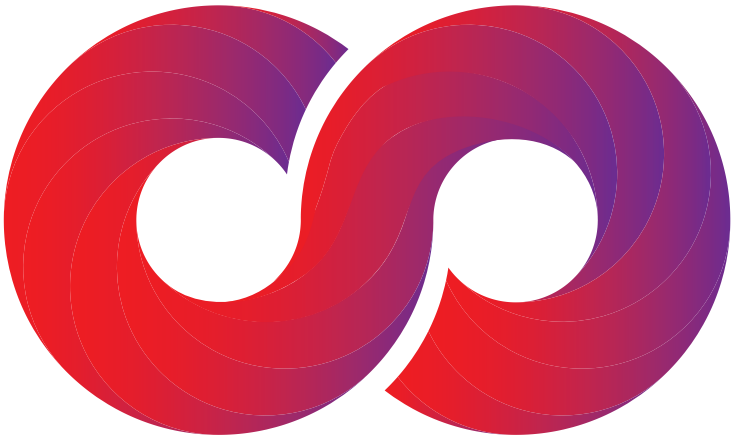

commonwealth connect

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Report on Commonwealth Connect 2.0: Governor Northam's 2020 Plan to Connect Virginia

Contents

I. Executive Summary

A. How the program works

The Commonwealth broadband team will work with local governments and groups of local governments to identify gaps in coverage within those localities and develop a plan to fill those gaps. Current providers, critical partners in delivering service to unserved areas, are incentivized to share their coverage areas during this process in order to avoid overbuilding.

The team will also oversee newly-resourced grant programs to make one-time capital grants to address the fundamental math problem preventing the private sector from extending service itself: in many places the cost of building broadband infrastructure is greater than the revenue that can be gained by serving that area.

The Commonwealth broadband team will continue to work with the Governor to refine executive branch policies and procedures, and the General Assembly on issues best-addressed by legislation in order to reduce barriers to broadband access.

The team will support the development of local government applications to grant programs overseen by the Commonwealth broadband team as well as federal grant programs, to fund gaps in existing coverage, with each region competing for funds on the basis of the most efficient use of funds on a state-dollar-per-connected-premises basis.

B. The scope of the problem and making a plan

Existing maps, including some mandated by the federal government, are not reliable to assess the extent of broadband coverage and gaps in that coverage.[1] Private-sector providers are also reluctant to offer what they consider proprietary data within their coverage maps. As a result, early attempts by the broadband team to gauging the scope of the problem was a statistical estimate and did not represent a householded number. Recent federal, state, and third party data collection and survey efforts suggest that the most conservative estimate of the number of necessary connections remaining is 365,632.[2]

[1] Federal maps compiled by the FCC suffer from an insufficient granularity as well as potentially misleading coverage areas. This is discussed in more detail later in this report.

[2] This figure is based on industry data, federal data, and the Commonwealth's own grantmaking efforts. It is the result of [Most conservative number of needed connections based on industry data, the census, and statistical analyses: 500,000] – [State grant funded connections to date: 47,000 from TRRC and 51,200 from VATI] – [Federally-funded grant connections: 32,660 from CAF2] – [Self-reported industry connections made without grant funding: 3508 connections made by electric cooperatives] = 365,632. We know that major telecom companies have also been expanding on their own, but we are unable to capture that data so, in the interest of conservative budgeting, it is not reflected here.

In each locality or region, the Commonwealth broadband team will act as advisors to local governments and groups of local governments to assist them in 1) finding partner ISPs with whom they can develop a plan; 2) determine likely costs for such a universal coverage plan; and 3) establish and include in any planning effort those assets the community or communities may have to support such a plan.

C. Investing in Virginia's broadband effort

Virginia will need to increase what it invests in broadband access to achieve functionally universal broadband coverage within a decade. Details related to scoping and how increased funding will be deployed can be found in on page 30.

1. **Increase VATI Funding to at least $35 million for each succeeding year:** the Virginia Telecommunications Initiative (VATI) is the primary vehicle by which Virginia is incentivizing the creation of new infrastructure in areas where it hasn't been previously economically efficient for the private sector to do so. These investments are essential to keeping Virginia on track for complete coverage.

2. **Ensure that the Virginia Tobacco Region Revitalization Commission continues its last-mile program:** The Tobacco Commission has been a key player in rural broadband deployment, and can continue to supplement state efforts by increasing the speed at which connections are made within its footprint.

D. Summary of policy recommendations

Deployment of broadband in the aggressive fashion necessary to accomplish the Governor's goal will require:

<u>Non-legislative policy changes:</u>

1. **Ensure DGS Acts as a Single Point of Contact for Land Use:** Currently DGS handles requests to cite telecommunications facilities on Commonwealth-owned land, but greater transparency and clarity is required.

2. **Request and Support Local Broadband Plans:** Require that a locality have adopted a granular plan for universal broadband coverage within 10 years, in order to access state funding support.

3. **Ensure VDOT continues to improve its conduit policy:** VDOT should expand its "dig once" policy to include more robust conduit installation and availability.

<u>2020 Legislative recommendations:</u>

1. **Create communications access for grandfathered prescriptive easements:** Currently, many utility companies in rural Virginia have access to their utility poles only under the property law principle of prescriptive easement, meaning

they have access to another's property, in this instance, only for the purposes for which they initially gained access, provision of electrical service. This can cause significant delay to negotiate access by telecom companies on to existing utility poles on private property. If we were to broaden utility pole easements to include any telecom services we could solve a major deployment problem for the industry

II. Introduction

A. The case for investing in universal broadband access and the broadband landscape in Virginia

Virginia's overall broadband internet infrastructure is robust. Northern Virginia has the largest collection of data centers in the world. In fact, more than 70% of all internet traffic by data volume flows through Northern Virginia. This existing infrastructure positions the Commonwealth to connect Virginians to an education and workforce training system ready to leverage all of our citizens' talents, increase Virginia small businesses' efficiency and effectiveness, and enable new healthcare technologies and service models. Faster, more reliable connectivity allows first responders and law enforcement to access data that could save lives and increase safety. Virginia is poised to build on the tremendous tech sector wins already accrued to become a new hub for global technology industries, the sector most likely to drive state, national, and global economic growth in the coming decades.

Unfortunately, access to broadband is dispersed unevenly. A digital divide still affects the economic prospects, social connectivity, and educational opportunities available to hundreds of thousands of Virginians. If we are going to ensure all Virginians share in this prosperity, we must ensure citizens who don't currently have access are brought online as quickly and affordably as possible.

The uneven distribution of broadband assets is the result of the costs of deploying broadband infrastructure relative to population densities. Essentially, the cost of a mile of infrastructure in Arlington is the same as a mile of infrastructure in Alleghany, but the number of customers that can be gained in Arlington is far greater. For areas with lower densities, the cost of the infrastructure outweighs the potential revenue that could be gained from customers. In those areas, without government intervention, citizens will never be served.

B. Governor Northam's vision

Recognition of the lack of broadly-shared access to the new digital society and economy is what led Governor Northam to announce his vision of a Commonwealth in which everyone has the infrastructure necessary to access the internet. On July 2nd of 2018, Governor Northam announced that the Commonwealth should achieve functionally universal broadband coverage within 10 years.

C. Return on Investment

Virginia stands to reap significant benefits from achieving universal broadband coverage.

Virginia will gain far more in economic benefit than universal coverage will require in terms of expenditure. While this plan calls for annual state spending of $35 million, Virginia will benefit significantly in excess of that figure.

