Department of Health and Human Services declares the pandemic over. The program also allows eligible households to apply for a one-time discount of up to $100 to purchase a computer for Internet access. In November 2021, the IIJA became law.[31] This Act provides $14.2 billion to extend the Emergency Broadband Benefit Program to a longer-term program called the Affordable Connectivity Program. These policies and the stated intent behind them reinforce the perception that households would adopt, but for the price of doing so. There is no evidence, however, that this perception is accurate as no

---

[28] See Great Nonprofits. *Community Technology Centers' Network, Inc. (Ctcnet).*

[29] See the FCC's *Emergency Connectivity Fund*.

[30] The Affordable Connectivity Program replaced the Emergency Broadband Benefit Program on December 31, 2021. Information on the latter program and the changes instituted upon enactment of the former are available at https://www.fcc.gov/broadbandbenefit

[31] Public Law 117-58, November 15, 2021. 135 STAT. 429. See the United States Department of Energy, Alternative Fuels Data Center.

empirical studies have been published that demonstrate change in adoption based on loss of income due to the pandemic.

While there appear to be no definitive international broadband Internet pricing studies, sources rank U.S. broadband pricing equivalent to that in peer countries. In its *Measuring Digital Development* report, the International Telecommunication Union (ITU) ranked the U.S. as tied for sixth place globally for affordability of fixed broadband Internet prices as a percentage of gross national income capita (ITU, 2020). The Economist Intelligence Unit's *Inclusive Internet Index* also highlighted how the U.S. compared to 99 other countries in terms of Internet availability, and affordability (The Economist, 2021).The U.S. ranked third overall and first in affordability.[32]

In sum, while high price remains an accepted political response to explain low adoption rates, other than the Prieger and Hu 2008 work, we find no empirical studies that determine price to be a significant barrier to adoption for most unconnected households.

B. Programs Addressing Lack of Computer Ownership

Lack of a computer in a household traditionally restricted broadband Internet adoption; however, technology now offers the ability to connect via mobile devices and increasingly those in unserved and underserved areas are taking advantage of that option. Initially as part of the (BTOP) in 2009, many broadband Internet programs targeted computer ownership as the first step in increasing adoption. For example, the Wireless Philadelphia Digital Inclusion Project showed that a free computer was a critical element in the success of their mission (OMG Center for Collaborative Learning, 2008). Similarly, Connect Kentucky's (2009) Computers 4 Kids program provided computers for low-income families with children.[33] The impact of these programs is uncertain however, as analysts most often report on program implementation rather than outcomes of such implementation and utilize subjective surveys of program administrators and participants rather than employing statistical methods to determine program effectiveness.

One exception is a 2020 study by Rosston and Wallsten, who examine Comcast's Internet Essentials (IE) program.[34] In 2011 as part of its approval of the Comcast-NBCU merger, the FCC mandated a commitment by Comcast to introduce a low-income broadband Internet program that Comcast branded Internet Essentials. As part of the program, eligible participants can purchase a laptop computer or Chromebook at a significantly reduced price. Rosston and Wallsten examined the IE program and found that approximately 66 percent of IE subscribers represented increases in low-income adoption as a result of the program, with the remaining subscribers being households that switched from a competitor and households that would have subscribed as part of a general upward trend in adoption. The authors concluded that it would be difficult to infer that subsidized computers made a difference in broadband Internet subscription.

Perrin and Bertoni (2017) used data from the Pew Research Center to discern possible digital literacy limitations as reason for lack of adoption. They found that providing a tablet computer with

---

[32] Note that countries with the same average price for broadband are equal only with respect to affordability if that price represents the same percentage of average income.
[33] See Connect Kentucky.
[34] See xfinity *Internet Essentials*.

Internet access to people without prior Internet experience did not encourage 40 precent of subjects to use the Internet. Most (70%) called technical support at some point to get help with their device, and almost half experienced login issues.

Another possibility to encourage adoption is advocating use of mobile-only connections for Internet access. Manlove and Whitacre (2019b) studied the development of mobile-only Internet access from 2011 through 2015, and discovered that specific groups were more likely to be adopters of mobile-only Internet access. Specifically, older users increased their incidence of mobile only connection as did racial and ethnic minorities and households in non-metro areas. Additionally, some demographic groups had shifted to using a smartphone only. They noted that 68 percent of Americans owned a smartphone; those in rural areas were 6 percent more likely to connect to the Internet via smartphone than via a fixed connection (in comparison to those in urban areas). Lower income and less educated individuals also were higher adopters of smartphone only Internet access.

C. Programs Addressing Digital Illiteracy

Digital literacy refers to the ability to use digital technology effectively. Most programs attempting to rectify the problem of digital illiteracy target specific groups, such as the elderly, or those who are under-educated, disabled, minorities, women, at-risk youth, or urban or rural low-income households.

