commonwealth connect

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Report on Commonwealth Connect:
Governor Northam's 2021 Plan to Connect Virginia

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I. Executive Summary

A. The Vision of Universal Broadband

Governor Northam's vision of universal broadband means that every Virginian will have access to reliable, high-speed internet regardless of their geographic location or household income no later than 2024. The work over the past 4 years have connected hundreds of thousands of households, supported projects that cut the digital divide by more than half, established a nationally recognized state broadband program, and set Virginia on a path to be one of the first large states in the country to achieve universal broadband.

To achieve this goal, the Commonwealth's broadband infrastructure must extend to all Virginians to whom it can practically be extended. Additionally, it will require the creation of new policy structures and models of service delivery to support affordable access to the internet for those who cannot afford it via that infrastructure.[1]

Since 2017, the Commonwealth has deployed approximately $124,000,000 in grant funding to connect more than 140,000 homes and businesses. When the Governor entered office, it was estimated that 500,000 connections were needed for unserved Virginians. Now, that number is down to at least 233,500.[2] During this period the Office of Broadband was created at the Department of Housing and Community Development (DHCD) to administer broadband grants and assist localities when planning for universal broadband.

2021 saw many major broadband announcements. In March, the Governor signed legislation from the General Assembly to make permanent an innovative pilot program under which investor-owned electric utilities were able to provide broadband capacity to unserved areas of the Commonwealth. A few months later, Governor Northam and the General Assembly invested an additional $700 million in American Rescue Plan Funding to expedite deployment of last-mile broadband infrastructure across the state.

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[1] For a small subset of Virginians whose homes are too remote for terrestrial infrastructure, satellite broadband will be the proper solution, with sufficiently affluent Virginians paying their own way, and low-income Virginians in remote locations receiving some subsidy.

[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 as of March 2018 based on industry data, the census, FCC data, and statistical analyses: 500,000] – [State grant funded connections to date: 47,000 from TRRC and 78,035 from VATI and 24,026 from CARES Act] – [Federally-funded grant connections: 32,660 from CAF2] – [Self-reported industry connections made without grant funding: 84,786 connections made by electric and telephone cooperatives] = 233,493. There are tentatively 186,475 RDOF connections that have been awarded but until these awards are finalized that cannot be included, and given that they are paid out over a decade, they should remain speculative rather than relied upon.

In response to this increased funding the Virginia Telecommunication Initiative (VATI), a program that funds public-private partnerships providing targeted financial assistance to extend broadband service to areas currently unserved by a provider, saw an unprecedented increase in requests. In September the VATI program received 57 applications from 84 localities, requesting $943 million in funding to connect over 250,000 Virginia homes and businesses.[3] These applications leveraged $1.15 billion in private and local matching funds, continuing the program's efficient use of public funds and bringing the total for project costs to $2 billion.

Awards are expected to be announced in December and it is likely that the next administration will be able to have projects engineered, approved, funded, and under construction that will completely close the digital divide, making Virginia the first large state to do so. These once-in-a-lifetime investments will reduce the goal of closing the digital divide and achieving universal broadband coverage from 2028 to 2024.

B. How the program works

The Commonwealth broadband team will continue to work closely with local governments to identify gaps in coverage and develop plans to fill them. Internet service providers are and will continue to be critical partners in delivering service to unserved areas. Therefore, current providers are incentivized to share their coverage areas during this process in order to avoid overbuilding.

The team will utilize and oversee relevant grant programs to support the construction of new broadband infrastructure to fill current gaps in coverage while also taking into account federal, local, and private sector activity.

Finally, the 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 aimed at eliminating barriers to broadband access, reducing the cost of deploying infrastructure, and bolstering support for low-income Virginians.

C. Where we are, progress so far, and the scope of the problem

Existing maps, including some mandated by the federal government, are not reliable to assess the extent of broadband coverage and gaps in that coverage.[4] As previously mentioned, recent federal, state, and third party data collection efforts suggest that the most conservative estimate of necessary connections remaining is 233,500, less than half of the estimated 500,000 connections needed for unserved Virginians when Governor Northam first took office.[5]

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[3] VATI applications showed approximately 292,935 passings, yet this number will undoubtedly be lower after the VATI challenge process is conducted.

[4] 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.

