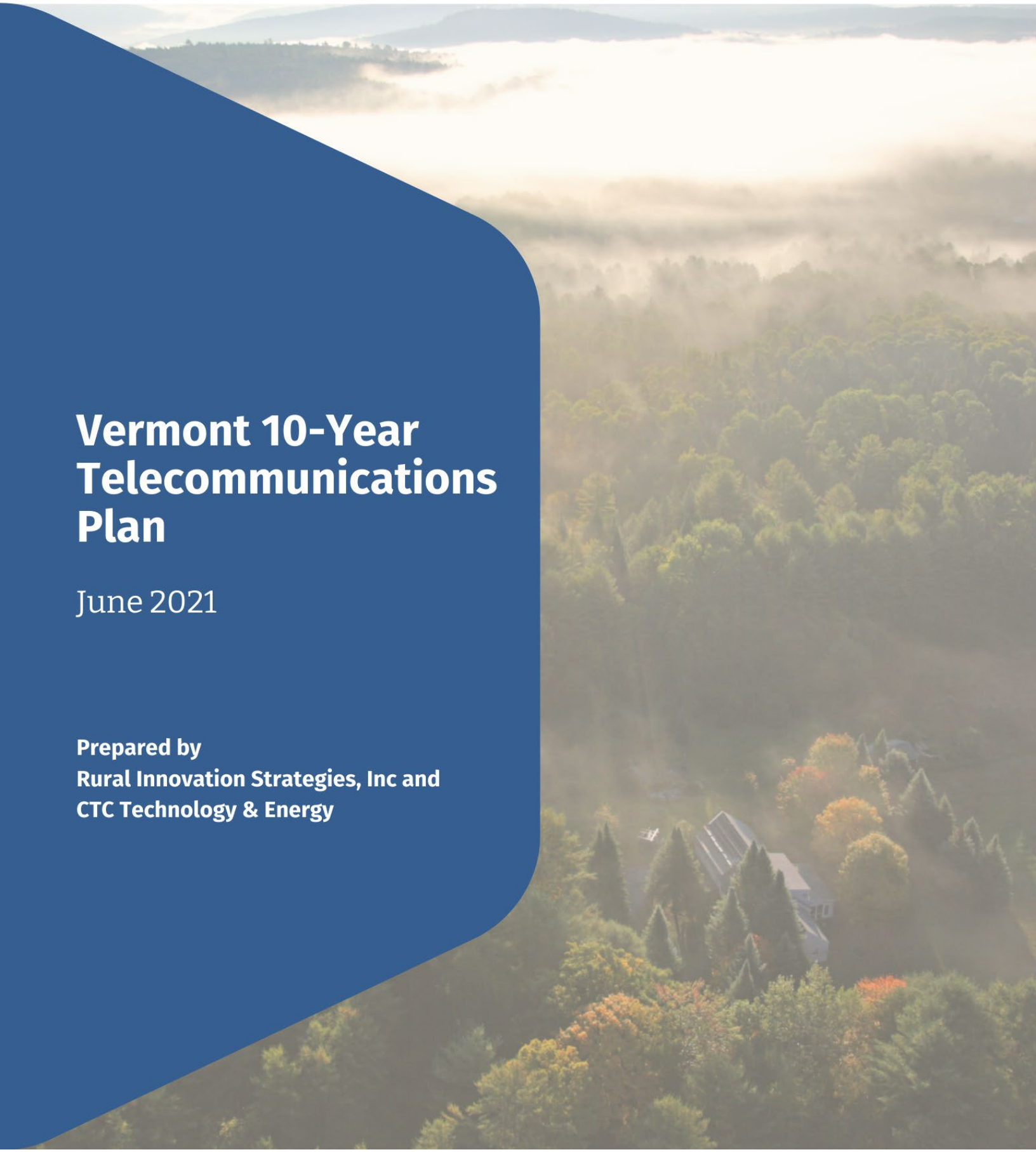

Vermont 10-Year Telecommunications Plan

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1 Executive Summary

The State of Vermont has commissioned its 10-Year Telecommunications Plan at a prescient and critical moment. The COVID 19 pandemic laid bare the importance of residential broadband, mobile broadband, public safety telecommunications systems, and PEG TV unlike any other time in history. High-speed broadband connectivity and devices are, without question, a requirement for the pursuit of an education, participation in the workforce, and access to safe and convenient healthcare services. High-speed broadband is not a luxury, but a foundational category of infrastructure that Vermont policymakers have determined needs to extend down every Vermont road, past every business and every home.

Crucially, this planning is being done at a time when federal funding has put Vermont on a viable path to universal broadband access. The resources allocated in the American Rescue Plan Act and the Rural Digital Opportunity Fund (RDOF), among others, have created an unprecedented opportunity to build connectivity to the last mile, and the possible upcoming federal infrastructure bill may add to that capacity.

The state has taken nation-leading steps over the past decade to build a foundation for achieving statewide broadband goals. The Vermont Department of Public Service's broadband availability data is among the best state-level broadband data in the country, and the constellation of partners ready to play a part in closing broadband gaps—including Communications Union Districts (CUD), telephone companies, internet services providers (ISP), and electric utilities—are all currently working, often in collaboration, to bring high-speed internet to every home in Vermont.

As such, this 10-Year Telecommunications Plan is oriented toward recommendations that will allow the state to seize the moment to create resilient systems that provide best-in-class connectivity for Vermonters for decades.

This Plan provides a roadmap to the achieving the following telecommunications goals, which are informed by 30 V.S.A. § 202c:[1]

- Bringing every currently unserved and underserved on-grid Vermont home access to 100/100 megabits per second (Mbps) broadband that can be scalable to faster speeds as demand warrants
- Leveraging residential fiber deployments into better mobile voice coverage along key roadways and in small communities

[1] The Vermont Statutes Online, 30 V.S.A. § 202c, https://legislature.vermont.gov/statutes/section/30/005/00202c.

- Ensuring that telecommunications systems are resilient, redundant, secure, and future-proof for commercial, consumer, and public safety needs
- Facilitating competition and choice of multiple internet service providers at the majority of premises in the state
- Promoting local input and oversight in the direction of future use for publicly funded broadband infrastructure through empowered regional Communication Union Districts
- Leveraging fiber broadband expansion to ensure public safety has access to reliable and redundant communications capacity

The Plan's recommendations are meant to educate stakeholders and advise public officials on how to augment the market forces currently shaping the telecommunications landscape, and address the market gaps caused by the state's geography, rural nature, and small population. The market forces at play in the state, and how they relate to planning efforts, include the following:

- 51,000 homes in Vermont are currently unserved or underserved (no cable or fiber to the home) and have no clear path to being served (e.g., were not funded via the Rural Digital Opportunity Fund or other federal program). These are locations the private market is unlikely to serve in the near term without outside support. Therefore, the focus of state resources should be bringing future-proof broadband of at least 100/100 Mbps to those places, through fiber to the home.
- Approximately 185,000 premises have broadband service of 25/3 Mbps, but not infrastructure currently capable of 100/100 Mbps. In the current moment of considerable private investment in broadband, there is reason to project that some portion these premises is likely to be upgraded to 100/100 speeds as a result of market forces that include potential upgrade of cable broadband networks to the next generation of cable modem technology (known as "DOCSIS") within the next 10 years, or fiber-to-the-premises construction by and Incumbent Local Exchange Carrier (ILEC). In fact, ILECs are already building fiber quickly in many parts of the state; Consolidated Communications has reported plans to build past over 200,000 premises that already have one cable or fiber option over the next five years, and Waitsfield Champlain Valley Telecom is also making substantial investments in converting copper customers to fiber in their entire footprint. In some locations, both dynamics will be present and those households will have options of both robust cable broadband and fiber-to-the-premises. Cable companies and ILECs both have significantly less expensive paths to 100/100 Mbps than new entrants.

- Up to 40 percent of Vermont Premises and up to 6,000 miles of class 1, 2, and 3 highway roads may not have outdoor mobile voice and data service. These unserved areas will be helped by the proliferation of fiber internet deployments; however, state subsidy may still be required for the state to provide service along travel corridors and in small communities. Given the topography and opposition to towers along some ridgelines, deployments should take into account local context and mobile voice providers should demonstrate alignment with community values as a condition of accessing state funding.

- Approximately 63 percent of premises may not have mobile voice connectivity indoors (mobile broadband signal strength diminishes going through walls). However, bringing 100/100 Mbps wired broadband connectivity to un- and underserved premises will allow most Vermonters to get in-home voice coverage over in-home Wi-Fi.

- Funding streams for public, educational, and governmental (PEG) television stations are projected to decline in the coming years as cable subscription rates fall, and for PEG stations to have predictable revenues, new funding mechanisms must be studied and secured to enable them to continue playing their pivotal role in the Vermont media and telecom landscape.

- While competition between cable and ILEC fiber providers in the more densely populated areas will keeps costs lower than what might be offered in a monopoly, service subsidy programs will be necessary to ensure all Vermonters have access to broadband. In addition, education programs will be needed to ensure citizens have the best practices for accessing broadband as well as broadband financial literacy training to make sure lower income households know the best options for reducing their costs while accessing the broadband services they need.

- Demand for broadband upload speeds is increasing by 20 to 30 percent each year which mean that infrastructure built today must be able to be upgraded to gigabit and even 10 gigabit symmetrical speeds in the coming decades.

Given the complex interplay between market forces and the state of Vermont's desire to help fill market gaps, it is important to note the inherent tension between providing agency to communities and efficient broadband deployment. The most efficient way to use dollars in the short run could be to simply pay private providers to build fiber to the home with no conditions, thereby ensuring monopolies for broadband delivery to rural places for decades to come. At the other extreme, federal dollars could be used only to underwrite publicly owned and operated fiber infrastructure through Communications Union Districts; further, that fiber could be permanently open access for use by any carrier, (i.e., prioritizing the goal in (30 V.S.A. § 202c (6)

no matter the cost) with requirements for net neutrality, zero data caps, and pricing limits. The latter scenario, however, could require multiples of the funding resources available in the state.

Though that tension may never be resolved in a way that pleases everybody, it is important for it to be discussed—and for the public and the state's decision-makers to understand the tradeoffs. As such, this Plan explores the tensions between community control and connecting more people, and seeks to optimize the balance through public-private partnership concepts that reflect the reality on the ground and the state's clear aspirations to close the broadband gap.

In navigating the tension between public and private solutions, four core Vermont values lie at the heart of this plan's analysis and recommendations:

- **Efficiency –** State resources should be targeted at households currently lacking infrastructure capable of delivering 25/3 Mbps broadband service; market forces should be leveraged where possible for efficiency, and partnerships between public and private entities encouraged so that private sector expertise and capital, as well as existing assets and infrastructure, can be leveraged as much as possible. This goal is informed by 30 V.S.A. § 202e (b) (5) and (9).

- **Longevity –** Infrastructure investments should focus on long-term needs and achieving the state's legislated goal of 100/100 Mbps minimum speeds via future-proof infrastructure capable of scaling to far higher speeds as necessary. This goal is informed by 30 V.S.A. § 202c (b) (8).

- **Local control –** From fiber broadband to mobile voice deployments to the adoption of public safety systems, local leaders should have input and agency over telecommunications solutions right for their communities. This goal is informed by 30 VSA Chapter 82.

- **Equity –** The benefits of expanded broadband should not be out of reach to Vermonters based on geography, income, race, or any other factor. This goal is informed by 30 V.S.A. § 202c (b).

Speed is of the essence if Vermont is going to close the broadband gap in the near term. The unprecedented federal funding for broadband across the country is encouraging but means there will be equally unprecedented demands for skilled labor and materials to build new fiber infrastructure. Meeting the goal stated in 30 V.S.A. § 202c (b) (10), that every premise (including those only with 25/3 Mbps service provided by cable) be served by 100/100 Mbps by 2024, will be a significant challenge in current market conditions, and may need to be reconsidered to align more with the H.360, which has authorized the Vermont Community Broadband Board until

2029. Regardless, implementing programs to close broadband gaps should not be rushed but should be done expeditiously because the need is clear and immediate across the state.

Increased dependency on broadband means the divisions between the connected and unconnected will continue to accelerate while exponential growth in speeds required for internet-based products and services will mean that 25/3 speeds (or even 100/100) will not be remotely adequate by 2031. Technology advances and investment decisions in the private sector are never certain; for that reason, market forces that appear to be driving 100/100 broadband in more densely populated parts of the state should be carefully watched in the next two years and subsidy plans adjusted if gaps emerge. Vermont has a moment now to leverage the extraordinary work undertaken over the past two decades to effectively deploy this unprecedented federal capital to create future-proof telecommunications infrastructure for the next generation and beyond.

1.1 Summary of Project Scope and Tasks

This Plan addresses all aspects of the scope of work outlined by the Department of Public Service—including analysis and recommendations designed to ensure the state of Vermont is prepared for the telecommunications requirements of the next 10 years and to meet the goals of 30 V.S.A. §202d. The Plan reflects the following tasks completed by the project team:

1. Ten-Year Overview of Expected Future Requirements for Telecommunications Services (see Section 4)
2. Survey of Vermont residents and business (see Section 2)
3. Assessment of the current state of telecommunications infrastructure (see Section 2 and Section 3)
4. Assessment of state-owned and managed telecommunications systems and related infrastructure (see Section 2, Section 5, Section 6, and Section 13)
5. Assessment of opportunities for shared infrastructure (see Section 7 and Section 11)
6. PEG television analysis (see Section 2 and Section 13)
7. Assessment of status, coverage, and capacity of telecommunications networks and services (see Section 2 and Section 3)
8. Analysis of alternative strategies to expand broadband and increase network resiliency (see Sections 5 – 9)
9. Assessment of emergency communications initiatives and requirements (see Section 1, Section 2, and Section 12)
10. Analysis of regulatory and legal barriers facing state action (see Section 14)
11. Initiatives to advance state telecommunication policies and goals (see Sections 5 – 14)

Appendix E also maps each element of the scope of work to the relevant sections of this Plan.

1.2 Summary of Findings

The following is a summary of key findings based on surveys, stakeholder interviews, data analysis, and cost-estimation exercises.

Fiber deployment—capable of delivering 100/100 Mbps service and greater—to unserved and underserved premises remains a priority across the public and private sectors.

Robust broadband deployment represents the highest priority for most stakeholders and policymakers. Future proof infrastructure to serve every unserved and underserved premises with fiber-to-the-premises will cost between $362 million and $439 million, depending on a range of factors, including market conditions at the time. For example, the cost estimate assumes certain material and labor costs; actual costs for these elements at the time of execution will have a large effect on the total project cost. In addition, there is some uncertainty about how many unserved and underserved premises are also off-grid.

Consumers, businesses, advocates, and state entities indicate that lack of mobile voice and data coverage on roads and at residential premises is an area of major concern.

There are areas of the state that still struggle for mobile connectivity, but mobile voice and data deployments should fit local aesthetic and environmental concerns held by Vermont communities. Radio frequency propagation analysis suggests that up to 40 percent of Vermonters may have difficulty obtaining mobile voice and data coverage at home. Pursuing the state's goal of 100/100 Mbps wired service will also make expansion of mobile voice and data service easier, because fiber can be used to backhaul mobile antenna sites.

Many safety telecommunications systems in Vermont are performing well; **however, some Land Mobile Radio systems are aging and need attention.**

All six Vermont public safety answering points (PSAP) have migrated to next-generation 911 (NG911) which offers a robust, future-proof system for telecommunications transmission. However, some local Land Mobile Radio (LMR) systems are aging, and yet FirstNet is not yet sufficiently mature or reliable for first responders to abandon LMR systems. In addition, public safety communications increasingly rely on private networks or networks outside their immediate oversight; in light of this, the Plan recommends specific applications and technical considerations regarding public safety over the next 10 years.

PEG TV stands as a bastion of localism and Access Management Organizations (AMO) are seeking stable and predictable revenue.

The public value delivered by PEG in Vermont merits public support as surveys and stakeholders interviewed reiterated the importance of PEG in generating and delivering local content—particularly in an era of declining local media and reporting. PEG stations are also well positioned to fill more and more essential community functions, from archiving footage of municipal events to providing digital skill-building resources and more.

1.3 Summary of Recommendations

In keeping with the state's prioritization for localism, use CUDs as the vehicle for infrastructure deployments to reach unserved and underserved premises with 100/100 Mbps service, thereby supporting the goals in 30 V.S.A. § 202c (b).

The Plan endorses the framework and emphasis of the Vermont Legislature's H.360 bill,[2] and recommends the following:

- CUDs should be eligible and targeted for funding where CUDs exist
- CUDs should be obligated to pass every on-grid premises as a condition of funding (which aligns with 30 V.S.A. § 202c (b) (2))
- CUDs should be responsible to comply with best practices for network standards as a condition of funding (which aligns with 30 V.S.A. § 202c (b) (3), (4), (5), and (7))
- The VCBB should disburse funding via a multi-phase approach that provides accountability and support to applicants (which aligns with 30 V.S.A. § 202c (b) (1))

This Plan recommends delineating requirements versus priorities concerning broadband expansion funding. It recommends that requirements must be met to qualify for funding, whereas those items listed as priorities should be pursued if possible and should be within the authority of CUDs to do so, or to require of their private partners, depending on the business case implications of the priorities. Recommended requirements and priorities have been created to align with goals in 30 V.S.A. § 202c, and are as follows:

- Requirements:
    - Provide service to all on-grid, unserved and underserved locations within the Communications Union District

[2] The Vermont Legislature's H.360 bill outlines recommendations for a broadband funding program. This plan was written first referencing the House version of H.360, and now includes commentary on H.360 as passed after input from the Vermont Senate.

  - Provide broadband service that is capable of symmetrical speeds of at least 100/100 Mbps
  - Meet best practices for technical standards to ensure broadband infrastructure is resilient and secure
  - Build networks capable of supporting future public good services, like mobile wireless expansion and public safety use cases

- Priorities:
  - Provide consumers with services that adhere to values that have been identified by the state, like net neutrality, transparent pricing, no data caps, and data privacy
  - Utilize public-private-partnerships to ensure high service quality
  - Provide consumers with affordable service options and support low-income or disadvantaged communities
  - Leverage lease fees on owned assets into a long-term funding source for digital skills, digital equity, and digital inclusion efforts

The Plan suggests the following network standards for state-funded deployments:

- Networks should be interconnected and redundant, with multiple paths of egress to the internet and with backup power where needed to minimize or eliminate outages
- Networks and ISPs must be capable of supporting lifeline services and fulfilling critical emergency functions
- Networks must be robust, flexible, and scalable—capable of supporting future generations of wireless technologies and the needs of public safety

This Plan also proposes additional specifications and refinements to H.360 as passed that can be made by the Vermont Community Broadband Board as it fulfills its legislative mandate. This Plan recommends the VCBB:

- Establish clear rules and scoring metrics around funding procedures based on the priorities in H.360
- Document fair processes for adjudicating conflicting funding requests from ISPs and CUDs
- Establish vendor procurement guidelines and systems that allow VCBB to review vendor proposals in conjunction with applications for funding

- Consider remediation options if a CUD does not achieve financial sustainability

The Plan also discusses the pre-development and pre-construction support and expertise CUDs will likely need to find and vet vendors, raise capital, adjust their business plans and projections as construction costs continue to fluctuate, and negotiate partnerships with operators.

Encourage CUDs to address demand-side broadband challenges like affordability, equity, and inclusion that must be met to achieve 30 V.S.A. § 202c, and incorporate that work into planning for the short and long term.

Closing the gap in access across the state should be accompanied by addressing issues like affordability, digital skill building, and digital equity for the state to maximize its investment in expanding broadband access. Digital equity, digital skill building, and affordability are all a result of the historical challenges regarding poverty, lack of racial equity, lack of education equity, housing discrimination, and more. The Plan recommends CUDs include subsidy programs for low-income subscribers in their business models and aggregate provision of subsidized service through a statewide program for efficiency. In addition, the state can take some policy and regulatory steps to address these issues, such as reviewing inmates' costs for making phone calls from Vermont corrections facilities.

Expand mobile voice and data services using an efficient, effective request for proposals (RFP) process in conjunction with updates to mapping resources, in support of 30 V.S.A. § 202c (3).

In light of the Governor's suggested $25 million allocation of American Rescue Plan Act funds for expanding mobile voice coverage, this Plan recommends an RFP-based approach to funding expansions of mobile voice and data service that allows the state to consider a range of options and weigh their cost, benefits, and achievability. The RFP process will also arm the state with data on what is achievable under different models, which will be key to ongoing policy-making and decision-making. An RFP approach will stimulate private sector investment as a complement to the allocated ARPA funds and will enable the state to fund those proposals that maximize benefits to Vermont with respect to coverage, competition, resilience, and other state priorities.

The state's RFP should seek proposals that accomplish the following:

- Target areas currently unserved by any carrier
- Exclude state ownership or ongoing upkeep of any infrastructure
- Be achievable within two years, taking into account permitting processes and backhaul connections

- Demonstrate that local input has been solicited and proposed deployment methods are viable
- Include letters of intent from carriers documenting their planned participation

Proposals should be considered in light of a range of primary goals:

- The extent to which the project will cover unserved road miles and serve unserved premises
- Inclusion of multiple mobile network operators
- Demonstration of resiliency, including features such as backup power and diverse backhaul
- Amount of private capital committed

Though public safety telecommunications will be enhanced if fiber infrastructure is deployed strategically pursuant to 30 V.S.A. § 202c (7), existing critical public safety systems should be maintained and enhanced for resiliency and redundancy.

New broadband facilities should comply with best practices for use by public safety. Such facilities should also comply with best practices for resiliency and redundancy, such as including extra strand capacity to serve public safety needs, avoidance of host remote isolation, and diversity of paths. Land-mobile radio remains a critical technology and should not be considered for replacement until other technologies can demonstrably achieve better reliability. Further, whether to adopt new services or systems such as FirstNet or other commercial offerings should remain a local decision made by local officials who best understand the coverage in their area.

The Plan recommends the state perform due diligence in its efforts to provide Access Management Organizations with a stable and predictable source of revenue.

The value of PEG is not in dispute and this plan affirms the intent to provide funding for PEG in a time of declining cable franchise revenues. To that end, the plan recommends support for PEG through annual appropriations but does not opine on any particular new taxing or revenue model. While agreeing with the overall support for PEG, this plan urges robust legal consideration of the recommendations included in the report commissioned by the Agency of Commerce and Community Development, “Analysis of the Financial Viability for Public, Educational and Government Access Television in Vermont.” That document proposes funding options to provide PEG channels with stable and predictable revenue but it is key that such strategies not impede other state goals (like expanding broadband coverage) or create potential legal complications. If there is a budget shortfall for PEG stations before a long-term funding stream is identified, the state should consider an allocation from the general fund.

2 Telecommunications Challenges and Needs in Vermont

Vermont has established a thorough process for receiving input on telecommunications planning work. In addition to the great eagerness stakeholders from the public and private sectors having to provide input in writing and via interviews, Vermont is truly unique in how it codifies a process that allows everyone access to decision-makers, including providing ample opportunity for public comment on the Draft Plan before its finalization.

Across the many states in which the project team has worked, none provide as much opportunity for input as Vermont; the input provided by Vermonters via surveys, interviews, and written input informs and advises this work.[3]

2.1 Challenges Identified by State Agencies

Through numerous interviews with state agencies and public sector leaders, a clear and consistent message emerged that public sector operations and systems are closely tied to the quality of wired residential broadband and mobile broadband services.

On the whole, state-owned telecommunications systems are working well and performed effectively during the stresses of the Covid-19 pandemic. However, state operations do face challenges due to a lack of universal residential broadband and mobile voice and data services. Especially as many state agencies shifted more and more operations online and into the cloud, and will continue to provide a portion of their services in this manner, addressing the residential broadband challenges will greatly benefit state agencies and the public sector as well.

Stakeholders within state agencies consistently expressed a hope that Vermont would focus on building out long-term telecommunications infrastructure to provide the necessary foundation for state agency operations. The ways in which universal broadband will benefit individual departments, teams, and the constituents they serve are diverse, but a selection of the responses and individual priorities shared by stakeholders is described below.

From workforce development programs to DMV services to unemployment applications, Vermont agencies expect to continue to engage with Vermonters online even after the pandemic subsides. Municipalities are likely to continue streaming or airing meetings live over the internet, and so the trouble reported during Covid-19 of constituents having trouble with connectivity during municipal meetings will be a problem so long as high speed internet remains unavailable to many.

The Agency of Digital Services (ADS) reported that the state moved to a cloud-based Microsoft Office 365 system before the start of the pandemic, facilitating remote work as employees could

[3] Appendix D identifies the stakeholders who provided input for this Plan. Appendices A – C are residential, business, and municipal leader survey results.

access to key systems from anywhere. ADS also helped state agencies transition to remote work by purchasing pre-configured laptops and facilitating the participation in Consolidated Communications' Enterprise@Home program,[4] which allows business customers to extend their LAN to their worker's remote sites, and let the state extend its enterprise network to employees' homes. However, the issue of employees' home networks and home connection cannot be solved until good infrastructure is built to every premises; many public sector employees working from home have struggled with residential connectivity challenges. ADS officials indicated that they may want to give employees the option to work remotely into the future, but that would be contingent on being sure of employee connectivity.

The Department of Disabilities, Aging & Independent Living (DAIL), as well as the Vermont AARP, reinforced the importance of connectivity for their constituents, and emphasized the need for accessibility and digital skill training and the need to keep service affordable, in addition to the need for universal infrastructure. They stressed that online tools and services are only valuable for Vermonters who have access to them, can afford them, and know how to use them. For example, while relay services and captioning options may be available for those with hearing loss, awareness of services and comfort using them across platforms are reported as ongoing hurdles.

The Department of Agriculture reported more online engagement with agricultural applications across the state. For example, farmers have switched to e-commerce to engage with larger markets, and expect to continue to strengthen their online presence after setting up websites to ship their products. Due to this trend, unreliable access to the internet has and will directly affect farmers' ability to conduct business. Additionally, advanced farm technologies often rely on digital components to function, and are vital for Vermont farmers as they adopt new, more precise agriculture practices.

The expansion of broadband systems and especially mobile broadband service was also identified as a need by the Agency of Transportation. Vehicles are becoming increasingly autonomous, and require access to cell service to function efficiently when it comes to navigating safety technology and traffic operations. The Agency of Transportation also recognized that the expansion of fiber would lead to a diversity of service options for staying connected on roadways even though these future advancements don't rely on wired systems alone.

The Agency of Education shared that remote and hybrid learning models will likely continue to exist after the pandemic in some form or another, as it presents options for expanded learning

[4] "Consolidated Communications' Enterprise@Home Connects Remote Home Office Locations With Reliable, Secure Technology," Consolidated Communications, News Release, July 29, 2020, https://www.consolidated.com/about-us/news/article-detail/id/750/consolidated-communications-enterprisehome-connects-remote-home-office-locations-with-reliable-secure-technology

for students across the state. With remote or hybrid learning models, students have the option to take a greater variety of classes than what their schools are able to offer in person, which increases students' ownership of their schedules and allows them the ability to engage with more subjects of interest. A survey conducted by the Department of Education found that 55 percent of students desire to continue learning partially or fully online after the pandemic.[5]

Crucially, the continuation of these learning programs require robust broadband infrastructure as educational platforms require increasing amounts of bandwidth. Building out telecommunications to schools and students remains a priority, but the Agency of Education expressed that providing technical assistance to school leaders to assist in navigating data privacy, cyber security, and platform selection is also a critical next step.