A recent study found that access to broadband throughout Virginia could empower growth in rural and small businesses which would add as much as $1,291,200,000 to gross state product and create approximately 9,415 new jobs, which would generate around $452,400,000. Just small business growth then would generate as much as $20,000,000 to $26,000,000 annually in new state income tax revenues.[3]

The impact on the agricultural economy promises to be even greater. A recent study by USDA's Economic Research Service found that full employment of connected agriculture technologies could increase agricultural output by 18%, which, in Virginia would mean our largest industry, currently generating $70,000,000,000 in economic activity, could grow by $12,600,000,000, which could yield tens of millions more in new annual state revenues.[4]

Households and local budgets will also see significant gains, with estimates showing increases in property values of between 3% and 8% dependent, as is often true with real estate, on location and nature of the specific property.[5]

These calculations, while robust, still fail to capture the economic benefits of increased market access for existing rural businesses, increased attractiveness of currently disconnected areas in competition for business expansion or relocation, the increased value to be gained to both the Commonwealth and its citzens through application of tele-health and technology-assisted aging in place, improved educational outcomes for Virginia students who currently don't have access to the internet, and a host of other benefits.

D. Virginia efforts to-date

One year after the first Commonwealth Connect Report was issued, the Commonwealth remains on track to realize the vision of Governor Northam for universal broadband coverage. The Commonwealth has deployed approximately $44,000,000 and this deployment of funds has led to the connection of over 108,000 homes and businesses since 2017.

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[3] The US Chamber and Amazon Study's Virginia factsheet can be accessed here: https://americaninnovators.com/wp-content/uploads/2019/03/rural_report_factsheet_VA.pdf

[4] That USDA study can be found at: https://www.usda.gov/sites/default/files/documents/case-for-rural-broadband.pdf

[5] There are many studies, but two that are illustrative are the RVA LLC study found here: http://glenechogroup.isebox.net/ftthconnect/?default=tXExg6Xo# while a UC Boulder/Carnegie Mellon study can be accessed here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2241926

The two agencies that have deployed the most capital to support broadband connectivity are the Virginia Tobacco Region Revitalization Commission ("Tobacco Commission") and the Virginia Department of Housing and Community Development ("DHCD"). Governor Northam appointed the Tobacco Commission's Executive Director to be his Chief Broadband Advisor, and the Chief Deputy of DHCD to be Deputy Broadband Advisor. The Secretariat of Commerce and Trade used the budgeted salary originally designated for the Chief Broadband Advisor to bring on an additional broadband policy analyst to support the broadband effort. The Commonwealth broadband team established a close working relationship with the Center for Innovative Technology's (CIT)'s office of Broadband Assistance. Further, regular communication now exists between the broadband team and agencies like DGS, VDOT, and DOW, whose mission intersects with broadband. This group has continued planning, meeting with stakeholders, developing policy recommendations, supporting local governments, and improving ongoing programs within government to keep Virginia on track to meet the Governor's vision.

The Commonwealth broadband team has created a new website, which is a comprehensive source of information for all those interested in the broadband effort.[6]

The team has also made available the Broadband Toolkit for local leaders, which includes model solicitations, as well as step-by-step guidance for localities to lead them from whatever their current state of connectivity may be to universal coverage.[7]

Finally, the Commonwealth broadband team has brought together the Commonwealth Connect Coalition. This coalition of over 115 members as of December 2019, includes organizations from across the spectrum of Virginia's social and economic landscape. The member organizations all support the Governor's goal of universal coverage as well as full funding of that goal by the General Assembly.[8]

III. Broadband Definitions

Broadband is the common term applied to any data connection that enables a large amount of data to be transmitted – via any medium, fiber-optic, radio or microwaves, etc. Simply put, broadband refers to internet connections that can allow access to web pages or downloads at high speeds.

In Virginia, having access to high-speed internet is defined as having access to a network that can transmit data at speeds of greater than 10 megabits per second download and 1 megabit per second upload. This is in contrast to previous iterations of internet networks

[6] The Commonwealth Connect Website is available here: https://www.commonwealthconnect.virginia.gov

[7] For a wide variety of tools, including the local leaders toolkit, follw this link: https://www.commonwealthconnect.virginia.gov/technical-assistance

[8] To learn more about the Commonwealth Connect Coalition, navigate to: https://www.commonwealthconnect.virginia.gov/CCBC

that utilized "dial-up" technologies and reached maximum speeds of 56 kilobits per second, but below the Federal Communications Commission's (FCC) definition of high-speed internet access of 25 megabits per second download and 3 megabits per second upload.

The various devices and transmission media over which the data travels can be owned and managed by a variety of different actors – or vertically integrated by one provider. Last Mile providers are Internet Service Providers (ISPs) who, as the name suggest, provide internet service to home or business. Middle-mile providers manage aggregated traffic between ISPs and backbone networks, while backbone operators manage very large data routes.

Types of technology that can achieve these speeds vary, but all ultimately require access to the fiber optic backbone of the Internet. Fiber optic cables are currently the gold standard and are made up of thin strands of glass or plastic known as optical fibers. Coaxial cables, copper and dedicated subscriber lines (DSL) are other forms of cable technology used to transmit data. Abandoned television frequency, also known as TV Whitespace, 4G data (cellular), satellite, and fixed wireless technologies all work to connect without wires to a backbone made of fiber.

Virginia's incentive funding programs are technology neutral and focus exclusively on the speed and latency of data transfer, not the methodology by which the data is transferred.

While all data ultimately travels on a fiber backbone, there are several business models for providing broadband to a community. Private sector providers (ISPs) generally own and operate their own networks and physical infrastructure. Wireless Internet Service Providers (WISPs) generally purchase "middle mile" access from another network operation and affix their transmission equipment to a tower or other vertical asset. Many municipal providers operate as a traditional ISP, but were created as an authority by (a) local government(s); while others do not provide last-mile service but rather offer economic development prospects or local governments access to subsidized Internet services. Finally, electric cooperatives are non-profit entities that were a key tool for rural electrification and are playing an active role in connecting many of their customers in currently unserved territories.

Definitions:

Broadband: A digital connection permitting a large amount of data to be transmitted over a connection within a certain amount of time, generally referenced in terms of both download speeds: the speed at which a user's computer receives data, and upload speeds: the speed at which a user's computer can send data to a remote computer or website.

Coverage/Service: For the purposes of this effort, a property is considered "covered" or "served" if the property owner can contact a telecommunications provider and receive

broadband service in a timely fashion without being required to pay more than a standard initial service fee.

Functionally Universal Coverage: Coverage that includes at least 95% of the serviceable properties in a locality, region, or state. While some localities will be able to achieve 100% coverage, others have properties too remote for it to be cost-effective to subsidize or chose not to have access.

Bandwidth: The specific measurement of a connection's data capacity. A connection with a low bandwidth would not be considered a broadband connection, while one with a high bandwidth would be considered broadband. Generally both download and upload figures are both used to describe a connection's bandwidth, in the format [download speed]/[upload speed] or "[download speed] over [upload speed]."

Wireline: A connection between a computer and the internet that runs entirely on wires, without any portion being transmitted through the air.

Fixed Wireless: A wireless data connection that involves a transmitter and receiver that are fixed in place. This is in-contrast to mobile/cellular wireless connections in which a tower broadcasts in all directions and a receiving device can be moved. Fixed wireless connections have higher data densities than do mobile wireless connections and are true broadband connections.

Backhaul: The connection between a remote portion of a network and the network backbone. In the context of this report it is referring to the fiber optic connections between towers providing wireless service and the internet.

Internet Service Provider or ISP: A company that provides a connection to the internet to individual customers on a retail basis.

Backbone: The robust, non-customer-facing portion of the internet by which the majority of data is transmitted. Conceiving of the internet as a circulatory system, these would be the major veins and arteries.