[5] 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 as of March 2018 based

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 a partner ISP(s) with whom they can develop a deployment plan; 2) determining the likely costs for such a universal coverage plan; and 3) establishing and identifying those assets the community or communities may have to support and implement such a plan.

D. Investing in Virginia's broadband effort

Virginia will need to maintain increased investment in broadband access to achieve functionally universal broadband coverage by 2024. Details related to scoping and how increased funding will be deployed can be found in on page 24.

1. **Maintain VATI Funding at least $50 million for each succeeding year through FY25:** the VATI program is the primary vehicle by which Virginia is incentivizing the creation of new broadband infrastructure in areas where it has not been previously economically efficient for the private sector to do so. These investments are essential to keeping Virginia on track for complete coverage.

2. **Efficiently and Effectively Deploy $700 million American Rescue Plan funding:** the Commonwealth must ensure that the ARPA funding is deployed in coordination with the central tenants of the VATI program: cost efficiency and universality. This funding will work side-by-side with state funds to achieve universal connectivity.

3. **Support and Expand Upon the Digital Equity Program Pilot:** Language in the 2021 Virginia Budget instructs the Department of Social Services, in coordination with the Chief Broadband Advisor, to design a program that provides a fixed reimbursement, which shall not exceed $15 monthly, for broadband service costs for select households currently participating in the Supplemental Nutrition Assistance Program (SNAP). Developing these program guidelines can help bolster existing federally-subsidized broadband assistance through the FCC Lifeline program. Doing so will also take advantage of low-cost plans offered by some private broadband providers. Once the program is designed, the Commonwealth should appropriate sufficient funding to bridge the gap between the $9.25 per month offered federally and the cost of broadband where they reside.

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E. Summary of policy recommendations

Deployment of broadband in the aggressive fashion necessary to accomplish the Governor's goal of universal coverage by 2024 will require:

Non-legislative policy changes:

1. **Request and support local broadband plans:** Localities should be required to adopt a granular plan for universal broadband coverage within 10 years, in order to access state funding support.

2. **Continue to refine and improve the Commonwealth's land-use:** Currently, the Department of General Services (DGS) handles requests to cite telecommunications facilities on Commonwealth-owned land. Greater transparency and consistency is required throughout this process.

3. **Ensure VDOT continues to improve access to rights of way:** The Virginia Department of Transportation (VDOT) should expand its "dig once" policy to include more robust conduit installation and availability.

2021 Legislative changes:

1. **Utility Leverage Program:** HB2304/SB1413 made permanent the pilot program under which investor-owned electric utilities may provide broadband capacity to unserved areas of the Commonwealth. The bill provides that investor-owned electric utilities may recover costs of and revenue generated from providing broadband capacity that serves as an electric grid transformation project in areas unserved by broadband, as defined in the bill. It also consolidates the State Corporation Commission (SCC) petition approval process into one hearing and streamlines the process by which an area is determined eligible. Municipal broadband authorities are allowed to participate.

2. **Create the Virginia Digital Equity Pilot Program:** Budget language directs the Virginia Department of Social Services (DSS), in coordination with Chief Broadband Advisor, to design a program that provides a fixed reimbursement, which shall not exceed $15 monthly, for broadband service costs for select households currently participating in the Supplemental Nutrition Assistance Program (SNAP). DSS shall report on the program design and structure, administrative cost estimates, program guidelines, and other relevant information related to implementation to the Chairs of the House Appropriations and Senate Finance and Appropriations Committees by November 1, 2021.

3. **Broadband Mapping**: Budget language directs the Department of Housing and Community Development (DHCD) $424,000 to create a statewide broadband

availability map with service territory data submitted by Virginia broadband providers. The published map will be anonymized, showing locations served and unserved by broadband without reference to any specific provider. DHCD will also establish a process to petition map inaccuracies.

4. **Municipal Authorities and VATI**: Budget language creates a VATI pilot program in which public broadband authorities may apply directly for Virginia Telecommunications Initiative funds without investment from the private sector. Awards shall not exceed 10 percent of total available VATI funds in FY22. This was a recommendation of the Broadband Advisory Council.

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 and more than 70% of all internet traffic by data volume flows through Northern Virginia. 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 problem that the COVID-19 pandemic has highlighted dramatically. The digital divide still affects the economic prospects, social connectivity, and educational opportunities available to hundreds of thousands of Virginians. In order to meet our obligations to all Virginians, we must ensure residents who do not 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. Without government intervention, residents will never be served in those areas.