The Department of Libraries remains concerned about some of their aging equipment on their fiber network, but is hopeful that ARPA funds will be able to be used to remedy this. They also hope to play a greater role in digital skills training and providing accessible devices and internet connections to the public.

There are also more direct telecommunications needs across state and municipal entities, especially for agencies with a presence in many of our small communities. For example, not all schools and libraries are connected to high speed internet in Vermont, and not all Agency of Transportation garages have cell service. Fixed and mobile broadband deployment in the next few years will help ensure the safety of state workers at town garages and the services that libraries and schools can provide in Vermont's small towns.

2.2 Residential Needs

As part of its efforts to perform a comprehensive evaluation of broadband gaps in line with the state's goal to provide fast, reliable connectivity to all residents, the State of Vermont commissioned an online survey of households. The survey was intended to gather basic data about the types of services to which residents subscribe and their use of these services. Moreover, the survey was designed to provide feedback on desired broadband and cell service and ways to improve accessibility. The survey explored other topics as well, such as PEG TV viewership. The results presented in this summary are based on responses from 920 households (completed surveys) deemed "valid" by the statistician analyzing the data.

The survey was promoted through organic and paid promotions, including a press release from Vermont's Department of Public Service (PSD); requests made to municipal and public sector stakeholders to post the survey on town listservs; social media promotion from a range of

[5] Department of Education stakeholder interview, April 5, 2021.

entities; paid Front Porch Forum advertisements; outreach via Communications Union Districts (CUD), and more.

The survey responses (presented in full in Appendix A) were weighted based on the age of the respondent and region. Since older Vermonters are more likely to respond to surveys than younger persons, the age-weighting corrects for the potential bias based on the age of the respondent. In this manner, the results more closely reflect the opinions of each county's adult population. That said, it should be noted there clearly are limitations to online surveys about telecommunications needs. For subsequent plans, the state may consider supporting a mail or phone survey, which would provide the most accurate findings.

2.2.1 Key Findings

Key findings are presented thematically in four subsections: broadband access gaps, cellular access gaps, internet service features and use, and PEG TV content. These and other findings are presented in greater detail in the body of the Plan.

2.2.1.1 Broadband Access Gaps

The survey found very few gaps in acquisition of residential internet services. Almost all households represented in the survey have internet service. Respondents support building infrastructure and improving broadband services in unserved areas. The following are key findings:

- **Almost all residents have home internet access and use the internet from any device at home.** Ninety-seven percent of respondents reported having internet access, including 72 percent who have both home internet service and a cellular/mobile telephone service with internet (smartphone). The high saturation of internet access would be expected in an online survey.

- **Six percent of all respondents use only a smartphone for home internet access.** This may limit their ability to fully utilize online services at home.

- **Consolidated Communications (CCI), Comcast Xfinity, and Green Mountain Access (Waitsfield and Champlain Valley Telecom) are the leading internet service providers used.** One-third of respondents subscribe to CCI, 24 percent subscribe to Comcast Xfinity, and 14 percent subscribe to Green Mountain Access (Waitsfield and Champlain Valley Telecom). Other ISPs comprise much smaller shares of the market.

- **Respondents support publicly funded broadband infrastructure.** Two-thirds of respondents are in favor of allowing municipalities to use taxpayer-funded bonds to build broadband infrastructure.

- **There is some willingness to pay to help build broadband access.** Seven in 10 respondents would be willing to pay a surcharge on their electric bill to help build broadband for unserved Vermonters; however, 47 percent would pay less than $10 per month. Just 22 percent of respondents would be willing to pay $10 or more per month.

- **Many respondents were unaware of the state's emphasis on Communications Union Districts or were uncertain.** Forty-four percent of respondents said they were aware of CUDs as a way to improve broadband access in unserved areas, while 43 percent were unaware and 13 percent were unsure.

2.2.1.2 Mobile Broadband Access Gaps

The survey highlighted gaps in mobile voice coverage, colloquially known as cell coverage, in Vermont, along with a desire for improved service. The following are key findings:

- **Cell coverage is considered highly important to respondents.** Nine in 10 respondents agreed or strongly agreed that cell coverage is important to improve for economic development/business reasons and is important to improve for public safety reasons. Eight in 10 respondents agreed or strongly agreed it is important to improve for quality of life reasons.

- **Cell service may not be meeting the needs of many respondents.** Only one-fifth of respondents agreed or strongly agreed that cell coverage in Vermont meets their needs, while three-fourths disagreed or strongly disagreed. When asked to rank statements about cell service, three-fourths of respondents ranked "I don't believe that cellular coverage needs to be improved at all" as last.

- **Improvements in cell coverage may be more important in residential areas than roadways.** Eight in 10 respondents agreed or strongly agreed that cell coverage improvements should focus on residences or where people lived, while fewer (49 percent) agreed or strongly agreed that improvements should focus on roads and roadways.

- **Most respondents believe the government should prioritize improving cell coverage.** Eighty-four percent of respondents agreed or strongly agreed that cell coverage in Vermont should be a priority for state government to address. When asked to rank statements about cell service, 48 percent of respondents ranked "I would like the state to pursue the most efficient way to increase cell coverage regardless of the method of deployment" as most important (the highest ranked statement).

2.2.2 Internet Service Features and Uses

Respondents value having access to internet and cell service, which would be key factors in deciding on where to live. Consistent and reliable internet are highly important service aspects, which may be critical to support household use of the internet for various activities such as teleworking. The following are key findings:

- **Availability of internet service and cell service coverage are key factors in deciding where to locate**. Seven in 10 respondents said that the availability of internet service at any speed would be extremely important in selecting a place to live, and six in 10 respondents said that the availability of good cell service coverage at the home would be extremely important. Additionally, 86 percent of respondents agreed or strongly agreed they would prioritize moving where they could get internet speeds that meet their needs, regardless of what type of infrastructure was available.

- **The highest ranked aspects when selecting an ISP are consistent and reliable service and fast connection speed.** These service aspects had the highest ranking when respondents were asked to choose the top factors. Additionally, 64 percent of respondents said consistent and reliability service is extremely important. Another 52 percent of respondents said having a fast connection is extremely important.

- **Privacy and net neutrality are other key aspects of internet service.** Specifically, 69 percent of respondents said it is extremely important that their ISP will not collect or sell data without permission. Also, 53 percent of respondents said that net neutrality is extremely important. Furthermore, more than four in 10 respondents would be willing to pay more for service from an ISP that offered net neutrality (42 percent) or privacy protection (45 percent).

- **Fewer respondents identified the ability to choose among multiple internet providers as a key factor of internet service, but this aspect is still important for many.** Approximately one-half of respondents said that having a choice of internet service providers is very (29 percent) or extremely (20 percent) important, and another 31 percent said it is moderately important. Although 42 percent would not be willing to pay a fee to ensure their community had a choice of multiple providers, another 32 percent would be willing to pay less than $10 per month, and 18 percent would pay $10-20 per month. Few respondents would pay more than $20 per month.

- **Home internet is widely used for entertainment and teleworking.** Most households have a member who uses the internet for entertainment (62 percent) or telework (54 percent) daily. One-third of households have a member who attends online classes or uses the internet for civic engagement weekly or daily. Nearly one-half (46 percent) of respondents

said a household member engages in telemedicine less than monthly, and 28 percent do so monthly.

- **Most respondents anticipate their usage of the internet for various activities to remain the same in the coming year.** However, nearly one-half (47 percent) of respondents anticipate their use of the internet for telemedicine to increase. A sizeable share anticipates their use of the internet for entertainment (38 percent), civic engagement (35 percent), telework (34 percent), and online classes (31 percent) to increase.

2.2.3 PEG TV Content

Many households access PEG TV content, most frequently for broadcasts of municipal functions, using a variety of media. Key results include:

- **A sizeable share of respondents views PEG TV content, but many not regularly.** Nearly four in 10 respondents watch PEG programming, including one in 10 frequent viewers who watch weekly or daily. One-fifth watch less than monthly.

- **The most frequently accessed PEG content is broadcasts of municipal functions.** Nearly one-fourth (23 percent) of respondents view this type of programming. One in 10 respondents access programs about local art or made by local artists, and 10 percent access information on local political candidates. Additionally, eight percent of respondents access programming about school functions, and five percent access content made for remote or distance learning.

- **A variety of media is used to watch PEG programming.** This includes online video platforms (15 percent), on the website of the local PEG channel (12 percent), through their TV cable package (11 percent), and social media (8 percent).

2.3 Public Comment

In addition to the online residential and business surveys, the Department of Public Service solicited input from the public through their website and via multiple videoconference forums hosted over Zoom. The input provided by the public has been tremendous, with well over 100 comments received throughout the planning process. These comments are essential to understanding public needs and shaping telecommunications priorities. Themes from comments received by those mechanisms are outlined here. For a full list of public comments and the project team's responses to those comments, please see Appendix F.

2.3.1 Broadband Policy

Public comments on broadband policy in large part focused on the critical nature of universal, high quality, and affordable broadband in Vermont. During the Zoom public input sessions, participants expressed support for the state's Communications Union Districts and their role in

providing broadband solutions. In online comments, the call for ubiquitous broadband was often compared to 20th century rural electrification and many noted the myriad ways in which a lack of broadband presents educational, economic, social, and health related impediments. For example:

> "Many remote workers cannot locate in our area due to poor internet service. During Covid, students and parents have been at a disadvantage if they live here. My own children visit less frequently because they do not have good reliable service in my house, and it is a huge disincentive to them relocating here."

Respondents also focused on a desire to have unserved and underserved Vermonters provided with service expediently and through fiber technology explicitly. Calls for specific speed thresholds varied but a strong desire of 100/100 Mbps service or greater delivered through fiber-to-the-premises networks was readily apparent. For example:

> "Without fiber infrastructure and access to it, people in Vermont are stuck with second-class Internet."

In addition to universal accessibility throughout the state, affordability in both installation and ongoing subscription costs were of great concern. The importance of network resiliency in the face of events like storms, a need for awareness around differing levels of climactic impact among broadband technologies, and general disappointment in the track record of for-profit internet service providers were also expressed. Lastly, many respondents also described the acute need for universal broadband as being underscored by the pandemic. For example:

> "The pandemic revealed in stark terms the cruel inequity of one neighbor being able to stay home and rely on her/his Internet connection to safely and effectively work and attend school, while a mile down the road, another neighbor's poor connectivity created a very real barrier to employment and/or education, and ultimately, to her/his safety."

2.3.2 Cell Service (Mobile Voice and Data Service) and Public Safety

Similar to a call for universal broadband throughout the state, public comments regarding mobile cell service focused on the need for coverage in all parts of Vermont often highlighting the issue as a basic public safety concern. For example:

> "Reliable and consistent cell service must be available throughout the state. It is a matter of public safety, enabling everyone access for help when needed; for reaching people in time of need."

Also echoing calls for affordable broadband, respondents expressed a strong desire for cell service to not only be universal, but affordable. It was mentioned that a lack of reliable cell service in the state necessitates the maintenance of a traditional landline in addition to a cell phone, thus creating extra expense. Some comments expressed a wish that mobile voice and data infrastructure to be built and installed with a sensitivity to surrounding landscapes, and still others questioned whether the health impacts of wireless technologies were being given enough consideration.

2.3.3 Public Access Television

Widespread support for public access television was readily apparent through the public comments. Vermonters expressed appreciation for a wealth of programming coming from the various local stations across the state, often citing diverse information needs these stations are filling, from local municipal coverage, to sports, to educational content. For example:

> "Whether we are streaming Underhill's planning commission hearing live, archiving the video of the latest "Racism in America" talk organized by Rev. Dr. Arnold Isidore Thomas of Jericho's Good Shepherd Lutheran Church, or helping students film videos about local roads' histories, MMCTV is one of the non-profit community media centers in the state giving voice to Vermonters."

Respondents also recognized an uncertain financial future for public access TV, and their recognition of its importance was often expressed alongside concerns around its funding. For example:

> "Public access television is increasingly critical to keeping informed about local issues. It needs a funding stream that is reliable and can provide the money it needs to maintain and improve the way it delivers programming."

Similar to comments regarding broadband, respondents also described how the pandemic has reinforced the essential nature of public access television for individuals and communities. Generally, a wealth of comments simply emphasized the critical nature of services provided by public access television. For example:

> "Being a senior citizen with limitations I am not able to be as involved in my community and state government as I would like to be. Having public access television helps me stay connected. To me it [is] not only a convenience, but a necessity."

As of the publication date of this Plan, a full record of comments made by the public can be viewed at the Vermont Public Service Department's website.

2.4 Business Needs

As part of its efforts to perform a comprehensive evaluation of broadband gaps in line with the state's goals, the State of Vermont commissioned an online survey of businesses.

The online business survey was promoted across the state, including a press release from the PSD, requests made from town administrators and managers, social media promotion from a range of entities, outreach to Regional Planning Commissions and Regional Development Corporations, chambers of commerce, and other efforts.

The survey received complete responses from 54 respondents with 77 percent of respondents owning a business that employs one to four employees. The survey results are presented in full in Appendix B.

The following are key findings from the business survey:

- Almost all businesses surveyed have internet access with the leading types of primary internet service being DSL (39 percent), cable modem (23 percent), and fiber service (21 percent). (*Note: businesses with slower connections may have been more motivated to respond to this survey, to express their need for better service).*
- 98 percent of respondents reported using internet access at their primary business location (which is unsurprising for an online survey), while 71 percent use mobile cellular data services, 69 percent use telephone services, and 50 percent use video services.
- Business internet service pricing mostly fell mostly between $50-$149 per month with the majority reporting $50-$99 per month (55 percent), and 14 percent reporting $100-$149 per month. 42 percent reported that they were moderately satisfied with the affordability of their service while 40 percent were either slightly satisfied or not at all satisfied.
- The speed of business internet connections is likely a barrier to efficient business operations in the state as 67 percent reported that their internet connection is either sometimes or often too slow for their needs. When asked to rank the importance of various aspects of internet service, respondents ranked speed as most important.
- The availability of mobile voice and data (cellular) coverage in Vermont is also likely a barrier to efficient business operations. 77 percent of respondents reported that cell coverage in the state sometimes, rarely, or never meets their needs.
- In the open comment section of the survey, the following themes emerged from responses:

- Quality internet access throughout the state is a priority across sectors as its presence or lack thereof has great impact on essentially all business stakeholders, e.g. owners, employees, and customers.
- A lack of cell coverage on roads and highways, homes, and at places of business negatively impact business operations in a myriad of ways, from creating challenges around staying in touch with employees to an inability to make business calls while in transit.
- Commenters were frustrated by internet service quality, affordability, and availability, and as a result have a desire for more competition among internet service providers

2.5 Public Safety / Emergency Communications Initiatives and Requirements

Emergency communications systems in Vermont, as across the country, are evolving rapidly—and increasingly comprise network elements outside of the users' immediate purview. In Vermont, this includes not only FirstNet, built by AT&T, but other wired and wireless networks that interconnect operations locations, communications sites, internet of things devices, and on-scene personnel.

The Nashville bombing incident on Christmas Day, 2020, heightened awareness of the dependency public safety has on networks as well as utilities (power) operated by other entities. A lack of knowledge of who operated each segment of the networks and where those network routes were located physically hampered public safety's ability to react quicker to the event. Public safety 911, internet, and telephone connections were impacted including the ability to receive and route 911 calls; and FirstNet Built by AT&T and other wireless carrier services all experienced outages ranging from a few hours to days.

The incident also reinforced the importance of public safety owned and operated land mobile radio (LMR) networks as the primary means of first responder communications in the field. The LMR networks for each of the impacted municipalities and states remained fully operational and targeted public-safety answering point (PSAP) talkgroups were used for PSAP-to-PSAP voice communications. LMR will remain the most reliable form of wireless mission critical communications for years to come, until AT&T and other commercial broadband networks prove resilient and interoperable. Any consideration of "streamlining" communications by using other networks (wired or wireless) should closely examine the areas of risk and likely differences in network resilience and redundancy, and incorporate robust accountability in planning, design, implementation, and management of those outside networks.

With that in mind, Vermont must continue to diligently maintain the statewide LMR system, and support upgrades and maintenance of local and regional LMR networks throughout the state. Some local public safety entities are struggling with aging LMR networks that are incapable of direct interoperability with the statewide P25 network and potentially neighboring networks.

Many components of these older networks (e.g., repeaters, radios, consoles, backhaul equipment, backup generators, and other operating equipment) have reached end-of-life and/or end-of-service, often forcing technicians to forage for parts on eBay or Craigslist to keep the network running. In addition, some LMR networks may not provide the needed coverage for first responder communications due to failing equipment, jurisdictional boundary changes, or environmental changes (e.g., taller/fuller trees, more buildings, etc.). Some local public safety authorities note that FirstNet and commercial mobile broadband services in their areas provide insufficient coverage.

These concerns are being addressed for state agencies. The Vermont Department of Public Safety's Radio Technology Services' (RTS) upgrade of the LMR network to APCO Project 25 (P25) standards[6] will enable state agencies to leverage enhanced technologies and will facilitate interoperability—not only among state agencies but between state and local agencies. As is noted as a goal in the state's statewide communication interoperability plan (SCIP),[7] Vermont should continue to migrate state agency users to the P25 system and establish interoperable connections, which the P25 suite of tools enables, among state and local agencies. Local and regional agencies should also be encouraged to upgrade their networks to P25 to facilitate interoperability among state, local, and regional agencies in all public safety disciplines.

The six Vermont PSAPs have all migrated to next-generation 911 (NG911) which is commendable. NG911 services utilize Internet-Protocol (IP) to provide a more robust and resilient system and supports the transmission of both voice and data. Vermont answering points can now receive data that provides location information and can receive text-to-911 data. As industry standards and best practices continue to develop, the state is positioned well to support additional benefits of NG911 technology such as the ability to receive photos and videos to assist first responders in their work.

[6] "Project 25," APCO International, https://www.apcointl.org/spectrum-management/spectrum-management-resources/interoperability/p25/.

[7] "Statewide Interoperability Planning: Statewide Communication Interoperability Plan," Vermont Department of Public Safety's Radio Technology Services, https://rts.vermont.gov/interoperability-planning#:~:text=Interoperable%20communications%20is%20a%20key,for%20interoperable%20emergency%20communications%20efforts; "Vermont Statewide Communication Interoperability Plan," May 2020, https://rts.vermont.gov/sites/rts/files/documents/SCIP%202020%20Vermont%20FINAL.pdf.

AT&T continues to build out the FirstNet network in Vermont, and thus their commercial network as well. They anticipate deploying 36 FirstNet sites in Vermont by the end of the first quarter of 2023. There were 19 FirstNet sites activated as of January 2021[8] and AT&T continues to deploy more, although access to viable tower site locations remains a challenge due to Vermont's terrain. In addition, there is often a balance of interest for tower builds in communities between advocating for public safety broadband and enhanced commercial wireless service and the environmental and aesthetic issues surrounding a large vertical structure installation.

Verizon and T-Mobile also continue to build out their networks in support of public safety broadband communications. Although AT&T is the FirstNet vendor, public safety agencies continue to have a choice of vendors and should assess the coverage, capacities, required features, and interoperability capabilities of each if they decide to use broadband applications.

2.5.1 Department of Homeland Security Statewide Communications Interoperability Plan (SCIP)

Vermont's SCIP, updated in May 2020, outlines the state's strategic goals and initiatives for enhancing interoperable and emergency communications in the subsequent one to three years. The SCIP works in tandem with this statewide plan and captures the following:

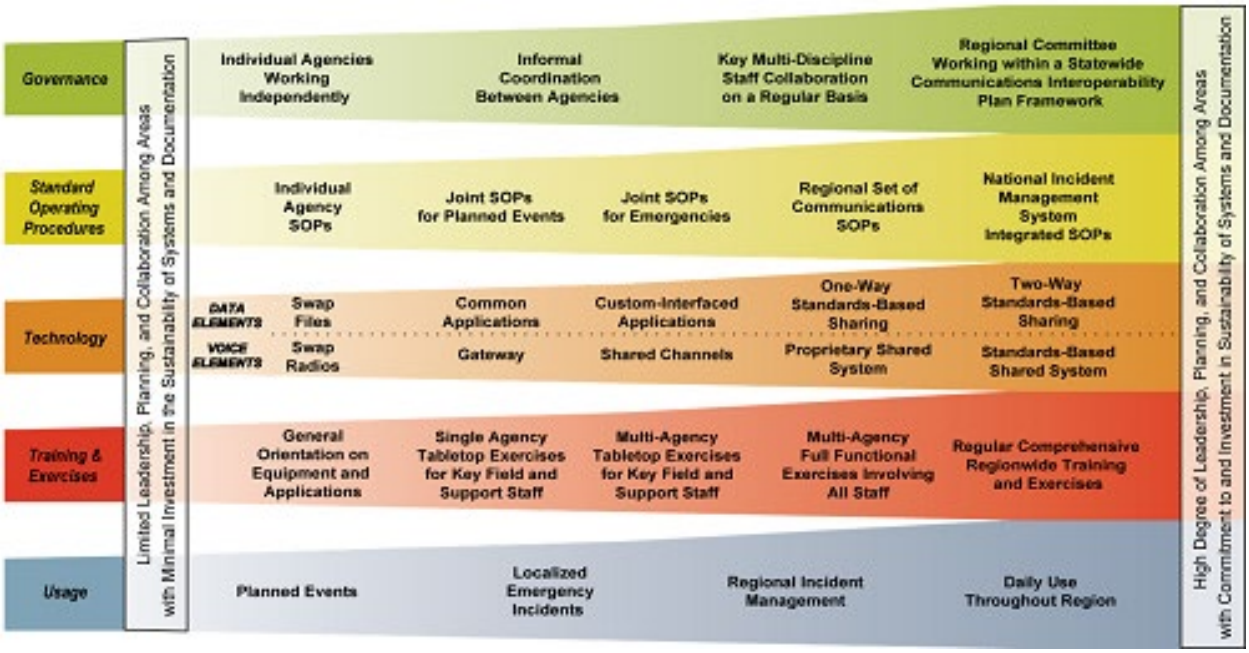
- "Current and future interoperable and emergency communications environment;
- Goals with specific steps for action (including owners and completion timeframes);
- Defined mechanisms to measure achievements; and
- Process by which the state will record progress and challenges each year."[9]

The goals and initiatives documented in the SCIP are driven by the National Emergency Communications Plan (NECP) and the Department of Homeland Security's Cybersecurity and Infrastructure Security Agency's (CISA) Interoperability Continuum[10] developed by SAFECOM. SAFECOM comprises members of the emergency response community and other stakeholders whose mission is to enhance public safety communications and improve interoperability. SAFECOM works closely with the Statewide Interoperability Coordinators (SWIC) and offers training/guidance for SCIP development and updates based on current trends in public safety

[8] Justin Trombly, "Planned FirstNet towers stumble this year, but officials confident in AT&T," *VTDigger*, Dec. 28, 2020, https://vtdigger.org/2020/12/28/planned-firstnet-towers-stumble-this-year-but-officials-confident-in-att/.
[9] "Statewide Communication Interoperability Plans," Cybersecurity & Infrastructure Security Agency, https://www.cisa.gov/statewide-communication-interoperability-plans (accessed May 2021).
[10] "Interoperability Continuum," Department of Homeland Security, https://www.cisa.gov/sites/default/files/publications/interoperability_continuum_brochure_2.pdf (accessed May 2021).

communications. The Continuum is a guide for progress toward a high degree of interoperability in five areas as shown in Figure 1.

Figure 1: Department of Homeland Security SAFECOM Interoperability Continuum



Vermont's SCIP defines an implementation plan for enhancements in each of the Continuum areas and considers the statewide and local LMR networks, broadband use, broadband applications, PSAP and call centers, and alerts and warnings.[11]

The SCIP also includes sustainability funding goals including the identification of other sources of funding. (Section 12.5 discusses several federal funding programs that can help attain these goals.)

The Cross Border/Interstate Interoperability Marker in the SCIP indicates that Vermont currently has little to no "established capabilities to enable emergency communications across all components of the ecosystem". Vermont public safety can plan to establish SOPs and MOUs with agencies and continue to have training and exercises that include bordering states and/or Canada over the next decade. Of note, Canada is currently evaluating models for their public safety broadband network. The PSBN Innovation Alliance (PIA) is piloting one of those models, a system of system model, with sites activated in the Toronto area. Their model would interconnect existing carrier networks and support the expansion of existing carrier networks to facilitate the

[11] "Vermont Statewide Communication Interoperability Plan," May 2020, https://rts.vermont.gov/sites/rts/files/documents/SCIP%202020%20Vermont%20FINAL.pdf.

provision of broadband to unserved rural areas. If the PIA's network expands eastward, interoperability with FirstNet or other U.S. carriers would be ideal.

2.5.2 Vermont Radio Technology Services

The Department of Public Safety's Radio Technology Services supports the land mobile radio (LMR) and related backhaul systems used by the Vermont State Police, the Division of Emergency Management, and the Division of Fire Safety; telephone systems used by several DPS units; and the VCOMM network which uses shared frequencies enabling interoperability among state, county, and municipal agencies.

RTS is currently upgrading the DPS LMR network to APCO Project 25 (P25) which will facilitate interoperability—not only among state agencies but between state and local agencies**.** The first agency to migrate to P25 will be the State Police.

One of the goals presented in the SCIP is to "Establish P25 as the operational standard in Vermont and migrate users to the new standard". This migration of State radio users to P25 moves Vermont state departments to the highest voice technology Standards-Based Shared System level on the Interoperability Continuum. RTS notes that agencies across the state (as in most states) different LMR technologies are in use – some are P25, some still using older technologies and would advocate for agencies to employ P25 over the next 10 years.

RTS continues to operate and maintain the microwave network which primarily provides backhaul for the LMR system but also provides a backup network for the DPS agencies' telephone system – a resourceful shared use of infrastructure and systems. DPS reports this network is highly reliable and adequately supports the capacity needed for these purposes. However, some agencies are migrating to fiber network services through the Agency of Digital Services for telephone backup. While in theory fiber networks can provide an adequate level of reliability and availability, plus the capacity needed, the fiber networks used by the state are also operated by commercial providers and therefore subject to their standards of reliability (which may not be public safety grade/mission critical) and also travel through public network switching locations. Therefore, any consideration of "streamlining" communications should closely examine the areas of risk and likely differences in network resilience.

RTS administratively supports FirstNet within Vermont. This provides Vermont agencies with a state view of the progress of FirstNet, a clearinghouse for information, and some support. RTS should continue to be this conduit for FirstNet information throughout its evolution and migration from 4G LTE to 5G. RTS should stay also abreast of technical advances in radio networks for voice, data, public safety internet of things (PSIoT) applications, and location determination (including z-axis (height) data).

2.5.3 Vermont Enhanced 911 Board and Next Generation 911 (NG911)

The Enhanced 911 Board was established by the legislature in 1994 as the single governmental agency responsible for design, implementation, and oversight of the statewide 911 system. The Board consists of nine members, appointed by the Governor, representing state, local and county law enforcement, emergency medical services, fire service, municipalities and three members of the public.