Middle Mile: Connections between backbone and last-mile connections are referred to as middle mile. These networks can be vertically integrated by a network operator who also owns backbone and last mile connections, or operated independently, connecting backbone and last mile networks. Conceiving of the internet as a circulatory system, these would be the large veins and arteries that distribute blood to and from the capillaries. It's important to remember that middle mile is a business model, not a physical description – a middle mile network could extend to within feet of a final customer, or end many miles away.

Last Mile: The portion of the internet that connects an end-user to the broader network, the last mile is a term given to the fibers or wireless signals that connect customers. Conceiving of the internet as a circulatory system, these would be the capillaries.

Microwave/Millimeter Wave/TV Whitespace: Types of wireless data transmission.

Coaxial: A type of electrical cable that has an inner conductor surrounded by a tubular insulating layer, surrounded by a tubular conducting shield. This is the medium by which cable television was originally distributed. There exist some legacy coaxial data networks, but these are being replaced with fiber.

Fiber: In this context, a reference to fiber optic strands, which are a type of cable capable of carrying pulses of light – representing data – at very high speeds. These pulses can be read by specialized equipment.

Dark Fiber: A "dark" or "unlit" fiber is an unused optical fiber. The dark strands can be leased to individuals or other companies who want to establish optical connections among their own locations.

Lit Fiber: Fibers currently used and operated. These networks are either being used or are available to another user without that user needing to operate a network themselves.

Take Rate: The rate at which offered services are purchased by potential customers. If a fiber optic company lays fiber past 10 locations and 7 purchase that company's services, then that region has a 70% take rate.

Smart City/Community: A locality that has a fully-developed and modern network available throughout its limits, with that network being used to support a variety of services which could include active transportation control, emergency management, specialized business supports, etc.

Smart Grid: An electricity supply network that uses digital communications technology to detect and react to local changes in usage or conditions.

Tele-health: The use of digital information and communication technologies, such as internet-connected computers or phones, to access health care services remotely and manage your health care. A video-conference with a psychiatrist would be a tele-health service.

Resource Sharing Route: Properties in which telecommunications providers are able to locate their equipment and potentially allow the property owner the use of some portion of that equipment.

IV. Current Broadband Availability

Previous broadband efforts were significantly hampered by the lack of good data about broadband availability. The Commonwealth Connect effort has been designed with that problem in mind, and provides a pathway to universal coverage even in the absence of good broadband mapping.

A. What is known about broadband availability statewide

Broadband access in Virginia, as tracked by FCC data looks encouraging at first glance, though the numbers are misleading. According to the data, 96.9% of Virginians have access to some form of connection, 94.7% having low speed connections offering at least 10 Megabits per Second (Mbps) download by 1 Mbps upload, and 92.1% having access to a high speed broadband connection offering at least 25 Mbps download by 3 Mbps upload.[9]

There is good reason to believe these numbers are exaggerated. Separating census blocks into rural and urban classifications shows different coverage statistics. For the purpose of this report, an urban block is any census block that wholly or partially overlaps a metropolitan statistical area (MSA).

In urban areas, the coverage percentages and speed tiers are relatively consistent: ~99% have access to the internet at any speed, 98.9% have at least a slow connection (10 over 1 Mbps), and 98.5% have access to a high-speed connection (25 over 3 Mbps).

In rural areas however, there is a drop-off between slow and high-speed access: 89% have access to the internet at any speed, 80.1% have access to a slow connection (10 over 1 Mbps), and 69% have access to a high-speed connections (25 over 3 Mbps).

The Commonwealth broadband team, in collaboration with Virginia Tech, has updated an interactive map based on this data. The interactive map can be seen as a rough outlining of areas that are highly likely to be unserved by broadband providers. While areas labeled as unserved are likely to be accurately labeled as such, there are certainly significant areas not identified that are also unserved. This is a result of the FCC's current, flawed, method of data gathering discussed in the next section.[10]

B. What isn't known and why

<u>Private provider wireline maps are not consistently reliable:</u>

The primary issue with FCC data is the lack of details related to coverage by wireline providers. The FCC requires broadband companies to report their data, but the rules for designating an area as covered are very loose. If a provider's service is utilized by at least one address inside of a census block, the provider may list that census block as fully covered by their service. In rural Virginia, census blocks can be extremely large (up to 117 square miles), which can lead to misleading maps. Previous submission guidelines allowed providers to designate a block as covered if they were capable of delivering

[9] The FCC's form 477 is the device by which ISPs detail their customer coverage. The data can be accessed here: https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477

[10] The map can be accessed at: https://broadband.cgit.vt.edu/IntegratedToolbox/

service within a 10-day period if requested, regardless of the potential cost, which permitted even more areas that aren't currently served to be claimed as served areas.

Feedback from surveys and website traffic on the Virginia Broadband Availability Map[11] show that service is not available in many places where the federal maps suggest otherwise.

While providers submit data every six months, the latest dataset available from the FCC was information submitted in June 2018, and released in September 2019, a fifteen-month delay between submission and publication. This could mean that recent service changes do not show up in the latest updated version of mapping based on FCC 477 data. This can create issues if the latest speed and availability information are needed to assist decision-making.

Private provider wireless maps also are not reliable:

Wireless coverage is even more overstated than wireline due, in part, to the nature of wireless service.

It is worth noting that, under current definitions and standards, mobile services (services delivered through cellular phones), are not considered broadband. There are fixed wireless services (connections delivered between towers and homes or businesses) that qualify as broadband for state purposes.

At present the location and range of towers is not required information to be submitted by providers. Along with GIS data, knowing tower locations and ranges would allow analysts to create a coverage map that takes into account distance from towers, area geography, topography, and other factors.

Additionally, there are two noteworthy unknowns regarding wireline and wireless service. First, the Commonwealth does not have good information regarding pricing for broadband services. Competition is limited, especially in rural areas where there is generally only one option, but there is not currently a system or data to determine if price is a significant hurdle to access availability. Second, there is little information on adoption, so while a provider may be delivering access to a particular service area, there is no way to determine if people are using it.

C. Using statistics to define the scope of the problem

The difficulty of precisely defining the scope of the unserved population has long hindered the availability of rural broadband. Perfect scoping of the problem isn't necessary.

[11] The Virginia Broadband Availability Map is a cooperative endeavor of CIT and Virginia Tech. While it is based on flawed input data, and should be regarded as incomplete at best, it is also a helpful reference. It can be found here: https://broadband.cgit.vt.edu/IntegratedToolbox/

The 2018 Commonwealth Connect report took a statistically derived approach. While direct access to reliable fiber maps and wireless propagation coverage is a challenge, the Commonwealth used available data to make reliable estimates of likely need and costs. A statistical approximation isn't as good as a complete survey of coverage matched to GIS data, but that would be a complex, costly, and time consuming undertaking.

According to USDA's Economic Research Service, Virginia has a rural population of approximately 1,041,000.[12] According to the 2015 FCC rural broadband report, approximately 64% of Virginia's rural population lacks access to broadband.[13] Thus, the first Commonwealth Connect Report showed approximately 660,000 Virginians in need of broadband access. Given the need to connect both homes and businesses, the initial scoping assumed that combining disconnected Virginians into households would be offset by the need to connect businesses, leaving the number of necessary connections at 660,000.

The total population figure having been reached statistically, we hesitated to "household" the data, as that would be taking us even further from validated data. However, when we divide the 660,000 unserved population number by the US Census' figure household size the final number of households is 251,908.[14]

Additional census analysis showed unserved home locations of around 287,000 and business locations of around 40,000 across Virginia. While these numbers are likely somewhat low, they track our own analyses closely enough to build confidence in our approach.