LaRose et al. (2007) found that prior experience with the Internet and the expected outcomes of using the Internet directly promoted broadband Internet adoption. With respect to demographic characteristics, the authors found that only age and income had direct impacts on adoption as younger and more educated individuals were more likely to adopt. They noted that differences in the adoption of high-speed Internet had previously been attributed to the demographics of rural communities, including age, education, and household income, but their work showed that the precursors of broadband Internet adoption were individuals' perceived benefits of the Internet, the ability to acquire those benefits, and a perception of value in using the Internet. Powell et al. (2010) found that libraries and other community organizations could compensate for shortages in digital skills that constitute barriers to adoption for some.

D. Other Programs Aimed at Increasing Adoption

Connected Nation

Since 2001, Connected Nation has participated in a least one project in all but eight states, offering programs to help bridge the digital divide.[35] Connected Nation's website states: "From state-based technology planning and mapping programs to national educational technology initiatives, Connected Nation has partners in all sectors including libraries, schools, state and local governments, large technology companies, and small businesses. Our impact on the adoption,

---

[35] Digital divide refers to the gap between those with ready access to computers and the Internet, and those without. Researchers now categorize the first digital divide as pertaining to access to technology, the second digital divide as pertaining to computer use, and the third digital divide as differences in social and cultural benefits derived from Internet use.

access, and use of technology is vast."[36] However, no empirical evaluation of such programs is made available. We were able to locate only one empirical analysis of Connected Nation program outcomes. Manlove and Whitacre (2019a) offered an empirical analysis evaluating the effectiveness of the Connected Nation program in five states during 2012 and 2013. They found that participation in the program had no statistically significant impact on broadband Internet adoption rates.

Various other broadband Internet adoption initiatives have been established within states, among groups of states, and for tribal areas. For example, Connected North was established in 2013 by Cisco to connect indigenous students to Internet.[37] Nevertheless, we were unable to find any empirical studies of such programs.

Research concentrating on other barriers to adoption analyze correlations among adoption and demographic characteristics as well as the Internet service offered. Clements and Abramowitz (2006) found that along with those having higher income, younger and more educated individuals and those with children were more likely to adopt broadband Internet. Weiner et al. (2012) found that race and ethnicity did not predict household-level broadband Internet adoption, and that the strongest factor for adoption was computer use by the household decision maker.

Wallsten (2016) found that for a FCC experimental broadband Internet project, providers (wireline and mobile) signed up less than 10 percent of the number of participants they had expected. His results express the difficulty of encouraging low-income households to sign up even with large discounts, suggesting that subsidies are likely to go to those who already subscribe. Subscribers also were willing to accept lower speed for lower prices. A conundrum is that while non-subscribers cite lack of knowledge as a barrier to adoption, they generally express a reluctance to accept digital literacy training classes. Wallsten noted that in one project, many were willing to forego an additional $10 per month savings or a free computer to avoid taking digital literacy classes.

VIII.   Rural Access and Adoption

The Rural Health Care Program (est. 1997) provides funding to eligible health care providers for telecommunications and broadband services necessary for the provision of health care.[38] The goal of the program is to improve the quality of health care available to patients in rural communities by ensuring that eligible health care providers have access to telecommunications and broadband Internet services. Rural and non-rural health care providers that are members of a consortium with more than 50 percent rural health care provider sites, receive a 65 precent discount on communications services. Beginning in 2016, health care provider funding requests exceeded the funding cap and in 2018 the FCC released the *Rural Health Care Program Funding Cap Order* increasing the annual funding cap to $571 million as of 2017 and adjusting the cap for inflation going forward. Flamm (2015) found that the program had a significant impact in stimulating entry of local broadband Internet service providers in rural areas receiving grants.

---

[36] See Connected Nation.
[37] See Connected North.
[38] See the FCC *Rural Health Care Program*.

Among the primary programs designed for increasing access and adoption in rural areas was the BIP instituted as part of the National Broadband Plan. BIP funds were intended for use in rural unserved and underserved areas and were made available for last mile and middle mile broadband Internet infrastructure projects areas that were at least 75 percent rural and unserved or underserved.[39] Eisenach and Caves (2011) used three case studies of programs subsidized by BIP to provide evidence that broadband Internet service already was widely available in the proposed program areas. They also showed that the taxpayer cost per unserved household was above benchmarks established under the program.