A 10-member Board staff implements the policies and directives of the 911 Board and is responsible for the day-to-day oversight of the statewide 911 system.

2.5.3.1 Statewide 911 System Overview

Vermont's statewide 911 system has effectively served Vermont since 1998. Since the first call was placed on November 17, 1998, the system has received and processed over four million 911 calls. Nearly 210,000 calls for service were answered in 2020. Wireless calls accounted for 71 percent of total call volume. In addition, 340 text-to-911 messages were received.

Over the past 23 years, the statewide 911 system has kept pace with advances in technology and Vermont has taken a leadership role in the implementation of Next Generation 911 (NG911) services as the standards and best practices for that technology have evolved. NG911 services utilize Internet-Protocol (IP) to provide a more robust and resilient system. With its faster IP infrastructure, NG911 supports the transmission of both voice and data. This allows Vermont to take advantage of its robust GIS data which is used for address validation before a 911 call is even placed, as well as for locating the caller at the time of a call and displaying the primary emergency responders for the caller's location.

NG911 technology also allowed Vermont to become the first state in the country to provide statewide Text to 911 services in 2012. Text to 911 provides life-saving access to 911 when callers are unable to make a voice call—including Deaf/deaf, Deaf-Blind, and Hard-of-Hearing members of the community, domestic violence victims, and others. As industry standards and best practices continue to develop, the state is positioned well to support additional benefits of NG911 technology such as the ability to receive photos and videos to assist first responders in their work.

2.5.3.2 System Status

The current fully-hosted NG911 system, implemented in October 2020, is provided by INdigital, an Indiana-based company that is a proven system provider focused solely on NG911 solutions, which operates in 34 states including statewide deployments in Indiana, Alabama, and New Hampshire.

Prior to implementation, the INdigital fully hosted system underwent an Independent Validation and Verification (IVV) process to assess system reliability and adherence to the technical requirements outlined in the contract. The results indicated the system was ready for deployment. Full results of the IVV are available upon request from the Board in a redacted copy of the IVV report.

Included in the INdigital contract are robust service level agreements (SLA) which align with industry best practice and will better serve Vermont than the SLAs in previous contracts. The partnership with INdigital will keep Vermont at the forefront of NG911 technology which is critical as NG911 deployments continue across the country. Additionally, the INdigital solution is expected to save the state just over $1 million in operating costs, as compared to the previous system provider, over the course of the five-year contract.

Vermont's NG911 maturity level is at the transitional state as defined by the FCC's Task Force on Optimal Public Safety Answering Point Architecture (TFOPA) NG911 maturity model. As reflected in the National 911 Annual Report for 2019, Vermont has reached the jurisdictional end state for governance, GIS data, NG911 core services, security, and operations and is at the transitional state in the categories of routing and location, network, PSAP call handling, and optional interfaces. Moving to jurisdictional end state in the remaining categories is, in some respects, outside the direct control of the Enhanced 911 Board and is dependent upon originating service providers implementing certain functions such as Location Information Services (LIS) to proactively improve address validation and/or connecting to the NG911 system in a manner that allows for the delivery of location information with the incoming call. The Enhanced 911 Board intends to work with these originating service providers and others to encourage implementation of this functionality.

The national vision for NG911 implementation is the creation of a nationwide "system of systems". Since the INdigital implementation, Vermont has been able to begin work in this area through the establishment of and interstate agreement with New Hampshire that allows for more efficient exchange of caller location information between the two states. Agreements of this sort with other neighboring states are possible, as is the possibility of improved disaster recovery planning options. Board staff will research the technical and operational implications of these types of agreements so that the 911 Board can fully consider these capabilities moving forward.

The 911 Board remains committed to providing a standards-based, resilient and reliable statewide 911 system and will continue to work with all stakeholders to ensure the best 911 service is provided to Vermonters.

2.5.3.3 Current PSAP (Public Safety Answering Point) Configuration

The 911 Board partners with five law enforcement agencies in Vermont for 911 call handling services. These five agencies operate a total of six PSAPs. Each PSAP is responsible for answering calls from a primary catchment area and is also responsible for handling overflow calls from all other PSAPs. The call handling services agreement, and associated reimbursement terms, are detailed in a formal Memorandum of Understanding with each agency.

The Vermont Department of Public Safety operates two PSAPs in Williston and Westminster. These PSAPs answered approximately 64 percent of the total 911 call volume in 2020 and, between the two facilities, house sixteen of the state's 24 911 workstations. Four regional PSAPs are operated by the Hartford, Shelburne, and St Albans police departments and the Lamoille County Sheriff's Department. These PSAPs answer about 36 percent of total 911 call volume and each house two funded 911 workstations. In addition, two unfunded workstations are currently housed at two of the regional PSAPs.

The geographic diversity of multiple PSAPs operated by distinct agencies has served Vermont well. Not only does it lessen the impact of human or natural caused events that could significantly impair call-taking capability within the state, but it also aligns with the intent of the enabling legislation that the 911 system be a state and local partnership.

Technology allows 911 calls to be answered at any of the six PSAPs regardless of where the call originated and allows all call-takers access to the same technical resources and equipment. Because the Board has developed standards-based training requirements and call handling protocols, 911 callers receive the same level of service regardless of where their 911 call is answered.

Additional details about the current 911 system configuration are available in the recently updated report, "Redundancy and Resiliency in Vermont's 911 System" – available upon request from the Enhanced 911 Board.

2.5.3.4 Priorities and Initiatives

With the approval of the 911 Board and in partnership with the system provider and other impacted stakeholders, the Board staff's upcoming priorities and initiatives (that have not already been mentioned in this document) include:

- Implementation of Real-Time Text (RTT) functionality which will allow for more effective text communications and the ability for both voice and text communications at the same time.

- Advancing interoperability and information/data sharing with Vermont dispatch centers including existing CAD connection capabilities and identification of other potential mechanisms for improving communication.

- Implementation of the Board's recently adopted "Rule Governing Outage Reporting Requirements for Originating Service Providers and Electric Power Companies" which is expected to provide information necessary to assess the impact of power outages on access to 911 in Vermont. The reporting requirements outlined in this rule for wireless and VoIP providers are much more granular than are required by the FCC and are more appropriate for the rural nature of Vermont. This rule mirrors the reporting thresholds implemented in California for wireless and VoIP carriers.

- Continued implementation of the Board's Rule Governing 911 Requirements for Enterprise Communications Systems (ECS) which helps ensure direct access to 911 from multi-line telephone systems and requires improved dispatchable location information when 911 calls are placed from an ECS.

- Continued monitoring of wireless location accuracy to ensure carriers are adhering to current FCC location accuracy requirements.

- Continued sharing of our authoritative GIS date with constituents such as the Public Service Department, Department of Public Safety (supports CAD and mapping), Vermont Emergency Management (for reverse-911 capacity), Google and similar companies to provide updates that improve their data, National Address Database via the Federal Geographic Data Committee to help support national emergency response (FEMA and other response agencies). Over four dozen entities in Vermont utilize the data collected and managed by the 911 Board including towns, regional planning commissions, and other public entities.

- Forest guide implementation; Vermont will monitor efforts at the national level to develop a national database that will allow a 911 call-taker to obtain accurate routing information for calls that must be sent to another jurisdiction.

- Engagement with stakeholders to discuss considerations and implications of receiving pictures and/or video through NG911 technology, including identification of benefits, costs, and other impacts.

- Continued work with constituents and partners to ensure adequate public and consumer education related to the way various telephone technologies interact with 911.

2.5.4 U.S. Department of Commerce FirstNet Initiative

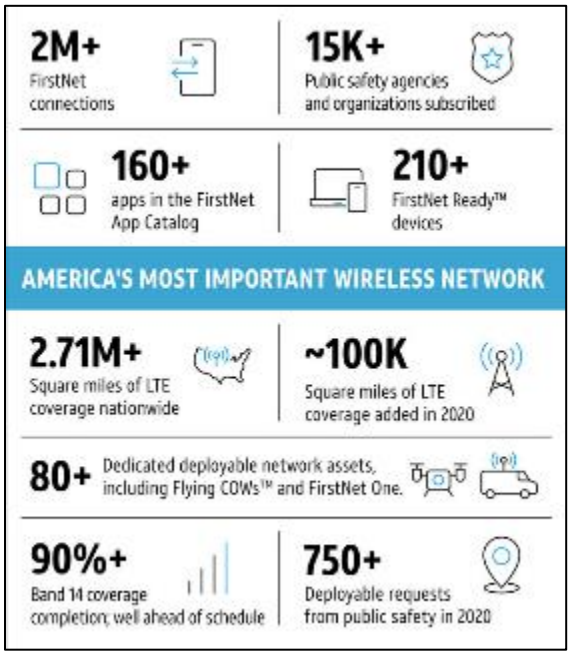
2.5.4.1 Overview

The Middle Class Tax Relief and Job Creation Act of 2012 ("the Act") created the First Responder Network Authority (FirstNet) to implement a nationwide, interoperable wireless broadband network for public safety users. It established FirstNet as an independent authority (with its own 15-member board of directors) within the U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA) and allocated over $7 billion for the network and other public safety needs. This funding was not expected to sustain the network beyond initial startup.

By law, FirstNet must oversee the planning, building, operation, and maintenance of the network—including its nationwide core and Radio Access Networks (RANs) in each state. The network itself offers mobile broadband communications and is meant to supplement, but not replace, mission-critical public safety voice radios. As the network matures, however, it may ultimately support mission-critical voice applications.

The Act requires that the network's minimum technology standards be based on commercial Long-Term Evolution (LTE), a fourth generation (4G) wireless technology that bases its operating standards on the Internet Protocol (IP), hence offering higher capacity and transmission speeds than previous technology and enhancing communications for emergency response and recovery.

Figure 2: FirstNet by the Numbers



Through a competitive bidding process, the FirstNet Authority selected AT&T to deploy and maintain a nationwide public safety broadband network (NPSBN). AT&T is making its commercial spectrum plus 10 MHz of public-safety dedicated spectrum leased from the Federal government available to public safety plus priority (next in line) and preemption (kicks user off the line) features. AT&T has been upgrading and building new sites to add the public safety spectrum and features throughout the country. The snapsot of FirstNet deployment in Figure 2[12] shows the status per AT&T FirstNet as of February 2021.

[12] "FirstNet by the Numbers," AT&T, Feb. 17, 2021, https://www.firstnet.com/content/dam/firstnet/white-papers/firstnet-by-the-numbers.pdf (accessed May 2021).

AT&T also maintains a fleet of portable network assets for public safety agencies' emergency response needs at no additional cost. These 80+ deployables come in various form factors (cellular sites on vehicles, drones), are in demand (AT&T received more than 750 requests in 2020) and are located strategically throughout the country facilitating more rapid deployment.

The contract with AT&T includes the migration to 5G as AT&T migrates its commercial network. Initial upgrades made last year to the FirstNet Core enable access to 5G services for FirstNet subscribers. According to the FirstNet Authority, "FirstNet subscribers will have access to AT&T's 5G mmWave spectrum in parts of 38 cities and more than 20 venues across the country" in April 2021.[13]

2.5.4.2 FirstNet Built by AT&T in Vermont

The project team interviewed AT&T representatives to understand the current status of the FirstNet network in Vermont. AT&T continues to build out the FirstNet network in Vermont, and thus their commercial network as well. They anticipate deploying 36 FirstNet sites in Vermont by the end of the first quarter of 2023. There were 19 FirstNet sites activated as of January 2021[14] and AT&T continues to deploy more, although access to viable tower site locations remains a challenge due to Vermont's terrain. In addition, there is often a balance of interest for tower builds in communities between advocating for public safety broadband and enhanced commercial wireless service and the environmental and aesthetic issues surrounding a large vertical structure installation.

To help offset these challenges and extend their coverage and capacity in Vermont, AT&T has a roaming agreement with VTel Wireless who provide fixed wireless (LTE) network services in some rural areas of Vermont. This also eliminates the need for building additional sites in some areas since the network will use existing VTel infrastructure. Building a new structure entails acquisition of a Certificate of Public Good after acquiring "State and local permit, certificate, or approval that has been issued for the facility under a statute, ordinance, or bylaw pertaining to the environment or land use."[15] The Certificate of Public Good requires a 60-day public comment period which, in AT&T's opinion, may be too long since they have not received a high volume of comments for new structure builds.

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[13] "FirstNet Partnership Kicks Off Fifth Year, Brings Initial 5G Investment to FirstNet," FirstNet Authority, News Release, April 1, 2021, https://www.firstnet.gov/newsroom/blog/firstnet-partnership-kicks-fifth-year-brings-initial-5g-investment-firstnet (accessed May 2021).

[14] Justin Trombly, "Planned FirstNet towers stumble this year, but officials confident in AT&T," *VTDigger*, Dec. 28, 2020, https://vtdigger.org/2020/12/28/planned-firstnet-towers-stumble-this-year-but-officials-confident-in-att/.

[15] Vermont General Assembly, 30 V.S.A. § 248a, Vermont Statutes Online, https://legislature.vermont.gov/statutes/section/30/005/00248a (accessed May 2021).

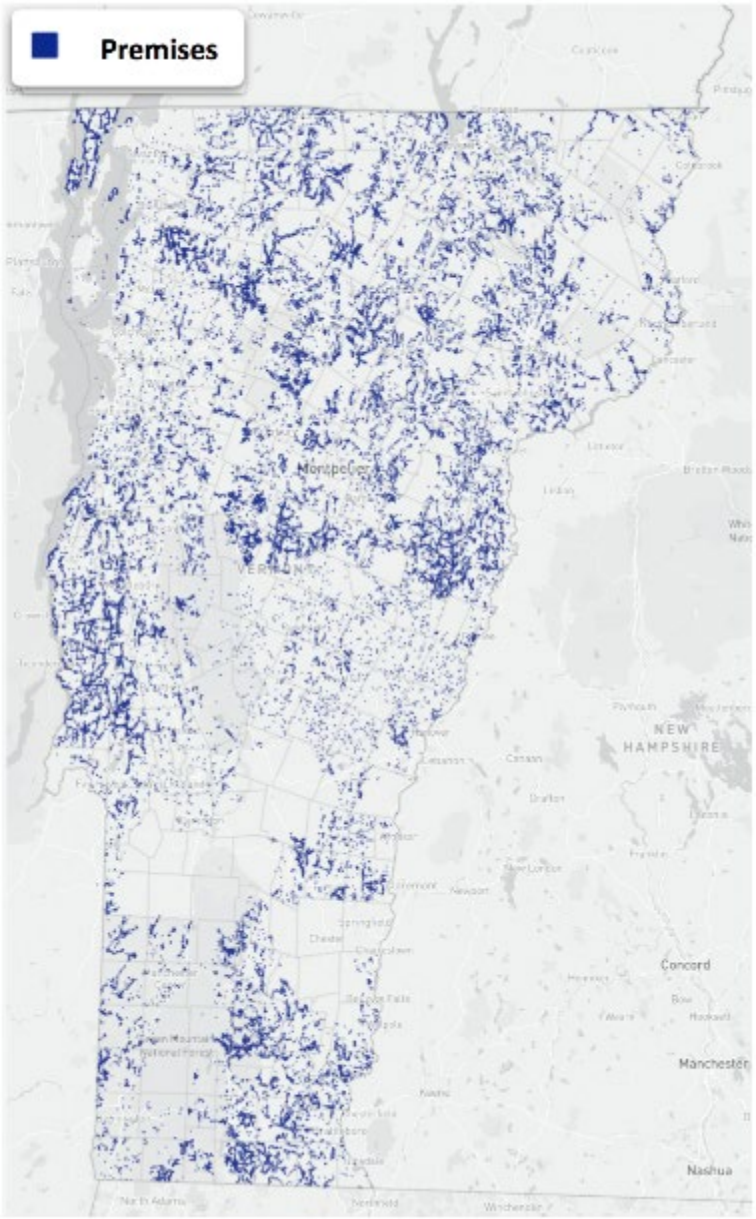
A fast backhaul network is very important to data-focused networks such as FirstNet. Fiber optic connections are ideal because of their capacity and ability to scale to higher speeds, but where fiber deployment is challenging or even impossible due to terrain, wireless microwave connections can be used. Satellite is rarely used for the fixed macro sites as it is quite expensive and comparably slow. AT&T notes that they are not having difficulty getting fiber backhaul to planned sites and the VTel roaming agreement enables AT&T to avoid having to build new sites in VTel's service area.

According to AT&T, the timeline for 5G deployment in Vermont is largely unknown, although there are some deployments in New Hampshire and Massachusetts. Over the next 10 years, however, Vermont should see the migration of not only AT&T to 5G but also T-Mobile and Verizon.

3 Identified Broadband Gaps in Vermont: Overview of Service Based on State Broadband Mapping and Testing

The Department of Public Service maintains a rich set of data providing address-level broadband coverage in the state (Figure 3)—which is one the most comprehensive and detailed in the country. They also have valuable wireless coverage data based on drive tests on major state roads. These maps provide an excellent foundation for assessing and addressing the state's broadband and mobile voice and data coverage challenges.

Figure 3: Unserved Premises in Vermont (Source: Department of Public Service)



First, however, there are several important historical events in the evolution of broadband deployment and availability in Vermont worth noting for context in this plan and to understand the current broadband landscape.

3.1 History of Broadband in Vermont

Nationally, the telecommunications landscape in rural areas has been shaped by the trajectory of local exchange carriers (LEC), including the Bell Telephone Company—which became the Regional Bell Operating Companies (RBOC)—and Rural Local Exchange Carriers (RLEC), which were started in places too rural for the Bell Telephone Company to provide service.

Many RLECs in Vermont have provided service to their communities continuously, without changing hands, for more than a century. These same companies were often the first in an area to start providing internet service as well, originally via dial-up and later with DSL. Today, these companies are also frequently replacing their old copper-based phone and internet systems with fiber due to its greater reliability, capacity, and ability to provide symmetrical speeds.

In Vermont today, there are a range of incumbent LECs (ILEC), the largest of which is Consolidated Communications, Inc (CCI). CCI provides the vast majority of LEC service in Vermont, and operates in an additional 21 states. CCI's presence in Vermont started with their purchase of FairPoint communications in 2016.

FairPoint Communications had been the major player in the phone and internet space in most of Vermont since 2007, when FairPoint acquired a large portion of the LECs from Verizon in Vermont (as well as New Hampshire and Maine). FairPoint was ultimately a challenging ILEC for residents, plagued by service disruptions, poor customer service quality, a major workforce strike, and bankruptcy. The legacy of FairPoint Communications still concerns some Vermonters today.

Today, competitive ISPs also provide service to a significant number of Vermonters. Charter Spectrum and Comcast are the two primary cable companies, but in various parts of the state there are additional smaller cable companies like Duncan Cable and Stowe Cable and fiber providers like Mansfield Community Fiber, Burlington Telecom, and ECFiber.

Vermont has made supporting broadband deployment a priority of the state since the first broadband grants were made in 2003 and 2004 to help small wireless companies provide service to areas that only had dial-up service. Another important historical event in the state's telecommunications trajectory was the receipt of significant federal Broadband Technology Opportunities Program (BTOP) and USDA funding by the Vermont Telephone Company (VTel). BTOP funding allowed VTel to build much needed transport fiber and middle mile in Vermont and New Hampshire. Middle mile and backhaul availability in the state today, including middle

mile owned by VTel, CenturyLink, Firstlight, CCI, and VELCO, is widespread and well suited to future broadband expansion.

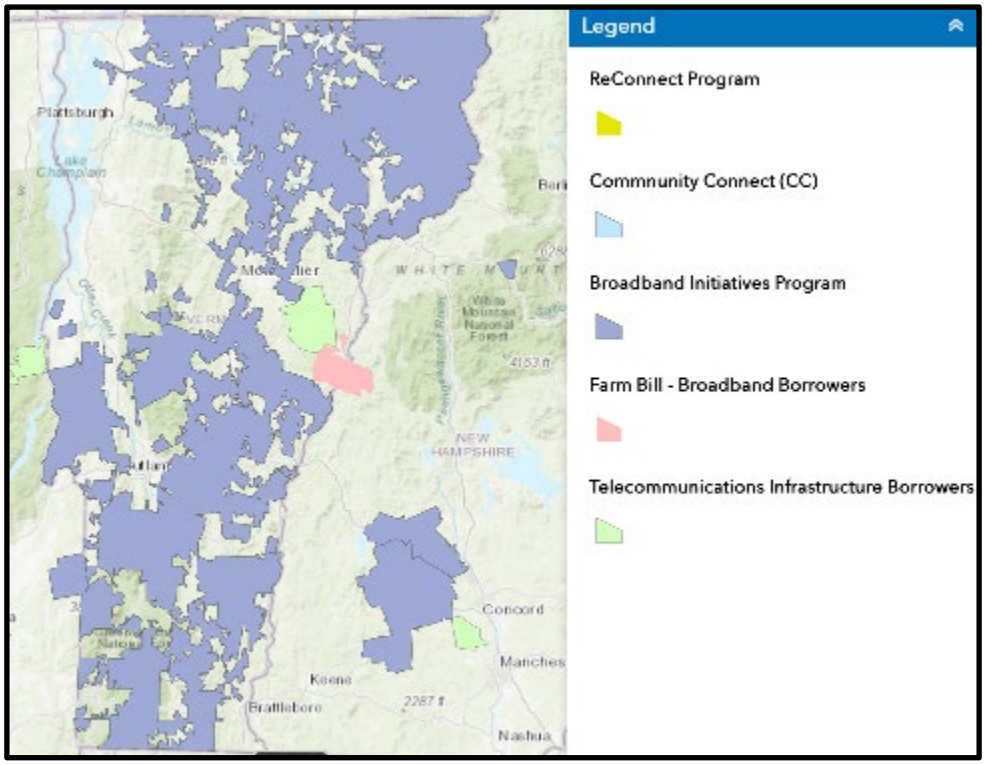
The USDA funding received by VTel as part of the American Recovery and Reinvestment Act allowed VTel to build a fiber-to-the-premises network in their ILEC territory, which provides some of the fastest internet in the nation at up to 10 Gbps symmetrical to residents in Springfield and surrounding towns.

Another portion of the USDA funding was used to set up a fixed wireless network across the state. This network was intended to provide a significant number of premises with fixed wireless service. The network ultimately received a varied reaction from consumers[16]; fixed wireless network service is impacted by trees and hills and performance can significantly vary from the speeds that can be achieved in perfect conditions.

The lasting repercussion of that fixed wireless deployment, however, has been that most of the state has not been eligible for other USDA broadband funding due to the agency's protocol not to fund the same area twice for another 10 years. Below is a map provided by the USDA showing funded areas in Vermont currently ineligible for additional subsidy.

[16] Valley News, "Special Report: VTel and its $116 million Vermont promise," *VTDigger*, August 3, 2015, https://vtdigger.org/2015/08/03/vtel-and-its-116-million-vermont-promise/

Figure 4: USDA Map of Funded Areas



This history has contributed, in part, to the strategies the state is pursuing today. Communications Union Districts (CUD) were established in 2014 to allow local areas to assume responsibility and control over the broadband solution in their areas; they have been empowered to work towards solutions in collaboration with ILECs and competitive ISPs that will meet the needs of residents for the long term. More details on CUDs are provided below.

3.2 Mobile Voice and Data

Vermont's mobile broadband coverage is strongly influenced by the topography and geography of the state. Due to the hills, mountains, and trees, almost no town is completely covered by service, though very few towns are also wholly unserved.

Through the directive of 30 V.S.A. § 202c, the state seeks to "support the availability of modern mobile wireless telecommunications services along the State's travel corridors and in the State's communities."

Indeed, the need for improved access to reliable mobile voice and data service was highlighted in our research: 9 out of 10 respondents from our residential survey considered cell covered as

highly important, and eighty-four percent of respondents agreed or strongly agreed that expanding cell coverage in Vermont should be a priority for state government to address.

Eight in 10 respondents agreed or strongly agreed that cell coverage improvements should focus on residences or where people lived, while fewer (49 percent) agreed or strongly agreed that improvements should focus on roads and roadways. In addition, almost half of survey respondents stated that they wanted the state to pursue the most efficient approach to improving service regardless of deployment method; a smaller group indicated a strong preference for deployment that did not entail building new towers.

The need for improved mobile voice and data was clear from interviews conducted with agencies such as the Department of Agriculture and the Department of Transportation sharing that cell coverage remained a major barrier for those that their department supported.

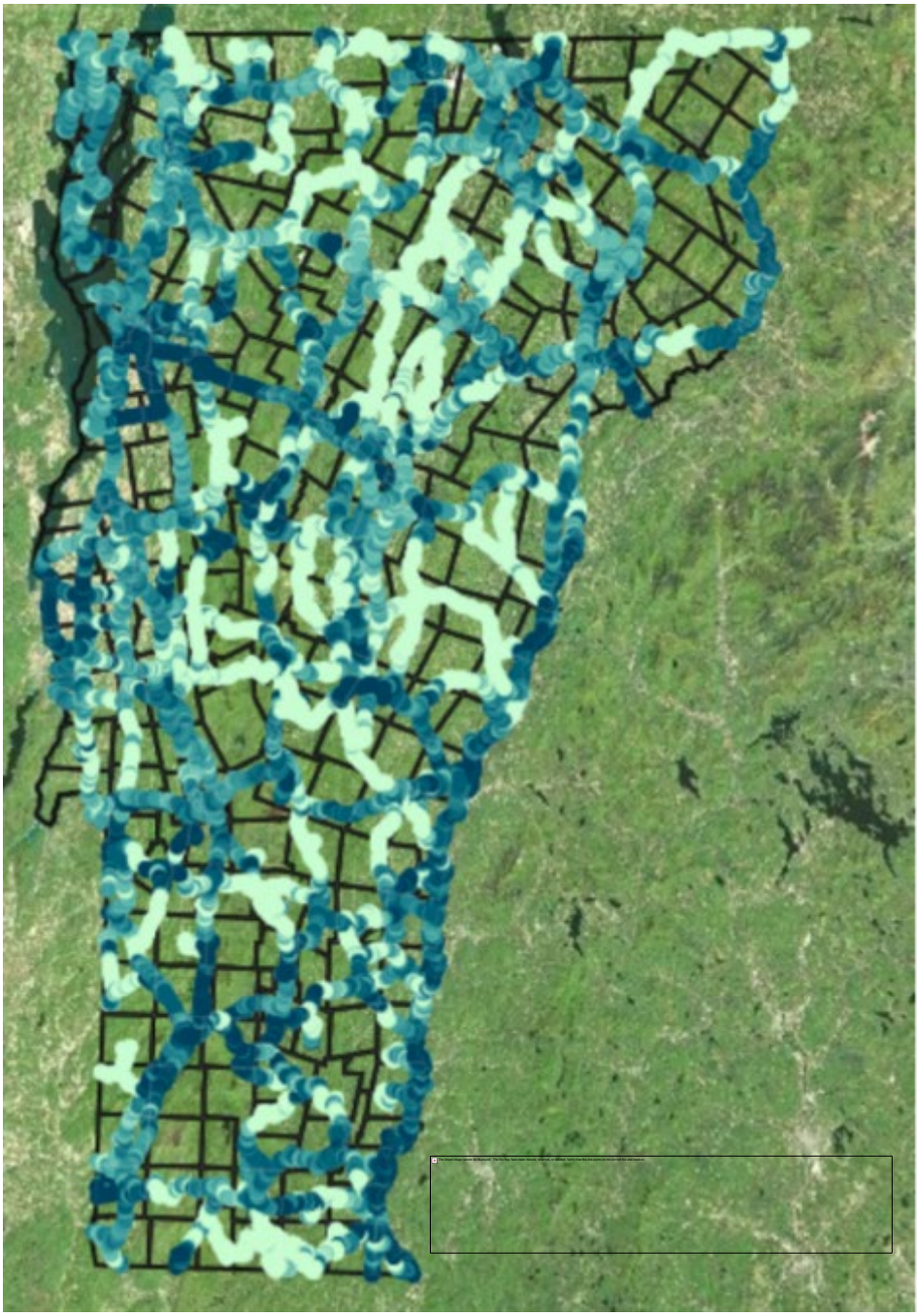
3.2.1 Drive Test Coverage Data

The Public Service Department conducted a wireless drive test data of Vermont state roads in 2018, and select regions of the state have mobile voice coverage data collected by volunteers. Because the drive test only measured coverage on major roads, the information from those tests is more impressionistic than comprehensive; however, it provides useful insight and is a good complement to the radio frequency propagation analysis performed for this plan.

