



Dominion Energy's

BROADBAND FEASIBILITY REPORT

**to the Governor, the State Corporation Commission, the
Broadband Advisory Council, and the Chairmen of
House and Senate Committees on Commerce and Labor**

December 1, 2018

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I. EXECUTIVE SUMMARY

As set forth in Enactment Clause 13 of Section 56-585.1 of the Code of Virginia (“Enactment Clause”), Dominion Energy Virginia (“Dominion Energy” or the “Company”) investigated the feasibility of providing broadband internet services using its electric distribution and transmission infrastructure. Per the Enactment Clause, the study included evaluation of barriers to such services and potential solutions to address such barriers. Dominion Energy also provided input about whether it is in the public interest and the “interest of the utility”¹ to provide broadband services to unserved areas of the Commonwealth.

This feasibility report (“Report”) outlines the current status of broadband in Virginia, which informed Dominion Energy’s analysis and conclusions pertaining to the deployment and barriers associated with enabling broadband throughout the state. Acknowledging that there is disparity within the Commonwealth as to broadband internet service accessibility, Dominion Energy undertook this analysis with a comprehensive view of broadband service levels, technologies, and existing electric infrastructure.

One reason for this disparity is the unregulated nature of the broadband services sector. Without an obligation to serve rural areas or a means to socialize the costs of creating access where it is not profitable to do so, companies providing high speed internet access have little incentive to expand their communications infrastructure into less populated areas in the Commonwealth, to the disadvantage of students, citizens and businesses located in those areas. As a regulated electric service provider, on the other hand, Dominion Energy’s

¹ “Interest of the utility” is not a defined term in the Code of Virginia. For purposes of this report, Dominion Energy has interpreted “utility interest” to refer to an incremental value to its traditional electric utility functions.

duty to provide electricity to all within its service territory puts it in a unique position to bridge the current broadband gap by leveraging its infrastructure if instructed to do so.

The Enactment Clause specifically references “unserved areas in the Commonwealth,” a term that is not specifically defined in the Code of Virginia.² The Federal Communications Commission (“FCC”), however, defines “broadband” as 25 Mbps download speed and 3 Mbps upload speed or greater. For geographic comparison, the Center for Innovative Technology (“CIT”), in coordination with others, has developed a Virginia Broadband Availability Map³ that identifies at a census block level “unserved areas,” defined as less than 10 Mbps download and 1 Mbps upload (“10 / 1 Mbps”), and “underserved areas,” defined as greater than 10 / 1 Mbps and less than 25 / 3 Mbps.⁴ For the purposes of this Report, Dominion Energy defines “unserved” areas as those that do not have access to 25 / 3 Mbps broadband speeds. Approximately 9.5% of Virginians are included in these unserved areas, while approximately 4% of Dominion Energy customers do not have access to 25 / 3 Mbps broadband. Dominion Energy relied on CIT and FCC data to correspond the unserved and underserved areas (*i.e.*, 25 / 3 Mbps) to Virginia localities in order to support a system-wide analysis of its service territory and existing infrastructure, consistent with the Enactment Clause. Instead of merely examining opportunities within its certificated retail service territory, Dominion Energy focused on all unserved areas in which its electric infrastructure currently exists, which includes 73 of the 95 counties in the Commonwealth. Through this comprehensive approach, Dominion Energy endeavored to meet both the letter and intent of the Enactment Clause.

² In certain circumstances, areas with access to satellite services are excluded from “unserved area” definitions.

³ See <https://www.cit.org/service-lines/broadband-mapping/>.

⁴ Because the data set defines “covered” as any census block with at least one address that has service, the overall broadband coverage data is typically overstated.

During the development of this Report, Dominion Energy engaged numerous and varied stakeholders in the broadband markets to understand existing need, current initiatives, barriers to broadband expansion, and potential solutions to resolve the digital divide. This outreach confirmed that there is no clear singular solution to expand access to broadband internet services. Several electric cooperatives, as part of the electric service provider community, are also engaged in or expressed interest for broadband expansion in their respective areas.

Dominion Energy's evaluation concludes that there are opportunities to leverage existing electric infrastructure to support expanded deployment of broadband in the Commonwealth provided that certain barriers are addressed, including corporate powers, real property rights, and cost recovery, among others. The most promising opportunity at this time appears to be leveraging both existing Dominion Energy electrical distribution and transmission infrastructure and the foundational, forward-looking telecommunications strategy and solution (the "Telecommunications Strategy") Dominion Energy proposed in its Grid Transformation Plan ("GT Plan"), authorized by the Grid Transformation and Security Act of 2018 ("GTSA").

A key component of the Company's proposed Telecommunications Strategy includes solutions which utilize various broadband technologies to electric distribution substations that will serve as a critical communications backbone to provide real-time grid status and control. This planned communications backbone could be adjusted to support additional broadband needs beyond those directly related to the requirements of the GTSA as proposed in the Company's GT Plan. Under this scenario, which contemplates the provision of broadband services in conjunction with the proposed GT Plan, Dominion Energy would serve as a "middle mile" broadband resource to enable other entities to reach

unserved customers through their established last mile initiatives and business models.

While this scenario most effectively leverages existing infrastructure and proposed plans for utility telecommunications network deployment, other scenarios involving Dominion Energy extending broadband infrastructure to, or closer to, the end-user may also benefit the public and the Commonwealth's objectives.

To address the Enactment Clause, Dominion Energy considered several potential broadband internet service models. At one end, the Company evaluated the feasibility of serving as a "middle mile" provider and bringing fiber to one or multiple substations in an unserved area. At the other end, it evaluated the possibility of serving as a "last mile" broadband Internet Services Provider ("ISP") through both a Fiber to the Home ("FTTH")⁵ approach and a Fixed Wireless approach. The Company also evaluated several other scenarios in the Report. Each model considered different technologies and electronics to evaluate options to expand broadband coverage in Virginia.

In this Report, Dominion Energy concluded that bringing fiber to its substations located in unserved areas is the model best aligned with utility interest,⁶ public interest, existing infrastructure usage, and the Telecommunications Strategy proposed in the GT Plan. The Company's ability to bring fiber to these substations would enable another third party (such as a cooperative or a Wireless ISP ("WISP")) to subsequently connect to this fiber backbone to provide broadband services to residents of that area. In areas where such a third party is not present, Dominion Energy may be able to provide broadband services leveraging a Fixed Wireless or FTTH approach. These approaches, however, are subject to a detailed site by site analysis, appropriate cost recovery clarity, and relevant approvals and

⁵ "FTTH" is the installation of fiber to end-users, both residential and commercial.