Using data from the FCC, Department of Commerce, USDA Rural Development Agency and information on state-level policies from the California Public Utilities Commission, Wallsten (2005) found that subsidies provided through USDA's Rural Development broadband Internet program were not correlated with increased rural access to broadband Internet.[40] He summarizes:

> While the analysis in this paper does not find a significant correlation between USDA broadband spending and broadband access, USDA Rural Development (2005) claims that 'Since 2001, Rural Development has utilized a variety of loan and loan guarantee programs to provide over $3 billion in funding and assist over 1.3 million rural subscribers in accessing broadband.' The report does not provide any details on how the number 1.3 million was determined, or whether any empirical testing was done to determine whether the program itself was responsible for making broadband available to those 1.3 million people. However, taking USDA's numbers at face value implies that USDA Rural Development spent about $2,300 per person connected. USDA's numbers thus seem to suggest that the program is not cost effective. For the same cost, for example, USDA could have paid for all 1.3 million people to subscribe to satellite broadband services for nearly five years.[41]

Under the Rural Digital Opportunity Fund (RDOF) established in 2020, the FCC approved up to $20.4 billion in funding over a 10-year period to support the construction of broadband Internet networks in rural communities. Eligible areas include those without access to adequate broadband Internet services defined by the FCC as 25 Mbps downstream and 3 Mbps upstream. The program includes a two-part application process by which entities seeking to participate in an auction to provide service must establish financial and technical capabilities to be eligible to bid. Winning bidders then provide additional information about qualifications and the network that they intend to use to meet their obligations, among other details.[42]

Also designed to connect rural communities to the Internet is the Rural Tribal Priority Window.[43] Under this program any federally recognized tribe or Alaska native village could apply for spectrum, designating their own desired license areas provided the entire area is rural tribal land. The available spectrum was a portion of the 2.5 GHz band with three channels: 49.5, 50.5 and 17.5 MHz.

---

[39] See the *United States Senate Broadband Initiatives Program (BIP) Guide*.

[40] Wallsten did find that USDA's broader telecommunications program is correlated with increased rural broadband Internet access but shows that the program costs on average about $1,500 per person who gains access to at least one provider, but who does not necessarily adopt broadband Internet.

[41] Wallsten (2005), p. 5.

[42] See Universal Service Administrative Co., *Rural Digital Opportunity Fund*.

[43] See the FCC's *2.5 GHz Rural Tribal Window*.

The 2.5 GHz band was suitable for both mobile coverage and fixed point-to-point uses. This program is no longer active; the window to apply was from February 3, 2020, to September 2, 2020. There were 419 applicants; applications are still being processed and no empirical studies are available.

Hollman et al. (2020) noted that to address rural access and adoption and in particular the existence of an urban-rural digital divide, a need exists for accurate measurement and reporting to quantify such divide. The authors develop a quantitative measuring unit that computes Internet throughput in low population density areas. The throughput data is matched with a survey of user perceptions of Internet use; used together, Hollman et al. (2020) were able to estimate the actual throughput of rural versus urban users as well perceptions of users' Internet access. In addition to the collection device, the authors are collaborating with the Nebraska Public Power District and Nebraska Rural Electrification Association to obtain detailed data with which they can estimate differences in Internet connectivity between rural and non-rural areas. This quantitative evaluation appears to be able to evaluate any evidence of a rural-urban divide; however, at present, the authors acknowledge possible reliability issues with the measurement device and are unable to offer rigorous results as to the efficacy of the measure or an urban-rural divide in any given location. The authors state that in the future the measure will provide a method to accurately visualize the urban-rural digital divide, which will aid in planning for community initiatives to remedy the problem.

Silva et al. (2018) used the NTIA's National Broadband Map and the FCC's Form 477 data to construct an empirical model to investigate the determinants of broadband Internet adoption in rural areas. The authors find that broadband Internet is available in most of the census tracts included in their study, particularly noting availability in the tracts with more educated, wealthier, and older people who have more choices of providers and are more likely to adopt. The positive impact of the older population on adoption contradicts other studies' findings; however, it is possible that in the areas studied, the contradictory result is due to the type of connection (i.e., traditional fixed broadband Internet versus mobile broadband Internet subscription). A key result was that if rural broadband Internet availability were to increase to 100 percent, the adoption rate would increase by 6.12 percent. A cost benefit analysis would help determine if the goal of 100 percent adoption is optimal.

Lastly, Whitacre et al. (2015) conducted a statistical analysis using data from the FCC and the National Broadband Map to analyze the relationship between broadband Internet availability and adoption and income in rural areas. They asserted that empirical analyses to assess the degree to which a lack of infrastructure might be responsible for any urban-rural digital divide was scant. They demonstrated that existing metro–non-metro differences in infrastructure availability comprised approximately 38 percent of the 2011 broadband Internet adoption gap between areas, and that 52 percent of the gap was due to differences in characteristics such as education and household income.

Note: the ReConnect Loan and Grant Program was established to furnish loans and grants for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide broadband Internet service in eligible rural areas.[44] Applications for loans and grants were accepted until March 9, 2022. In the first round of the ReConnect Program, USDA invested $656,052,244 in high-speed broadband Internet infrastructure to create or improve e-Connectivity for rural

---

[44] See the United States Department of Agriculture, *ReConnect Loan and Grant Program*.

customers across 33 states. To date, USDA has announced $852,077,212 for projects in the second round of funding, for a total of $1,508,129,456 invested through the ReConnect Program. We were unable to find any empirical analyses of outcomes from any of the funded projects.