D. Industry data supports and deepens current understanding

Recent work by CostQuest, a consulting firm hired by US Telecom, a national telecommunications industry association, on a new mapping protocol included a pilot effort in Virginia and Missouri. This effort was incomplete in its ability to fully map coverage levels since not all telecommunications companies in Virginia participated. However, they were able to accomplish three important items.

First, they were able to prove that it is possible to create a "fabric" that includes a detailed digital map with both address-level information as well as the location, in physical space, of all buildings on those parcels. This is significant, as it points toward a mapping strategy that could be incredibly effective should the FCC undertake it and require licensee participation.

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[12] State factsheets from USDA-ERS can be generated at https://data.ers.usda.gov/reports.aspx?ID=17854

[13] FCC Report on Rural Broadband Availability accessed at https://www.fcc.gov/document/report-broadband-availability-america

[14] The US Census found that the average Virginia household had 2.62 members. This and other useful Virginia demographic data can be found here: https://www.census.gov/quickfacts/VA

Second, they were able to use their fabric to make some projections about the number of served and unserved citizens in Virginia, and helpfully, their findings closely tracked our own, using a different methodology. This independent confirmation lends weight to both our early assumptions and the possibility that a "householded" figure at which we or they arrive upon may be useful.

Finally, the industry effort identified household and business locations and characterized each, creating an "upper limit" on the number of households that don't receive service at around 500,000, with the true number somewhat less than that given the non-participation of several major telecom providers.

While that data is not publicly available, it is important in that it partially confirms our statistically-derived assumptions and allows us to operate with greater confidence as we measure progress toward the goal. However, as has been mentioned before, it is not necessary for us to have this information in a perfect form for Virginia to address this problem.

E. What "functionally universal" coverage means and how it is achieved

When hundreds of thousands of Virginians lack access to broadband, Virginia should have a bias toward action and focus on connecting people. In the short term, state and local broadband funders will not have difficulty locating groups of people who need access.

Over the coming 2-3 years, local and regional broadband planning efforts will align the incentives of incumbent providers and the Commonwealth, as a failure to identify and distinguish areas served by current providers could result in an "overbuild" in which a publicly-subsidized competitor overlaps with the incumbent provider.

This will allow each region or locality to start with a plan for universal coverage that includes all areas that may be unserved, and then back out both those areas identified as served by current providers and those areas that still need access to broadband.

F. Broadband affordability

Every expenditure of taxpayer resources must be prioritized to achieve maximum impact. To that end, this effort will focus on supporting the expansion of high-speed broadband infrastructure to areas currently unserved as we have defined them (10/1 Mbps or less).

There are many communities in Virginia where service is technically available – that is to say, the infrastructure exists – but services are not available at rates that the average citizen can afford. The FCC recognized this issue and in 2015 voted to add broadband internet service as an option to Lifeline – a government program that provides subsidies for low-income families who need phone service. Many ISPs also offer their own assistance programs designed to assist households that might not otherwise be able to afford internet access.

This is a challenging public policy issue. No state has a significant or innovative approach to improving affordability.

V. Non-State and Local Actors

A. Private-sector providers in Virginia

Virginia is home to private-sector broadband companies both large and small, from Fortune 500 companies serving hundreds of thousands of Virginians, to small operators serving only a handful of customers.

Similarly, Virginia telecommunications companies employ a variety of technologies, including dial-up or digital subscriber line (DSL) networks, improved coaxial line networks, and the two technologies likely to be supported by state deployment efforts: fixed wireless broadband and fiber optic networks.

Private-sector broadband providers currently act as ISPs for the majority of Virginians currently served and are critical parts of any plan for universal coverage moving forward. These highly adept and well-resourced private-sector partners already spend millions of dollars annually enhancing current service and expanding coverage to those on the periphery of their existing networks.

We anticipate that there will be many public/private partnerships for infrastructure construction in the coming years, fueled by increased incentive payments from the state as well as increased allocations of capital from large, multi-state corporations.

According to filings with the FCC, there are 171 wireline and fixed-wireless internet service providers in Virginia currently serving customers.

B. Public sector providers in Virginia

Municipal providers:

Municipal broadband networks are permitted in Virginia; however, they must adhere to legislative requirements that limit their ability to compete with incumbent providers.[15]

Significant requirements include:

- Service prices shall not be set lower than the prices charged by any incumbent provider for a functionally equivalent service.
- The service shall not be subsidized.

[15] Those legislative requirements can be found here and in associated code sections: VA Code § 56-265.4:4, VA Code § 56-484.7:1, VA Code § 15.2-2108.6

- In order to provide cable or "triple play" services a feasibility study must be completed that shows that the network will be profitable within one year of installation (this is exceedingly difficult for any cable operator, public or private).

There are a number of municipal broadband networks in Virginia; however, there is no authoritative list of current networks.[16]

1. Charles City County
2. Eastern Shore of Virginia Broadband Authority (ESVBA)
3. Martinsville Information Network (MINet)
4. nDanville
5. Nelson County Broadband Authority
6. Roanoke Valley Broadband Authority
7. Rockbridge Area Network Authority
8. Wired Road Authority

Regional authorities:

Regional broadband authorities are permitted under Virginia law and are engaged in a variety of activities including: acting as an ISP, providing dark fiber leases to ISPs, operating municipal-use or education networks, or some combination of all three. Currently, the Virginia State Corporation Commission (SCC) lists 27 active authorities in the Commonwealth:

1. Albemarle Broadband Authority
2. Amherst County Broadband Authority
3. Appomattox County Broadband Authority
4. Bedford County Broadband Authority
5. Bland County Wireless Service Authority, Inc.
6. Charlotte County Broadband Authority
7. Cumberland County Wireless Authority
8. Eastern Shore of Virginia Broadband Authority
9. Fauquier County Broadband Authority
10. Franklin County Broadband Authority
11. King and Queen County Wireless Authority
12. King George County Wireless Authority
13. Lancaster County Broadband Authority
14. Louisa County Broadband Authority
15. Middle Peninsula Broadband Authority
16. Middlesex Broadband Authority
17. Nelson County Broadband Authority
18. New River Valley Network Wireless Authority
19. Northern Neck Broadband Authority
20. Orange County Broadband Authority

[16] Broadband Communities Magazine keeps a database of providers as well as a number of other valuable tools at its website, available here: http://www.bbpmag.com

21. Page County Broadband Authority
22. Pulaski County Wireless Integrated Network Authority
23. Roanoke Valley Broadband Authority
24. Shenandoah Wireless Broadband Authority
25. Spotsylvania County Wireless Authority
26. Surry County Broadband Authority
27. Tazewell County Wireless Service Authority

C. Cooperatives and Mid-Atlantic Broadband

Virginia's electric & telephone cooperatives:

Cooperatives - both telephone and electric - have a long history of delivering essential infrastructure to rural America and play an important role in Virginia broadband deployment. With assets in some of the most rural parts of Virginia, telephone cooperatives are in a unique position to help close the digital divide. Many telephone co-ops have provided broadband services for years and some are transitioning from DSL to fiber-to-the-home. These cooperatives are of vital importance to the effort to deploy broadband to hard-to-reach areas.

Applications like electric meters and household energy management systems have made broadband critical to the operations of electric companies and cooperatives. Recognizing the need for broadband for improved business operations and the needs of its members, some electric co-ops have begun deploying last mile broadband services to their members and many in Virginia anticipate providing service in the coming years, either themselves or in partnership with another co-op or a traditional private-sector provider.