⁶ See note 1 *supra*.

cooperation from the State Corporation Commission (“SCC”) and other stakeholders. For Dominion Energy to undertake or collaborate in these activities, several barriers would need to be addressed, including corporate powers, easements, and property rights, among others.

Dominion Energy recognizes that broadband access and adoption support economic development and social equity while simultaneously promoting public health, public safety and educational opportunities for citizens of the Commonwealth. And, like other electric service providers in the Commonwealth, Dominion Energy may be suited to assist in providing that access. The Company’s proposed GT Plan, currently pending approval by the SCC, provides a solution that could help expand broadband internet service to the unserved areas in Virginia. Should the SCC approve the Company’s GT Plan in whole and the legislature find broadband expansion in the public interest and available for full cost recovery by the incumbent electric utilities, Dominion Energy would welcome the opportunity to support the Commonwealth in its initiative to bring broadband internet service to unserved areas.

II. BROADBAND LANDSCAPE

In this section, Dominion Energy provides an overview of the current status of broadband within Virginia. The section concludes with a discussion of Dominion Energy’s objectives and approach for this Report.

A. Definitional Framework

The FCC’s definition of “broadband” is provided in Section 706 of the Telecommunications Act of 1996 (P.L. 104-104) (“Telecom Act”): “high-speed, switched, broadband telecommunications capability that enables users to originate and receive high quality voice, data, graphics, and video telecommunications using any technology.”

Additionally, the FCC broadband definition requires a speed benchmark of 25 Mbps download and 3 Mbps upload (25 / 3) for fixed broadband.⁷

Of note, some funding programs and definitions for fixed broadband benchmarks can require less than 25 / 3 Mbps and are often set at 10 / 1 Mbps. However, Dominion Energy has applied the 25 / 3 Mbps benchmark for broadband speed requirements when assessing various business models given the continued advancement of broadband technology and the sustainability of technologies selected.

The CIT, in partnership with the Center for Geospatial Information Technology, The Office of Telework Promotion and Broadband Assistance, and others, developed a Virginia Broadband Availability Map.⁸ The map identifies “unserved areas” (less than 10 Mbps and 1 Mbps upload) and “underserved areas” (greater than 10 Mbps download and 1 Mbps upload and less than 25 Mbps download and 3 Mbps upload). For the purposes of this Report, Dominion Energy used this Virginia Broadband Availability Map as a resource to identify the unserved areas of the Commonwealth according to the FCC definitions (below 25 / 3). Because the data set defines “covered” as any census block with at least one address that has service, the overall broadband coverage data is typically overstated; however, it is the only comprehensive resource available for the region.

In addition to an “unserved” definition, it is also important to define the different broadband infrastructure components that Dominion Energy used to explain the models in subsequent sections. Broadband infrastructure consists of three main components⁹:

1. The internet backbone consists of very large capacity fiber optic trunk lines that interconnect large computer networks and Tier 1 ISPs. These data routes

⁷ Additionally, “mobile broadband” is evaluated separately by the FCC and its speed benchmark is set at 10 / 1 Mbps. That is considered outside of scope for this Report.

⁸ Center for Innovative Technology (2016, December). *Virginia Broadband Availability Map and Integrated Broadband Planning and Analysis Toolbox*. Retrieved from <https://broadband.cgit.vt.edu/IntegratedToolbox/>

⁹ *WI Public Service Commission, UW-Extension Madison, and the Center for Community Technology Solutions (2014, January). Wisconsin’s Broadband Reference Guide*. Retrieved from <https://broadbandmatters.com/what-broadband>.

interconnect multiple fiber-optic lines capable of transmitting extremely large amounts of data. It provides a path for the exchange of information to which local or regional networks can connect. These data routes and backbone connections are owned by private providers and commercial, government, academic, and other non-profit institutions. Tier 1 providers maintain their networks and sell their services to ISPs that provide middle mile services or local services to end consumers and businesses.

2. The middle mile links the backbone to the local ISPs and telecommunications providers that serve business and consumers directly. In some communities, the middle mile may connect large enterprises and anchor institutions that enable them to share applications, infrastructure, and other resources without going through a local ISP. These networks, primarily constituted of fiber optic cables, provide a backhaul link between local ISPs' end-customers and the backbone of the internet. Depending on the availability of fiber and location of the local ISPs, the lack of access to middle mile services can be a barrier to broadband expansion, particularly for independent, local ISPs.
3. The last mile brings the broadband connection to residents' homes and businesses within the provider's coverage areas. The last mile is defined as the final connection point that reaches the end-user's premise. This is typically the most expensive component of broadband infrastructure and the most challenging component for rural broadband. One of the key variables that impacts the cost-effectiveness of last mile solutions is subscriber density. The lower the density the higher the cost/subscriber and the tougher the business case. The last mile component consists of the most varied technology solutions (as identified in the

Table below) and typically poses the greatest challenges and focused efforts for broadband availability.¹⁰

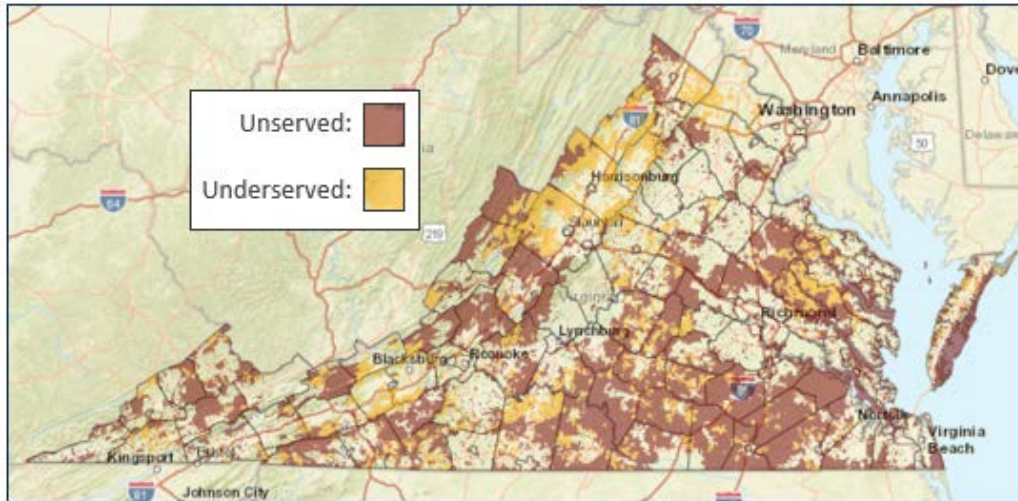


Figure 1: Virginia Broadband Availability Map¹

B. Technology Comparisons

There are many different technologies today that can bring broadband to end-users and institutions. This section defines the different components of the broadband infrastructure and existing technologies.