The following is a high-level map of drive-test data gathered on major roads in 2018, with additional data collected by volunteers in 2020. (An interactive map is maintained by the Department of Public Service.)[17]

[17] "Mobile Wireless Drive Test," State of Vermont Department of Public Service, https://publicservice.vermont.gov/content/mobile-wireless-drive-test (accessed May 2021).

Figure 5: High-Level Drive Test Routes



3.2.2 Radio Frequency Propagation Analysis

Locations of cell provider antenna sites in Vermont, obtained using Section 248a data,[18] provided the basis for a radio frequency propagation model estimating the level of mobile service at

[18] "Wireless Communications Facilities – 248a Cases," Vermont Public Utility Commission, https://puc.vermont.gov/sites/psbnew/files/doc_library/wireless-communications-facilities-section-248a_0.pdf

Vermont homes and on roads. This dataset includes the type of tower, from latticed towers to monopoles or "stealth trees" to radios on siloes, steeples, or water towers, as well as the height and whether a telecommunications carrier is permitted to be on the structure, among other data.

Other data needed for the model was estimated based on mobile broadband provider industry standards and best practices for performing these analyses. For example, the predominant bands used by major carriers in the United States are 600 MHz, 700 MHz, 850 MHz, 1900 MHz, 2100 MHz, 2500 MHz, and mmWave bands. Out of all these bands, the lowest frequency band on which all the major carriers have capability to operate on is the 700 MHz band. Also, lowest frequency bands can propagate over much longer distances. Hence, the analysis assumed all the major carriers would be operating on 700 MHz band.

The following additional assumptions were used in assessing wireless coverage throughout the state:

1. Only 248a towers with major carriers co-located used. The major carriers were T-Mobile, AT&T, Sprint, Verizon, and VTEL. Out of the 412 towers in the 248a dataset, 375 towers had major carriers co-located on them.

2. For buildings, church, and silo this report assumes antenna RAD centers as structure height. For all the other tower structures this report assumes antenna RAD centers to be 90 percent of the structure height.

3. Propagation maps were created for the 700 MHz band, and 10 MHz channel was available.

4. Additional assume propagation characteristics include the following typical parameters:

    - Transmitter power = 30 Watts
    - Receiver Threshold = -91dBm
    - Antenna gain = 13.6dBi
    - Noise Figure = 4dB
    - Signal to Interference Noise Ratio (SINR) = 6dB
    - Body Loss = 3dB
    - Fade Margin = 7dB
    - Cable Loss = 3.5dB
    - Adjacent/ Co-channel Interference = 10dB
    - Building Loss (for indoor only) = 13dB
    - Vehicle Loss (for outdoor only) = 5dB

Lastly, it should be noted that in some locations, mobile voice coverage in Vermont may be provided by a tower located in New Hampshire, New York, or Massachusetts; towers in other states were not used in this analysis.

3.2.2.1 Coverage of Vermont Premises

Using the propagation model and premises location from the Public Service Department, the data suggests that mobile voice and data coverage of homes and businesses in Vermont is illustrated by the following map, and comprises the indoor and outdoor coverage indicated in the table below. This report estimates that a significant percentage of Vermonters, perhaps 40 percent, may have difficulty obtaining sufficient coverage and capacity at home, with even more only able to get reliable service outdoors.

Figure 6: Vermont Wireless Coverage Map

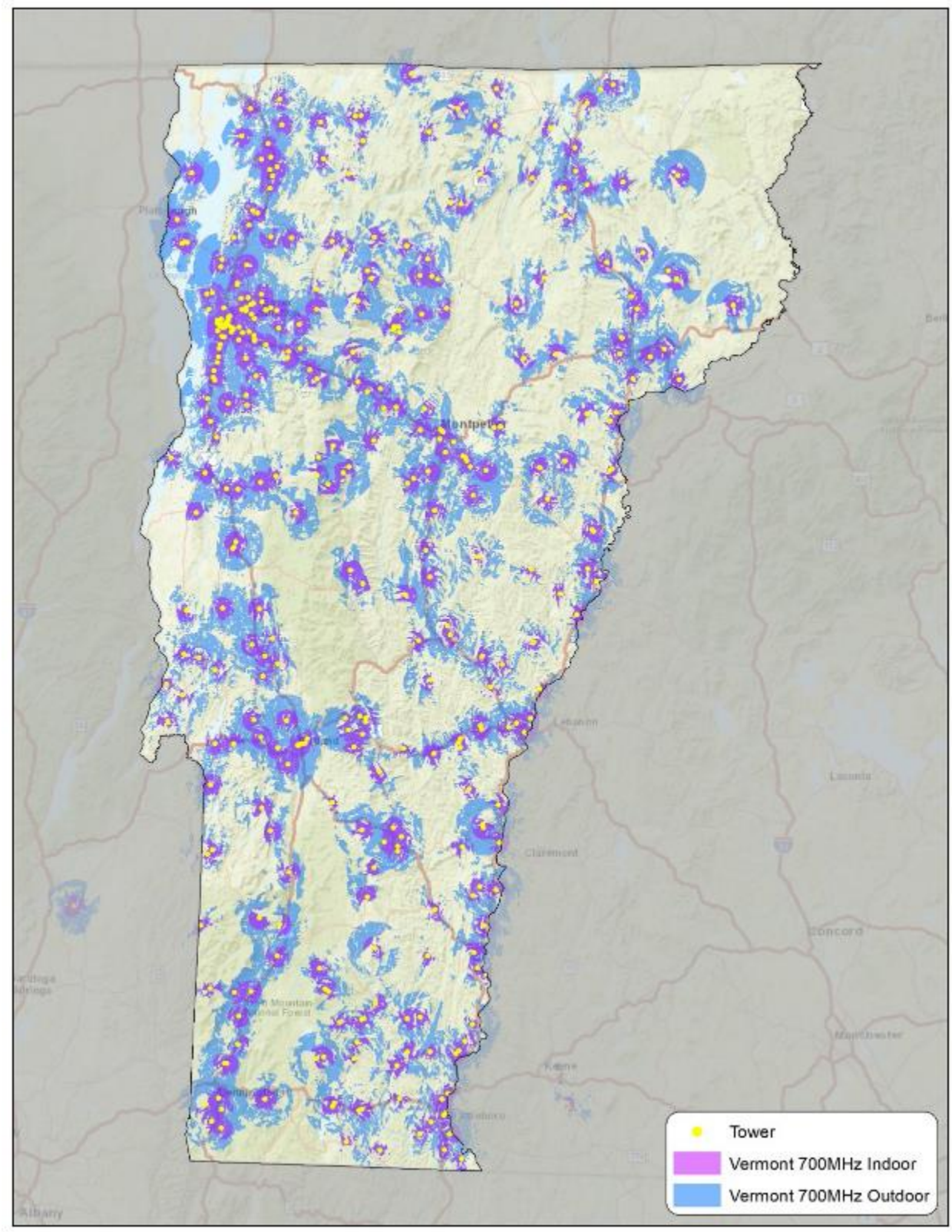


Table 1: Vermont Wireless Coverage – Estimated Addresses Served

Category	Number/ Percentage
Total number of PSD e911 addresses	308,085
Addresses served indoors	114,814
Addresses served outdoors	184,072
Addresses served outdoors but not indoors	69,258
Addresses not served either indoors or outdoors	124,013
Percent of addresses covered indoor	37%
Percent of addresses covered outdoor	60%
Percent of addresses covered outdoor but not indoor	23%
Percent of addresses with no coverage	40%

3.2.2.2 Coverage Along Driving Corridors and Roads

To supplement the drive-test coverage data collected by the PSD, an additional analysis was performed of mobile voice and data coverage along Vermont roadways using the propagation analysis.

In order to perform this analysis, road centerline data was retrieved from the State of Vermont's website. The centerline data was then classified into road types to match the Vermont Agency of Transportation's general road statistics. As this classification was not publicly available, a lookup table from Vermont Center for Geographic Information was provided via email as well as a general description on how the Agency of Transportation general road statistics were created. Then, road polylines were intersected with cell signal polygons generated from the RF propagation analysis, identifying areas that the analysis projected to be covered through both indoor and outdoor usage, as well as sections of roads, by type, that fell within areas of mobile voice and data coverage.

The analysis reinforces the need for increased coverage along roads. Only slightly more than half (55 percent) of roads in Vermont, across all road types[19], currently have mobile voice and data coverage from according to our propagation analysis (again, this number does not include roads

[19] For more information on road type classifications, please refer to Vermont Statute 19 V.S.A. § 302.

potentially covered by towers located across state lines). For full results by road type, please see the following table.

Table 2: Mobile Voice and Data Coverage Along Driving Corridors

	Total Road Miles	Percent of Total Road Miles in State	Miles Not Covered by Mobile Voice and Data Service	Miles Covered by Mobile Voice and Data Service	Percent Covered by Mobile Voice and Data Service
Class 1 Roads	139.8	0.9%	11.3	128.4	91.9%
Class 2 Roads	2,791.0	17.1%	1,206.2	1,584.8	56.8%
Class 3 Roads	8,535.8	52.3%	3,742.6	4,793.1	56.2%
Class 4 Roads	1,594.6	9.8%	948.3	646.3	40.5%
Highway	2,708.8	16.6%	1,095.8	1,613.0	59.5%
Legal Trails	536.7	3.3%	309.2	227.5	42.4%
Grand Total	**16,306.8**	**100.0%**	**7,313.4**	**8,993.3**	**55.2%**

3.3 Wired Broadband Coverage

Vermonters have made it clear that they highly prioritize reliable, fast broadband. Availability of internet service was a key factor that Vermonters would consider when deciding where to move, and speed of connection was a primary consideration when choosing an internet provider.

Today, based on the state's data, almost 70,000 premises, or about 20 percent of the total, do not currently receive at least 25 Mbps download and 3 Mbps upload speeds—the current definition of broadband by the FCC,[20] and just shy of 17 percent of rural census blocks in Vermont have a choice between multiple providers who provide wired, 25/3 Mbps service.[21] However, these numbers do not reflect recently announced investments in broadband expansion that are rapidly changing the broadband landscape.

This Plan's analysis of the state of residential wired broadband and competition is as follows.

3.3.1 Scope of Unserved and Underserved Premises

Since the state's broadband data were compiled in 2019, there have been expansions of service by providers (e.g., Consolidate Communications, ECFiber, Waitsfield and Champlain Valley

[20] This estimation includes RDOF locations.
[21] RISI analysis; see Section 3.2.2 for methodology.

Telecom, OTELCO, Mansfield Community Fiber, and others). The phone survey conducted during the preparation of Vermont's Covid-19 Response Telecommunications Recovery Plan, which targeted premises considered to be unserved and underserved by the Public Service Department, found that 14 percent of those respondents (who were considered unserved or underserved) actually did have wired service capable of 25/3 Mbps, due in many cases to construction that happened after the data were collected.

The state also funded deployment to approximately 8,700 addresses via the Emergency Connectivity Initiative through a variety of technologies, roughly 2,000 of those addresses with fiber.

The FCC's Rural Digital Opportunity Fund (RDOF) auction has granted funding to a variety of entities to serve approximately 19,000 premises in Vermont, 17,000 of which will be served by fiber, and 2,000 to be served by Starlink through a low-Earth orbit (LEO) satellite connection. Winning bidders have up to six years to complete construction to the unserved and underserved premises.

Consolidated Communications, in addition to winning a substantial portion of RDOF locations, has announced that a private equity investment is allowing them to build fiber to over 200,000 premises in areas that already have cable. Construction has already started in Brattleboro and Montpelier.

This report used various datasets from the PSD and the FCC and geospatial mapping tools to calculate the remaining sum of premises that are still lacking a clear path to 100/100 Mbps service. The assumptions used in this calculation are as follows:

- Premises currently unserved and underserved, but funded at the gigabit-low latency tier (which only fiber can provide) by RDOF, are considered served
- Premises currently unserved and underserved, but funded at the above-baseline, low latency tier (in Vermont's case, LEO satellite) by RDOF, remain unserved and underserved, because LEO satellites will never be able to provide symmetrical 100/100 Mbps service
- Premises served by cable currently are considered served for two reasons:
    - Cable providers have upgrade paths to 100/100 service that do not necessarily involve new fiber construction
    - CCI has reported it is overbuilding more than 200,000 premises that currently have cable
- Premises funded by the Connectivity Initiative with fiber or cable are considered served

- Premises funded by the Connectivity Initiative with fixed-wireless solutions are considered unserved and underserved; for more information, see the discussion of the limitations fixed wireless in Section 5

Our analysis finds that approximately 51,000 premises do not currently have access to 25/3 Mbps service, and do not have a path to coverage (e.g., were not funded by the RDOF auction at the gigabit-low latency tier or funded via 2020 Connectivity Initiative grants). These premises are often on the outskirts of towns or in the most rural areas, and can be in non-contiguous areas. Serving these premises at the "last mile" presents a challenging business case; as such, they should be the priority locations for capital subsidy available for broadband expansion.

3.3.2 Communications Union District Coverage

In 2015, the Vermont Legislature authorized the formation of Communications Union Districts (CUD),[22] enabling two or more towns to join together to provide communication infrastructure to residents. Much like a water and sewer or solid waste district, CUDs allow towns to aggregate demand for a service and find efficiency by sharing operation of the district.

CUDs are critical entities for closing the digital divide in Vermont. The state has promoted and supported CUDs as a mechanism for expanding broadband across the state in the most rural areas; the infrastructure the state has built around CUDs and the progress CUDs have made makes it clear that CUDs will continue to play an important role in the telecommunications landscape in the state.

East Central Vermont Telecommunications District ("ECFiber") became Vermont's first operational CUD in 2016 and has since served as a model for other regions across Vermont seeking to address the growing needs of unserved or underserved areas. In 2018, for instance, twelve municipalities in Central Vermont followed ECFiber's lead to form CVFiber. By mid-2020, 27 towns in Vermont's Northeast Kingdom region voted to form NEK Broadband, which now covers 48 cities and towns and serves as the state's largest CUD.[23]

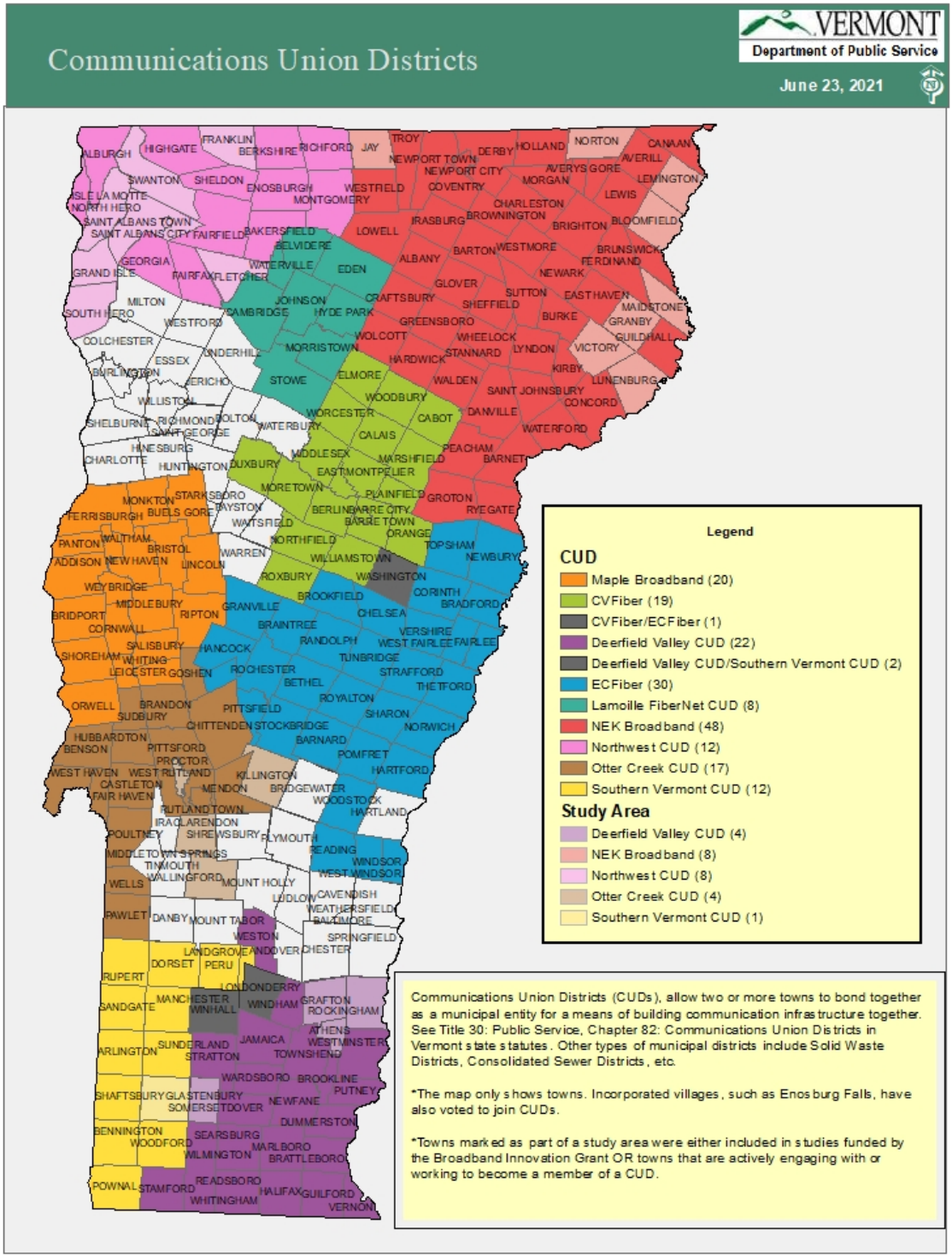
A growing number of municipalities across the state have chosen to join or form a CUD in the past six years. In total, nine districts representing 186 of Vermont's 246 towns and cities have formed,[24] as identified in the following table and illustrated in the map below.

[22] 30 V.S.A § 3051
[23] "More than 40 towns vote to join high-speed internet groups," Associated Press, March 6, 2020, https://apnews.com/article/2a1aaa62984f0ffc7ce518b8accd15e9.
[24] "Vermont Communications Union Districts," State of Vermont Department of Public Service, https://publicservice.vermont.gov/content/vermont-communications-union-districts.

Table 3: Vermont CUD Membership and Coverage (Public Service Department, as of June 2021)

CUD	# Communities	Population 2019	% Total State Population	Road Mileage	% Total State Road Mileage	Total PSD Premises	10-1 Premises	4/1 Premises	Unserved	Under-served Premises (< 25/3)	% Under-served	100/100 Premises	25/3 Premises	RDOF Gigabit Low Latency Premises	RDOF Above Baseline Low Latency Premises	GMP/VEC Eligible Premises	Connectivity Initiative Cable Premises	Connectivity Initiative Fiber Premises	Connectivity Initiative Wireless Premises
Addison CUD	20	35,975	6%	1,356	7%	17,221	52	5,874	722	6,648	10%	2,051	8,522	509	105	591	-	24	28
CVFiber	19	54,066	9%	1,573	8%	23,556	16	4,790	1,491	6,297	9%	607	16,652	1,704	30	995	-	11	793
CVFiber/ECFiber	1	1,010	0%	91	0%	619	5	261	151	417	1%	-	202	261	-	14	15	-	178
Deerfield Valley CUD	21	36,123	6%	1,773	9%	23,966	178	4,519	2,845	7,542	11%	2,272	14,152	1,619	206	2,045	38	-	651
Deerfield Valley CUD/ Southern Vermont CUD	2	2,386	0%	186	1%	3,116	-	172	189	361	1%	8	2,747	60	23	91	-	-	128
ECFiber	30	55,221	9%	3,004	14%	30,792	28	4,091	1,910	6,029	9%	13,934	10,829	1,895	122	1,147	-	676	16
Lamoille FiberNet CUD	8	22,811	4%	796	4%	11,470	11	3,482	1,096	4,589	7%	470	6,411	691	90	716	-	-	437
NEK Broadband	48	62,154	10%	3,626	17%	36,212	230	10,237	6,457	16,924	24%	534	18,754	6,269	483	2,842	165	386	2,954
Northwest CUD	12	29,410	5%	1,075	5%	14,653	97	4,820	2,098	7,015	10%	157	7,481	1,326	466	1,109	-	532	802
Otter Creek CUD	16	45,504	7%	1,107	5%	20,672	2	2,265	752	3,019	4%	758	16,895	380	79	632	-	-	-
Southern Vermont CUD	12	33,094	5%	982	5%	17,777	47	1,296	901	2,244	3%	204	15,329	539	98	731	-	-	1
Non-CUDs	**66**	**246,190**	**39%**	**5,173**	**25%**	**108,023**	**73**	**6,372**	**2,364**	**8,809**	**13%**	**32,782**	**66,432**	**1,268**	**469**	**1,451**	**53**	**497**	**950**
All CUDs	189	377,754	61%	15,568	75%	200,054	666	41,807	18,612	61,085	87%	20,995	117,974	15,253	1,702	10,913	218	1,629	5,988
State Totals	**255**	**623,944**	**100.00%**	**20,742**	**1**	**308,077**	**739**	**48,179**	**20,976**	**69,894**	**1**	**53,777**	**184,406**	**16,521**	**2,171**	**12,364**	**271**	**2,126**	**6,938**

Figure 7: CUD Coverage Map (Source: Public Service Department)



There are many reasons municipalities choose to form or join a CUD, but perhaps the most valuable benefit for rural communities is the ability to achieve efficiencies of scale by aggregated un and underserved premises across towns. Less dense and isolated towns may not individually provide the profitability needed for ISPs to expand or provide adequate service to their area, nor may they have the leverage to appropriately scale for efficient solutions on their own. By aggregating demand and sharing resources, CUDs allow towns to gain more negotiating power and increase their appeal to potential investors.

Some municipalities, including the majority of the Chittenden County area, and southern parts of the Windsor and Rutland areas, have yet to join a district. It is important to recognize that some towns may choose not to be part of a CUD if current broadband options provide adequate coverage for their residents. Indeed, Chittenden, Windsor, and Rutland counties have the lowest percentages of underserved (< 4/1 Mbps) buildings in the state and the highest percentages of buildings with internet speeds of 25/3 Mbps or greater,[25] which may be a contributing factor to the delayed uptake of CUD membership in these areas. In contrast, areas with inadequate coverage have displayed a stronger response to CUD recruitment and formation.

It is expected that more towns will continue to join CUDs in the coming weeks and months, especially as state plans to support broadband expansion solidify, and as existing CUDs continue to do outreach to neighboring communities. In addition, it is expected that CUDs may explore merging with other districts to achieve greater scale. CUDs were originally formed loosely around Regional Planning Districts in the state, and though some will remain this size, some may merge or closely coordinate to share administrative burden, fixed costs, strategies, and gain greater scale.

3.3.3 Wired Broadband Competition in Vermont

Advocates and public officials in Vermont, as well as national data on broadband pricing, indicate that having a choice between multiple broadband providers can lower prices and benefit consumers. In rural areas, however, there are often not enough total potential customers to entice multiple ISPs to offer broadband service.

This report presents an original analysis that compares the amount of broadband competition in rural Vermont to states across the country. An analysis of census blocks in the FCC's 477 data, filtering the dataset down to just rural census blocks, and comparing the number of census blocks with two ISPs or more vs those with one or none by state, finds that:

[25] "Broadband Statistics Summary by Town as of December 31,2019," State of Vermont Department of Public Service, Excel file, https://publicservice.vermont.gov/sites/dps/files/documents/Connectivity/BroadbandReports/2020/BroadbandStatistics_county_2020_02202020.xlsx (accessed May 2021).

- The national average for number of rural census blocks with more than one fiber or cable provider is 16.8 percent, the median is 16.9 percent
- Vermont ranks very close to the average, with 16.7 percent of rural census blocks having a choice between two or more fiber or cable providers
- For context, the state with the most competition in rural areas is Rhode Island (76.7 percent of rural census blocks have multiple cable or fiber providers); however, this state is an outlier with very few census blocks designated as rural
- Massachusetts ranks 5th on the list, with 25 percent of rural census blocks having a choice; New Hampshire is 7th with 23 percent of rural census blocks having a choice
- The state with the least competition is Idaho; 3.38 percent of rural census blocks have a choice

All of the limitations of the FCC's data apply to this analysis; namely, measurements at the census block are less precise than ideal, and the data is not current as of this report, and so recent construction is not reflected in this analysis. It is expected, however, that the recently announced plans by Consolidated Communications to build fiber to over 200,000 premises in areas with existing cable will greatly increase the amount of competition in Vermont. 200,000 premises presents a significant percentage of the overall number of premises in the state, and Vermont may well become one of the states with the most competition in rural areas after CCI completes their construction.

3.3.4 Price and Speed Comparisons With Other States

Internet speeds recorded by speed tests can provide context to the internet landscape of the state. The speed-test provider Ookla aggregates regional internet speed test data quarterly and publishes averages by state.[26] As of Q1, 2021 New Jersey, Rhode Island, and New York had the fastest median download/upload speeds in the country: 138.69/35.70 Mbps, 134.19/33.71 Mbps, and 129.41/23.62 Mbps, respectively.

By comparison, Vermont's median speeds were 73.08 Mbps download and 10.95 Mbps upload, placing Vermont 45th on the list and closely aligned with other rural states of similar demographics. However, this comparison should be considered with significant context; namely, that speeds vary based on many factors and do not simply reflect the availability of fast internet. For example, speed tests are impacted by the internet packages offered and purchased by consumers, in home equipment and distance from the access point, use of the test on a desktop, laptop, or phone, demographics (e.g., older people tend to not need or subscribe to as fast of

[26] "Market Analysis: Fastest Providers," Ookla, https://www.speedtest.net/global-index/united-states?fixed#market-analysis (accessed May 2021).

internet), and the make-up of the local business sector. The rurality of the state will also have a big impact on speeds, as attenuation may occur to a greater degree when premises are more spread out.