The Virginia Telecommunications Industry Association (VTIA) and the Virginia, Maryland, & Delaware Association of Electric Cooperatives (VMDAEC) supplied information for this report:

1. VTIA membership:

Members:

- Buggs Island Telephone Cooperative (recently acquired by Mecklenberg Electric Cooperative)
- Burke's Garden Telephone Company, Inc.
- Citizens Telephone Cooperative, Inc.
- Highland Telephone Cooperative
- MGW Telephone Company
- New Hope Telephone Cooperative
- Pembroke Telephone Cooperative
- Peoples Mutual Telephone dba RiverStreet Networks
- Scott County Telephone Cooperative
- TDS Telecom

2. VMDAEC membership:

Members (not all are providing broadband services):

- A&N Electric Cooperative
- B-A-R-C Electric Cooperative
- Central Virginia Electric Cooperative
- Community Electric Cooperative
- Craig-Botetourt Electric Cooperative
- Mecklenburg Electric Cooperative
- Northern Neck Electric Cooperative
- Northern Virginia Electric Cooperative
- Prince George Electric Cooperative
- Rappahannock Electric Cooperative
- Shenandoah Valley Electric Cooperative
- Southside Electric Cooperative
- Powell Valley Electric Cooperative

Mid-Atlantic Broadband:

Mid-Atlantic Broadband (MBC) is a unique actor in Virginia, and is unusual by any standard: nonprofit, mission-driven, open-access middle mile network in rural Virginia.

To date, MBC has successfully implemented over $100 million in state and federal grants from entities like the Virginia Tobacco Region Revitalization Commission, the federal Economic Development Agency and others and now owns and operates over 1,800 route miles of open-access middle mile wholesale fiber in Southern Virginia.

MBC was able to build an advanced fiber optic network in rural Virginia where it was financially infeasible for a private sector operator to build the network infrastructure. MBC then created a "wholesale-only" business model focused on provision of middle mile services, whereby MBC does not serve residential or business customers directly. MBC developed internal capabilities and expertise to operate the network to "carrier-class levels". This allows private sector telecom providers to purchase lit fiber (10 megabits to 100 Gigabits per second), or dark fiber, or colocation services from MBC to reduce their costs, expand access to their customers and provide a level playing field in the region to benefit economic growth and development.

Today, MBC serves over 45 carrier customers, from large global telecom providers to small locally owned ISPs. Conservative estimates show that over 100,000 residential and business customers in southern Virginia benefit directly from the MBC network. There is a multiplier effect when MBC sells a transport circuit to an ISP or provides a dark fiber lease to a telecom provider. Cellular and mobile voice/data services are enhanced with an MBC fiber that connects a cell tower and provides large bandwidth to that site.

D. Virginia's investor-owned electric utilities

Recent legislation affecting Virginia's two investor-owned electric utilities, Appalachian Power and Dominion, began a pilot program that will permit these companies to leverage the communications network construction they're already doing to modernize their grid. When creating an internal network, the utilities are now permitted to construct additional capacity that can then be leased out to private-sector ISPs for the purposes of serving unserved Virginians.

The first project utilizing this new authority is underway in Grayson County and more have been announced, awaiting SCC review.

VI. How Other States are Increasing Broadband Availability

While states and regions vary significantly in the challenges they face, broadband expansion and access has been addressed in nearly every state in the union. State lawmakers seem focused on measures aimed at bringing broadband access to those who lack service by funding connectivity programs, directing more support to projects in unserved areas, and streamlining policies and procedures to speed broadband infrastructure deployment.

A. State funding

Minnesota established the Office of Broadband Development to support the state's goal to achieve coverage to all businesses and homes in the state, with minimum download speeds of 25 megabits per second and minimum upload speeds of at least 3 megabits per second, no later than the year 2022.[17] Minnesota has allocated $85 million over the past four years for broadband support programs.

Since 2017, the MN state legislature has directed $20 million in broadband funds annually for the Border-to-Border Broadband grant program. These grants focus on providing state resources to help make the financial case for new and existing providers to invest in building infrastructure into unserved and underserved areas of the state. The grants provide that any area unserved or underserved is eligible based on availability of a wireline service; service provided by mobile – and even fixed – wireless carriers are not considered in determining areas eligible for grant programs. The grants provide up to 50 percent of project development costs with an established maximum grant of $5 million per project. The grants require matching funds and eligible applicants include businesses, political subdivisions, Indian tribes, and non-profits.

Minnesota has also funded statewide mapping efforts to compliment, and often times supplement, federal mapping tools. The state contracts with a third party to prepare maps,

[17] More on Minnesota's program can be found here: https://mn.gov/deed/programs-services/broadband/

based on provider submitted data[18], to represent areas of broadband service availability. Similarly, in Utah, the Broadband Outreach Center[19] has worked with over 50 providers in the state to enhance the FCC's map of existing broadband and allow users to identify broadband service by speed and technology type throughout the state. Utah maintains this map and uses the information to market their infrastructure.

In 2018, on the heels of a Purdue University study[20] estimating the return of four dollars to the local economy for every dollar spent rural broadband deployment, Indiana unveiled a $1 billion[21] infrastructure plan, which included $100 million for broadband. The Next Level Connections Grant program, which is funded from toll road revenue, awarded $28.3 million in projects throughout 2019. The program is currently limited to unserved census blocks, although this may change as more areas become served.

In 2018, Wyoming [22] allocated $10 million to establish a new grant program for broadband deployment. Also in 2018, Alabama established the Broadband Accessibility Fund[23] with $7.4 million available to non-government entities that provide broadband service to communities with 25,000 residents or fewer. Iowa[24] approved tax cuts for internet service providers to encourage build out in communities with limited or no access to broadband. These credits primarily consist of a reduction in local property taxes as well as a state sales tax break. In 2019, Michigan's legislature allocated a one-time $20 million to the Connecting Michigan Communities Grant program.[25]

Officials in Colorado have called for 100 percent of rural Colorado to have broadband available by 2020. The state has taken a different approach: in 2018, Colorado committed $100 million over five years by redirecting money for rural telephone service to support broadband deployment and award grants for projects aimed at deploying broadband service in unserved areas of the state.[26] Funding comes from a 2.6 percent "high-cost support" fee on Colorado phone bills that historically has been used to offset costs of providing landline phone service in sparsely populated parts of the state.

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[18] The use of a third party allows the providers to carefully curate what information they will and won't release, permitting more-accurate maps while protecting their proprietary data.
[19] More on Utah's mapping program can be found here: https://broadband.utah.gov/
[20] That study is available here: https://www.pcrd.purdue.edu/files/media/006-RPINsights-Indiana-Broadband-Study.pdf
[21] Indiana's program details can be found here: https://www.in.gov/gov/files/NextLevel%20Connections%20facts%20sheet.pdf
[22] Wyoming's grant program legislation can be read here: https://www.wyoleg.gov/2018/Introduced/SF0100.pdf
[23] A release regarding Alabama's broadband access fund is here: https://governor.alabama.gov/press-releases/governor-ivey-signs-alabama-broadband-accessibility-act/
[24] Details on Iowa's tax cut program can be read here: https://www.legis.iowa.gov/docs/publications/LGE/87/Attachments/SF2388_GovLetter.pdf
[25] Michigan's broadband program details are here: https://www.michigan.gov/dtmb/0,5552,7-358-82547_56345_91154---,00.html
[26] Colorado's program details are here: https://leg.colorado.gov/sites/default/files/documents/2018A/bills/2018a_002_signed.pdf

In 2019, Illinois announced a major infrastructure program called Rebuild Illinois and dedicated $420 million to broadband. $400 million is allocated to partnering with Internet service providers and $20 million to the Illinois Century Network, which currently services K-12 schools, higher education, public libraries, museums, state and local governments, and the health-care community. A broadband advisory council was appointed by the Governor and will deliver a report outlining how the funds will be allocated by the end of the year.[27]

In 2014, officials in Washington created a targeted and temporary universal service program[28], set to expire in 2020, to support legacy and small incumbent local exchange carriers (ILECs) during the transition to broadband.