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 get online. On July 2nd of 2018, Governor Northam announced that the Commonwealth should achieve functionally universal broadband coverage within 10

years. In August of 2021, due to the success of connecting Virginians and once-in-a-generation federal ARPA funding, this goal was revised from 2028 to 2024.

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 at least $50 million, Virginia will benefit significantly in excess of that figure.

A 2019 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.[6]

The impact on the agricultural economy promises to be even greater. A recent study by the United States Department of Agriculture (USDA) 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, potentially yielding tens of millions more in new annual state revenues.[7]

Real estate values 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.[8]

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 citizens 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

Two years after the first Commonwealth Connect Report was issued, the Commonwealth remains on track to realize the vision of Governor Northam for universal broadband

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[6] 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

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

[8] 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

coverage. The Commonwealth has deployed approximately $124,000,000 in grant funds and this deployment has led to the connection of over 140,895 homes and businesses since 2017.

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. 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 Office of Broadband at DHCD has been expanded, bringing on four new staff (including staff positions absorbed from the broadband team at the Center for Innovative Technology) and creating a Director of the Office of Broadband within the agency. Further, regular communication now exists between the broadband team and agencies like DGS, VDOT, and a variety of other state agencies. This group has continued planning, meeting with stakeholders, standing up working groups, 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 website, which is a comprehensive source of information for all those interested in the broadband effort.[9] 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.[10]

Finally, the Commonwealth broadband team has brought together the Commonwealth Connect Coalition. This coalition of over 120 members as of December 2020 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.[11]

E. Coronavirus Response

The Coronavirus pandemic brought unprecedented challenges to Virginia's unconnected as school and work transitioned virtually and the unconnected were effectively left behind. Governor Northam took several steps to address the digital divide during the pandemic. In October 2020, Governor Northam allocated $30 million in funding from the federal Coronavirus Aid, Recovery, and Economic Security (CARES) Act to improve broadband access. The funding was awarded to 50 localities for 71 projects, which will connect 24,026

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

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

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

unserved locations and 6,796 locations to more affordable broadband.[12] These projects ranged from traditional last-mile build-outs to free service for low-income communities to investments in middle mile networks to increase capacity and facilitate deployment.

To address the digital divide amongst Virginia students, Governor Northam allocated $18.9 million in CARES Act funding for student connectivity and remote learning. Administered by the Virginia Department of Education (VDOE), the Virginia Initiative to Support Internet Outside of School Networks (VISION) grants were awarded to 126 school divisions. These grants will be used by schools to provide computing devices, networking equipment, hotspots and data plans, low-cost Internet programs, and any technical support and training needed to support this technology.

A stop-gap measure utilized throughout the COVID-19 pandemic were free, publicly accessible Wi-Fi hotspots, typically found at community anchor institutions (schools, libraries, etc.) and accessible from the parking lot. While insufficient for true broadband utilization, these hotspots were critical lifelines for the unconnected. To streamline accessing these valuable resources, the Commonwealth broadband team, in partnership with the Center for Geospatial Information Technology (CGIT) at Virginia Tech, launched the Virginia Wi-Fi Hotspot Location Map. The hotspot map eventually included the locations of over 1,200 free internet access points across the Commonwealth.

III. 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. In Virginia, broadband speed is defined in the VATI guidelines and is currently defined as having access to a network that can transmit data at speeds of greater than 25 megabits per second download and 3 megabit per second upload.

3G / 4G / 4G LTE / 5G: These terms refer to different types of cellular networks. In general, cellular networks are not considered broadband for the purposes of state policy. Each "G" refers to a generation of technology, with 4G LTE representing a transitional stage between 3G and 4G. 5G is a technology offering a great deal of promise including extremely high speeds, but currently it is in very early stages of deployment and true 5G is unlikely to be widely available in Virginia in 2021, 2022 or even 2023.

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.

[12] Full list of CARES Act broadband awards can be found here: https://www.commonwealthconnect.virginia.gov/cares-act-awards

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.

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]."

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.

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.

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.

Fiber (Dark): 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.

Fiber (Lit): 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.

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.

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.

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

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

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 is 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.

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.

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.

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.

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.