IX.   Supply-Side Factors that Affect and may Increase Broadband Adoption

To increase broadband Internet access and adoption among those who remain unserved and underserved, policymakers have relied primarily on supply-side programs that increase broadband Internet availability; however, demand-side programs also have been implemented. As availability has been found to be ubiquitous in areas that continue to have unserved and under-served households, it may be that supply-side and demand-side policies are inexorably connected and might most effectively be considered in conjunction with one another. Several studies address the degree to which supply and demand side factors are linked.

In 2001, Prieger empirically analyzed whether broadband Internet carriers avoided areas with high concentrations of low-income and minority households and found little evidence of such (Prieger, 2001b). He found that higher education levels, Spanish language use, and commuting distance (demand-side factors) as well as market size and Bell presence (supply-side factors) increased access probability, while inner city or rural location decreased access probability.

Using ITU data, Lee and Brown (2008) estimated factors that affect global broadband Internet adoption and found that the supply-side factors of inter-platform competition, Internet content, services, and applications, and faster broadband Internet speed, are positively associated with higher levels of adoption. The authors also found that income and education (demand-side factors) were not found to influence adoption.

X.   Regulatory Framework Considerations

Bauer (2015) provided a useful framework by which to consider broadband Internet diffusion and adoption governance. While not empirically based, the author contended that established regulatory theory and practice may not provide reliable guidance because they are founded on prior technologies and industry structures that no longer exist. Moreover, how government and nongovernment forms of coordination affect diffusion and adoption outcomes is complicated by the existence of non-linear direct and indirect effects whose impact on performance is not well understood. Bauer noted that the right combination of policy instruments and coherence between technology and regulation is often more important than the type of policy instrument employed. He offered the following summary in Table 2 of varying effects of possible policy instruments.[45]

---

[45] Bauer (2015, p. 19).

Table 2

Direct and Indirect Effects of Policy Instruments

Governance instrument	Network operators		Content, application providers		Overall sectoral effect
	Incumbent	New entrant	Modular	Coupled	
R&D support	+	+	+	+	+
Demand-side measures	+	+	+	+	+
Mobile data roaming	–	+	+	+/–	?
Mobile net neutrality	–	+	+	+/–	?
Overall stakeholder effect	?	+	+	?	

Because broadband Internet technologies have different advantages for cost, usability, throughput, etc., a policy structure whereby different broadband Internet technologies compete and consumers can choose the technology (or combination thereof) that meets their needs is optimal. Bauer recommended technology neutral governance: regulation should neither require nor assume a particular technology. By extension, the rules should neither favor nor discriminate against a particular technology.

The assertions of Bauer's 2015 position paper are supported by empirical work examining the impact of regulatory interventions in broadband Internet markets. Using Ookla and Akamai data of realized download speeds for a sample of OECD and medium-income countries, Bauer (2014) showed that regulatory interventions such as unbundling or open access provision positively impacted broadband Internet availability in markets with limited competition. His results also provided evidence that the optimal policy for a given country was dependent on the specific context of a country so that no single best practice model emerged from the observations.

Similarly, Bauer and Tsai (2014) analyzed the effects of public policy on broadband quality, as they asserted that benefits from advanced ICT services were increasingly dependent on the quality of available connectivity. They specified that the most important factor with a positive effect on quality and quality improvements is competition. They also cited evidence that regulatory interventions such as unbundling or open access provision positively impacted markets with limited competition.

In a comparable study, Prieger et al. (2014) conducted an empirical analysis of quality competition among broadband ISPs using National Broadband Map data from 2011 to 2013 for local markets in California. Their results show that incumbent local exchange carriers (ILECs) improved the quality of their ADSL offerings when a cable provider entered the market, and also when cable operators started to offer higher speeds. However, ILEC ADSL providers did not raise their service quality in response to ADSL competition from CLECs but did improve speeds when CLECs deployed fiber in

the market. These results substantiate Bauer and Tsai (2014) regarding the role of competition in maintaining quality.

Friederiszick et al. (2008) conducted a panel data analysis of 25 European countries to understand the correlation between entry regulation and infrastructure investment. They showed that stricter regulation negatively impacted infrastructure investment by entrants but had no effect on investments by incumbent providers. Using data from 20 EU countries, Grajek and Roller (2012) found that access regulation negatively affected investment incentives.

Biedny et al. (2021) analyzed legislation designed to increase broadband Internet availability by requiring state-funded construction projects to notify local Internet providers about the opportunity to bury conduit for easier wire installation in the future and permitting policies that require timely response from local jurisdictions regarding installation of broadband Internet equipment. Their data comes from Iowa, which passed such legislation in 2015. The authors determined that the legislation increased fiber availability by approximately 5 percent compared to states that had not passed such legislation; however, they found no impact on fixed wireless diffusion. They concluded that the results offered only limited support for the claim that such policies have any significant impact on broadband Internet fiber availability, and no support for benefits with respect to fixed wireless.