¹⁰ FCC (2017, September 8). *Getting Broadband Q&A*. Retrieved from <https://www.fcc.gov/consumers/guides/getting-broadband-qa>

Technology (National / VA Coverage) [Typical Speed]	Description	Benefits	Limitations
Digital Subscriber Line (“DSL”) (90% / 76%) [5- 25 Mbps]	DSL runs over copper lines and allows consumers to access the internet by using their existing telephone lines but allows calls and data to be transferred at the same time. Very High Bitrate DSL (“VDSL”) and new technology have increased speed. However, in some areas of Virginia copper lines are not being repaired at an adequate rate.	<ul style="list-style-type: none"> - Large coverage area - Phone can be used while on the internet 	<ul style="list-style-type: none"> - Service diminishes the further data travels along copper lines - Limited throughput - Copper plant is at end of life, service could go away in some rural areas soon - Carriers are looking to retire the copper networks and infrastructure <p><i>Not considered for purposes of this Report because it does not make use of existing facilities or the GT Plan.</i></p>
Cable (85% / 88%) [5-100 Mbps]	Cable is one of the most common forms of access, but speeds vary significantly by area. Cable service is provided through coaxial cable and can deliver fast and reliable “last mile” internet access to consumers. However, a copper line can slow down service as it extends from the central office.	<ul style="list-style-type: none"> - Large coverage area - Relatively fast speeds - Low latency - Continues to see technology improvements and investment by cable companies 	<ul style="list-style-type: none"> - Shared bandwidth - Need fiber backbone to deliver higher speed broadband - Requires upgrades needed to support very high-speed broadband <p><i>Not considered for purposes of this Report because it does not make use of existing facilities or the GT Plan.</i></p>
Fiber Optic (25% / 48%) [>25 Mbps]	Fiber is the most desired internet connection as it is the fastest form of broadband technology. Most of the backbone and middle mile is deployed using fiber optic cable. Fiber optic cable can offer much faster speeds over longer distances than both DSL and cable. It is also the latest technology and even if broadband speeds increase significantly, a single existing fiber optic connection can still support it.	<ul style="list-style-type: none"> - Improvements of data throughput are continuously happening - Very low latency 	<ul style="list-style-type: none"> - Relatively expensive last mile solution

Technology (National / VA Coverage) [Typical Speed]	Description	Benefits	Limitations
Fixed Wireless (51% / 25%) [10 – 50 Mbps]	Residential fixed wireless solutions travel through radio waves transmitted by access points which are usually mounted on freestanding towers. Fixed wireless speeds are comparable to DSL or cable. However, the technology is constantly evolving, still requires very highspeed back-haul, and is highly dependent on local terrain. Additionally, business-level fixed wireless can offer 500 Mbps symmetrical plans that rival dedicated fiber in terms of reliability, security, and speed of installation. While not as fast as fiber optic cable, it can be a good alternative when there is a low concentration of customers over a larger territory.	<ul style="list-style-type: none"> - Fast deployment - Large coverage area - Lower speed than high speed Fiber, Cable, and VDSL 	<ul style="list-style-type: none"> - Access to towers - Foliage and terrain impacts coverage - FCC limits useable frequencies - Independent Wireless Operators are often capital constrained
TV White Space (N/A) [up to 25 Mbps]	TV White Space is an emerging technology and a subset of fixed wireless solutions. It uses the unused spectrum between local broadcast channels in the ~600 MHz range to send signals to rural areas. This frequency can travel rugged terrain and several miles.	<ul style="list-style-type: none"> - Fast deployment - Unlicensed spectrum - Travels rugged terrains - Potentially a good fit in rural VA 	<ul style="list-style-type: none"> - The FCC’s level of commitment to this technology has been unclear, as it has become available with broadcast HDTV - Technology is still considered in the early stages by the industry - Many telecom companies are interested in purchasing the unused TV spectrum <p><i>Not considered for purposes of this Report because it does not make use of existing facilities or the GT Plan.</i></p>

Table 1: Broadband Technology Comparison

C. Need for High Speed Broadband

Availability of high-speed broadband access plays a critical role in economic development. Today, most businesses consider broadband an important resource and would not consider operating in or moving to a region without high-speed internet access. Communities that lack high-speed broadband service are at a significant disadvantage for attracting and retaining businesses and residential growth.

High-speed internet access is essential for educational institutions and for students to do their homework and pursue their studies at home. The main driver of bandwidth demand at schools is that more classrooms and resources are online, and those classrooms have more and more connected devices, interactive lessons, and internet-reliant homework assignments. In addition, a growing number of states are administering student academic achievement testing online. The formal and informal education of the labor market is also adversely impacted by the lack of access to cost-effective high-speed broadband at home.

High-speed broadband can also improve healthcare in a region and reduce overall costs. Health providers are offering broader telemedicine and telehealth services which offer in-home services to patients. There is a wide variety of healthcare-related services that require high-speed broadband, including sharing of medical records, remote monitoring of patients, and communicating via videoconference with medical professionals in other locations.

In summary, Dominion Energy identified the potential positive impact of broadband to the Commonwealth:

1. Economic Development: Availability of high-speed internet is crucial to attracting innovative technology companies and highly-skilled talent outside of major urban centers.
2. Education Access and Equity: Educators are increasingly using the internet to enhance lessons and even require internet access outside of the classroom.

An FCC study found that 7 in 10 teachers assign homework that requires an internet connection. Expanding access to internet promotes equity for students in competition for higher education and job opportunities.

3. Employment Opportunity: Access and opportunity for good jobs are now tied to access to high speed internet. According to Pew Research, 79% of Americans now use online resources during the job search process, and for 34% of job seekers, online resources are the most important tool in finding a job.

Closing the digital divide by furthering the deployment of advanced telecommunications capabilities remain the top priority for the FCC, and its 2018 Broadband Deployment Report concludes there is much work still to be done.

Many state and local legislators and organizations have put significant effort and resources towards eliminating the digital divide and bringing broadband to unserved areas of the Commonwealth. They recognize the importance of broadband and the impact it has on economic development, education access and equity, and employment opportunities.