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

IV. Current Broadband Availability

Previous broadband efforts were significantly hampered by the lack of good data about broadband availability. Commonwealth Connect 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.[13]

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 (10/1 Mbps), and 98.5% have access to a high-speed connection (25/3 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 (10/1 Mbps), and 69% have access to a high-speed connections (25/3 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.[14] <u>This map, while a good faith effort to gather the best data available, is not accurate and should not be relied upon by anyone for anything other than a general overview of network availability.</u>

B. What is not known and why

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

The primary problem with FCC data is the lack of detail 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 service within

[13] 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

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

a 10-day period if requested, regardless of the potential cost, which permitted even more areas that are not currently served to be claimed as served areas.

Feedback from surveys and website traffic on the Virginia Broadband Availability Map[15] show that service is not available in many places where the federal maps suggest otherwise.

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 is not necessary.

Previous Commonwealth Connect reports 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 is not as good as a complete survey of coverage matched to GIS data, but that would be a complex, costly, and time consuming undertaking.

[15] 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/

According to USDA's Economic Research Service, Virginia has a rural population of approximately 1,041,000. [16] According to the 2015 FCC rural broadband report, approximately 64% of Virginia's rural population lacks access to broadband.[17] 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. When we divide the 660,000 unserved population number by the US Census' figure household size the final number of households is 251,908.[18] After 266,507 connections made by state, federal, and private investment, the remaining unserved household number is estimated to be 233,493.

While Federal data is unreliable, for the reasons described above, it can be included in our analysis as a means of setting a lower bound. Census analysis showed unserved home locations of around 287,000 and business locations of around 40,000 across Virginia. Further, when the FCC announced its Rural Digital Opportunity Fund auction (RDOF), it identified 189,358 home and business locations without access to broadband in Virginia.

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.

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 bound" on the number of households that do not receive service

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

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

[18] 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

at around 500,000 as of December 2018, 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.

E. Updated analysis of unserved locations as of October 2021

The Broadband Team's most recent estimate reflects the idea that the true figure is between the "lower bound," reflected by RDOF, and the "upper bound," reflected by the industry data. In an effort to determine a best estimate, our analysis proceeds by subtracting known connections from the largest likely figure that could realistically be considered unserved locations, yielding a current estimate of 233,493 home and business locations without infrastructure access to broadband.

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.

F. 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.

As the program continues to operate in more and more areas of Virginia, the work done by local and regional broadband planning authorities will align the incentives of incumbent providers with those of the Commonwealth. A failure to identify and distinguish areas that already have access to service 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.

V. Broadband Affordability

The COVID-19 pandemic has thrown a sharp spotlight on the other side of the digital divide: hundreds of thousands of Virginians have broadband infrastructure at their homes, but cannot afford to pay for service.

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.

Unfortunately, the $9.25 offered by the FCC under the Lifeline Program[19] is largely inadequate to actually permit Virginians to take service under even the most generous low-cost plans offered by ISPs in Virginia. Adding to these constraints, some of Virginia's largest internet service providers, such as Comcast, do not participate in the Lifeline Program.

Were the Commonwealth to undertake a statewide approach to service provision for low-income Virginians, a wise place to begin that effort would be by leveraging the $9.25 Lifeline Program payments. This program is currently available to all of Virginia's 387,000 Supplemental Nutrition Assistance Program (SNAP) households. In combination with additional state funds, along with potential emergency benefits under the recent stimulus, the Commonwealth could provide some low-income households the opportunity to receive service. This will work for those Virginians able to receive service from ISPs offering low-cost plans. For those living in an area without an ISP offering a low-cost plan, this funding could somewhat reduce the financial burden of broadband.

No matter what approach the Commonwealth pursues, this is a challenging public policy area. No other state in the nation currently has a program that can claim significant success, nor a particularly innovative approach to improving affordability.

VI. 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.

[19] For more info on the FCC's Lifeline Program, navigate to: https://www.fcc.gov/general/lifeline-program-low-income-consumers

According to the December 2019 Form 477 filings with the FCC, there are 171 wireline and fixed-wireless internet service providers in Virginia currently serving customers. However, the FCC filings in not an all inclusive list of internet providers. A comparison of the FCC Form 477 filings and the Commonwealth Connect report indicates that approximately 80% of providers in Virginia are listed in the dataset.[20]

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 – when the municipality is acting as the municipality, rather than through an authority.[21]

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.
- 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).