Prices for service in Vermont range by provider, but do not seem to be significantly different than service costs in other New England states.

One difficulty in comparing service costs across states is that many major ISPs can and do change pricing, often by offering "teaser rates" that start at advertised low rates and gradually increase over time or after a certain length of service.

In addition, hidden fees change the price paid by consumers for internet. For example, Comcast had planned to implement data caps across the northeast during 2021, which could result in extra fees if customers exceed data limits in a month, however, they have delayed enforcement of data caps until an unspecified time in 2022.[27, 28]

Lastly, it can be difficult to compare costs because the speeds those costs pay for can vary greatly. Some providers offer speeds "up to" a certain amount, though in practice, the actual speeds perceived by the customer could be very different than the maximum advertised speed. Comparing the cost of service rated "up to 200 Mbps" with service rated "up to 300 Mbps," when there is no guarantee customers are getting advertised speeds, is a challenge.

3.3.4.1 Vermont Pricing

The table below summarizes the pricing, speed, and availability of services delivered by internet service providers in Vermont. Please note that all prices listed in this Plan were current as of the time of this writing and are subject to change at any time.

[27] Jon Brodkin, "Comcast reluctantly drops data-cap enforcement in 12 states for rest of 2021," *ArsTechnica*, Feb. 19, 2021, https://arstechnica.com/tech-policy/2021/02/comcast-responds-to-pressure-cancels-data-cap-in-northeast-us-until-2022/

[28] "We're Giving Our Northeast Customers More Time," Comcast, News Release, Feb. 18, 2021, https://corporate.comcast.com/stories/were-giving-our-northeast-customers-more-time (accessed May 2021).

Table 4: Broadband Service Pricing in Vermont

Provider	Starting Price*	Download Speed Range	Technology
Xfinity	$39.99/mo.	Up to 300 Mbps	Cable
Spectrum	$49.99/mo.	Up to 200 Mbps	Cable
CenturyLink	$49.00/mo.	Up to 80 Mbps	DSL
Burlington Telecom	$55.00/mo.	Up to 150 Mbps	Fiber
Vermont Telephone Company	$34.95/mo.	Up to 1,000 Mbps	Fiber
Consolidated Communications	$62.00/mo.	Up to 100 Mbps	DSL, fiber
Viasat	$70.00/mo.	Up to 12 Mbps	Satellite
HughesNet	$99.99/mo.	Up to 25 Mbps	Satellite

*Pricing per month plus taxes for length of contract. Additional fees and terms may apply. Pricing varies by location and availability. All prices subject to change at any time. May or may not be available based on service address. Speeds may vary. As of 04/21/21. Source: https://www.allconnect.com/local/vt

3.3.4.2 Pricing in Neighboring States

The following tables include prices presented on the providers' websites.

Table 5: Xfinity/Comcast Pricing in Neighboring States

Download Speed (Mbps)	VT	NH	ME	MA	CT	RI
25	$49.95	$49.95	$49.95	$49.95	$49.95	-
100	$39.99	$77.95	$77.95	$77.95	$77.95	-
200	$54.99	$39.99	$39.99	$39.99	$39.99	-
300	$59.99	$59.99	$59.99	$59.99	$59.99	-
600	$69.99	$69.99	$69.99	$69.99	$69.99	-
1000	$79.99	$79.99	$79.99	$79.99	$79.99	-
2000	$299.95	$299.95	$299.95	$299.95	$299.95	-

Table 6: Consolidated Communications Pricing in Neighboring States

Download Speed (Mbps)	VT	NH	ME	MA	CT	RI
10	-	-	-	$27.00	-	-
20	$37.09	-	$37.09	-	-	-
25	-	-	-	$43.95	-	-
40	$47.59	-	$47.59	-	-	-
50	-	$49.89	-	$46.95	-	-
100	-	$62.00	-	-	-	-
1000	-	$74.55	-	-	-	-

3.3.4.3 National Pricing

The following tables include prices presented on the BroadbandNow website:

Table 7: Charter Spectrum Pricing (National)

Speed	Price/Month
100/10	$49.99
400/20	$69.99
940/35	$109.99

Table 8: Viasat Pricing (National)

Speed	Data Cap in GB	Price/Month
12/3	12	$50
12/3	25	$75
12/3	50	$100
25/3	Unlimited	$150

Table 9: HughesNet Pricing (National)

Speed	Data Cap in GB	Price/Month
25/3	10	$49.99
25/3	20	$59.99
25/3	30	$89.99
25/3	50	$139.99

3.3.4.4 State-Level Pricing

3.3.4.4.1 Vermont

Table 10: VTel Pricing (Vermont)

Speed (Mbps)	Price/Month
1000 (Fiber Optic Internet)	$34.95
1000 (GigE Solo)	$69.95
1000 (GigE Gamer)	$79.95
10,000	$399.95

Table 11: ECFiber Pricing (Vermont)

Download Speed (Mbps)	Price/Month
25	$72.00
100	$104.00
300	$134.00
800	$164.00

Table 12:Burlington Telecom Pricing (Vermont)

Download Speed (Mbps)	Price/Month
5	$40.00
150	$55.00
300	$65.00
1000	$70.00

Table 13: Waitsfield & Champlain Valley Telecom Pricing (Vermont)

Download Speed (Mbps)	Price/Month
10	$46.95
25	$53.95
50	$63.95
100	$76.95
500	$91.95
1000	$103.95

3.3.4.4.2 New Hampshire

Table 14:Granite State Communications Pricing (New Hampshire)

Download Speed (Mbps)	Price/Month
25	$49.95
50	$69.95
100	$89.95

Table 15:Tamworth Wireless Cooperative Pricing (New Hampshire)

Download Speed (Mbps)	Price/Month
1	$29.99
2	$49.99
3	$69.99
4	$89.99

3.3.4.4.3 Maine

Table 16:Coastline Wireless Pricing (Maine)

Download Speed (Mbps)	Price/Month
20	$39.99
40	$54.99
60	$69.99

Table 17:RedZone Pricing (Maine)

Download Speed (Mbps)	Price/Month
25	$44.99

3.3.4.4.4 Massachusetts

Table 18: Starry Internet Pricing (Massachusetts)

Download Speed (Mbps)	Price/Month
100	$30
200	$50

Table 19: NetBlazr Pricing (Massachusetts)

Download Speed (Mbps)	Price/Month
200	$39.95
1000	$59.95

Table 20: Shrewsbury Electric and Cable Operations Pricing (Massachusetts)

Download Speed (Mbps)	Price/Month
100	$54.95
200	$69.95
300	$99.95

3.3.4.4.5 Connecticut

Table 21: Thames Valley Communications Pricing (Connecticut)

Download Speed (Mbps)	Price/Month
6.6	$29.99
110	$39.99
330	$59.99
1000	$79.99

3.4 Survey of Other State Broadband Programs and Offices

The National Conference of State Legislatures performed a survey of state programs to address broadband gaps in June 2020. At that time, all 50 states had launched some program or initiate to address broadband gaps,[29] ranging from temporary (and sometimes even unfunded) task forces and commissions to fully fledged independent authorities and offices.

Almost certainly due to increases in resources to support broadband deployment, many states are now in the process of converting task forces and commissions into more established frameworks, like state offices and authorities. A survey done by the project team found that most of these offices are or will be housed under Economic Development or Information Technology departments within state government, though this is not uniform across states. As part of the

[29] "State Broadband Task Forces, Commissions or Authorities and Other Broadband Resources," National Conference of State Legislatures (NCSL), June 2020, https://www.ncsl.org/research/telecommunications-and-information-technology/state-broadband-task-forces-commissions.aspx.

processes of expanding and establishing new frameworks, many states are also seeking to add staff capacity with broadband expertise.

Among Vermont's New England peers, Maine and Massachusetts have the most robust broadband expansion programs. Maine's program, the ConnectMaine Authority (ConnectME), was established in 2020[30] and has an annual operating budget of around $1.5 million, funded by a small surcharge (0.25 percent) on all communications, video, and internet service bills, as well as a surcharge ($0.10) on all landline numbers. In July 2020, Maine voters passed a broadband bond of $15 million, which ConnectME administers.[31] ConnectME is also slated to oversee broadband investments of up to $129 million, funded by the American Rescue Plan Act.

The Massachusetts Broadband Institute (MBI) supported a 1200 mile, publicly owned middle mile network in 2014, which is operated by a private company. The network cost almost $90 million and was partly funded by federal BTOP grants.[32] Since then, the MBI has provided over $30 million in grant funding to various broadband projects that are either hybrid fiber/coaxial cable, or fixed wireless.

It is hard to compare per capita spending on broadband state to state, considering the range of resources from different sources that have been used for different types of broadband infrastructure. Vermont's allocation of 10.8M to the VEDA Broadband Expansion program via Act 79 in 2019 is slightly more per capita than Maine's recent bond, but in the same order of magnitude. It is also more per capital than the $30 million in last-mile project funding Massachusetts has spent in the past few years; however, the varying time frames, projects, lending parameters, and processes do not make this a particularly useful comparison. Another complication in comparing per capita spending on broadband is the varied amount of federal funding for broadband awarded to each state. Vermont has been the recipient of substantial federal money, for example, the BTOP and USDA resources awarded to VTel, as well as CARES act resources that were directed to broadband.

Perhaps more important than how much money has been spent on a per capita basis is how the money has been spent. In that regard Vermont has been a regional and leader on the strategy and public policy behind broadband deployment.

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[30] 35-A.M.R.S.A. Ch 93, Advanced Technology Infrastructure, https://www.maine.gov/connectme/sites/maine.gov.connectme/files/inline-files/statute_2020.pdf.
[31] "Grants," ConnectMaine, https://www.maine.gov/connectme/grants (accessed May 2021).
[32] "MassBroadband 123 Network Construction," Massachusetts Broadband Institute, https://broadband.masstech.org/about-mbi/past-programs/massbroadband-123-network-construction (accessed May 2021).

Vermont's Communication Union District model is being replicated across the country, including recently in New Hampshire and Maine.[33,34] Many states, including Maine but also Tennessee, Georgia, and others, have undertaken or are currently pursuing efforts to improve upon the FCC's 477 data for planning purposes, specifically about what areas are currently underserved. Vermont's Public Service Department has been a nationwide leader on this front, having provided address-level broadband availability data for several years already.

In addition, Vermont's emphasis on prioritizing 100/100 Mbps service will ensure that investments made now in broadband infrastructure will last for decades and not need to be duplicated in the future. Setting 100/100 Mbps as the goal is increasingly common amongst public advocates across the country, but Vermont is a leader in adopting it as the official state goal.

Crucially, Vermont's emphasis on leveraging public entities in solving broadband challenges will ensure many of the goals set by advocates and public officials—like reaching the last mile and providing affordable service—can be realized. The involvement of local public entities in the broadband solution will also provide a foundation for addressing demand-side broadband challenges, like affordability and digital equity, for the life of the networks.

Lastly, Vermont's approach to telecommunications policy on the local and statewide level is notably community-driven. The CUD mechanism is almost entirely guided by local decision-making and local control. Vermont is singular in the access and input it gives the public in statewide telecommunications planning between the public input sessions, comment solicitation, and Draft Plan review processes.

[33] "New Hampshire Senate Bill 457 (2020), LegiScan, https://legiscan.com/NH/text/SB457/2020 (accessed May 2021).
[34] Sec. 1. 30-A MRSA §2203, sub-§9, 127th Maine Legislature, https://legislature.maine.gov/legis/bills/bills_127th/billtexts/HP063201.asp (accessed May 2021).

4 10-Year Technology and Usage Trends

4.1 Broadband Market and Technology Trends

Telecommunications systems, at their simplest, transmit packets of data from one location to another, around the world. Recent technological advancements have created faster and more reliable mechanisms to transmit packets of information; these new technologies are in the process of being deployed for commercial purposes and will impact telecommunication services and policy in the next 10 years. At the same time, all of our telecommunications systems are constrained by the properties of physics and so the highest-capacity and most reliable telecommunications technology today—technology that uses light traveling along a glass strand, or fiber optic cable—is not likely to be superseded in the future.

4.1.1 Fiber Broadband Deployment Trends

Fiber-optic based internet deployments are accelerating in urban and rural areas alike. The vast majority of subsidy in the FCC's recent RDOF auction went to building fiber networks; a clear sign that if any amount of subsidy is available, building fiber networks is almost always the best long-term choice.

Part of the reason ISPs are electing to build fiber, other than the unmatched symmetrical speeds, is that fiber does not degrade as fast as other types of technology, like copper phone lines or coaxial cable. In fact, many cable providers and ILECs are slowly replacing copper infrastructure with fiber.

One related repercussion of the transition to fiber deployment is that technology used to require several connections to a premises is converging into being provided through a single fiber optic cable. Phone systems and cable TV are the notable examples—both are still predominantly provided over metallic cables, but can also be provided on a single strand of fiber where that technology is deployed.

This convergence can create challenges. For example, when phone service was transmitted over copper via electric pulses and thus did not also need power at the home, phone systems could work during a power outage at the home. Light waves transmitted over fiber optic cable cannot function without power at the home, so backup batteries much be provided at the home to keep phone systems working. See Section 6 for CUD network standards (i.e., best practices for resilient fiber networks).

4.1.2 Fiber Broadband Deployment Methods

In rural areas, the telecommunications systems are almost always Passive Optical Networks (PON) rather than Active Ethernet networks.

Gigabit PON (GPON) technology, or a PON network capable of reaching gigabit speeds, is a proven, cost-effective solution delivered by most fiber carriers today, especially in rural areas. The basic premise of all PON architecture is to share the optical feeder and port on the Optical Line Terminal (OLT) among as many subscriber terminals as possible (commonly 32 subscribers per OLT port). In common terms, GPON systems allow users to share the strands of fiber in the access network, rather than building out a dedicated strand all the way from the OLT to each premise, which is how they achieve cost savings. Because strands of fiber have so much capacity, many subscribers can share a fiber from the OLT to a splitter near the premises without performance issues or capacity issues. Typically, the maximum distance recommended between the OLT location (typically in a cabinet or hub) and the end user is about 12 miles, or 20 kilometers. As a result, GPON networks in Vermont usually have one hub per town in a central location, ideally with a backup generator.

The typical alternative to PON networks is called Active Ethernet. Active Ethernet architecture provides a dedicated strand from the network electronics to every customer premise, and as such requires more strands overall and a larger hub location or powered outdoor cabinets to house OLT equipment. Because each strand must be actively powered, the maximum distance from hub to end-user could be much further, up to 75 miles, and each user can have the full capacity of their dedicated strand. However, the cost of deploying an Active Ethernet network far exceeds the cost of deploying a PON network because, for example, the shared fiber strands in a GPON network enable the fiber operator to install lower fiber counts (at a lesser cost), and fewer ports are required on the OLT equipment. In addition, the passive nature of the network also eliminates the need for power at cabinets in the field. Overall PON architecture has advantages in lower capital expenditures and reduced energy consumption, less rack and hub space required, and more favorable resiliency metrics like longer mean-time-before-failure. Because the cost savings do not greatly affect network performance or capacity, new rural networks typically are PON.

4.1.3 Wireless Network Deployment Trends

Wireless network deployment in Vermont and across the country often takes many forms depending on the type of technology and frequency spectrum used. Deployments can be open access at the structure level, (e.g., a tower is used by multiple providers) or even at the radio level (a single antenna can be used by multiple providers). In addition, deployments can be at a variety of scales, from towers with high-capacity radios using frequencies that can send signals for 5 miles or more, to small-cell deployments that can reach a more localized area but do not require massive tower infrastructure.

Given the variety of deployment methods, networks need to be tailored to local contexts. Potential deployments in Vermont and around the country often are opposed by communities when new tower locations are proposed on prominent ridgelines, hills, or mountains.

Communities generally are more supportive of placing new towers next to existing towers or more antennas on existing towers, because this minimizes the damage to natural habitats, or on hills or mountains with less local prominence or significance. The reality is that mobile voice and data deployments must be tailored to the local context; aesthetic concerns regarding new towers in Vermont communities will likely continue to be a factor in deployments moving forward.

Whatever the future wireless deployment mechanisms are in Vermont, wireless networks will be made much easier by widespread availability of fiber because the latter requires the former for backhaul. Solving the last mile residential broadband challenge will also make future wireless deployments of all varieties much easier.

4.1.4 Cable Industry Trends

Cable providers, like Comcast, Charter, Duncan Cable, Stowe Cable, and others, are major providers of broadband to homes and businesses in Vermont. Several trends in this industry are worth noting.

First, though cable systems are not considered to be able to provide symmetrical speeds, the speeds upon which data can be transmitted across coaxial cable are increasing. Cable technology is measured by the telecommunications standard known as Data Over Cable Service Interface Specification (DOCSIS), and the most up-to-date commercially deployed DOCSIS standard, DOCSIS 3.1, is capable in of providing multi-gigabit download speeds and a gigabit of upload capacity to an aggregate group of subscribers sharing a network node, in perfect conditions. (Actual speeds rarely if ever meet the speeds that are theoretical under laboratory conditions; actual speeds depend on constraints with customer devices and electronics, backhaul, oversubscription, attenuation, and other factors.)

Because of the speeds that DOCSIS 3.1 (and in the future DOCSIS 4.0, which is not yet commercially prevalent) offer, cable providers can and will continue to remain competitive as bandwidth demands increase, and upgrades to cable systems will meet the state's 100/100 Mbps goal. Comcast, for example, has an "upgrade path" to incrementally increase the speeds of its network by primarily by upgrading the electronics on either end of the cable (without needing to replace the cable itself) as consumer demand increases.

Another trend apparent in the cable industry, predominantly with bigger providers, is to implement data caps for residential customers. Data caps set a limit to the total amount of data that can be accessed per month, and result in extra fees when customers exceed that limit. Data caps are not regarded by advocates as a pro-consumer policy.

Implementation of data caps is a national trend that has not affected Vermont cable subscribers yet, but may within the next few years. Comcast considered implementing data caps in 2021[35] but has announced they will not enforce those caps until 2022. Charter Spectrum, as a condition on their merger with Time Warner Cable, is not allowed to implement data caps until May 2023.[36]

4.1.5 Emerging Technologies

Several new broadband technologies, namely 5G wireless and low-Earth orbit (LEO) satellites, have received a lot of attention nationally and in Vermont as providers, advocates, CUDs, and others consider how these technologies will affect the market and potentially be part of the solution to providing access to every Vermonter. It is important to understand the benefits of these technologies, along with their limitations, so as to understand where they have a role in the broadband landscape.

4.1.5.1 5G Wireless

5G is the fifth generation of mobile network technology. Like other wireless technologies, 5G uses electromagnetic radio waves to transmit data; but can transmit data at significantly higher speeds than advanced 4G LTE technology and other wireless predecessors. 5G uses a wider range of frequency bands, including millimeter waves for the very highest speeds, with a much higher frequency and wider channels than have been used before. Signals travel between devices over many paths, beam-forming technology dedicates capacity to individual devices, and radios are more sophisticated; together, these innovations allow the network to transmit more data at higher speeds. Industry advocates have shown that 5G wireless technology can deliver multi-Gbps peak data speeds at ultra-low latency in perfect settings, however, actual speeds experienced by wireless users are often only a small percentage of the peak data connection rate.

However, the many limitations to this technology mean the vast majority of Vermont 5G deployments will use the same low-band and mid-band frequencies as currently used in 4G deployments; as a result, the performance will be an incremental improvement to 4G—and 5G is not an economical or viable technology to close the broadband access gap, relative to a fiber solution. In addition, the highest frequency and highest speed millimeter-wave 5G signals that provide fiber-like speeds do not permeate common physical barriers like hills and trees very

[35] Jon Brodkin, "Comcast reluctantly drops data-cap enforcement in 12 states for rest of 2021: ISP grants reprieve in Northeast but still caps users in most of its US territory," Ars Technica, Feb. 19, 2021, https://arstechnica.com/tech-policy/2021/02/comcast-responds-to-pressure-cancels-data-cap-in-northeast-us-until-2022/.

[36] Phillip Dampier, "Spectrum Drops FCC Request to Allow It to Impose Data Caps in 2021; Was Likely to Be Rejected," Stop the Cap, Jan. 19, 2021, https://stopthecap.com/2021/01/19/spectrum-drops-fcc-request-to-allow-it-to-impose-data-caps-in-2021-was-likely-to-be-rejected/.

well,[37] so outdoor deployments meant to serve all premises and indoor users in rural areas would not be an effective strategy.

More importantly, millimeter waves are strongest within 800 feet from 5G-enabled antennas. To reap the full benefits, all premises would need to be within 800 feet of an antenna, and the network would also need to have access to fiber backhaul. This would require a significant fiber network, and moreover, the number of radios needed to cover low-density rural areas would be cost-prohibitive. There is simply no business case for providers to deploy millimeter wave 5G radios in rural areas due to the low density of population. As cell carriers and major ISPs decide where to begin deploying 5G networks, they will likely focus on high-density cities first, and only bring the varieties of 5G that operate on low-band frequencies to rural areas. As a result, 5G deployments in rural areas will only provide an incremental improvement over 4G.

4.1.5.2 Low-Earth Orbit Satellite

LEO satellite internet is another emerging technology that has received significant attention in the past year. In particular, Elon Musk's company SpaceX and their internet company Starlink is currently emerging from a Beta test of their service, which was available to a select number of Vermonters as well as people across the country.

LEO satellite companies aim to create a constellation of satellites to provide better internet coverage than traditional satellites. In particular, because these satellites are closer to earth, they provide connections with lower latency connections than traditional satellite internet.

Anecdotal user reports found in the press indicate that users without a better option were generally happy with the service during the beta test, however reliability issues, price, and the possibility of data caps on the service in the future caused some concerns.[38,39]

The reliability of the service is impacted by a few factors. First, trees and other obstacles have a material effect on the service and can block internet for a time until the satellite moves past the obstacle. Second, the receiver dishes will always have to skip from one satellite to the next as they pass over (the satellites are not geo-synchronous), potentially resulting in an interruption in service until the satellite constellation is complete. Third, and most importantly, it is yet to be seen how speed and reliability will be affected as more people join the network. Like any network

[37] Sascha Segan, "Testing Verizon 5G in Chicago: Speedy, But Watch Out for That Tree," *PCMag*, May 17, 2019, www.pcmag.com/news/testing-verizon-5g-in-chicago-speedy-but-watch-out-for-that-tree.
[38] Michael Sheetz, "What early users of SpaceX's Starlink satellite internet think about the service, speed and more," *CNBC*, April 15, 2021, https://www.cnbc.com/2021/04/15/spacexs-starlink-early-users-review-service-internet-speed-price.html.
[39] Amanda Gokee, "Lawmakers skeptical of Starlink solution for broadband problems," *VTDigger*, March 7, 2021, https://vtdigger.org/2021/03/07/lawmakers-skeptical-of-starlink-solution-for-broadband-problems/.

and in particular wireless networks, the more users there are, the lower speeds can be, as there is a set amount of bandwidth available to be shared amongst users.

In general, LEO satellite service appears to be a good option for Vermont premises that currently only have access to DSL or traditional satellite, provided they have an uninterrupted view of the northern sky. There are thousands of camps and off-grid premises in the state that may never be connected with wired service that could benefit from Starlink's service.

However, Starlink's service does not replace the need to build fiber to as many premises as possible. Starlink's service may not scale as quickly as fiber as bandwidth needs increase in the next decade, and will not be able to provide symmetrical speeds. Importantly, the satellites will also need to be replaced every five years or so. If the service is not making sufficient profit in five years, 10 years, or further in the future, Space-X may not replace satellites or the service may shutter altogether. The state is right to promote fiber-to-the-premises connections, which will be fast, reliable, and meet the needs of Vermonters for decades.

4.2 Broadband Use Trends

According to FCC data, bandwidth needs and broadband usage across public and private spheres increased 38X from 2010 to 2020,[40] and there is every indication our increased need for broadband capacity and speed will continue apace.

The Covid-19 pandemic fundamentally altered the way Vermonters live, and as Vermonters emerge from the pandemic, many of our newfound ways of using the internet to learn, work, and socialize will remain. From increased videoconferencing and video consumption at higher and higher resolutions to an ever expanding number of household items and machines and sensors connected to the internet, bandwidth needs will only continue to grow.

Based on interviews conducted during our previous analysis, internet service providers across the state reported recent increases in bandwidth usage, likely due to the pandemic, with a larger increase in upstream utilization. For example, Waitsfield and Champlain Valley Telecom reported a 30 percent increase in bandwidth usage; AT&T reported that core network traffic increased 22 percent and that video conferencing increased 400 percent. ISPs also reported changes in peak utilization times. Peak internet usage used to be around 8 p.m., but providers are finding now that peak usage occurs throughout the day as well as in the evening, as people continue to work and learn from home. While residents return to pre-pandemic routines, usage will see a decrease,

[40] Rob Toledo, "Report: The Average Household's Internet Data Usage Has Jumped 38x in 10 Years," DecisionData.org, April 17, 2020, https://decisiondata.org/news/report-the-average-households-internet-data-usage-has-jumped-38x-in-10-years/.

but future forecasts show that overall, bandwidth need will continue to increase. A report states that data usage increases annually by 20 percent to-30 percent per person.[41]

4.2.1 Remote Work

Many American workers worked from home at some point during the pandemic. A report by the Upwork Economist found that the remote work experience over the past year has contributed to a doubling of the expected growth rate of full-time remote work over the next five years from 30 percent to 65 percent.[42]

For many employees, the flexibility to work remotely in part or in full will become a permanent part of their job. In one survey, 56 percent of hiring managers feel that the shift to remote work has gone better than expected,[43] while only one in 10 feel it has gone worse than expected. In the same survey, 61 percent of hiring managers stated that they will include remote options in their work post pandemic.[44]

Working remotely cannot be done without reliable, high speed internet, and remote work in particular relies on upload speeds as much as download speeds for sending files like PDFs, images, videos, and datasets to colleagues, as well as two-way videoconferencing.

Vermont began positioning itself as a remote work destination before the pandemic, offering $10,000 incentives for remote workers to relocate to the state.[45] During the pandemic, due to low Covid-19 case numbers and an emerging brand as a remote work destination, many more people with an ability to work remotely moved to the state, in addition to the thousands of existing Vermont residents who transitioned to working remotely.

For those with good internet access, this transition to remote work was relatively easy, but for those without an existing connection, remote work was a challenge. The ability to work remotely is considered a perk by employees and now, a reality of life. Not having a fast broadband connection will only become more of a limiting factor to Vermont workers and the Vermont economy; it is clear that for Vermont workers to maximize their potential, broadband must be ubiquitous and fast.

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[41] "U.S. Internet Usage and Global Leadership Are Expanding," USTelecom, Nov. 27, 2017, https://www.ustelecom.org/wp-content/uploads/2018/12/USTelecom-Research-Brief-11.27.17.pdf.
[42] Adam Ozimek, "The Future of Remote Work, " Upwork, https://content-static.upwork.com/blog/uploads/sites/6/2020/05/26131624/Upwork_EconomistReport_FWR_052020.pdf.
[43] "The Future of Remote Work."
[44] "The Future of Remote Work."
[45] Anne Wallace Allen "Lawmakers approve new move-to-Vermont incentive program," *VTDigger*, May 27, 2019, https://vtdigger.org/2019/05/27/lawmakers-approve-new-move-vermont-incentive-program/.