D. Approach

Dominion Energy's approach to this Report is based on several guiding principles that comport with the CIT's stated mission to "accelerate the socio-economic growth of Virginia's rural and unserved areas through the application and use of broadband telecommunications." Dominion Energy outlined several guiding principles to support its objectives:

1. Evaluate existing broadband technologies and business models without bias;
2. Identify opportunities to accelerate broadband deployment or improve areas that do not meet the 25 / 3 Mbps speed benchmark;

3. Develop a report that incorporates input from key stakeholders (*e.g.*, localities, electric cooperatives, neighboring utilities, broadband-related authorities, private providers, state and local organizations, and legislators);
4. Consider all geographic areas in Virginia in which Dominion Energy has transmission and / or distribution infrastructure;
5. Focus on opportunities where Dominion Energy is in a unique position to support broadband delivery to rural and unserved areas;
6. Align Dominion Energy's transmission and distribution infrastructure plans and proposed grid transformation projects to promote efficiency;
7. Determine the barriers and challenges to broadband expansion to inform practical conclusions; and
8. Remain cognizant of Dominion Energy's primary responsibility to deliver safe and reliable power to its customers.

Overlaid on these guiding principles, Dominion Energy developed this Report to meet all requirements stated in the Enactment Clause.

III. STAKEHOLDER ENGAGEMENT

As part of the Report, Dominion Energy spoke with numerous and varied stakeholders across the broadband ecosystem. This section outlines the types of stakeholders that were engaged and their perspective on rural broadband.

A. Stakeholders

The discussions with stakeholders were critical to obtain an understanding of the barriers to broadband expansion, current initiatives, and potential solutions to solve the digital divide. This information was key to understanding the proper criteria for assessing the value to ISPs, businesses, residential customers, and communities for the different business models that were considered. These meetings were conducted both in person and

over the phone. Information and feedback were also collected via emails. The table below outlines the different types of stakeholders that Dominion Energy engaged during this analysis.

Stakeholder Type	Description	Objective
Electric Providers	Other electric utilities and electric coops that operate in Virginia	Informed demand assessment in local area, current efforts, and opportunities for collaboration
ISPs	National and local ISPs that deliver broadband and other services	Understand the barriers to broadband expansion and opportunities for collaboration
Organizations	Federal, state, and local organizations focused on bringing economic development and/or broadband to rural areas	Informed demand assessment in Virginia, understand current initiatives and opportunities for collaboration
Localities	Counties and cities that Dominion Energy serves (Distribution Customers)	Inform demand assessment, existing initiatives in local areas and long-term franchise and / or financial collaboration
Legislators	Individuals that have an interest in rural broadband initiatives and policies	Understand existing initiatives and potential future efforts
Regulators	Broadband-related authorities in VA	Inform supply assessment and true barriers to broadband expansion and seek input

Table 2: Stakeholders Engaged Through the Process

Over the course of several months, Dominion Energy reached out to at least two entities in each group to solicit information and perspectives on broadband. The results of this Report would not have been possible without collaboration and valuable input from these identified stakeholders. In addition, the Company met with SCC Staff to seek guidance and input.

B. Common Themes

Collecting feedback from a variety of perspectives provided a thorough overview of the current state of rural broadband in Virginia and a vision for the Commonwealth’s future. Common themes and feedback provided by these stakeholders include:

- Because broadband is not regulated like electric, there is no existing requirement to bring broadband to all areas.
- The main challenge for expanding broadband coverage to all areas is low population density, inadequate access to low-cost capital thereby increasing the cost to serve per customer, and unknown adoption rates.
- CIT's broadband coverage map was confirmed as the best source of data for broadband coverage information. However, the map requires further validation in the field prior to planning and investment.
- A desire to leverage Dominion Energy's Transmission and Distribution infrastructure for middle mile deployment exists among some stakeholders.
- Concerns about real estate rights and service territory limitations are prevalent.
- Degradation of existing copper-based wirelines will exacerbate broadband coverage gaps.

IV. PUBLIC INTEREST

As discussed previously, high-speed broadband access would lift significant barriers to economic development, educational access and equity, and employment opportunities. As existing copper infrastructure degrades, the inequities of broadband access in the Commonwealth will likely exacerbate. The Company believes that bridging the broadband divide, for these reasons, is in the public interest.

A legislative directive or a finding by the SCC can establish that provision of broadband by an incumbent electric utility is in the "public interest." The Company presented in this Report a number of important public policy objectives, including economic development and educational access and equity, that support expansion of broadband internet service to unserved areas of the Commonwealth in general. During the Company's

stakeholder discussions, local and state officials, as well as other constituencies, uniformly supported broadband expansion in Virginia, joining the voices of federal agencies advocating for the same, including the FCC and the United States Food Administration’s Rural Utilities Services division. The analysis in this Report thus helps provide additional basis for a finding by the SCC or a legislative directive on behalf of the Commonwealth that broadband is in the public interest.

V. POTENTIAL DEPLOYMENT MODELS

The Enactment Clause sets forth three categories for electric utility provision of broadband internet services:

- (i) *To make improvements to the distribution grid in furtherance of providing such broadband Internet services in conjunction with its [GT Plan];*
- (ii) *To operate broadband Internet services using utility distribution and transmission infrastructure to provide broadband services to unserved areas in the Commonwealth; [and]*
- (iii) *To permit a commercial entity to lease such capacity to provide broadband Internet services to unserved areas of the Commonwealth.*

In order to conduct a comprehensive evaluation, Dominion Energy started with a bottom-up review of its electric facilities in and around the unserved areas of the Commonwealth, specifically all unserved areas in which its electric infrastructure currently exists. It evaluated several scenarios to enable broadband service within Virginia. These models comprehensively addressed the three categories set forth in the Enactment Clause.

These models are depicted in the following graphic and are further described below. “Utility interest” for each model, for purposes of this Report, is interpreted to mean incremental value to Dominion Energy’s traditional electric utility functions.