While they are older studies, Prieger's (2001a, 2007) panel data analyses of U.S. regulatory impacts on broadband Internet innovation showed that progress would have been greater if FCC regulations on the innovation and introduction of advanced telecommunications services had not been imposed, and that decreasing regulatory delays decreased time to introduce new services. Wright and Hazlett (2016) came to the same conclusion, finding that broadband Internet markets in the U.S. showed notable growth in response to deregulation reducing Title II requirements.[46]

A final consideration is the impact of local loop unbundling (LLU) policies.[47] Hausman (2001, 2002) showed that LLU regulation in the U.S. impeded incumbents' deployment of network facilities required for DSL (advantaging cable operators).

Ovington et al. (2017) used data for EU-27 countries to estimate the impact of varying types of competition on broadband Internet adoption. They illustrated that LLU has had a positive impact on broadband participation, although the impact was smaller in areas where other networks already had a significant share of broadband Internet lines.

---

[46] Title II of the Telecommunications Act defines obligations of common carriers.

[47] LLU refers to the regulatory policy whereby the incumbent operator makes its infrastructure (physical wire connections) available to other providers. LLU might encourage competition by reducing economic barriers to entry, allowing new entrants to construct some components of their networks and obtain other components from the incumbent.

Appendix G
Federal and State Funds Available for Broadband Expansion and Support

	Name of Program	Agency	Funding	Description	Recipients/Eligible Applicants	Eligible Uses/Service to be Provided
Infrastructure Investment and Jobs Act (IIJA)	Broadband Equity, Access, and Deployment	NTIA	$42.45 billion	The BEAD program appropriates $42.45 billion for states, territories, the District of Columbia, and Puerto Rico to use for broadband planning, deployment, and adoption projects. Each will receive at least $100 million, including an initial funding of $5 million to support broadband planning, building capacity in state broadband offices and outreach and coordination with local communities. Each will submit a 5-year action plan which shall be informed by collaboration with local and regional entities. The remaining funding will be distributed based on a formula that considers the number of unserved and high-cost locations in the state, based on maps to be published by the Federal Communications Commission in 2022. Priority is for deployment in unserved locations (those below 25/3 Mbps), followed by underserved locations (those below 100/20 Mbps), and then community anchor institutions. See https://www.benton.org/blog/largest-us-investment-broadband-deployment-ever for additional details.	States, territories, D.C. states may not exclude cooperatives, nonprofit organizations, public-private partnerships, private companies, public or private utilities, public utility districts, or local governments.	Data collection, broadband mapping and planning (no more than 5% of state funding for planning); broadband infrastructure deployment to unserved and underserved areas (e.g. construction); connecting eligible community anchor institutions; promotion of broadband adoption, including through the provision of affordable internet-connected devices; provision of WiFi or reduced-cost internet access to multi-family housing units; and for other uses the NTIA determines are necessary to facilitate the goals of the program. Networks must provide speeds not less than 100 megabits per second download and 20 megabits per second upload.
	Affordable Connectivity Program	FCC	$14.2 billion	ACP is an FCC Benefit program that helps ensure that low-income households can afford the broadband they need for work, school, healthcare and more by funding $30/month discount for broadband internet service, and discounted devices for eligible households. It is a modification of the Emergency Broadband Benefit (EBB) which was funded at a higher level ($50 monthly subsidy) from the Consolidated Appropriations Act, 2021.	Eligible households must meet federal poverty guidelines or other stated criteria. Service must be obtained from participating Internet Service Providers (which receive funding from FCC and apply discount to consumers' monthly bills.)	Helps low income households afford home broadband service by providing up to a $30 monthly benefit on a household's monthly internet bill. For low-income households on Tribal lands, the benefit is up to $75. Eligible households can receive a one-time discount of up to $100 to purchase a laptop, desktop computer, or tablet if household contributes $10-$50 toward purchase. Limited to one monthly service discount and one device discount per household.
	Tribal Broadband Connectivity Program	NTIA	$2 billion	IIJA adds funds for TBC program competitive grants for broadband infrastructure deployment; affordable broadband programs; distance learning, telehealth, digital inclusion efforts; and broadband adoption activities. Deadlines are extended to allow grantees more time for deployment and broadband adoption.	Tribal Governments, Tribal Organizations, Tribal Colleges or Universities	Planning (feasibility), broadband infrastructure deployment (construction), broadband adoption/digital literacy/tech support, digital skills training, Workforce Development, Devices/equipment, public connectivity/computer access, research and/or evaluation, data and/or mapping, smart communities/cities/regions, telehealth.
	State Digital Equity Planning Grant	NTIA	$60 million	Formula grant program for states and territories to develop digital equity plans. Goal is to promote the meaningful adoption and use of broadband across targeted populations, including low-income households, aging populations, incarcerated individuals, veterans, individuals with disabilities, individuals with language barrier, racial and ethnic minorities, and rural inhabitants.	States, Territories, District of Columbia	Planning (e.g., feasibility).
	State Digital Equity Capacity Grant	NTIA	$1.44 billion	Formula grant program with funds distributed via annual grant programs over five years to implement digital equity projects and support the implementation of digital equity plans, thereby promoting digital inclusion of targeted populations.	States, Territories, District of Columbia	Planning (e.g. feasibility), broadband adoption/digital literacy/tech support.