4.2.2 Population Changes

Population growth in Vermont slowed in the past several years, with Census data showing incremental decreases prior to the pandemic. Now, however, the state has seen a surge in home purchases by people from outside Vermont as a result of the pandemic. Though the impact of these home sales on the state's population change is not yet clear, the Agency of Commerce and Community Development cited research from the University of Vermont which anticipates that, of the new arrivals in Vermont (many of whom are currently working remotely), one-third will stay permanently (and will presumably continue to require broadband service), one-third will leave after the pandemic is over, and another third are undecided.[46]

Currently, more than 80 percent of home sales in Vermont are going to out-of-state buyers.[47] The repercussions of the current immigration trends and real estate market are numerous, but a common concern in surveys of Vermont residents and interviews with employers and advocates alike was that given how critical broadband is to remote work, new Vermonters will be clustering in areas with good broadband—and areas without good broadband will be left behind. Though it is not clear the extent to which this is happening now (the real estate market is strained all over), realtors report an intense concern over the broadband and mobile voice coverage amongst prospective buyers, and the underlying concern that gaps in broadband could create geographic inequalities is very valid.

In addition, there is growing concern that more in-migration prompted by climate change may happen in the next 30 years—well within the lifespan of the telecommunications infrastructure being planned and built today.

Taken together, it is clear the state must ensure the telecommunications systems being planned and built this decade are resilient, future proof, and have the capacity to scale should in-migration continue and bandwidth needs increase.

4.2.3 Education

As with many other aspects of life, our education system may be forever altered by the Covid-19 pandemic.

During our work on the Covid-19 Response Telecommunications Recovery Plan, the Department found that students without home broadband whether due to lack of access or affordability challenges accessed school assignments at friends' houses, or at public Wi-Fi locations such as

[46] Interview, Ken Jones, Agency of Commerce and Community Development, conducted October 16, 2020.
[47] Mitch Wertlieb and Matthew F. Smith, "Limited Inventory, Many Out-of-state Buyers Keep Vermont Home Sales Unattainably Brisk," Vermont Public Radio, March 29, 2021, https://www.vpr.org/post/limited-inventory-many-out-state-buyers-keep-vermont-home-sales-unattainably-brisk#stream/0.

libraries or school parking lots. Clearly, school districts with better broadband infrastructure were able to better reach students.

In addition, the school districts that were not 1:1 with devices before the pandemic were able to use emergency resources to acquire devices so that students were able to better learn from home. Now, those devices will continue to be used for homework and in other out of school contexts, even if teaching is done in-person.

As a result, it is expected that districts may continue using a combination of in-person and "in the cloud" teaching, whether that be "flipping the classroom," assigning homework where students must collaborate over Google Docs, or even teaching during snow days.

In addition to conducting more classes online, a growing number of schools are providing curriculum about digital skills that are necessary for many 21st century jobs, like coding and computer science. These courses can start at a young age and require a computer and internet connection to practice and learn.

For students that do not have access to reliable, fast internet at home, the education opportunity gap will continue to widen; it is critical that Vermont's telecommunications policy and planning includes strategies to address both broadband access and affordability across the state.

4.2.4 Telehealth

In Vermont, telehealth usage skyrocketed at the height of the Covid-19 pandemic. While telehealth usage has leveled off to some extent, usage remains significantly higher than pre-pandemic numbers, and the populations increased exposure to telehealth will likely result in more long-term usage.

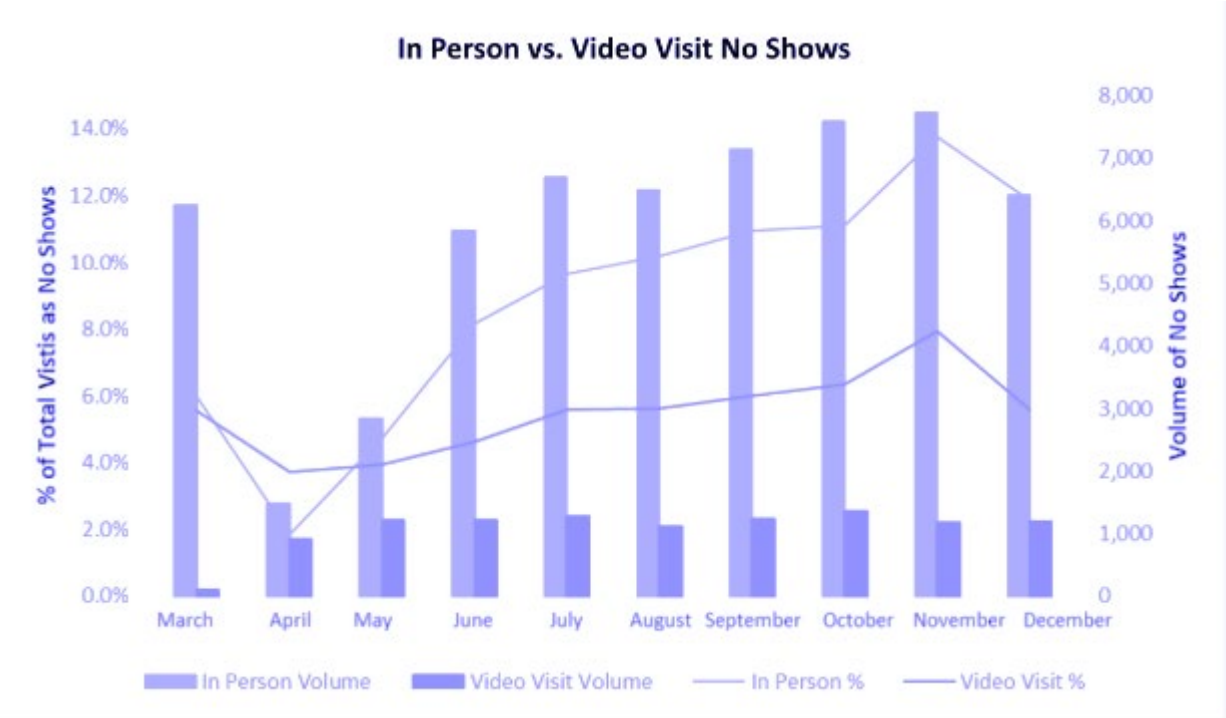
Due to the pandemic, more than 60 percent of healthcare providers now offer telehealth services, also stating that they plan to continue offering similar services in the future. The changes to reimbursement for telehealth services have helped increase adoption, with the U.S. Centers for Medicare & Medicaid Services (CMS) issuing waivers that allow a range of medical visits to be reimbursed by Medicare and the temporary allowance of audio-only telehealth appointments to be reimbursed by Medicaid at the state level. Continuation of telehealth reimbursements post-pandemic are still under consideration.

In particular, chronic care management and mental health services have seen increased patient engagement and success. According to a OneCare Vermont survey, the top four telehealth

services Vermont providers plan to continue post-pandemic are chronic management, mental health services, medication management, and non-urgent acute visits.[48,49,50]

According to UVM's 2020 eHealth summary, telehealth saw a decrease in no-show rates. No-show rates from in-person visits were consistently higher in comparison to telehealth video visits, the average no-show rate being 3.3 percent lower with video visits (Figure 8).

Figure 8: In-Person vs. Video Visit No-Shows[51]



[48] "Medicare Telemedicine Healthcare Provider Fact Sheet," Centers for Medicare and Medicaid Services, March 17, 2020, https://www.cms.gov/newsroom/fact-sheets/medicare-telemedicine-health-care-provider-fact-sheet; *see also:* "OCR Announces Notification of Enforcement Discretion for Telehealth Remote Communications During the COVID-19 Nationwide Public Health Emergency," U.S. Department of Health and Human Services," HHS, News Release, March 17, 2020, https://www.hhs.gov/about/news/2020/03/17/ocr-announces-notification-of-enforcement-discretion-for-telehealth-remote-communications-during-the-covid-19.html.

[49] "Vermont Medicaid Continuing Telemedicine Coverage for Dental Services & Temporary New Telephonic Coverage for Brief Communication Services for Dental Providers, Department of Vermont Health Access, April 10, 2020, https://dvha.vermont.gov/sites/dvha/files/documents/News/DVHA%20Telemedicine%20%26%20Emergency%20Telephonic%20Coverage_Dental%20Providers%2004.10.2020.pdf.

[50] "COVID-19 and Telemedicine Services," Michael S. Pieciak, Commissioner, Department of Financial Regulation, March 19, 2020, https://dfr.vermont.gov/sites/finreg/files/doc_library/dfr-memo-covid19-telehealth-guidance.pdf.

[51] Source: UVM Network of Health, eHealth summary, February 2021, courtesy of Todd Young.

As telehealth services continue to expand, areas with limited broadband are increasingly at a disadvantage. Video-based telehealth services work best with at least 25/3 Mbps speeds, and according to a OneCare Vermont survey, more than 75 percent of providers reported insufficient broadband access as a barrier for patients to participate in telehealth services. Providers routinely experience appointments where they are required to switch to audio-only to complete providing care. Though audio-only appointments may make telehealth services available to more people, some providers believe that video-enabled telehealth appointments provide for better outcomes especially with certain specialties.

HealthIT.gov has outlined the recommended absolute minimum bandwidth speeds based on provider type and what capabilities these speeds support:[52]

Table 22: Recommended Absolute Minimum Bandwidth Speeds for Telehealth

Small Physician Practice: 10 Mbps	Clinic/Large Physician Practice: 25 Mbps	Hospital: 100 Mbps
Supports practice management functions, email & web browsing	Supports clinic management functions, email & web browsing	Supports hospital management functions, email & web browsing
Allows simultaneous use of EHR and high-quality video consultations	Allows simultaneous use of EHR and high-quality video consultations	Allows simultaneous use of EHR and high-quality video consultations
Enables non-real-time image downloads	Enables real-time image transfer	Enables real-time image transfer
Enables remote monitoring	Enables remote monitoring	Enables continuous remote monitoring
Makes possible use of HD video consultations	Makes possible use of HD video consultations	Makes possible use of HD video consultations

It is important to keep in mind that these are the minimum speeds currently recommended. As remote diagnostics, real-time image transfer, and internet of things (IoT) remote monitoring healthcare wearables become more ubiquitous, faster speeds will not only be required for providers, but also at patients' homes and places of work to make these services possible.

[52] "What Is the Recommended Bandwidth for Different Types of Health Care Providers," HealthIT.gov, September, 10, 2019, https://www.healthit.gov/faq/what-recommended-bandwidth-different-types-health-care-providers

The benefits of telehealth are clear; telehealth offers access to care for residents that are limited by transportation, health needs, or even busy schedules. It also decreases no-shows, saving hospitals money, and decreases road miles that need to be driven to appointments. Telecommunications systems in Vermont are a critical foundation to improving health outcomes for Vermonters and the overall efficiency of our healthcare system.

4.2.5 Transportation

One of the most rapidly advancing sectors in the United States is the transportation sector, and as our transportation system gets smarter, more electrified, and more efficient, connectivity needs must increase as well.

Autonomous driving is, in part, already a reality, but as more vehicles have these capabilities and autonomous driving systems become more sophisticated, our transportation landscape could change significantly.

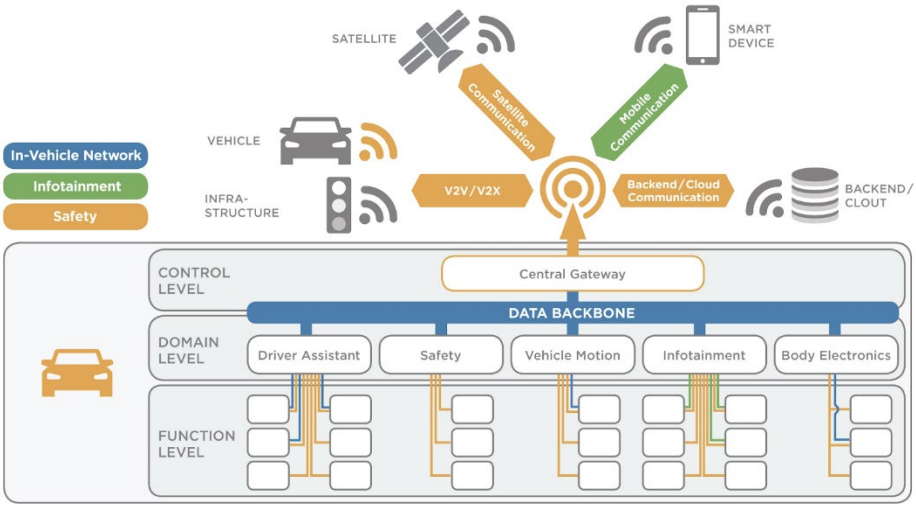
One forecast suggests that vehicles with some level of automation will increase to 40 percent to 60 percent of all vehicles on the road by 2050.[53] A more assertive forecast suggests that 95 percent of passenger miles traveled will be in automated vehicles by 2030. These forecasts are further supported by the number of electric vehicles on the rise. Vermont had the highest number of public electric vehicle chargers per capita in November 2020 with 114 EV chargers per 100,000 people.

Advancements in transportation promise to reduce accidents, reduce the number of cars on the road, eliminate traffic jams, and provide greater safety to passengers and pedestrians alike. Some experts have estimated that connected vehicles will prevent 10,000 fatalities and as many as 500,000 injuries every year in the United States alone.[54]

To accomplish this, vehicles must have access to low-latency broadband connections supported by a fiber backbone to react, adapt, and communicate with vehicles, physical infrastructure, and other inputs.

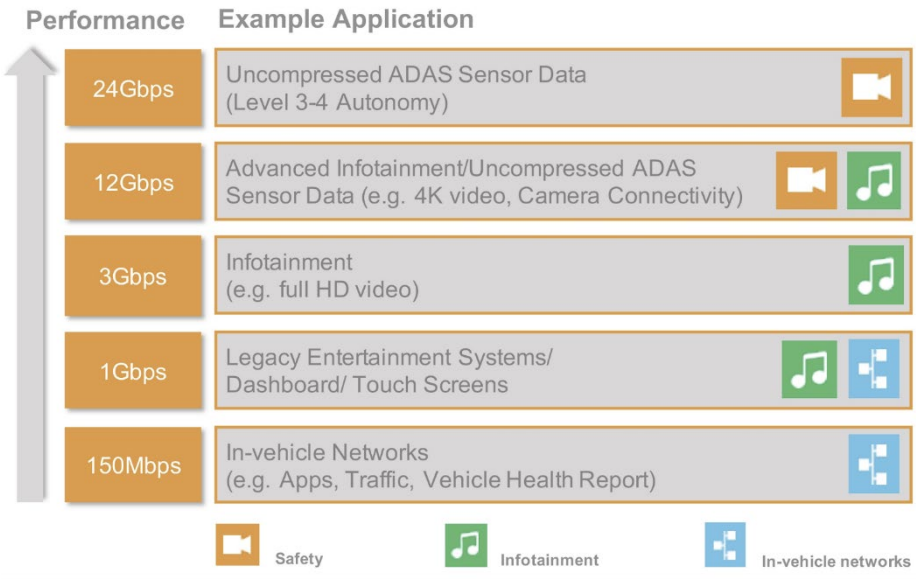
[53] "Preparing for Automated Vehicles: Traffic Safety Issues for States," Governor's Highway Safety Association, August 2018, https://www.ghsa.org/sites/default/files/2018-08/Final_AVs2018.pdf.
[54] Hitachi, "Connected Cars Will Send 25 Gigabytes of Data to the Cloud Every Hour," Quartz, February 13, 2015, https://qz.com/344466/connected-cars-will-send-25-gigabytes-of-data-to-the-cloud-every-hour/

Figure 9: Network Requirements for Connected, Autonomous Vehicles[55]



Level 5 vehicles will upload a minimum of 25 GB of data to the cloud every hour to support advanced driver assistance system (ADAS) sensors, such as high-resolution stereo and/or mono cameras, RADAR, and LIDAR, as well as future human-machine interfaces (HMI), such as large 4K/8K screens or heads-up displays (HUD).[56]

Figure 10: Data Upload Requirements for Autonomous Vehicles



[55] TE Connectivity, "6 Key Connectivity Requirements of Autonomous Driving," IEEE Spectrum, https://spectrum.ieee.org/transporation/advanced-cars/6-key-connectivity-requirements-of-autonomous-driving

[56] Id.

One estimate suggests that data traffic associated with mobility and transportation is expected to grow to 9.4 exabytes every month by 2030 as autonomous vehicles become more ubiquitous.[57] This exponential growth will exert significant pressure on broadband systems unless sufficient capacity is built into our systems, and communities that do not upgrade risk becoming new "flyover" areas of the country as owners and passengers of autonomous vehicles pass them by.

In the next 10 years and beyond, Vermont will need ubiquitous wireless broadband access along roads to accommodate the great advances already underway in our transportation systems, along with the fiber to connect the networks.

4.2.6 Shift in Consumer Habits Driving Data Consumption

Consumer habits are driving an increased need for more data and more bandwidth and are expected to drive bandwidth needs substantially in the next decade.

The core reason is that more and more of our communication and entertainment systems are being delivered over a broadband connection. Just like email replaced physical letters, smartphones are replacing traditional landlines[58, 59] and streaming services are replacing cable subscriptions.[60]

Secondly, more and more electronic devices are internet enabled and therefore users of the overall bandwidth coming into the house. Phones and computers may be obvious to most, but increasingly printers, radios, televisions, refrigerators, car chargers, doorbells, and more are also connected.

Lastly, consumers are also gravitating towards entertainment and leisure activities that require more and more bandwidth. For example, high-definition movies or sports, interactive online videogames, and Zoom calls with family all require more bandwidth than watching lower-definition video (or DVDs), offline gaming, and audio-only calls.

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[57] David Smud, Craig Wiggington, Simon Ninan, Karthuik Ramachandran, and Paul Moceri, "Connecting the Future of Mobility," Deloitte, February 28, 2017, https://www2.deloitte.com/us/en/insights/focus/future-of-mobility/role-of-telecommunications-in-new-mobility-ecosystem.html/#endnote-sup-9.

[58] Stephen J. Blumberg, Ph.D., and Julian V. Luke, "Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, July–December 2016," National Center for Health Statistics, May 2017, https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201705.pdf.

[59] "Mobile Fact Sheet," Pew Research Center, April 7, 2021, https://www.pewresearch.org/internet/fact-sheet/mobile/.

[60] Lee Rainie, "Cable and Satellite TV Use Has Dropped Dramatically in the U.S. Since 2015," Pew Research Center, March 17, 2021, https://www.pewresearch.org/fact-tank/2021/03/17/cable-and-satellite-tv-use-has-dropped-dramatically-in-the-u-s-since-2015/.

Taken together, the collective bandwidth usage of our society is increasing by as much as 30 percent each year. Ensuring our telecommunications systems are built to last will mean designing them with the ever-increasing bandwidth demands of consumers in mind.

4.3 Incentive Regulation Plan for Consolidated Communications, Inc.

Vermont's Incentive Regulation Plan (IRP) for Consolidated Communications, Inc., is set to be re-evaluated in the coming year by the Public Utility Commission PUC). IRPs regulate the phone service rates of large local exchange carriers (LEC) in Vermont and are meant to protect consumers who have no choice for phone service while also allowing LECs to remain competitive as more customers have greater choice in phone service providers and technologies (e.g., mobile cellular, VoIP). The IRP is not a mechanism for negotiating or regulating other aspects of telecommunication service beyond telephone rate regulation. By statute, IRPs expire—and so must be re-evaluated—after seven years.

Currently, the regulation of basic local exchange service (BLES) through the IRP provides consumers with a low-cost option that could otherwise be unavailable. Because many residential premises in Vermont have no choice in phone service due not being covered by either mobile voice service or a competitive ISP, it is crucial to continue to protect consumers' access to an affordable phone connection in future years. As wireline broadband is deployed to more under- and unserved addresses, the Public Utility Commission may consider revisions to future IRPs that reflect progress made in providing customers with more choice. Such revisions could include ending rate regulation in areas with competitive choice from other wireline carriers.

5 Technology Assessment and Recommendation for Fiber for Unserved Areas

Fiber optics, cable, and fixed wireless are the dominant technologies for delivering broadband. Based on our evaluation, the state should focus its efforts on deploying fiber in unserved areas to most efficiently and effectively meet its goal of providing access to 100/100 Mbps service throughout Vermont. Locations with coaxial cable have an upgrade path to 100/100 Mbps speeds (potentially through the expansion of fiber and upgrade of electronics in the cable network). While fixed wireless has certain strengths, its inability to scale as quickly and its higher long-term costs make it unviable for closing the state's broadband gaps over the long term.

5.1 Fiber Is the Most Capable, Scalable Broadband Technology

Broadband transmitted through fiber optic cable (often called fiber broadband) is the highest-speed and most scalable broadband technology available. Current off-the-shelf technologies enable fiber-to-the-premises (FTTP) networks to provide capacity in excess of 1 Gbps to each subscriber, with new electronics making it possible to go to 10 Gbps or beyond in the coming years. It is possible to reach faster and faster internet speeds by upgrading the electronics on the fiber strand without needing to replace the underlying fiber—fiber internet will be relevant for decades to come.

Fiber broadband also is more reliable than many other technologies—especially wireless broadband technologies, as fiber does not suffer from interference from other signals or line-of sight limitations.

Importantly, maintenance and repair costs of fiber optic cables are low—approximately 1 percent of construction costs annually. Equipment replacement occurs every seven years, but new equipment costs are only a small percentage of the capital cost of an FTTP network. Because of the low maintenance costs, the fact that the fiber itself does not degrade, and the fact that speeds are fast and able to be increased considerably as demand dictates, FTTP is the only internet infrastructure that is "future-proof."[61]

In addition, fiber broadband has been shown to have a significant positive effect on local economies. A Purdue study noted that every dollar invested in fiber networks by rural electric

[61] "What Does It Take for a Rural Town to Get High-Speed Internet?," Center on Rural Innovation, May 28, 2020, https://ruralinnovation.us/blog/what-does-it-take-for-a-rural-town-to-get-high-speed-internet/

co-ops added $4 to the economy in return,[62] and fiber broadband has also been shown to increase housing values by more than 3 percent.[63]

5.2 Fiber-to-the-Premises in Currently Unserved Areas Will Make Mobile Deployment Easier

A significant additional benefit of an FTTP investment is that fiber will lower barriers to deploying mobile service. Fiber availability reduces the cost and time to market for wireless carriers to deploy antennas in unserved areas.

5.2.1 Overview of Mobile Carriers' Need for Fiber

The wireless industry needs fiber to backhaul its antenna sites because 3GPP standards require capacity and reliability. If hundreds of users are to be connected from a site—and each user needs 10 Mbps to 50 Mbps of capacity—then even with oversubscription, the mobile carriers need at least 1 Gbps to the site.

Mobile wireless capacity is a particularly limiting factor in locations where residents are unserved or have only satellite or fixed wireless service; because those residents do not have more robust home broadband as a communications option, they need greater mobile bandwidth. Mobile capacity was also less of a concern when voice or text were the main mobile communications; with web access and streaming media now the norm on smartphones, downstream and upstream capacity is now essential.

Fiber is not the only way to achieve this capacity at wireless sites—but as described in Section 5, it is reliable and, importantly, also scalable. Once an antenna site is connected to fiber, backhaul capacity is no longer the limiting factor—and the tower owner can add sectors, upgrade technologies, or make space for more carriers.

In areas unserved by fiber, however, there is a chicken-and-egg element to deploying mobile service. Wireless providers typically work with a wireline provider such as CCI, Comcast, or Crown Castle at the time of installation of new antenna sites. According to AT&T, fiber providers have procedures under which they typically will not begin work until a new site is in place. This practice potentially greatly increases the amount of time needed to bring wireless service to an area, since the fiber extension (which may be many route miles in areas that are unserved or served only by DSL) can require months to construct.

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[62] "Report: Broadband Would Benefit Rural Areas, State," Perdue University, August 28, 2018, https://www.purdue.edu/newsroom/releases/2018/Q3/report-broadband-access-would-benefit-rural-areas,-state.html.

[63] "Study Shows Home Values Up 3.1% with Access to Fiber," Fiber Broadband Association, June 29, 2015, https://www.fiberbroadband.org/blog/study-shows-home-values-up-3.1-with-access-to-fiber

In contrast, in an area where FTTP has been built using best practices such as spare fiber and scalable electronics, the fiber is already in proximity to a wireless site. This has advantages both in terms of time and cost, since even a complex drop installation can be done in days or weeks instead of months. From a cost perspective, too, this approach has significant benefits. A short drop installation may be thousands of dollars instead of tens or even hundreds of thousands of dollars—entirely changing the business case for adding a site and serving an area.

Also, fiber providers often will not want to build to an unserved area to connect a single location (e.g., a wireless site) unless there is an adequate business case for the fiber—such as potential demand for service to other businesses or institutions. in contrast, building an FTTP network reverses this equation, with the business case already created by the FTTP network and serving the unserved residents, and the wireless service simply adding to the revenue already in the model.

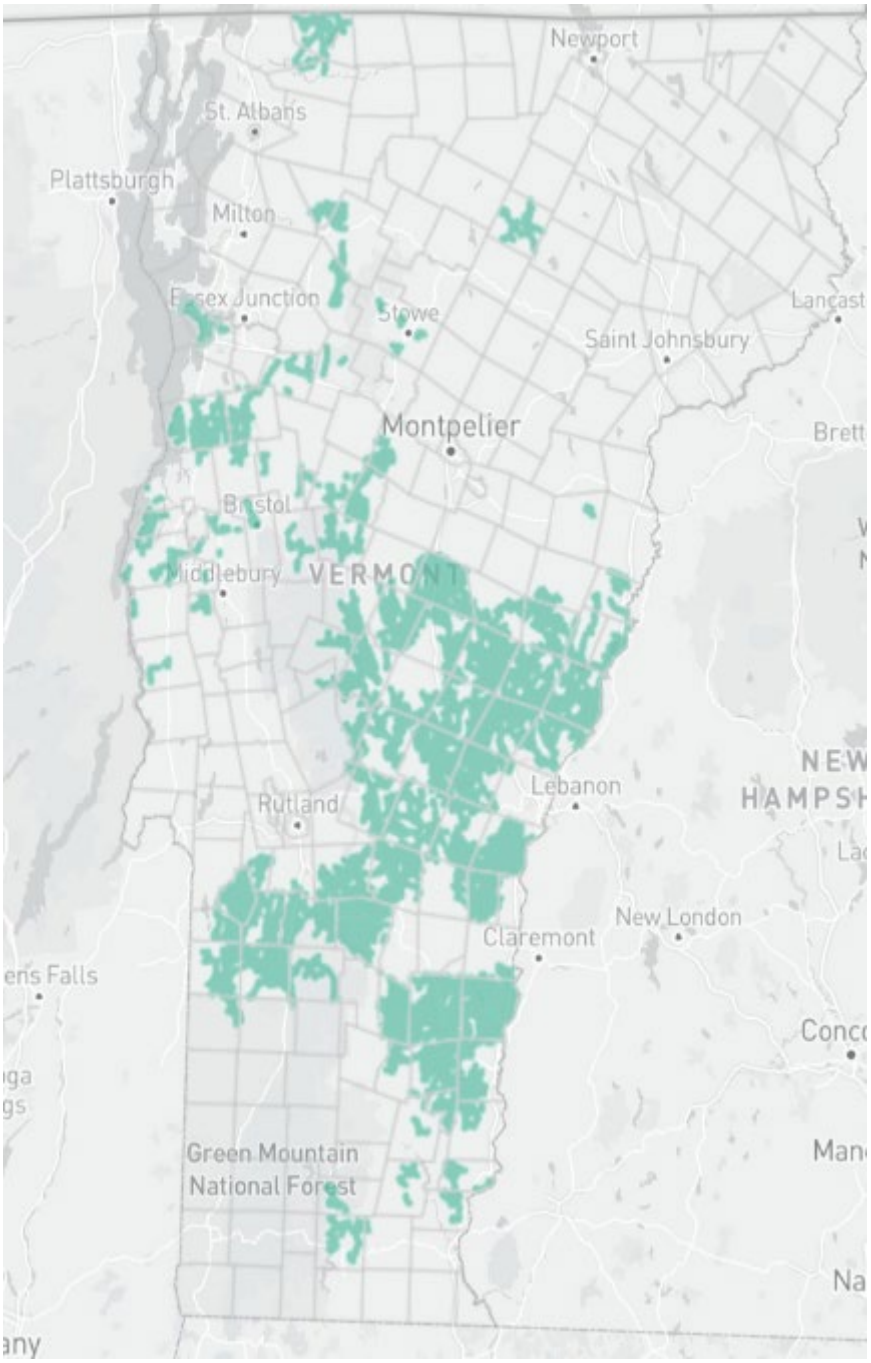
5.2.2 Overview of Fiber's Benefit to Expansion of Cellular and Public Safety Service in Vermont

Residential broadband is only one aspect of the state's critical telecommunications landscape. Mobile voice and data service coverage (colloquially known as cell service) is another important service with significant gaps in the state. Fortunately, improving other aspects of telecommunications will only get easier with the deployment of fiber.