	Models
1	Substation
2	Additional Access Points
3	Distribution Main Line
4	Distribution Transformer
5	Full Delivery

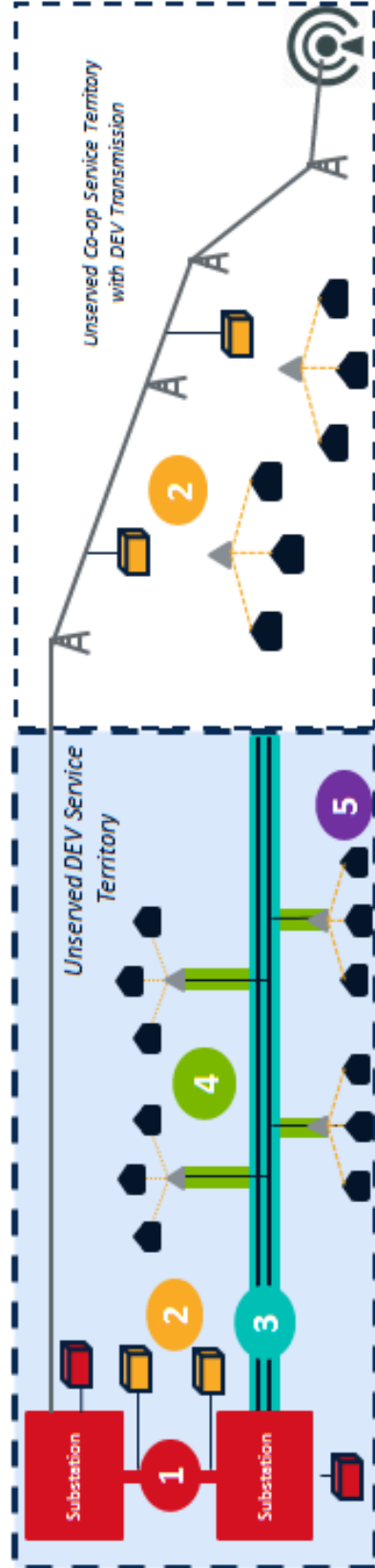


Figure 2: Description of Proposed Models

Model 1 “Substation”

Under this substation model, Dominion Energy would build fiber between its substations for the purposes of internal communications and operations and then lease excess capacity to third parties. The GT Plan, as proposed, contemplates creating a telecommunications network for a large number of distribution substations, similar to the network already in place on the electric transmission system. Model 1 contemplates establishment of a communications cabinet near the substation and the ability for third-parties to directly interface into Dominion Energy’s dark fiber plant and facilitate the delivery of internet services to residents in the proximity of that substation. An advantage of this approach is that it not only enables rural broadband but also increases reliability and resiliency for electric distribution services and supports the integration of Distributed Energy Resources (“DERs”).

Dominion Energy has envisioned bringing fiber to all substations that are geographically located within an unserved broadband area and that do not currently have fiber. These 160 substations would serve as access points for third party providers. A more detailed analysis of geography, existing infrastructure, and third-party ISP telecommunications requirements will ultimately determine the number of access points needed to adequately provide broadband services to each unserved area.

The Telecommunications Strategy proposed in the GT Plan includes deployment of various broadband technologies and telecommunication solutions that will serve as the communications backbone to provide real-time grid status and control. This planned communications backbone could be adjusted to support additional broadband needs beyond those directly related to the requirements of the GTSA as proposed in the Company’s GT Plan. Combined with the work contemplated by the GT Plan, the Company estimates costs for Model 1 up to approximately \$310 million. This cost would be approximately \$75 million higher without the planned Telecommunications Strategy investments proposed in

the GT Plan. Thus, marrying broadband solutions with the proposed Telecommunications Strategy both enables broadband access and enhances grid resiliency and DER integration. This approach also provides significant value to traditional utility operations and therefore is likely in the interest of the electric utility, as interpreted for this Report.

To be successful, Model 1 requires active participation and interest from local ISPs to provide the actual internet service and to reach unserved customers by bringing broadband access from the substation to the home. The Telecommunications Strategy proposed in the GT Plan includes the development of a telecommunications network for a large number of distribution substations, similar to the network in place on the electric transmission system.

Model 2 “Additional Access Points”

This approach builds upon Model 1 by providing additional local access points along fiber paths between substations and along existing fiber paths – most of which fall on transmission lines. Additional access points would allow local broadband providers more opportunities to connect, decreasing their fiber deployment efforts and reaching more residents near these fiber paths. It may be possible for Dominion Energy to extend the fiber to a more desirable point that has closer proximity to areas of need. The Model 2 approach requires active participation and interest from local broadband providers to establish the last mile – connecting the access point to the end-use customer, and offers limited incremental value to the utility as compared to Model 1.

Model 3 “Distribution Main Line”

This model builds upon Model 1 by bringing fiber from substations along the distribution feeders to a communications cabinet outside the substation. Model 3 brings the fiber closer to the end customer and could potentially provide wireline support or

redundancy for Dominion Energy devices (including DERs, high-speed reclosers, and other Distributed Automation [“DA”] device support). In addition to fortifying service for electric distribution customers, the Model 3 approach provides value to traditional utility operations, and therefore is likely in the interest of the electric utility, as interpreted for purposes of this Report. Because the GT Plan includes grid hardening and self-healing grid investments over a certain number of distribution feeder miles, if approved, these GT Plan programs could reduce the make-ready costs associated with Model 3 in areas where they overlap.

Model 4 “Distribution Transformer”

This model expands on Model 3 by bringing fiber from substations, along distribution feeders, to the transformer location and then to a nearby communications cabinet that would allow easy access by ISPs. Model 4 brings fiber even closer to the end customer and enables an ISP to offer fiber services to the end customer; however, the additional needs for strand separation and technological requirements introduce significant inefficiency. Because the GT Plan proposes grid hardening over a certain number of distribution miles, if approved, these GT Plan programs could reduce the make-ready costs associated with Model 4 in areas where they overlap. Even if Model 4 were deemed in the interest of the electric utility, there is little near-term value to utility operations.

Model 5 “Full Delivery”

In this model, Dominion Energy would be the ISP for end-use broadband customers in areas where no third parties are willing to offer broadband services. Model 5 has two variants: 1) FTTH and 2) Fixed Wireless Broadband. The FTTH model is incremental to Model 4 and would retain the possible GT Plan cost overlap detailed above to reach the end customer. The Fixed Wireless Broadband solution is incremental to Model 1 and could include GT Plan overlap with respect to fiber to substations as detailed above and even

overlap with the solutions proposed in the GT Plan's Telecommunications Strategy. Costs for the FTTH model could reach up to \$1 billion. Though a Fixed Wireless Broadband approach in targeted areas may cost substantially less, a detailed investigation and analysis is needed to better understand the total costs of that approach. Like Model 4, Model 5 may prove to be in the interest of the electric utility, however, there is little near-term value to utility operations.

VI. REGULATORY / LEGAL CONSIDERATIONS

This section identifies the potential regulatory and legal barriers and other considerations complicating an investor-owned utility's provision of broadband internet services.