Officials in Arkansas established the High Cost Fund (ARHCF)[29] to promote and assure the availability of universal broadband service at rates that are reasonable and affordable, and to provide for reasonably comparable service and rates between rural and urban areas. The customer in a high-cost region recovers ARHCR fees paid by qualifying telecommunications providers.

B. Regulatory activity

Though implementation varies, "dig once" policies, which seek to lower the cost of broadband deployment by providing internet companies access to public rights of way and minimizing the number of excavations required to install telecommunications infrastructure, are supported in states including Arizona, Utah, Minnesota, Maine, and West Virginia. The 2018 General Assembly in Virginia directed the Center for Innovative Technology (CIT) to conduct a feasibility study of a statewide dig once policy, including the installation of conduits with bridge and tunnel construction projects. Federal legislation passed in 2018 that directs states to lay the groundwork for potential "Dig Once" policies.

C. Neighboring states

Closer to home, Virginia's neighboring states vary in their efforts to address the digital divide, and Virginia can swiftly take the lead regionally by implementing the Governor's Connected Commonwealth initiative.

North Carolina's Broadband Infrastructure Office (BIO)[30] aligns NC Broadband, the statewide effort to expand high-speed internet access, with the FirstNet public safety initiative for improved resource sharing across state agencies. In 2017, Governor Cooper proposed the establishment of the Growing Rural Economics with Access to

[27] Illinois' broadband announcement: https://www2.illinois.gov/dceo/Media/PressReleases/Pages/PR20190815.aspx
[28] Washington's temporary universal service program is described here: http://app.leg.wa.gov/RCW/default.aspx?cite=80.36.650
[29] Learn more about the Arkansas program here: https://bit.ly/2DPzqoT
[30] North Carolina's program website is: https://www.ncbroadband.gov/

Technologies (GREAT) Grant Program.[31] The program has invested $10 million in funding to provide grants to deploy broadband infrastructure in 2018 and 2019, with $15 million allocated to the program for the next 10 years. North Carolina's efforts also include "The Playbook," a guide for local communities to create incentives and favorable policies that enable them to build new partnerships with broadband providers and increase broadband access. The BIO has divided the state into three regions and provides a single point-of-contact for technical assistance.

The Tennessee Broadband Accessibility Act[32] (TNBAA) was passed in 2017 and launched the state's efforts to incentivize and support deployment and adoption of broadband in unserved areas across the state. The legislation focused on three main areas- investment, deregulation, and education. The Broadband Accessibility Grant Program was established within the Department of Economic and Community Development (TNECD) and allocated $30 million over a three-year period ($10 million per year) to encourage deployment to unserved homes and businesses. In addition, tax credits to private sector providers totaling $15 million over three years ($5 million per year) will be available based on the purchase of broadband equipment used to provide broadband access in the state's most economically challenged counties. The TNBAA permits the state's electric cooperatives, previously restricted from providing retail broadband services, to provide broadband services within their territories while strengthening protections that prevent cooperatives from using electric system assets to subsidize broadband services.

West Virginia passed legislation in 2018 calling for a "uniform and efficient system of broadband conduit installation coinciding with the construction, maintenance, or improvement of highways and rights-of-way."[33] The West Virginia Division of Highways (WVDOH) has since issued guidance[34] to assist district offices in the submission, processing and enforcement of permit applications from companies seeking to install, extend, expand or upgrade telecommunications facilities within the WVDOH rights-of-way.

In 2018, West Virginia entered a partnership with the Zayo Group and the announcement of the company's plan to build a 200-mile fiber route across the state[35]. The state credits their broadband-friendly policies- including providing access to the state's rights-of-way

[31] Details on North Carolina's grant program can be found here: https://www.ncleg.net/EnactedLegislation/SessionLaws/HTML/2017-2018/SL2018-5.html
[32] Tennessee's rural broadband program details are here: https://www.tn.gov/ecd/rural-development/tennessee-broadband-grant-initiative/tennessee-broadband-accessibility-act-article.html
[33] West Virginia's conduit program legislation is here: http://www.wvlegislature.gov/Bill_Text_HTML/2018_SESSIONS/RS/bills/HB4447%20SUB%20ENR.pdf
[34] And specific dig once policy guidelines from West Virginia can be found here: https://broadband.wv.gov/assets/files/pdfs/news/Dig-Once-Policy-Guide-October-2018.pdf
[35] The announcement regarding West Virginia's backbone/middle mile project can be read at https://broadband.wv.gov/index.php?p=resources/news/the-wv-broadband-enhancement-council-welcomes-exciting-news-from-the-zayo-group

in attracting Zayo's investment. The project will connect major internet exchanges in Ashburn, Virginia and Columbus, Ohio, creating opportunities for network expansion along the route as well as potentially attracting data centers to locate in West Virginia. West Virginia is also seeking to leverage an extensive 275 mile fiber build by Facebook, who will sell excess capacity along the route to ISPs.[36] Facebook will also be building their route through Virginia.

In 2013, Maryland completed the build out of the One Maryland Broadband Network: a 1,324-mile fiber optic broadband network that linked 1,068 government facilities and "community anchor institutions" in every county of the state. The state received a federal grant under the Broadband Technology Opportunities Program (BTOP) for over $115 million and provided over $43 million dollars in matching funds. This backbone supplies core infrastructure and connects thee separate systems: the state-run "networkMaryland," established for public sector use, the nine-jurisdiction Inter-County Broadband Network, which connects government buildings and other anchors across Central Maryland, and the non-profit Maryland Broadband Cooperative made up of a consortium of rural carriers.

The Kentucky Wired broadband initiative offers a cautionary tale. In 2015, Kentucky began construction on a 3,000-mile build out of fiber optic cable in an effort to bring high-speed internet access to all 120 counties in the state. The project, originally budgeted for $324 million and financed with bonds backed by the state's credit, is currently four years behind schedule because of persistent delays and is about $100 million dollars over budget with projected costs many times that amount. The use of state-backed bonds, unrealistic revenue projections, and a misunderstanding of which federal funding programs would support the project are a few of the program's many errors.

VII. Virginia Broadband Programs

All of the Commonwealth's broadband work has been streamlined and connected by the Commonwealth broadband team. While different actors within the team may reside in multiple areas of the Executive Branch, all are working in a coordinated and unified fashion.

A. The Virginia Telecommunications Initiative (VATI)

History:

The VATI program was established in 2016 as a state-funded program administered by DHCD. The goal of VATI is to create strong, competitive communities throughout the Commonwealth by preparing those communities to build, utilize, and capitalize on telecommunications infrastructure. In partnership with localities and private service

[36] https://www.register-herald.com/news/facebook-comes-to-west-virginia/article_36594e44-914f-51f0-9c5c-77a637ca5002.html

providers, VATI provides financial assistance to supplement the construction costs for extending service to areas that presently are unserved.

Localities receive VATI funding through a competitive grant process in which each project is evaluated based upon a demonstrated need and benefit for the community, applicant readiness and capacity, and the efficiency of the planned use of taxpayer dollars. For both of the first two funding years (2017 and 2018) $1 million dollars was budgeted for the program. In 2017, VATI received 17 applications totaling more than $3.7 million in funding requests of which five localities received nearly $945,000 for last-mile broadband construction projects. In 2018, 12 applications were received totaling more than $2.8 million in funding requests of which four localities received $978,000. As these numbers show, demand for VATI funding from Virginia localities has been much greater than the funding available.