Name of Program	Agency	Funding	Description	Recipients/Eligible Applicants	Eligible Uses/Service to be Provided
State Digital Equity Competitive Grant	NTIA	$1.25 billion	Discretionary grant program with funds distributed via annual grant programs over five years to implement digital equity projects, thereby promoting digital inclusion of targeted populations.	Local Education Agency; state governments, including any political subdivisions of the state; Tribal/Native American governments; non-profit organizations; community anchor institutions; and work Force development programs.	Broadband adoption/digital literacy/tech support, digital equity programs
Middle Mile Grants Program	NTIA	$1 billion	The program funds construction, improvement or acquisition of middle mile infrastructure. Purpose is to expand and extend middle mile infrastructure to reduce the cost of connecting unserved and underserved areas to the internet backbone.	Eligible applicants include states, counties, cities/townships and their subdivisions; tribal governments; Native American entities; public utility districts; economic development authorities; regional planning councils; technology and telecommunications companies; electric utilities; electric cooperatives; and nonprofits.	Broadband infrastructure deployment (e.g., construction)
U.S. Dept. of Agriculture ReConnect Program	Dept. of Agriculture Rural Utilities Service (RUS)	$1.926 billion	The ReConnect Program offers loans, grants and loan-grant combinations to build infrastructure and install equipment to provide modern, reliable high-speed Internet in rural America. ReConnect Program is funded by annual appropriations, CARES Act, and IIJA.	Rural areas (specifically defined) without sufficient access to broadband (100Mbps down/20Mbps up). Eligible recipients include most state and local government entities, federally-recognized tribes, non-profits, for-profit businesses, consortia of eligible entities.	ReConnect funds capital costs including construction, improvement, or acquisition of facilities and equipment needed to provide broadband capable of delivering 100 Mbps symmetrical service and acquisition of an existing system not currently providing sufficient access to broadband. Up to 5% may be used for preapplication expenses.
US. Dept. of Agriculture Broadband loan program	Dept. of Agriculture Rural Utilities Service (RUS)	$74 million	The Rural Broadband Access Loan and Loan Guarantee Program makes loans and loan guarantees to finance construction, improvement or acquisition of facilities and equipment needed to provide high speed broadband service in eligible rural areas.	Corporations, Limited Liability Company, Cooperative or Mutual Organizations; a State or Local Unit of Government.	Broadband loans provide funding on a technology-neutral basis for financing the construction, improvement and acquisition of facilities required to provide broadband service.
Private Activity Bonds	IRS Internal Revenue Code	$600 million	States are allowed to issue Private Activity Bonds to finance broadband deployment, specifically for projects in rural areas where a majority of households do not have access to broadband (25/3 Mbps) if at least 90% of locations provided service did not have access to broadband before.	PABs can be issued by a local government, industrial development authority, housing finance authority, or other authorized entity, subject to state volume cap as allocated among regions by State of Florida.	The IIJA amends the Internal Revenue Code creating a new category of exempt facility bond which is called "qualified broadband projects" to help fund those projects.
Affordable Connectivity Outreach Grants	FCC Wireline Competition Bureau	TBD	This program helps inform and educate consumers about the ACP program, the FCC may provide grants to outreach partners.	TBD	TBD
U.S. Dept. of Agriculture ReConnect Program	US Dept. of Agriculture Rural Utilities Service (RUS)	$350 million in grants available for Tribal Governments, $35 million max award; $200 million in loans, $50 million max award; $250 million in combo loan/grant; $350 million available for grants, $35 million max award	ReConnect furnishes loans and grants to provide funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide broadband service in eligible rural areas. Up to 5% of the award may be used for preapplication expenses.	Corporations, limited liability companies and partnerships, cooperatives or mutual organizations, states or local governments or subdivisions, territories, or Indian tribes.	Costs of construction, improvement or acquisition of facilities and equipment needed to provide broadband service in eligible rural areas. Potential awardees must meet a 100 Mbps symmetrical minimum service requirement in all proposed service area.