However, when a locality creates a broadband authority, under the Wireless Services Authorities Act, those restrictions do not apply, and as a result, while the restrictions are not useful, they are also not a significant hindrance to the creation of municipal networks in the majority of Virginia.[22]

There are a number of municipal broadband networks in Virginia; however, there is no authoritative list of current networks.[23]

1. Eastern Shore of Virginia Broadband Authority (ESVBA)
2. Martinsville Information Network (MINet)
3. nDanville
4. Roanoke Valley Broadband Authority
5. Wired Road Authority
6. Fiberlync (Orange County Broadband Authority)

Regional authorities:

[20] With the caveat that, for reasons discussed in this report, this is inaccurate data, FCC Form 477 data can be found here: https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477
[21] 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
[22] https://law.lis.virginia.gov/vacode/title15.2/chapter54.1/
[23] 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

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 33 active authorities in the Commonwealth:

1. Albemarle Broadband Authority
2. Amherst County Broadband Authority
3. Appomattox County Broadband Authority
4. Bath-Highland Network Authority
5. Bedford County Broadband Authority
6. Bland County Wireless Service Authority, Inc.
7. Campbell County Broadband Authority
8. Charlotte County Broadband Authority
9. Cumberland County Wireless Authority
10. Eastern Shore of Virginia Broadband Authority
11. Fauquier County Broadband Authority
12. Franklin County Broadband Authority
13. King and Queen County Wireless Authority
14. Lancaster County Broadband Authority
15. Louisa County Broadband Authority
16. Middle Peninsula Broadband Authority
17. Middlesex Broadband Authority
18. Nelson County Broadband Authority
19. New River Valley Network Wireless Authority
20. Northern Neck Broadband Authority
21. Northumberland County Broadband Authority
22. Orange County Broadband Authority
23. Page County Broadband Authority
24. Portsmouth Community Broadband Network Authority
25. Pulaski County Wireless Integrated Network Authority
26. Roanoke Valley Broadband Authority
27. Rockbridge Area Network Authority
28. Shenandoah Wireless Broadband Authority
29. Southside Network Authority
30. Spotsylvania County Wireless Authority
31. Surry County Broadband Authority
32. Tazewell County Wireless Service Authority
33. Wired Road 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:

VTIA Members:

- Burke's Garden Telephone Company, Inc.
- Empower Broadband Inc. (formerly Buggs Island Telephone Cooperative)
- Highland Telephone Cooperative
- Lumen (formerly CenturyLink)
- Lumos Networks
- MGW Telephone Company
- New Hope Telephone Cooperative
- Pembroke Telephone Cooperative
- Peoples Mutual Telephone dba RiverStreet Networks
- Scott County Telephone Cooperative
- TDS Telecom

VMDAEC membership:

Members (An asterisk denotes which cooperatives have last-mile broadband subsidiaries):

- 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. They now own and operate over 1,800 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

2019 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 are 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. This legislation was made permanent in the 2021 General Assembly Session.

So far the program has facilitated universal broadband coverage in Grayson, Surry, Northumberland, Westmoreland, Richmond, Lancaster, and King George counties. Dozens more additional universal projects are under review in the FY22 round of VATI.

VII. 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.[24] Minnesota has allocated over $125 million for broadband support programs.

Since 2017, the MN state legislature has directed $125 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, based on provider submitted data[25], to represent areas of broadband service availability. Similarly, in Utah, the Broadband Outreach Center[26] 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.

Georgia perhaps has the most robust broadband mapping nationwide, with a parcel-level broadband availability map that shows served and unserved areas of the state. The state developed this map apart from federal data and the finished product demonstrates clearly the shortcomings in the Federal FCC broadband map. The map was developed with

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

[25] 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.

[26] More on Utah's mapping program can be found here: https://broadband.utah.gov/

participation from 43 of the 44 Georgia broadband providers.[27] With this premise level map, Georgia has a much clearer picture of where and how much investment is needed and the black-white data will certainly streamline their grant program.

In 2018, on the heels of a Purdue University study[28] estimating the return of four dollars to the local economy for every dollar spent rural broadband deployment, Indiana unveiled a $1 billion[29] infrastructure plan, which included $100 million for broadband. The Next Level Connections Grant program, which is funded from toll road revenue, so far has awarded $100 million in projects.

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.[30] 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.