Because of the strong demand for the program, the 2018 VATI budget was increased to $4 million dollars per year with a December 2018 deadline. Thirty-one applications were received totaling over $11 million in funding requests of which eleven localities received $4.9 million, including a letter of intent.

After three straight years of demand for the program more than doubling available funds, the FY20 VATI budget was increased to $19 million dollars. Applications were due in September 2019 and the program received 39 applications, requesting approximately $43 million in funding and leveraging $58 million in matching dollars. In January 2020, Governor Northam announced that 12 applications from 13 different localities would receive $18.3 million in funding. These awards will connect more than 36,000 homes, businesses, and community anchors.

VATI moving forward:

VATI is the primary vehicle by which the Commonwealth incentivizes broadband infrastructure deployment. VATI focuses on deploying one-time capital for the purposes of building broadband infrastructure in a public/private partnership model. This makes VATI an ideal use of funds, since coverage can be increased without creating a new program.

Stakeholders from across the telecommunications industry, local governments, and technical advisors all support the model of the VATI program and while the program guidelines will be refined as the program evolves, the basic program structure is unlikely to change during the coming years given the efficient manner in which it is able to deploy capital and engage with stakeholders with low administrative costs. As directed by policy makers, the primary determinant of project awards will be the efficiency with which connections are made on a per-public-dollar basis. Additional considerations such as offered speeds, difficulty of a given population to be reached, and affordability may also be considered as modifying a project's score beyond solely efficiency, but at no point will inefficient projects be supported.

B. Tobacco Commission's broadband programs

History:

Created by the Virginia General Assembly to revitalize and diversify the economies of 40 southern and southwest Virginia localities, the Tobacco Region Revitalization Commission is a political subdivision of the Commonwealth. The Commission has long recognized that broadband access is vital to attracting companies and their employees to rural Virginia. It has directed significant funding to address the "digital divide" in its footprint. In excess of $130 million has been granted to construct robust broadband infrastructure in every Tobacco Region locality. The Commission's investments have also leveraged tens of millions of matching investments from other sources, primarily federal broadband funding programs.

In 2017, the Commission created a last-mile broadband grant program and set aside $10 million to assist in the construction of these projects. Last-mile projects include fiber-to the-premise, fixed wireless, or some combination of both technologies, assuming greater than 10 Mbps download and 1 Mbps upload speeds.

In March 2018, the Commission approved an initial round of funding to nine projects for $11 million, leveraging an additional $16 million in matching project funds to serve 31,500 homes and businesses across 13 localities within the Commission's footprint. In May of 2019, the Tobacco Commission funded an additional $7,900,000 of broadband connections across 14 localities. These funds will lead to the connection of at least 16,000 new homes and businesses.[37]

The Commission's broadband program moving forward:

The Commission will shortly announce its next last-mile funding round. It is anticipated that the Commission will approve grants or loans for this round at its September 2020 meeting. The Commission anticipates a modest level of last-mile broadband funding for future grant rounds, with program guidelines remaining similar to those of the VATI program.

C. Office of Broadband Assistance

History:

Virginia's Office of Broadband Assistance supports the acceleration of broadband telecommunications in rural Virginia. This state-sponsored program provides broadband technical assistance to unserved localities across the Commonwealth and has just been transferred from CIT to DHCD to better streamline broadband efforts.

[37] More information about the Commission's last-mile program, as well as contact information and application deadlines, is available at: https://www.revitalizeva.org/grant-loan-program/grant-programs/research-development-grant-program/

The technical assistance provided by the Office of Broadband Assistance allows localities unserved by broadband to develop strategic plans for broadband deployment. The Office of Broadband Assistance emphasizes that the most efficient way of expanding broadband in Virginia is through public-private partnerships, and utilizes a three-step process to help facilitate public-private partnerships that address unique local broadband needs. Staff at the Office of Broadband Assistance perform a comprehensive broadband assessment, help the locality determine its needs and goals, and help facilitate a public-private partnership through a Request for Proposal. This process is unique because it produces tangible, goal-driven, fiscally achievable broadband solutions at no cost to the locality.

The Office of Broadband Assistance has assisted many Virginia localities in developing strategic broadband deployment plans, which has helped to drive significant broadband expansion and promote local broadband awareness. Unfortunately, the office is constrained by a lack of available staff and has been unable to assist localities needing assistance.

In addition to helping localities develop strategic broadband deployment plans, the Office of Broadband Assistance also serves as a repository of broadband information (ex: broadband funding, best practices, and statistics), a conduit for elected officials, providers, localities and citizens, and a helper for locality-led broadband initiatives.

<u>The Office of Broadband Assistance moving forward:</u>

The Office of Broadband Assistance has been formally tasked to DHCD and is a key part of the overall Commonwealth broadband team. These Broadband team members will take the lead in supporting the local planning efforts occurring across the Commonwealth.

VIII. Fund Deployment, Methodology, and Timeline for Project Awards

A. VATI as the primary mechanism for deployment of funds

The FCC believes that the U.S. rural broadband problem could be solved with a national deployment of approximately $40 billion in public funds.[38] Given Virginia's relatively high population density, the cost of functionally universal coverage is achievable.

The Commonwealth will need to make a significant investment in the VATI program to ensure every Virginian has access to broadband.

B. Assumptions and timeline

[38] Transition paper by Paul de Sa, Chief, FCC Office of Strategic Planning and Policy Analysis: http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0119/DOC-343135A1.pdf

While this timeline is based on assumptions and statistical derivations, it is well-founded and can be tightened in future years as better data is acquired and more projects are funded. Further assumptions included in this budget estimate are:

1. A connection is "made" when it is contracted for.
2. The VATI and Tobacco Commission programs remain in substantially the same form.
3. Virginia remains at least as competitive for federal grants as it has been in prior years.
4. Private-sector and co-op investment in broadband deployment continues as currently projected.
5. Remaining connections will escalate in cost, ranging from below $400 state dollars per connection to as much as $2000 state dollars per connection, averaged between wireless and wireline connections, with future deployments benefitting from escalating leverage but facing less efficient project areas. For the purposes of making calculations, this report assumes an aggregate continuation and slow cost increase starting from the most recent VATI award efficiency of $510/connection.[39]
6. The number of connections necessary will not exceed 500,000 (less actions taken between that data and this report) which is more conservative than the smaller number of connections that the Census, FCC, and statistical analyses done by the Commonwealth broadband team all suggest.
7. As costs escalate in harder-to-reach areas of the Commonwealth, "smart grid" telecommunications networks constructed by utilities will have the opportunity to reduce the costs of accessing these areas.

The VATI program is currently funded at $19 million per year. This program requires a public/private partnership and, as a result, no project funded through it can have any ongoing state budget impact – this program injects capital into projects that are then managed and maintained by the private sector.

Success in this effort requires that this funding be increased to at least $35 million per year for the following seven budget years, after which state funding could decline. This state funding, with the continued investment of at least $3 million per year by the Tobacco Commission within its footprint, over the coming eight-year period, would total around $320 million over the decade-long project. Assuming the federal government can, at least, keep pace with Virginia investments over that period of time, the combined $320 million in state funds and $320 million in federal funds can then be matched by at least $640 million in local and private-sector dollars.