	Name of Program	Agency	Funding	Description	Recipients/Eligible Applicants	Eligible Uses/Service to be Provided
Existing Programs	Community Connect Grant Program	US Dept. of Agriculture Rural Utilities Service (RUS)	Community Connect Grant Program	Community Connect provides financial assistance to eligible applicants that will provide broadband service in rural, economically-challenged communities where broadband service does not exist (lacking 10/1 Mbps).	Incorporated organizations, federally recognized tribes, state and local units of government, other legal entities including cooperatives, private organizations, or LLCs.	The construction, acquisition, or leasing of facilities, spectrum, land or buildings used to deploy broadband service for all residential and business customers located within the Proposed Funded Service Area or all participating critical community facilities (such as public schools, fire stations, and public libraries) or for providing broadband service free of charge to same for two years.
	E-Rate – Schools and Libraries USF Program	FCC – Federal Universal Service Fund (USF)	Ongoing	The schools and libraries universal service support program, known as the E-rate program, helps schools and libraries to obtain affordable broadband by funding discounts for service pricing. Category one services are to a school or library (telecommunications, telecommunications services and Internet access), and category two services deliver internet access within schools and libraries (internal connections, basic maintenance of internal connections, and managed internet broadband services). Discounts for service pricing increase with the percentage of students eligible for free or reduced price school lunches, and vary depending on whether the school/library is located in an urban or rural area. Discounts range from 20% to 90% of the prices of eligible services. It is administered by the Universal Service Administrative Company under the FCC's direction and is not dependent on Congressional appropriations.	Schools and libraries	Telecommunications, telecommunications services and internet access (category one) and services that deliver internet access within schools and libraries such as internal connection, basic maintenance of internal connections, and managed internet broadband services (category two); Emergency Management Grants.
	Rural Digital Opportunity Fund (RDOF)	FCC – Federal Universal Service Fund (USF)	$20.4 billion over 10 years, up to $16 billion in Phase I, $4.4 billion in Phase II	RDOF funding is awarded from the FCC Universal Service Fund through a reverse auction process for eligible areas – census blocks where no provider is offering broadband at 25/3 Mbps. Eligible entities (those which establish baseline financial and technical capabilities) may bid to serve one or more eligible areas. Bids must state a performance tier commitment – Minimum, Baseline, Above Baseline, or Gigabit – each of which has associated speed and other requirements. Upon notification of award, winning bidders must submit a detailed long form application for approval of funding to the FCC including certification of eligible telecommunications carrier status. Phase I funding is being awarded for the auction which concluded November 25, 2020. Phase II auction will occur to cover locations in census blocks that are partially served, as well as locations not funded in Phase I. FCC USF is not dependent on Congressional appropriations.	Entities seeking to participate must establish baseline financial and technical capabilities in order to be eligible to bid.	Construction of facilities to provide broadband and voice services to serve all locations in the eligible area at the committed performance tier (speed, latency, data usage). At least one broadband and voice service must be offered at rates that are reasonably comparable to the rates for similar service in urban areas.

Name of Program	Agency	Funding	Description	Recipients/Eligible Applicants	Eligible Uses/Service to be Provided
Lifeline	FCC - Federal Universal Service Fund (USF)	Ongoing	Lifeline program originated in 1985 to provide a discount on phone service for qualifying low-income consumers. In 2016 the FCC extended the program to provide discounts for broadband internet access. The Lifeline program is funded from the FCC's Universal Service Fund and administered by the Universal Service Administrative Company (USAC). USAC is responsible for data collection and maintenance, support calculation and disbursement for the Lifeline program. The FCC USF is not subject to Congressional appropriations.	Eligible low-income consumers in every state, territory, commonwealth, and on Tribal lands.	Discounted telephone service and broadband for low-income consumers.
Connect America Fund CAF II	FCC - Federal Universal Service Fund (USF)	Ongoing (approximately $5 billion annually to eligible recipients)	This is part of the Universal Service High Cost program and is designed to expand access to voice and broadband services for areas where they are unavailable.	Service providers	Subsidizes the cost of building network infrastructure or performing network upgrades to provide broadband in areas where it is lacking.
Connecting Minority Communities Pilot Program	NTIA	$268 million	The CMC program seeks to expand educational instruction and remote learning opportunities, spur economic development, create opportunities for employment and entrepreneurship, by building the digital capacity of the eligible institutions and furthering broadband access, adoption, and digital skills within those institutions and in their surrounding anchor communities. Grants are for the purpose of extending broadband internet access, connectivity and digital inclusion, and will be distributed to help these entities purchase broadband service or equipment, hire IT personnel, operate a minority business enterprise, and facilitate educational instruction and learning. The CMC program was established by the Consolidated Appropriations Act, 2021.	Historically Black Colleges or universities, Tribal Colleges or Universities and minority-serving institutions or eligible consortiums.	Purchase broadband service or equipment, hire IT personnel, operate a minority business enterprise, and facilitate educational instruction.
Broadband Infrastructure Program	NTIA	$288 million	This broadband deployment program is directed to partnerships between a state, or one or more political subdivisions of a state, and providers of fixed broadband service to provide qualifying broadband service (greater than 25/3 Mbps) to eligible service areas. Funding was established by the Consolidated Appropriations Act, 2021.	Partnership of a state or one or more subdivisions and a provider of fixed broadband service.	Grants to covered broadband projects, defined as competitively and technologically neutral projects for the deployment of fixed broadband service in eligible areas.
Telecommunications Infrastructure Loans and Loan Guarantees	Dept. of Agriculture Rural Utilities Service (RUS)	Ongoing	This program provides financing for the construction, maintenance, improvement and expansion of telephone service and broadband in rural areas. The types of loans available are: cost-of-money loans from RUS; Loan Guarantees through the Federal Financing Bank; Hardship Loans from RUS to serve underserved areas.	State and local governmental entities; Federally Recognized Tribes; non-profits, including Cooperatives and limited dividend or mutual associations, for-profit businesses. Eligible areas are rural areas and towns with a population of 5,000 or less, areas without telecommunications facilities or areas where the applicant is the recognized telecommunications provider.	Loans may be used to finance telecommunications services in rural areas for new construction, improvements, expansions, acquisitions (if cost is incidental to cost of improvements), and refinancing.