A. Corporate Power Restrictions

Dominion Energy reviewed its corporate powers, as stated in its Articles of Incorporation, and limited by certain applicable statutory provisions. The Company's Amended and Restated Articles of Incorporation ("Amended Articles") provide that "[t]he purpose of the Corporation is to engage in the business of a general electric, power and lighting company, with all the rights, powers and privileges conferred by the constitution and laws of the Commonwealth of Virginia as they now or may hereafter exist." Section 13.1-620 D of the Virginia Code ("Va. Code") imposes limitations on the corporate powers of public service corporations, such as Dominion Energy. Because its Amended Articles limit Dominion Energy's power to the electric utility business, the Company may only engage in broadband internet services if the SCC or Virginia General Assembly were to deem such actions as "related to or incidental to" that business purpose or otherwise resolve the prohibition. While the Company believes that the current state of the law, as well as the existence of this Broadband Report – mandated by the GTSA – grant the SCC authority to

so find, the Company cannot ignore precedent.¹¹ Specifically, the Company would need the SCC to make a conclusive finding that the Company's participation in select fiber development projects is related to or incidental to its electric utility business, or, in the alternative, is authorized through the preemption of relevant federal law if it were to provide broadband internet services. Therefore, should the SCC disagree with the Company's analysis discussed in detail in the Appendix,¹² Va. Code § 13.1-620 D would present an unavoidable barrier necessitating a legislative or regulatory change in order for the Company to execute any of the activities outlined in this Report.

When the Company met with SCC Staff regarding this Report, SCC Staff suggested that the Company could seek declaratory relief from the SCC on this issue. Alternatively, legislation that expressly recognizes the provision of broadband internet service as incidental to the utility's core business practice would resolve the issue. Regardless of the manner in which it occurs, what is needed most here is unequivocal confirmation of the Company's corporate power and authority to lawfully engage in the provision of broadband internet.

B. Cost Recovery

Under the provisions of Chapter 10 of Title 56 and the Regulation Act, a utility must have the opportunity to recover its reasonably and prudently incurred costs of providing its services to jurisdictional electric customers, including a fair return on its investment.

Depending on the nature of the cost, the Company seeks recovery from electric customers

¹¹ See, e.g., *The Chesapeake and Potomac Tel. Co. of Va. v. Va. Elec. & Power Co.*, 1990 Va. PUC LEXIS 77 (Aug. 3, 1990) ("C&P"). (distinguishing between permissible joint use arrangements on distribution poles and prohibited leases of installed communications facilities to third parties). *C.f.*, *Application of Virginia Electric and Power Company and VPS Communications, Inc.* (approving Dominion Energy's request to offer telecommunications services over leased, Company-owned infrastructure so long as such action was "in conjunction with the Company's installation of its own facilities for its own utility use.")

¹² A summary of the current unsettled state of SCC precedent with respect to the Company's corporate power and regulatory authority to provide broadband services alongside its electric distribution and transmission functions is provided in the Appendix.

through a variety of means, including through its base rates for generation and distribution services reviewed during the triennial review proceedings and through stand-alone rate adjustment clauses as provided for under Va. Code § 56-585.1 A. Current law does not entitle the Company to recover the costs of fiber assets used to provide broadband service unrelated to its electrical services from its electric customers, and any recovery of the reasonable and prudent costs of such fiber investments would be necessary in order for the Company to undertake the activities described in this Report.¹³

C. Barriers Relating to Property Rights

Property rights are a key consideration for the feasibility of utility-provided broadband access. Sometimes, but not in all instances, a utility distribution easement can be used by the utility or by third parties for the purpose of providing broadband service. Because utility corridors are comprised of multiple contiguous easements, all of the easements in the corridor where broadband would be installed require review to determine which easements have sufficient rights for broadband and which do not. Substantial liability can result from unauthorized use of a utility easement for purposes beyond its current scope of rights. Accordingly, it is critical for the Company to review existing easements and, where necessary, obtain or identify additional easement rights needed to support broadband services across third-party property. The cost of acquiring these additional rights can be substantial, and the utility does not hold condemnation authority under Virginia law for broadband internet service. Either the third party broadband lessee must obtain the rights through negotiation or condemnation, or legislation is needed to create a process for the

¹³ Broadband internet is not an SCC-regulated public utility service under Virginia law. To the extent a fiber asset is used, or held for future use, by the Company for the provision of broadband service, the Company's cost to construct, own and operate the asset cannot be recovered through the Company's rates for electric public utility service

utility to expand its rights under its distribution easements to include communication services.

The ability and cost of obtaining additional easement rights thus present another significant barrier to broadband expansion that would require legislation establishing a mechanism that would clear the way for the utility to access real property easements for the purposes of providing broadband internet service, while preserving the due process and property rights of land owners.

D. Functional Separation Considerations

This Report contemplates the use of both electric transmission and distribution assets for the deployment of fiber enabling broadband services to rural areas. Virginia's functional separation rules (the "Functional Separation Rules") require that Dominion Energy's regulated electric transmission function ("Transmission") be treated separate and distinct from its regulated electric distribution function ("Distribution") to minimize conflicts of interest that would give either regulated function an advantage over non-regulated, similarly situated businesses. The Functional Separation Rules, by prohibiting actions taken in concert by these entities that could be deemed anti-competitive, could introduce complications for providing broadband service through both the utility's Transmission and Distribution functions if these rules were extended beyond the Company's current electric service functions to apply to this new and separate service.

If applied to broadband services, the Functional Separation Rules could create a regulatory regime that hampers the utility's ability to efficiently provide broadband services because it imposes limitations on Transmission and Distribution's ability to share information or otherwise act in a way that could be characterized as anti-competitive. SCC or legislative action is thus needed to clearly exempt from the Functional Separation Rules

any business initiatives related to providing broadband to unserved areas through both the Transmission and Distribution functions.