[39] This estimate is based on the data currently available, and will need to be refined over time as new data is available through future grant funding rounds. It's also important to note that this is in the aggregate – some projects will be less expensive on a per-connection basis, while others will be more expensive. Virginia has seen a slow increase in aggregate costs, and this report assumes that trend will continue. Thus, each successive year sees the cost per connection increasing from $510 in FY2021, to $525 in FY 2022, to $550 in FY 2023, to $575 in FY 2024, etc. This is a projection, and subject to annual refinement in future versions of this report.

This new funding, in excess of $1 billion, over the remaining eight-year period, should be sufficient to accomplish ubiquitous coverage by 2028. It will be matched with continued planned investment by the private sector and electric coops, leveraging of the "smart grid" communications networks being constructed by the electric cooperatives, investor-owned utilities, and municipal utilities, and continued technological improvement.[40]

C. Year by year infrastructure spending estimates

Because of the above budget recommendations, the following expenditures would be made on a year-by-year basis, with the cumulative totals exceeding our necessary costs ahead of the 10th year of the effort, FY28:

Virginia State Infrastructure Expenditures by Fiscal Year			
Fiscal Year	VATI	TRRC	Cumulative Total
FY19	$4m	$11m	$15m
FY20	$19m	$8m	$42m
FY21	$35m	$3m	$80m
FY22	$35m	$3m	$118m
FY23	$35m	$3m	$156m
FY24	$35m	$3m	$194m
FY25	$35m	$3m	$232m
FY26	$35m	$1m	$270m
FY27	$35m	$0	$308m
FY28	$12m	$0	$320m

Following from those budgetary assumptions, Virginia should be able to fund, through its grant programs, infrastructure leading to approximately 74,510 and 72,381 connections each in the coming two years, with costs per connection escalating in each successive year.[41] In the out years, with most of the work completed, we anticipate the need for funding to decrease. At that point, the utility leverage opportunities will be better understood, and gaps will be identified and filled.

[40] It should be noted that the leveraging of the electric utilities' "smart grid" telecom network is very likely to do far more than merely offset the increased cost of harder-to-reach places, but for the time being that likelihood is being kept out of these calculations as a safety margin backstopping these estimates.

[41] Virginia has seen a slow increase in aggregate costs, and assumes this will continue. Thus, each successive year sees the cost per connection increasing from $510 in FY2021, to $525 in FY 2022, to $550 in FY 2023, to $575 in FY 2024, etc. This is a projection, and subject to annual refinement in future versions of this report.

Virginia Premises Connected by Fiscal Year			
Fiscal Year	Cumulative State Expenditures	Number of Connections Made	Cumulative Connections Total
FY19	$15m	32,000 (actual)	32,000
FY20	$42m	52,277 (actual)	84,277
FY21	$80m	74,510	158,787
FY22	$118m	72,380	231,167
FY23	$156m	69,090	300,258
FY24	$194m	66,087	366,345
FY25	$232m	63,333	429,678
FY26	$270m	57,600	487,278
FY27	$308m	53,846	541,124
FY28	$320m	17,778	558,902

*connections to not exceed 500,000, at which point full connectivity should have been achieved[42]

IX. Policy Recommendations

Meeting the Governor's goals of deploying broadband universally will require a number of different initiatives, improvements and resources. Some of these will take place within the executive branch of government, and others will require legislation. Not all changes can or should be made at once, so some recommendations will need to be met in future years. Further, some challenges do not currently have clear solutions.

A. Policy improvements within the Executive Branch

Agency actions:

1. **Ensure DGS acts as a single point of contact for land use:** Currently DGS handles requests to cite telecommunications facilities on Commonwealth-owned land. The Commonwealth broadband team has been engaged with DGS as well as all landowning agencies to improve and streamline telecommunications access and understanding of existing rules and regulations governing land use by various agencies and on parcels set aside for differing purposes.[43]

[42] See page 28 #6

[43] For a look at the current land use portal, improved, and continuing to be refined, navigate to: https://dgs.virginia.gov/real-estate/leased-real-estate/Telecommunication-providers/

2. **Require local broadband plans for state investment:** VATI and Tobacco Commission grants should require, either as a "gatekeeping" requirement or a significant scoring metric, that applicant localities adopt a tactical plan for universal broadband coverage within 10 years as a part or addendum to its comprehensive plan. This plan could be for an individual locality, or as a part of a multi-locality authority, planning district or other grouping of localities. Failure to have, or be working on, such a plan would preclude access to state broadband support programs or state support for pursuit of federal funding programs.

3. **Ensure VDOT continues to improve its conduit policy:** VDOT has done a remarkable job of employing a "dig once" policy, but it has opportunities to improve in two areas. First, it does not always install conduit when engaged in trenching activities, and second, it rarely affixes conduit to bridges, overpasses, and tunnels. The Commonwealth broadband team and VDOT engineers have been working with industry stakeholders to improve bridge standards and notification of industry of new construction, as well as working with VDOT to refine their permitting processes and acquisition of fiber when large-scale projects make use of state right of way.

Coordination:

In addition to specific policy and regulatory changes, a critical improvement in the state's approach to broadband deployment is the coordination of all broadband-related efforts by the Chief Broadband Advisor.

Coordinating staff-level grant application and review processes between DHCD and the Tobacco Commission has ensured that decision-making between the two primary, state funding agencies of broadband infrastructure are consistent and complementary.

Ensuring that agency efforts within the Education, Public Safety, Transportation, Commerce and Trade, and Healthcare secretariats are tracked and, when opportunities for collaboration exist, that they are highlighted and taken advantage of remains a core function of the Chief Broadband Advisor.

B. 2020 legislative changes recommended:

1. **Create communications access for easements:** Currently, many utility companies in rural Virginia have access to their utility poles via easement, meaning they have access to another's property, in this instance, only for the purposes for which they initially gained access, provision of electrical service. This causes problems when property owners refuse to allow telecom companies access to the electrical utility poles on their property. If we were to broaden utility pole easements to include any telecom services we could solve a major deployment problem for the industry

C. Policy challenges not yet met but necessary for full deployment

Even after adoption of recommendations, there will still be obstacles to swift broadband deployment, related to continuation of increases in funding for infrastructure support programs, costs of equipment and engineering for broadband networks, proper implementation of funding programs and support for smart-grid leverage, as well as re-scoping that will be necessary once local planning efforts yield superior data.

Challenges remaining:

1. **Cost of equipment:** One of the primary costs associated with broadband deployment is the expense of the purchase of fiber, switching equipment, transmission equipment, etc. By pursuing policies that reduce the costs of these items the Commonwealth could potentially attract additional sale and manufacture of these items in-state while simultaneously increasing the number of citizens that could be reached per dollar expended.

2. **Cost of shared infrastructure for network deployment:** Another significant cost in the deployment of fiber networks is the cost of attaching communications infrastructure to utility poles owned by a third party. While the FCC sets a fixed rate for investor-owned utilities, municipalities and non-investor-owned utilities can charge a wide variety of rates. Additionally, varying rules and engineering requirements affect timing and compliance costs related with pole attachments. This issue has proven difficult to address in the past, but will likely need to be revisited at some point.

3. **Cost associated with easements during network deployment:** While the parties have begun to negotiate, there remain significant challenges related to the direct costs, engineering costs, and time-of-approval uncertainty related to the crossing of third-party-owned real estate when deploying broadband networks.

4. **Filling gaps and identifying borders of coverage:** Local planning efforts will include identification of served and unserved areas in a more-granular and comprehensive fashion than has been previously available, but there will likely remain serious challenges associated with identifying specific borders and gaps in coverage areas.

5. **Ensuring that new unserved areas aren't created**: If a community reaches universal coverage, but then permits development of new housing or business locations without adequate access to broadband infrastructure, then those citizens and businesses will be new unserved locations. Local governments should require that all new development include provisions for broadband infrastructure.