Name of Program	Agency	Funding	Description	Recipients/Eligible Applicants	Eligible Uses/Service to be Provided
Coronavirus State and Local Fiscal Recovery Funds	Department of Treasury	$10 billion	American Rescue Plan (ARPA) provides funds to eligible governments to be used to make necessary investments in broadband infrastructure which has been shown to be critical for work, education, healthcare, and civic participation during the public health emergency. The priority is to fund reliable, affordable broadband infrastructure and other digital connectivity technology projects. The program encourages projects that are designed to serve locations without access to reliable wireline 100/20 Mbps broadband service. Recipients must require the service provider to participate in the Affordable Connectivity Program.	States, territories, Tribal governments	The project invests in capital assets designed to directly enable work, education and health monitoring. The capital project is designed to address a critical need that resulted from or was made apparent or exacerbated by the Covid-19 public health emergency. The capital project is designed to address a critical need of the community to be served. Eligible uses include: broadband infrastructure projects (with symmetrical speeds of 100 Mbps), Digital Connectivity Technology Projects, Multi-Purpose Community Facility Projects (that directly enable work, education and health monitoring) located in communities with critical need for the project. Also more may be eligible on case-by-case review.
Florida Broadband Opportunity Fund	Florida Dept. of Economic Opportunity	FY 2022-23 appropriation of $400 million from the General Revenue Fund contingent upon state receipt of federal Coronavirus State Fiscal Recovery Funds.	The appropriation is to expand broadband Internet service to unserved areas of the state through the Broadband Opportunity Program. Grants are to be made for installation or deployment of infrastructure that supports the provision of broadband Internet service pursuant to Fla. Stat. § 288.9962.	Eligible applicants include: corporations, limited liability companies, and general, or limited, partnerships that are organized under Florida law or authorized to do business in Florida; political subdivisions; Indian tribes; and governmental entities or educational institutions under certain circumstances (Fla. Stat. § 288.9962)	BOP to award grants to applicants who seek to expand broadband Internet service to unserved areas of Florida. Grants are to fund installation or deployment of infrastructure that supports the provision of broadband Internet service. Grant funds may not be used for broadband Internet service in areas where broadband is already deployed. The Florida Office of Broadband may not award grants to provide broadband in an area where federal funding has been awarded (Fla. Stat. § 288.9962).

Disclaimer: this table is compiled from identified source information and does not purport to collect all information regarding each and every broadband program. Rapid developments are occurring with regard to funding of broadband expansion in underserved and unserved areas. Please check relevant agency websites for updated and current information.

20-Apr-22

Sources:

1. Building A Better America: Guidebook to the Bipartisan Infrastructure Law for State, Local, Tribal, and Territorial
2. State and federal agency websites including the Florida Department of Economic Opportunity, Federal
3. Bipartisan Infrastructure and Jobs Act Summary: A Road to Stronger Economic Growth
4. Coronavirus State & Local Fiscal Recovery Funds: Overview of the Final Rule, U.S. Department of the Treasury
5. Online Sunshine, The 2021 Florida Statutes

Links:

https://www.whitehouse.gov/wp-content/uploads/2022/01/BUILDING-A-BETTER-AMERICA_FINAL.pdf
See above.
https://www.cantwell.senate.gov/imo/media/doc/Infrastructure%20Investment%20and%20Jobs%20Act%20-%2
https://home.treasury.gov/system/files/136/SLFRF-Final-Rule-Overview.pdf
http://www.leg.state.fl.us/Statutes/index.cfm?Mode=View%20Statute&Submenu=1&Tab=statutes