Mobile voice coverage systems, including public safety communications systems, use radio transmitters to propagate wireless signals, and these radios have to be connected to the greater internet to provide service. This is known as connecting to backhaul, and to ensure mobile voice systems have as much capacity as they need, the ideal backhaul is a fiber connection. In this way, deploying more fiber throughout the state will make improving other communications systems easier.

There is a range of ways to improve mobile voice service, from placing high-powered radios on big towers on hills and ridges, to using small cells on utility poles to provide coverage to a half-mile area. Either of these methods are benefitted by access to fiber backhaul. The following illustrates existing fiber plant in Vermont.

Figure 11: Fiber Infrastructure in Vermont[64]

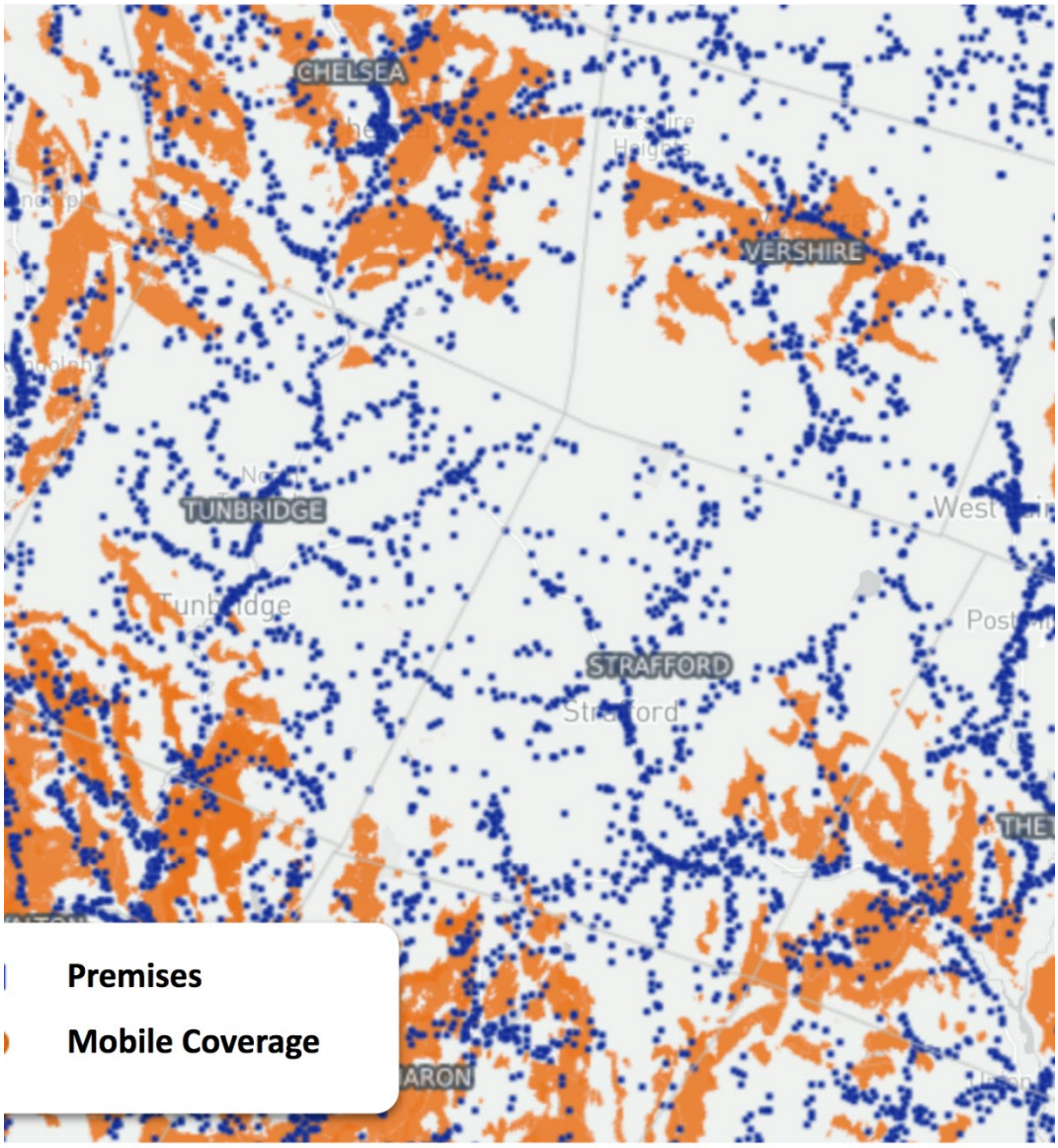


[64] Source: Data provided by the Department of Public Service via the Vermont Geodata portal.

Many locations that already have fiber struggle with mobile voice coverage. By overlaying a propagation model performed for this report (see Section 3), it becomes apparent where a wireless antenna deployment would be made easier due to the presence of fiber.

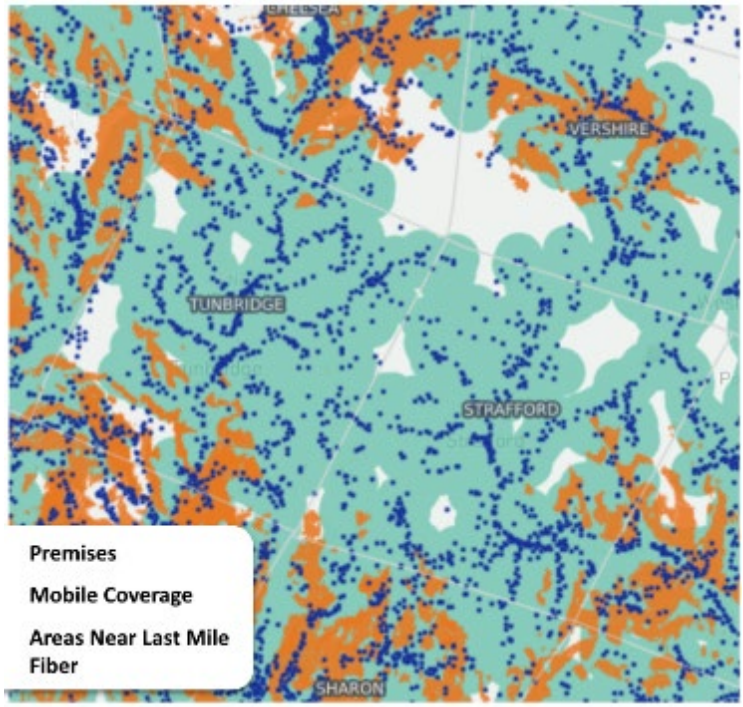
In this map, for example, it is clear that many premises in Strafford and Tunbridge may have gaps in mobile broadband coverage.

Figure 12: Mobile Voice Service Gap in Orange County



However, those premises are almost all within half a mile of a last-mile fiber network, as evidenced by the map below:

Figure 13: Fiber Penetration in Mobile Service Gap in Orange County



The presence of this fiber should make new mobile radio deployments easier; new fiber backhaul need not be brought to the ideal radio locations from far away because fiber already permeates the area.

5.3 Cable Broadband Is Upgradeable with Fiber and Electronics

Cable broadband is the dominant broadband technology in Vermont and in the U.S. with the capability of providing 25/3 Mbps service (i.e., the FCC's definition of broadband) in almost all cases. However, because cable originated as a one-way television technology and evolved through a broadband environment where download speeds far exceeded upload speeds, the technology is capable of increasingly fast download speeds—up to 1 Gbps in some places—but generally is limited to 10 Mbps or less in the upstream direction. In other words, Comcast's cable broadband network in its current form cannot achieve Vermont's requirements (i.e., 100/100 Mbps).

The cable industry recognizes that the upstream limit is a significant impediment, particularly given the need for broadband service that can support interactive video, telemedicine, and remote learning and work; it also recognizes that achieving higher upstream capabilities will require investment in the infrastructure. But, while the cable industry as a whole is looking at a range of options to address the upstream issue, it has not yet embarked on any single course as its next step. The potential approaches range from a focus on upgrading network electronics to one that stays with the current technologies but expands fiber optics closer to users' homes.

5.3.1 Cable System Upgrades Could Take Different Forms

In its 1Q21 earnings call, Comcast reported lab testing of more advanced electronics and that it intended to "increase upstream in a capital-efficient way"[65]—an allusion to new DOCSIS 4.0 technology that adds many enhancements to the current DOCSIS 3.1 standards. Perhaps most notably, DOCSIS 4.0 adds the ability to operate in "full duplex," in which the entire cable spectrum is available for both upstream and downstream operation. In tests, this has been shown to deliver multi-gigabit download speeds with 1 Gbps upload.

Upgrading to DOCSIS 4.0 will require enhancements in the outside cable plant, including replacement and upgrade of headend and hub equipment, and node and amplifier electronics, as well as expansion of fiber outside plant—and installation of new cable modems and set-top converters at users' premises. And, since the technology is still in the lab, it will require an assessment of what cable plant design will be needed, and what elements of the current systems can be kept as-is.

Another approach (which does not rely as heavily on technologies still under development) would be to expand fiber optics deeper into the network. Doing so would reduce the number of subscribers sharing a network segment and make more of the limited upstream capacity available to a given subscriber. Cable operators in many communities are already doing this reactively as they find parts of their networks experiencing congestion.

As the fiber upgrade process continues, a cable system may gradually become a fully fiber-optic network. In portions of the system that have aerial plant (like most of Vermont), this generally requires lashing a fiber cable to the coaxial cable at relatively low cost per foot. In some parts of their systems, Comcast and other operators are able to offer fully symmetrical services (that is, upload speeds that match the download capability), as well as services higher than 1 Gbps; that can occur when the operator has built fiber to that home or business—and the operator typically then prices the service at level sufficient to recover the cost of the fiber build.

A third approach to upgrading a cable broadband system would be a combination of enhanced fiber and modifications of electronics. While keeping the current DOCSIS 3.1 headend and hub electronics and cable modems, the cable operator can modify the node and amplifier diplex filters to increase the upstream bandwidth. In this way, the cable operator is essentially widening the upstream bandwidth beyond its current home (in a small sliver below the former Channel 2) to a wider band.

[65] "Edited Transcript: Q1 2021 Comcast Corp Earnings Call," Comcast, April 29, 2021, https://www.cmcsa.com/static-files/a6156203-a308-4ed5-a8ba-65cb9d7d67ad

5.3.2 Upgrading a Cable System Will Cost an Estimated $1,000 to $2,000 per Passing

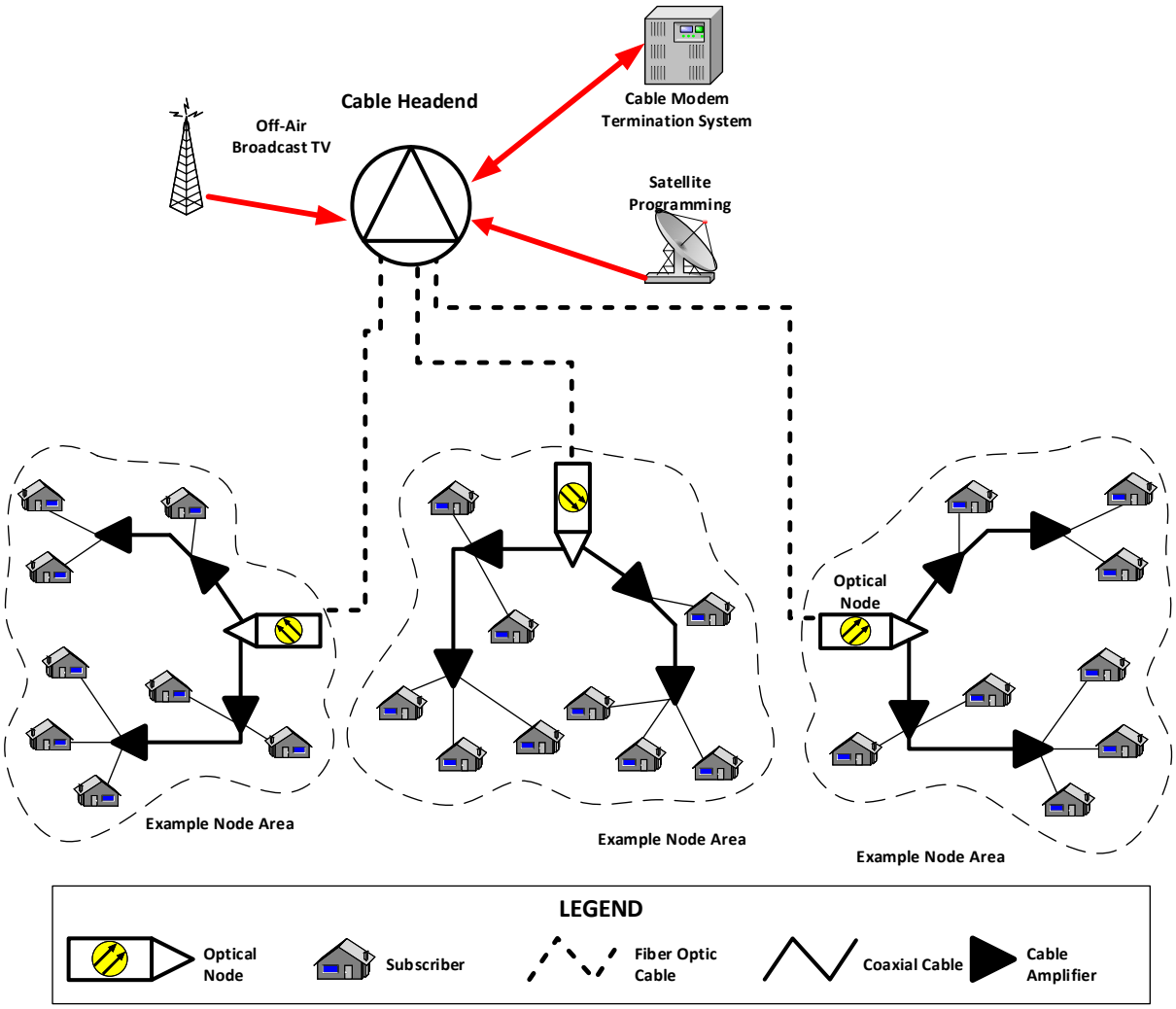
As mentioned, the past approach of the cable operators has been to increase bandwidth incrementally and reactively based on local demand. The effort to upgrade a cable system to 100/100 Mbps or more would require one or more of the above technical approaches, which will cost on average $1,000 to $2,000 per passing, depending on a range of factors, including the density of the area (dictating how much fiber is needed per subscriber), the condition of the system, and whether the area is aerial or underground utilities.

The upgrade cost will go toward the following:

- Expansion of fiber through aerial overlash or underground construction
- Modification or replacement of nodes and amplifiers
- Sweeping and balancing of the upgraded cable plant
- Replacement of coaxial cables and other components that are not capable of carrying the enhanced capacity
- New headend and hub electronics
- New cable modems

Finally, it is worth noting that cable, like most utilities, is designed in a "branching tree" design (Figure 14). The last quarter-mile to the home can constitute 75 percent of the cable plant—meaning that even a relatively small push of fiber toward the home requires overlashing or building many miles of fiber.

Figure 14: Cable Broadband in a Branching Tree Design



5.4 Fixed Wireless Has Strengths in Some Use Cases—But Is Not a Viable Solution on Its Own for the State's Broadband Gaps

Fixed wireless has many technical advantages and is effective as a broadband solution for a range of use cases. However, based on our analysis, fixed wireless technology is not a viable solution for the state's unserved areas, for two primary reasons. First, fixed wireless cannot comprehensively address the state's 100/100 plus scalability standard. Second, a fixed wireless solution will be more costly than fiber in the long run, despite having lower upfront capital costs.

The sections below out fixed wireless' advantages, followed by its limitations.

5.4.1 Fixed Wireless Has Advantages in Terms of Deployment Speed and Capital Cost

Broadband speeds in compliance with the FCC's definition (i.e., 25 Mbps download, 3 Mbps upload) are more readily available from fixed wireless networks than in the past, owing to the recent introduction of the Citizens Broadband Radio Service (CBRS) spectrum into the market and new wireless technologies. While wireless ISPs (WISP) typically are not able to offer connection speeds on a market-wide basis comparable to cable or fiber networks built to each premises, a fixed wireless connection may be a desirable solution if cable or fiber is not cost-effective. This is especially true in low-density rural areas where there are few homes and businesses per mile, and therefore the cost of building wired networks is often high.

5.4.1.1 Relatively Fast Speed to Deploy

Fixed wireless has many advantages as a broadband technology, including a relatively fast speed to build if rooftops or other elevated sites are readily available. As opposed to an underground or aerial cable, wireless broadband is provided from access point antennas on towers or rooftops. The customer antenna may be on the home or business or on a mast on the customer premises (Figure 15).

Figure 15: Example Fixed Wireless Network with Antennas on a Monopole and Customer Premises

5.4.1.2 Lower Upfront Capital Costs per Premises

While fixed wireless service can be provided in some cases using customer-provisioned hotspot-type devices, in rural areas and many urban ones it is usually necessary to also install an antenna on the building or outside a window. Even in these use cases, fixed wireless has a lower capital cost per premises than a fiber network. For example, capital costs for fixed wireless deployments are typically to be $1,000 to $3,000 per installed customer in a rural environment, with an additional $500 or more on average for customer premises equipment and installation at the premises.

5.4.1.3 Increasing Performance Possible With New Spectrum and Technology Improvements

Fixed wireless networks can use various technologies and spectrum bands. The fixed wireless technologies evaluated use the following spectrum:

TV White Space (TVWS)	500 MHz
Unlicensed	900 MHz, 2.4 GHz, 5 GHz
Educational Broadcast Service	2.5 GHz
Citizens Broadband Radio Service (CBRS)	3.5 GHz

Fixed wireless performance has increased in recent years due to the availability of new spectrum and technology improvements. In many use cases, fixed wireless can deliver tens of Mbps download per user with mid-band CBRS and unlicensed spectrum, and greater than 100 Mbps download in optimal line-of-sight conditions over a lightly loaded network.

New mmWave technology provides the potential for even higher speeds—hundreds of Mbps and even 1 Gbps over short distances with direct lines of sight. Trial implementations have attempted to deploy mmWave using a mesh architecture, though these are in flatter, less treed areas than many parts of Vermont.

Of the bands identified above, EBS, CBRS, and 5 GHz technology have channel widths capable of delivering 25 Mbps down and 3 Mbps up (i.e., the federal definition of broadband). For unlicensed spectrum, there exists the potential for other networks to be operating on the same, adjacent, or other interfering frequencies. Network planners need to take precautionary measures to mitigate different types of interference; such efforts include checking for a clean frequency in the area of interest and appropriate antenna and antenna pattern choice.

TVWS delivers service over unused television frequencies (known as white space). TVWS bands have much better non-line-of-sight transmission qualities than the other bands; however, due to its narrower bandwidth, TVWS is not capable of delivering 25 Mbps down except to small numbers of users, and therefore should only be considered in cases where other connectivity is not available or feasible. Also, TVWS equipment is far more expensive than other off-the-shelf wireless equipment. Finally, in areas near Montreal, Burlington, and Albany there are existing broadcast television channels, and the potential TVWS spectrum is significantly more limited than in more remote areas.

Most fixed wireless networking solutions require the antenna at the subscriber location to be in or near the line of sight of the base station antenna. This can be especially challenging in mountainous regions. It is also a problem in areas with dense vegetation or multiple tall buildings. Wireless internet service providers (WISP) often need to lease space at or near the tops of radio towers; even then, some customers may be unreachable without the use of additional repeaters. And because the signal is being sent through the air, climate conditions like snow, rain and fog can impact the quality of service.

In addition, there is a tradeoff in these bands between capacity and the ability to penetrate obstructions such as foliage and terrain. The higher frequencies have wider channels and therefore the capability to provide the highest capacity. However, the highest frequencies are those most easily blocked by obstructions. Wireless equipment vendors offer a variety of point-to-multipoint and point-to-point solutions. Point-to-multipoint networks may have limited network capacity, particularly upstream, making the service inadequate for applications that require high-bandwidth connections. A medium-sized business, then, would likely need a point-to-point solution with dedicated bandwidth, while small businesses and residences could be served by a less expensive point-to-multipoint solution.

The CBRS band is predicted to connect the most addresses—primarily due to its spectrum properties, and the fact that FCC licensing rules allow CBRS antennas to be mounted higher than TVWS antennas. It also has the greatest broadcast power of the three technologies and is available throughout Vermont.

5.4.2 Fixed Wireless Is Effective as a Broadband Solution for Limited Use Cases

Given the characteristics of fixed wireless technology, it generally is effective in use cases such as the following:

- The service area is extremely low density, and therefore the average cost per premises of the fiber is very high (perhaps significantly more than $10,000),
- The service needs to reach the full target population within a year, as opposed to over two or more years
- The network is only expected to operate for a few years, and therefore does not need to be replaced as it becomes technologically or physically obsolete
- The network will be deployed in a higher-density setting (urban, suburban), but one where there is only limited capital funding available (making fiber builds unaffordable), and only a limited percentage of individuals in the dense environment needs to be reached (for example, families of schoolchildren, or individuals who cannot afford wireline services—who collectively will not overload the network)

5.4.3 Fixed Wireless Is More Costly Than Fiber in the Long Run

A fixed wireless solution may have a lower initial capital cost and faster deployment time than a fiber solution, but fixed wireless typically has higher total cost of operations, even in rural settings. Outside of the use cases described above, fixed wireless is more expensive in the long run, as described below.

5.4.3.1 Fixed Wireless Cost Factors

The following factors will determine the costs associated with a fixed wireless network:

- **Wireless equipment used:** Different wireless equipment has different aggregate bandwidth capacity and use a range of different spectrum bands, each with its own unique transmission capabilities.
- **Backhaul connection**: Although the bottleneck tends to be in the last-mile connection, if a WISP cannot get an adequate connection back to the internet from its tower, equipment upgrades will not be able to increase available speeds beyond a certain point.

- **Future capacity and lifespan of investment:** Wireless equipment generally requires replacement every five to 10 years, both because exposure to the elements causes deterioration, and because the technology continues to advance at a rapid pace, making decade-old equipment mostly obsolete. The cost of deploying a wireless network is generally much lower than deploying a wireline network, but the wireless network will require more regular investment.

- **Availability of unobstructed line of sight:** Most wireless networking equipment require a clear, or nearly clear, line of sight between antennas for optimum performance. WISPs often lease space near the tops of radio towers, to cover the maximum number of premises with each base station.

5.4.3.2 Sample Cost Comparison (Fixed Wireless vs. Fiber)

As an example, this plan presents the real-world costs for a rural county with 4,190 passings and a density of 19 passings per mile. In that county, a comparison of candidate fixed wireless and fiber deployments[66] found that fiber had lower long-term costs.

In the sample cost comparison, fiber construction and electronics cost an estimated $16,000 per passing. Ongoing costs of fiber maintenance and electronics were estimated at $150 per passing per year, with a two-year construction period and an eight-year replacement cycle for the electronics. The fiber would connect all 4,190 passings.

In contrast to the fiber model, the fixed wireless model for the county would reach only 3,215 passings (due to lack of line of sight to about one-fourth of the passings). Using a mixture of CBRS, unlicensed, and TVWS technologies, the fixed wireless deployment would have an estimated capital cost of $6,100 per passing for core and base station equipment, installation, and user electronics.

Operational costs for the fixed wireless network include tower leases, maintenance, and regular replacement of the electronics—and add a significant $2,400 per year per premises for the fixed wireless network.

Leasing antenna space on a tower costs approximately $60,000 per year at typical market prices. This is a critical consideration because, for a typical site that serves 60 passings (potential customers), the cost for tower leases alone exceeds $1,000 per year per passing.