E. Affiliates Act Considerations

Use of an unregulated affiliate is another way in which the Company could provide broadband Internet services to the unserved areas of the Commonwealth. This route, however, would require SCC approval under the Affiliates Act, Va. Code § 56-76 *et seq.*¹⁴ When reviewing an application for approval under the Affiliates Act, the SCC will consider whether the goods or services provided by the regulated utility to its unregulated affiliate are being provided at the higher of fully distributed cost (to include a return component) or the market value / market price.¹⁵ In addition, goods and services provided by an unregulated affiliate to the regulated utility should be provided at the lower of cost (which may include a return component) or the market value / market price.¹⁶ Thus, if the Company were to lease excess fiber capacity to an unregulated affiliate, the Company and the affiliate would first need to seek approval from the SCC through a showing that the unregulated affiliate would pay the Company the higher of cost or market.¹⁷

F. Distribution Pole Considerations

Where fiber is currently supported on its distribution poles, Dominion Energy places its internally-used fiber in the power supply space on poles, while attaching entities normally place their fibers in the communications space. If broadband providers are to use fiber from the utility's fiber bundle in the power space, Dominion Energy must control access to assure the integrity of electric operations. Because the Company cannot allow

¹⁴ The Affiliates Act covers any "contract or arrangement providing for the furnishing of management, supervisory, construction, engineering, accounting, legal, financial, or similar services," and any "contract or arrangement for the purchase, sale, lease or exchange of any property, right or thing," between the utility and an affiliated interest as defined in Va. Code § 56-76. Va. Code § 56-77 A.

¹⁵ See *Guidelines for Filing Applications Under Title 56, Chapter 4 of the Code of Virginia (Affiliates Act)*.

¹⁶ *Id.*; see also *VPS Communications*.

¹⁷ The Company would also need to file a copy of any arrangement with an affiliate with the North Carolina Utilities SCC. Commission. N.C.G.S. § 62-153(a).

access to the power space, it anticipates that, in this scenario, the utility will retain ultimate ownership and control over the fiber bundle, with broadband providers having clearly articulated contractual rights to use their fibers pursuant to procedures designed to assure grid safety and reliability.

G. Electric Utility Serving as an ISP Considerations

In the event Dominion Energy is to provide broadband services to the public, it would need to obtain the necessary certification (for itself or a special purpose affiliate) as a telecommunications services provider from the Commission for intrastate service.¹⁸ This requirement should not pose a legal barrier for the Company if the requirements for approval of such certifications and affiliate transactions follow the Commission's prior guidance contained in prior rulings involving utility affiliates that sought telecommunications service certifications.¹⁹ While not a barrier *per se*, these additional regulatory requirements would introduce attendant additional costs for the Company to be recovered from its ratepayers.

H. Broadband Services and the GTSA

The electric utility's ability to provide broadband internet services is dependent on resolution of these legal barriers and considerations and a clear statement from the legislature that public policy supports socializing the costs across electric utility customers. The utility's interest in doing so is similarly affected.²⁰ The Company believes that such action would be a natural extension of the policies expressed by the enactment of the GTSA. The requirement to submit this Report appears in the GTSA, which not only permits, but essentially instructs, the Company to make prudent investments in the electric distribution

¹⁸ Certification from the FCC for interstate service would not be required, but certain of the FCC's regulations applicable to interstate telecommunications carriers would apply and would require certain filings with that agency.

¹⁹ *broad, e.g., Application of Virginia Electric and Power Company and VPS Communications, Inc., for a certificate to provide interexchange telecommunications service and for approval of affiliates transactions*, Case No. PUC960136, Order Granting Certificate and Approving Affiliate Transactions, 1997 Va. PUC LEXIS 792, 1997 S.C.C. Ann. Rept. 247, 249–50 (Aug. 8, 1997); *Application of Appalachian Power Co.*, 1998 WL 35868278 (Mar. 4, 1998).

²⁰ See note 1 *supra* and discussion starting on page 20.

system to enable a new and versatile energy platform that can deliver safer, more reliable power to customers, while remaining adaptive to new innovations and emerging developments in the energy landscape. Fiber optic infrastructure is critical to that platform, and the GTSA contemplates the connection between the construction of such fiber networks and the extension of broadband internet service to the unserved areas of the Commonwealth, whether by the Company or others. Not only does the GTSA pave the way for expanded investments in renewable energy, smart grid technology, and energy efficient programs, it signals a need to reshape the manner in which utilities may provide those and other related services. The passage of the GTSA also demonstrates how collaboration between many interests can set the stage for long-term cooperation that can lower costs and enhance services for all participants. This legislative directive serves as additional support for the changes needed to allow the Company to lawfully engage in the fiber development projects addressed herein.

VII. CONCLUSIONS

This Report demonstrates several options that the Commonwealth could pursue in bringing broadband internet service to unserved areas. In the immediate future, the path forward of most significant combined utility and public interest seems to be associated with the middle mile model which would enable local entities to reach rural customers through their last-mile initiatives. Notably, the process of connecting substations with fiber will increase both broadband and electric reliability. Substations (Model 1) is Dominion Energy's preferred model as it provides the greatest value to electric customers and those in need of broadband. The addition of electronics and additional service points (Model 2) may also be of interest to local providers.

Dominion Energy requests the SCC and public policy makers provide guidance on the appropriate middle mile model and corresponding cost-recovery mechanisms. Based on

the guidance provided, further detailed planning will be required in each geographic area to determine the optimal solution to enable rural broadband along with corresponding capital and operation and maintenance costs. This may include performance of a site by site analysis in conjunction with the proposed programs of the GT Plan. The deployment approach and timeline cannot be determined at this point without first obtaining some level of certainty and clarity on the proposed GT Plan programs, the rural broadband initiative, and all cost recovery mechanisms.

In addition to providing safe and reliable electricity to the residents of the Commonwealth, Dominion Energy is also committed to helping bridge the broadband divide between rural and urban Virginia. Importantly, the Company looks forward to working with the SCC, public policy makers, and other stakeholders to accomplish both of these objectives.

VIII. APPENDIX

A. Acronyms

Acronym	Definitions
ADSS	All-Dielectric Self Supporting
ARPU	Average Revenue per User
BWA	Broadband Wireless Access
CAF	Connect America Fund
CIT	Center for Innovative Technology
CPCN	Certificate of Public Convenience and Necessity
CVEC	Central Virginia Electric Cooperative
DA	Distribution Automation
DHCD	Department of Housing and Community Development
DSL	Digital Subscriber Line
DWDM	Dense Wavelength Division Multiplexing
FCC	Federal Communications Commission
FTTH	Fiber to the Home
GT Plan	Grid Transformation Plan
ILEC	Incumbent Local Exchange Carrier
ISP	Internet Service Provider
LiDAR	Light Detection and Ranging
LTE	Long-Term Evolution (standard for high-speed wireless connection)
MBC	Mid-Atlantic Broadband Cooperative
O&M	Operations and Maintenance
OPGW	Optical Ground Wire
ROI	Return on Investment
ROW	Right of Way
SLA	Service Level Agreements
UFA	Utility Facilities Act
USDA	United States Department of Agriculture
VCI	Vibrant Community Initiative
VDSL	Very High Bitrate Data Subscriber Line
VMDAEC	Virginia Maryland Delaware Association of Electric Cooperatives
WISP	Wireless Internet Service Provider