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.[31]

Throughout 2020, over 30 states devoted large portions of their allotment from the Coronavirus Aid, Relief, and Economic Security (CARES) Act to broadband deployment. Several increased existing state broadband grant programs, including $100 million in Arkansas[32], $61 million in Tennessee[33], and $50 million in New Hampshire[34]. Other states have devoted CARES Act funding to other broadband ventures, such as $40 million in Arizona to construct a state-owned open access, middle mile network.[35] Like Virginia,

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[27] The Georgia broadband plan is here: https://broadband.georgia.gov/media/15/download

[28] That study is available here: https://www.pcrd.purdue.edu/files/media/006-RPINsights-Indiana-Broadband-Study.pdf

[29] Indiana's program details can be found here: https://www.in.gov/gov/files/NextLevel%20Connections%20facts%20sheet.pdf

[30] Colorado's program details are here: https://leg.colorado.gov/sites/default/files/documents/2018A/bills/2018a_002_signed.pdf

[31] Illinois' broadband announcement: https://www2.illinois.gov/dceo/Media/PressReleases/Pages/PR20190815.aspx

[32] Arkansas' program website: https://broadband.arkansas.gov/

[33] Tennessee announcement: https://www.tn.gov/governor/news/2020/8/21/gov--lee-announces--61-million-in-emergency-broadband-grants.html

[34] New Hampshire announcement: https://www.goferr.nh.gov/covid-expenditures/connecting-nh

[35] Arizona announcement: https://azgovernor.gov/sites/default/files/flexibility_and_funding_for_schools.pdf

many states have or are in the process of dedicating large portions of their American Rescue Plan Act (ARPA) funding to broadband.

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 Commonwealth Connect vision.

North Carolina's Broadband Infrastructure Office (BIO)[36] 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 Technologies (GREAT) Grant Program.[37] 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[38] (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

[36] North Carolina's program website is: https://www.ncbroadband.gov/
[37] Details on North Carolina's grant program can be found here: https://www.ncleg.net/EnactedLegislation/SessionLaws/HTML/2017-2018/SL2018-5.html
[38] 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

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."[39] The West Virginia Division of Highways (WVDOH) has since issued guidance [40] 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[41]. The state credits their broadband-friendly policies including providing access to the state's rights-of-way 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.[42] 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

[39] West Virginia's conduit program legislation is here: http://www.wvlegislature.gov/Bill_Text_HTML/2018_SESSIONS/RS/bills/HB4447%20SUB%20ENR.pdf

[40] 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

[41] 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

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

$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.

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

A. Virginia Telecommunication Initiative (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.[43] Given Virginia's relatively high population density, the cost of functionally universal coverage is achievable. The Commonwealth will need to continue to make significant investments in the VATI program to ensure every Virginian has access to broadband.

B. Rural Digital Opportunity Fund (RDOF)

The Rural Digital Opportunity Fund (RDOF) auction preliminary results were released in December 2020 and resulted in $238 million awarded to connect 186,475 locations across the Commonwealth. Winning bidders have until June 2021 to officially accept the bid and commit to build to their winning locations.

The FY21 round of VATI and RDOF auction occurred concurrently, which led to the programs interacting and VATI awards leveraging/extending RDOF awards. The total number of VATI connections for FY21 is 25,147 yet this does not factor in the several projects that were able to win and accept bids on RDOF areas because of the VATI support in adjacent locations. These VATI-leveraged RDOF passings totaled 7,445.

C. Assumptions and timeline

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. VATI remains 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.

[43] 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

5. "Smart grid" telecommunications networks constructed by utilities will have the opportunity to reduce the costs of accessing especially hard-to-reach areas.

D. Cost Escalations

As private and public investments in broadband continue to connect the least expensive locations, each year of the broadband effort will see a rise in costs due. Compounding this escalation have been unforeseen macroeconomic strains placed on the telecommunication industry due to the COVID-19 pandemic and subsequent federal funding infusions into broadband. In the past year alone the federal government conducted the $9 billion Rural Digital Opportunity Fund (RDOF) and infused billions more into broadband by way of the CARES Act and American Rescue Plan Act (ARPA).