Table 3: Acronym Definitions

B. Legal Case Study

The following summarizes the current unsettled state of SCC precedent with respect to the Company's corporate power and regulatory authority to provide broadband services alongside its electric distribution and transmission functions. In a 1990 case,²¹ the SCC considered the Company's leasing of excess capacity on its fiber optic communication system installed for the operation of its public utility electric system to Wheat First Securities ("Wheat"). The SCC was responding to a petition filed by the local telephone utility, Chesapeake & Potomac Telephone Company ("C&P") requesting the SCC to investigate whether the Company was unlawfully providing retail telephone service in C&P's certificated service territory and, if so, to enjoin such activity. The SCC held that the Company's lease of fiber capacity to Wheat violated § 13.1-620 D of the Virginia Stock Corporation Act ("VSCA") because leasing the fiber capacity to Wheat was not "related to or incidental to" the Company's stated business as an electric public service company.²² Based on that finding, the SCC ordered the Company to cease its leasing of fiber capacity to Wheat.²³

The Company asserted that its leasing of excess communications capacity was analogous to its leasing of pole space to telephone and cable television companies, a lawful activity in which the Company could engage, to support a finding that it was related to or incidental to its public service business.²⁴ The SCC disagreed, finding the Company's actions were not related to or incidental to its operations as an electric power public service company:

²¹ *Id.*

²² The Company had not sought prior approval from the SCC before entering into the fiber lease with Wheat, and the SCC found that "for an electric utility to lease its private excess telecommunications capacity to a third party is to engage in a distinctly different public service which is certificated to another, to the detriment of the latter." *C&P, supra*, at 240. However, the SCC did not decide the specific question whether the lease of fiber capacity violated C&P's exclusive franchise under the Virginia Utility Facilities Act to provide local telephone service within its certificated service area.

²³ The SCC did not decide the specific question whether the leasing of fiber capacity to Wheat violated C&P's exclusive franchise under the Virginia Utility Facilities Act to provide local telephone service within its certificated service area. The SCC also did not decide whether the leasing of capacity on the Company's fiber optic facilities installed for its electric public utility service conflicts with language in § 13.1-620 D stating that no corporation shall be organized under the VSCA for the purpose of conducting more than one kind of public service business (excepting the telephone and telegraph businesses and the water and sewer businesses, which may be combined).

²⁴ *Id.*

The leasing of pole space to other entities that need to route cable to homes is not the same as leasing the use of public service facilities . . . [T]he joint use of poles by electric and telephone utilities *is not competition* with each other's service *but cooperation that aids each other's service*. Joint use is to be encouraged to avoid the duplication of poles. (emphasis added).

Arguably, the SCC's finding in *C&P* was grounded in competition concerns, in contrast to the cooperation in aid of each other's services identified in the Report. Allowing broadband providers to expand into unserved areas, to the extent that the fiber networks needed for electric utility operations coincide with the routes needed for broadband fiber backbone networks, is arguably the type of cooperative activity that should be found lawful as related or incidental to an electric company's stated business. The Company would therefore need the SCC to apply similar reasoning to the fiber development projects presented in its Broadband Report to conclude that the limitations of Va. Code § 13.1-620 D are not violated, despite other propositions for which *C&P* may stand.

The Company took a different approach when it later sought to provide interexchange telecom service after the marketplace had been restructured by the Telecommunications Act of 1996 ("Telecom Act") to foster competition. In a 1997 case, the Company initially requested the SCC to issue a certificate of public convenience and necessity ("CPCN") authorizing the Company to provide interexchange non-switched dedicated telecommunications service throughout Virginia, over leased and owned facilities, including the Company's 250 route-miles of fiber optic facilities.²⁵ In response to a recommendation by the SCC Staff, the application was amended to request that the CPCN be issued to VPS Communications, Inc. ("VPSC"), a subsidiary of the Company that replaced the Company as the Applicant.

The SCC directed its Staff and the Company to file briefs addressing the precedential effect of the SCC's "related to or incidental to" ruling in *C&P*. The Company argued that

²⁵ *Application of Virginia Electric and Power Company and VPS Communications, Inc.*, Case No. PUC960136, Order Approving Affiliate Transactions (Aug. 8, 1997), Order Granting Certificate and Approving Affiliate Transactions (Aug 8, 1997), 1997 S.S.C. Ann. Rept 247 ("VPSC").

passage of the Telecom Act preempts § 13.1-620 D to the extent it restricts the Company's provision of telecom services. SCC Staff asserted that, although the Telecom Act "sends a strong message to the states, forbidding them from blocking new entrants into the telecommunications market," it still permitted the SCC to decide not to issue a certificate to the Company if the SCC found that doing so would be adverse to the public interest.²⁶

The SCC ruled that it was "appropriate" to grant the certificate to VPSC but did not revise its prior ruling in *C&P* or otherwise provide an explanation for why it was "appropriate" to grant a CPCN to VPSC.²⁷ The SCC also ruled that the Company would only be permitted to install fiber for VPSC "in conjunction with" installing its own fiber facilities" because "it is not appropriate for [the Company] to install new fiber solely for VPSC."²⁸ As a result, the Company cannot be assured that its ruling in *C&P* is no longer operative.²⁹

²⁶ *VPSC, supra*, at 249.

²⁷ *VPSC, supra*, at 250.

²⁸ *Id.*

²⁹ Va. Code § 56-587, enacted after *C&P* and *VPSC*, states that a public service company, through an affiliate or subsidiary, may conduct, notwithstanding the portions of § 13.1-620 D, three specified business, "even if such business is not related to or incidental to the stated business as a public service company." However, the three specified businesses are limited to operations as a licensed retail electric supplier encompassing customer choice of electric energy suppliers; a licensed aggregator pursuant to § 56-588 or for purposes of participation in an approved pilot program encompassing retail customer choice of electric energy suppliers; or, an owner, manager, or controller of any plant or equipment or any part of a plant or equipment used for the generation of electric energy. The effect of this statute on the authority of a subsidiary or affiliate of the Company to own or operate broadband facilities or furnish broadband service is unclear. If the decision were made for a Dominion Energy Virginia subsidiary to be utilized for such purposes, however, a direct or indirect subsidiary of the Company should be avoided.