Simply put, there are not going to be enough work crews, fiber-optic cable, wireless broadband transmission equipment, and other materials to meet the demand of the federal government, dozens of state programs, and private investment. Virginia ISPs have universally shared their experiences with increased demand of materials and inability to secure labor within their organization, leading to a sharp rise in costs. Due to these restraints, it is estimated that costs will double over the next 24 months. The FY21 VATI round saw an average state cost per passing of $1,997. Factoring in rising costs due to industry strain as well as more expensive locations each year, it is estimated that the future average cost state cost per passing will rise to an average of approximately $4,000.

Despite rising costs, Virginia is well positioned compared to other states because of a well-established grant program, improved economics from the utility leverage program, and deep local expertise in developing plans to achieve universal coverage. With aggressive investment, Virginia can close the digital divide well before the original goal of 2028 by 2024.

E. Year by year infrastructure spending estimates

Looking at the prior years of VATI-supported projects, the anticipated, steady, escalation of costs has occurred:

Historical VATI Figures for State Cost Per Passing

Fiscal Year	VATI Funding	State Cost per Passing by Year	State Cost per Wireline Passing by Year	State Cost per Wireless Passing by Year
2017	$1m	$597.25	$572.26	$511.01
2018	$1m	$1,889.43	$1,889.43	N/A
2019	$4m	$323.23	$1,051.42	$175.03
2020	$19m	$507.52	$1,590.81	$624.86
2021	$50m	$1,997.27	$2,189.55	$730.56

Prior to the new economic conditions, anticipated funding over the seven-year period to accomplish universal coverage total $1 billion by 2028, with $333 million needed in state investment, $333 million in federal investment, and the remaining $333 million investment from the private sector and local governments. Our original estimate is impacted by macroeconomic trends in the telecommunications industry and the proposed acceleration of our timeline of accomplishing universal coverage from 2028 to 2024 using American Rescue Plan funding.

Our revised estimate to accomplish universal coverage total $1.6 billion by 2024, with $850 million needed in state investment ($150 million in VATI and $700 million in American Rescue Plan) and $666 million from the private sector and local government. With a combined $7 billion in discretionary funding delivered to state and local governments in the Commonwealth, additional local funding is expected to be contributed to the goal of universal funding, with the private sector also increasing investment to unlock these additional funding sources.

Three Year Plan State-Only Investment Scenarios

Year	Passings/Year	Cost/Pass	Total Cost	VATI	Federal Funding Required
2022	77,834	$ 3,500	$272,416,667	$50m	$222,416,667
2023	77,833	$ 3,600	$280,200,000	$50m	$230,200,000
2024	77,833	$ 3,821	$297,383,333	$50m	$247,383,333
Totals	233,500		$850m	$150m	$700m

The reason the expected private-sector share of funding has declined is that, while project costs are expected to rise, the revenues derived from those projects will not. It's reasonable to expect the share funded by private actors to decline on a percentage basis when the total cost of a project increases by 30-40% but the revenues remain flat. Further, while additional federal funding has been proposed by the federal executive branch around infrastructure, including construction of broadband networks, this funding cannot confidently be considered for this report.

Broadband Expansion Cost Share Scenarios, Three Year Plan

	Original Projections through 2028	*Revised Projections with Economic Factors, Accounted*
State Government Investment	*$333m*	*$850m**
Federal Government Investment	*$333m*	*$78.6 million***
Local Government and Private Sector Contributions	*$333m*	*$666m*
Total Cost	*$1b*	*$1.6b*

**$700M in discretionary American Rescue Plan funding included as state investment.*
***Estimated payments to FCC RDOF Phase I awardees based on the 10-year payment schedule. This figure represents estimated payments to awardees in the first three years. Please note this is subject to change.*

This is a conservative approach. One of the strengths of the broadband program is that it is focused on one-time capital expenditures. As a result, should achieving universal coverage be accomplished under-budget, unexpended funds can be re-tasked to accomplish other goals of the Governor or General Assembly.

IX. Policy Recommendations and Remaining Challenges

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.

Agency actions:

1. **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.

2. **Continue to refine and improve the Commonwealth's land-use:** Currently the Department of General Services (DGS) handles requests to cite telecommunications facilities on Commonwealth-owned land, but greater transparency and clarity is required.

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

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 Health and Human Resources 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.

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. **Ensuring that new unserved areas are not 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.

4. **Affordability:** While the pilot program at DSS is a strong first step, the Commonwealth will need to take further steps to support the creation of programs that will both subsidize service for some low-income Virginians, and support construction of purpose-built networks to get service to low-income Virginians in dense areas.