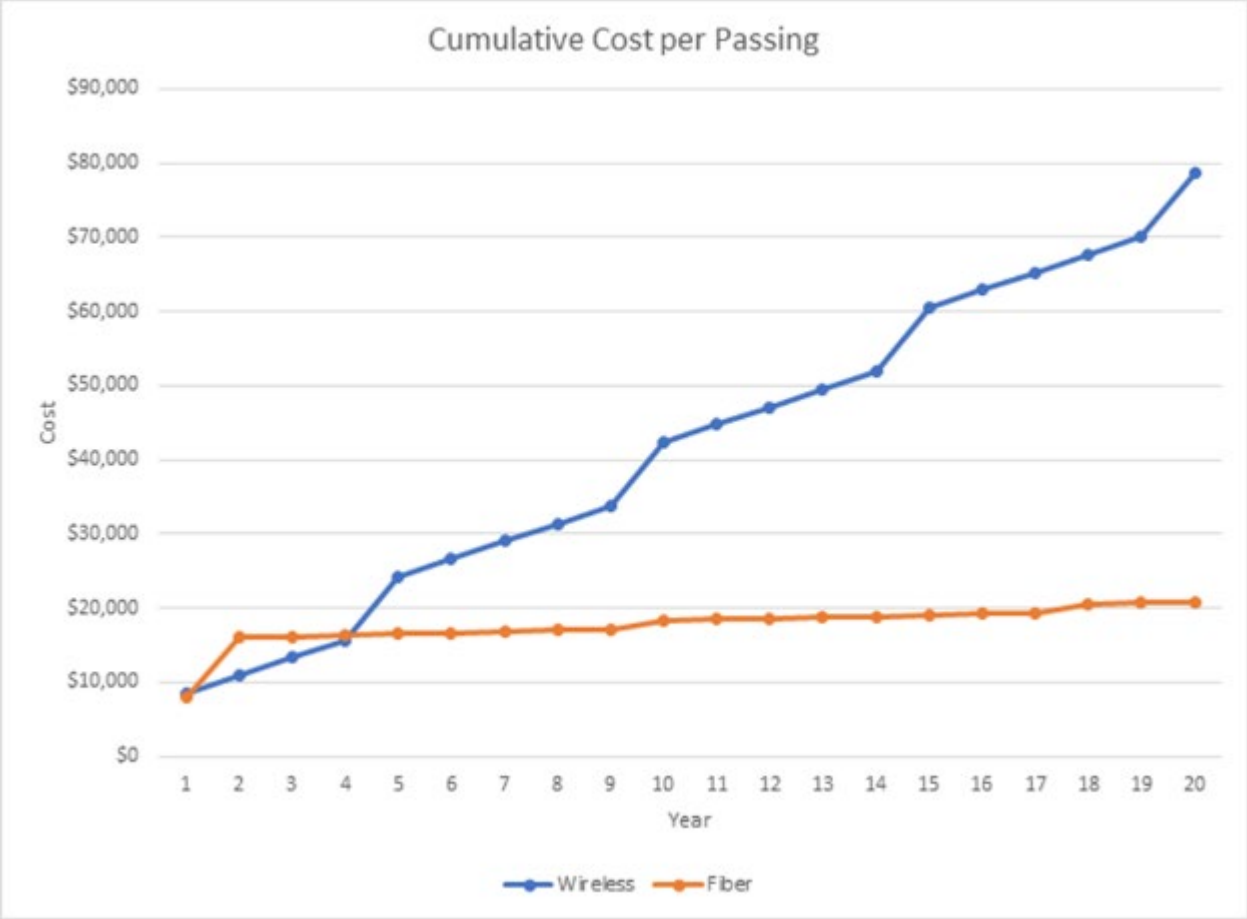
Upgrading a wireless network requires replacement of the radios at the antenna site and at the user premises. Electronics may need to be replaced at five- to 10-year intervals due both to technological obsolescence and wear and tear—and unlike a fiber network, the electronics

[66] Both assuming a 35 percent take-rate.

comprise almost all of the capital cost of the network, thus significantly increasing the ongoing cost.

As the chart below illustrates, because of the fixed wireless network's higher ongoing operating costs, the total cost of the wireless solution exceeded the cost of the fiber network after the first five years (Figure 16).

Figure 16: Representative Comparison of Costs for Fiber and Fixed Wireless Solutions by Year



5.4.4 Fixed Wireless Cannot Comprehensively Address the 100/100 Plus Scalability Standard

Stated simply, fixed wireless technology cannot comprehensively address the standard of 100/100 Mbps and continue scaling to higher speeds.

Fixed wireless technology provides an aggregate capacity between 100 and 250 Mbps. Using unlicensed and CBRS spectrum and innovations like higher-order multiple input, multiple output (MIMO) antennas and spatial multiplexing, these capacities could increase to as much as 750

Mbps. That means download speeds in the tens or even low hundreds of Mbps may be possible for a limited number of users over a fixed wireless network.

However, it is important to note that this is the aggregate capacity out of a single antenna or antenna array; in a point-to-multipoint architecture, this capacity will be shared among all users connected to a single base station. And given the limitations of available spectrum, a wireless solution is not as scalable as a wireline solution; the spectrum available for fixed wireless broadband provides much lower bandwidth than what is available in an FTTP network. Adding base stations to provide greater capacity to more users (e.g., building new towers or adding antennas to existing towers) dramatically increases the cost of a fixed wireless network—making that approach much less feasible.

Cost aside, and focusing solely on technical capabilities, fixed wireless networks are also hampered by terrain, trees, and population density. Vermont's unserved areas typically are less dense and more rugged, wooded, and isolated—and therefore different from a typical fixed wireless use case with a town center or hilltop site covering hundreds of premises in relatively close proximity. The longer the distance from a base station antenna to users' homes, the more difficult it becomes to serve those homes with fixed wireless technology. (As an example, CBRS technology in most situations cannot consistently deliver more than 25 Mbps downlink capacity further than 6 miles away, or if there are more than 600 users.[67])

Except for point-to-point networks such as the microwave links used by public safety networks (which have two perfectly known antenna endpoints on towers, and optimized links over licensed spectrum), it is difficult to impossible to guarantee performance over a fixed wireless network. A fixed wireless network's real-world performance usually will not be accurately known until an installer arrives at the premises to be served.

[67] Assuming three sectors, three 20 MHz CBRS channels, and typical oversubscription ratios.

6 Infrastructure Design and Costs for Unserved Areas

This section describes safety and resiliency-oriented network design standards to which new fiber network deployments should adhere, as well as cost estimates for deployment of a statewide fiber-to-the-premises (FTTP) network to connect all unserved businesses and residents.

6.1 Network Standards for New Deployments

FTTP infrastructure deployments will serve as the cornerstone network in their service areas, providing residential, business, and institutional services and, likely, also significant amounts of wireless backhaul or even connectivity to the hub sites operated by satellite providers.

As such, Vermonters will need to rely on the CUDs' fiber networks to reach 911, both in the current voice and text form and for future video and advanced applications. Especially in areas where wireless signals are weak or nonexistent, residents will rely mostly or entirely on the fiber network to call for help.

Telcordia recommendations call for 99.9 percent availability of telephone lines,[68] and this level of predicted and actual availability should be the absolute minimum for any broadband infrastructure in the state. It is possible with sound design and operational practices to improve on this number, potentially to bring availability closer to 99.99 percent.

To achieve this level of reliability, network standards for new deployments should include requirements that reflect best practices for fiber routing and resiliency; hub facilities, switching, and routing; and interconnection with 911 systems and the internet backbone. For example, having redundancy in field equipment as specified below is a solution to the sort of problem that, on traditional phone networks, was known as remote host isolation. These best practices include:

- **Redundancy of fiber routes from the headend and hub facility to the internet backbone.** If these routes are operated by other service providers, then there also need to be demonstrated service level agreements (SLA) and repair and maintenance plans that guarantee continued connectivity through multiple data centers and points of presence (such as, both to Boston and New York).
- **Appropriate resilience in headend/central office and hub facility**
    - Sized for CUD network equipment, colocation by ISPs and potential wireless or other providers and room for growth

[68] Telcordia (Bellcore) GR-499-CORE. See, for example: "VoIP Availability and Reliability Model for the PacketCable™ Architecture Technical Report," CableLabs, 2019.

  - Physically robust structure, such as a precast building using steel reinforced concrete
  - Two or more separate cable entry points for fiber
  - Appropriate mounting of cables in cable ladders, under floors and/or above ceiling
  - Redundant (1+1) HVAC sized for initial equipment and expansion, fed from separate circuit breakers
  - Electrical service for initial equipment and expansion, 120/240V service and surge protection
  - Generator sized for initial equipment and expansion
  - Security and fire protection systems including alarms and inert gas fire suppression systems

- **Sufficient backup power**
  - Generator and fuel and battery providing backup power of up to three days at all central office or hub buildings.
  - Fixed or deployable generators and batteries to provide three or more days of backup power to active field electronics in cabinets.
  - Backup power of up to three days for all switches and components handling interconnection to the public network (also for separate ISP infrastructure handling this role, if open access)
  - Backup power at the premises for broadband and VoIP phone service in accordance with state and federal regulations, including the option for customers to purchase more backup battery capacity should they want to exceed minimum requirements
- **Redundancy in backbone electronics** to provide 99.999 percent availability for the electronic network, including staff and spares to ensure continued operation.[69]
- **Avoidance of host-remote isolation** so no neighborhoods or communities have the vulnerability of being isolated in the event of an outage.

[69] Not including the access network from the last electronic component to the premises.

- **Regular third-party cybersecurity and configuration audit of network operators and ISPs**, including verification of 9-1-1 operation and compliance with resilience best practices.

The sections below describe the design and cost estimates for deployment of a statewide fiber-to-the-premises (FTTP) network to connect all unserved businesses and residents.

6.2 FTTP Service Area Definition

FTTP deployment costs are determined for addresses identified by the State as unserved – a total of 54,406 addresses for which there is no 25 Mbps downstream / 3 Mbps upstream ("25/3") service available, not including locations awarded by RDOF at the gigabit, low-latency tier. Addresses served by fixed wireless that were funded by the Connectivity Initiative are included in this analysis.

The total list of target unserved addresses was divided by CUD to create service areas corresponding to each CUD (Figure 17, below), with a candidate hub location selected to function as an aggregation point to house distribution network electronics located within a served area. While the specific hub location is not significant to the cost estimate, a viable candidate was chosen for each CUD that is central to the target address in each CUD to allow a detailed design to be created for purposes of cost estimation. Moreover, each candidate hub location sits on property owned by the State or other governmental entities, such as fire stations.

For this analysis, all towns across the state that have unserved premises but were not yet in a CUD were assigned to a CUD based on geographic proximity. Towns without any unserved premises (e.g., Springfield) were not included in a CUD. It was also assumed for this analysis that a new CUD was formed in the Chittenden County region. The resulting address list is illustrated in Figure 18, below.

The ultimate CUD configuration will be different than the arrangement pictured. This arrangement should not be taken as a recommendation for how towns should sort into CUDs; it was created for the sake of performing the cost analysis based on current CUD membership and possible future CUD growth.

Figure 17: CUD Service Area Boundaries

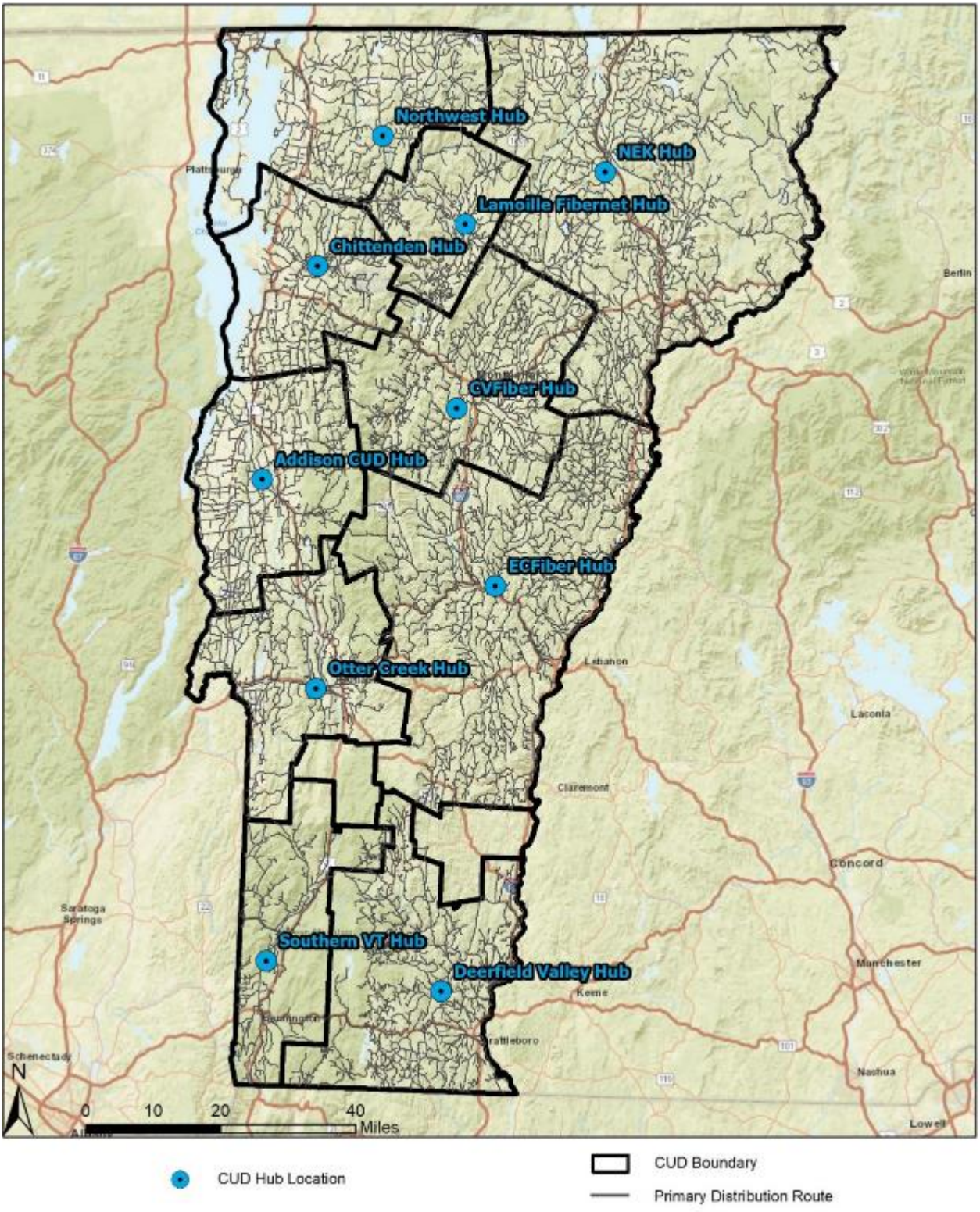
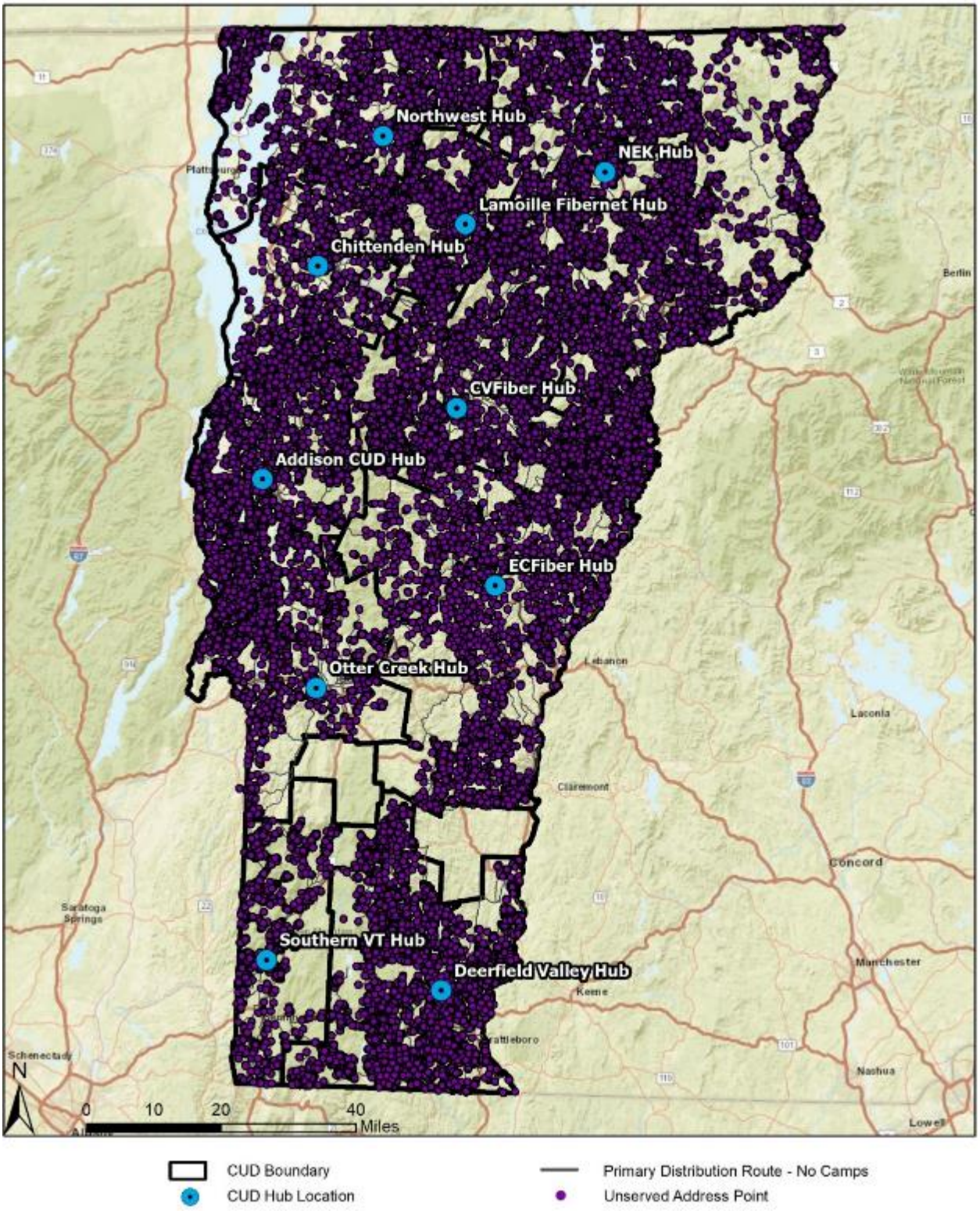


Figure 18: Target Unserved Addresses for FTTP Deployment



A significant challenge presented by a design targeting only unserved addresses in a rural environment is that the address points are located in numerous noncontiguous pockets or in areas on the perimeter of towns or other served areas. As a result, any representative model must take into account the need to build cable plant through served areas in order to connect unserved area. Our model does not include addresses in served areas, but includes many miles of cable in served areas in order to create a workable design.

Within an ESRI ArcGIS framework, addresses were set to "snap" to roads, identifying the roads where cable plant was needed in order to serve the addresses. The ESRI Network Analyst tool was used to create a cable topology to connect the addresses to aggregation points (fiber tap locations and fiber cable splice points), and to connect the aggregation points to the hub locations where the network distribution containing electronics would reside. The design model anticipates placement of a small communications It is assumed that connectivity to each hub can be achieved by a potential operator without new cable construction.

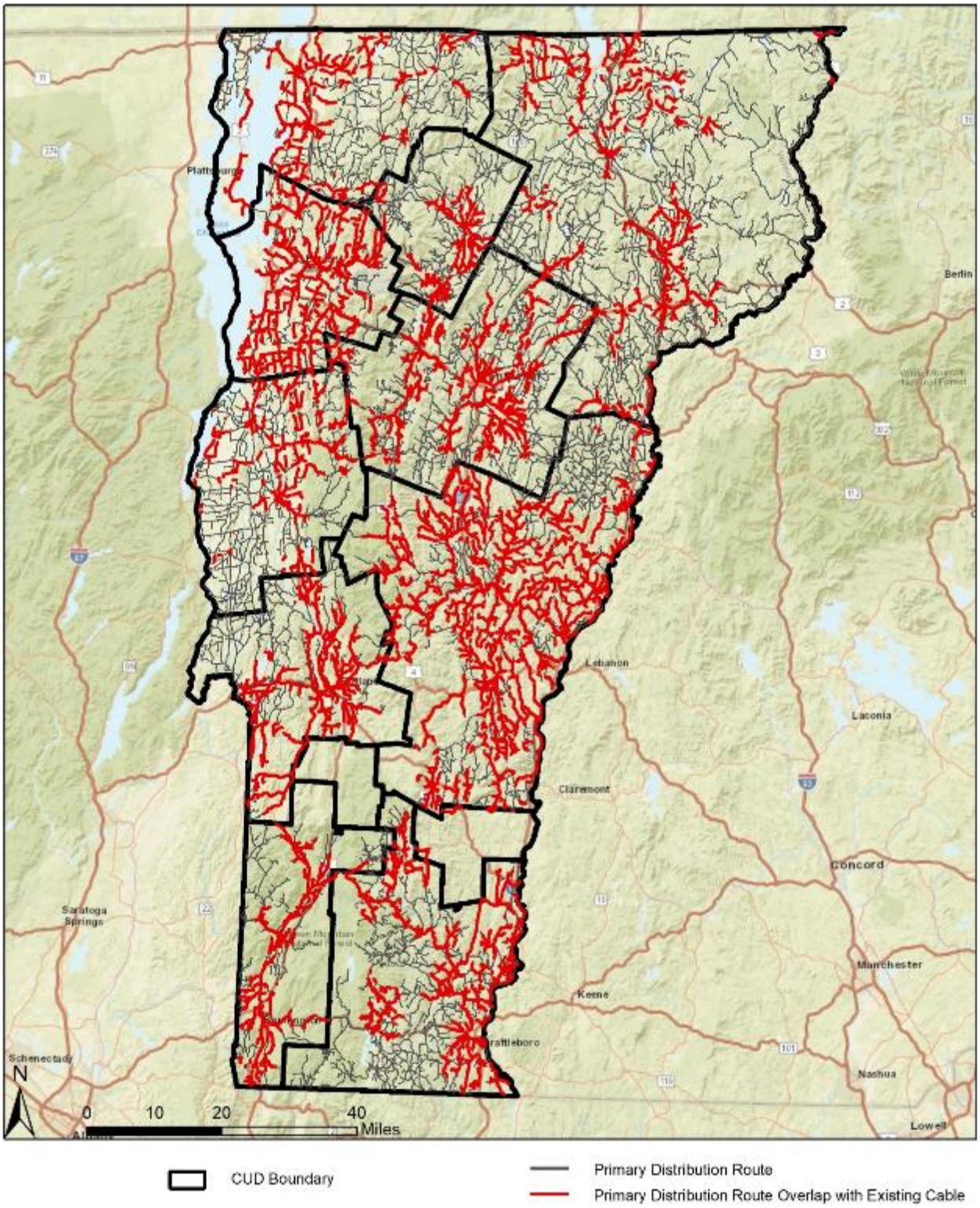
The approach provides the street mileage and number of unserved passings for each CUD area (Table 23).

Table 23: Miles of Cable Plant and Addresses Passed

CUD	Miles of Cable Plant	Unserved Addresses Passed
Addison	923.91	6,126
Chittenden	650.28	2,083
CV Fiber	1,294.23	6,879
Deerfield Valley	1,232.24	6,455
EC Fiber	1,881.67	5,746
Lamoille Fibernet	528.97	3,933
NEK	2,422.72	11,455
Northwest	966.36	7,229
Otter Creek	687.43	2,746
Sothern Vermont	471.43	1,754
Totals	**11,059.24**	**54,406**

The resulting cable plant architecture is shown at a high level in Figure 19.

Figure 19: High-Level FTTP Cable Plant Routes



We note that these totals include 9,126 addresses identified in the State's database as "camps," which range from unimproved properties without grid-based power to fully outfitted residences that may have grid-based power, landline telephone service, or both. Because the total number of these on-grid buildings is unknowable, design was created that includes camps and a design that excludes camps—the latter of which reduced the needed cable plant mileage by 795 miles, or 7 percent of the total.

6.3 Design Objectives and Key Attributes

CTC developed a conceptual, high-level FTTP outside plant network design and cost model that is aligned with best practices in the industry; reflects the State's goals for capacity, resilience, and scalability; and is able to support a variety of electronic architecture options.[70] The design assumes a combination of aerial and underground construction based on the placement of the existing utilities.

The recommended architecture is a hierarchical data network that provides critical scalability and flexibility, both in terms of initial network deployment and its ability to accommodate the increased demands of future applications and technologies. The characteristics of this hierarchical FTTP data network are:

- **Capacity** – ability to provide efficient transport for subscriber data, even at peak levels
- **Availability** – high levels of redundancy, reliability, and resiliency; ability to quickly detect faults and re-route traffic
- **Failsafe operation** – physical path diversity in the network backbone to minimize operational impact resulting from fiber or equipment failure
- **Efficiency** – no traffic bottlenecks; efficient use of resources
- **Scalability** – ability to grow in terms of physical service area and increased data capacity, and to integrate newer technologies without new construction
- **Manageability** – simplified provisioning and management of subscribers and services
- **Flexibility** – ability to provide different levels and classes of service to different customer environments; can support an open access network or a single-provider network; can provide separation between service providers on the physical layer (separate fibers) or logical layer (separate Virtual Local Area Network (VLAN) or Virtual Private Network (VPN) providing networks within the network)

[70] The network's outside plant is both the most expensive and the longest-lasting portion. The architecture of the physical plant determines the network's scalability for future uses and how the plant will need to be operated and maintained; the architecture is also the main determinant of the total cost of the deployment.

- **Security** – controlled physical access to all equipment and facilities, plus network access control to devices

This architecture offers scalability to meet long-term needs. It is consistent with best practices for either a standard or an open-access network model to provide customers with the option of multiple network service providers. This design would support the current industry standard Gigabit Passive Optical Network (GPON) technology, as well as emerging 10 Gbps XGS-PON and NG-PON2 standards. It could also provide the option of direct Active Ethernet (AE) services on a limited basis, such as for business customers, using spare fiber capacity built into the designs.

Specifically, the physical fiber design uses a distributed tap architecture, suitable for a low-density deployment in which service drops to the network tend to be separated by considerable distance. The relatively low density of the target deployment, having less than five homes per mile, suggests a slightly different design approach is needed than for higher density areas in which commercial FTTP is most prevalent.

In a higher density area, having perhaps 50 or more homes per mile, service drops can be cost-effectively run from a fiber access point serving upwards of 12 passings. Overlap of fiber drop paths and other layers of the network hierarchy are limited by the close proximity of these access points Rural deployments of this type are characterized by large distances between passings, adding significant cost to overlay these layers of fiber using more traditional “distributed split”, “centralized split”, or “home-run” architectures. Instead, a distributed tap architecture allows access points (fiber “taps”) to be placed at varying distances within the network, each serving only one or two homes in many cases. A single fiber strand can be used to serve up to 32 homes along a given leg of the network, avoiding the cost of long segments of overlapping network layers and the corresponding duplication of fiber strands without an effective increase in capacity.

Scalability to meet future needs is built into the network by limiting the number of passings served by a given leg of distributed taps, each supported with a single fiber strand, and by incorporating spare fibers into the distribution plant to allow these legs to be split into two or more with minor resplicing of fiber strands.

Figure 21, below, shows a logical representation of the FTTP network architecture recommended based on the conceptual outside plant design. The drawing illustrates the primary functional components in the FTTP network, their relative position to one another, and the flexibility of the architecture to support multiple subscriber models and classes of service.

The design assumes placement of manufacturer-terminated fiber tap enclosures within the public right-of-way or easements, providing watertight fiber connectors for customer service

drop cables, and eliminating the need for service installers to perform splices in the field. This is an industry-standard approach to reducing both customer activation times and the potential for damage to distribution cables and splices. The model also assumes that the entity constructing the network obtains easements or access rights to private roads.

The network design and cost estimates assume the network will:

- Use existing publicly-owned land to locate a central office or headend facility; the cost estimate includes the facility costs with adequate environmental and backup power generators to fulfill the resilience requirements in this report
- Obtain easements or access rights to private roads where public right-of-way does not exist.

The FTTP network design was defined based on the following criteria:

- Fiber will be installed in the communications space of the electrical utility poles where poles are present, and in newly constructed conduit in other areas, or with new utility poles, depending on what is most cost-effective. Based on communications with pole owners in the unserved areas and with CUDs who have constructed networks in similar areas, aerial plant is assumed to comprise 90 to 95 percent of the plant. As such, two separate models were created—one with 90 percent aerial and one with 95 percent aerial
- We assume construction costs averaging approximately $30,000 per mile in unserved areas, which includes approximately $5,100 per mile for make ready, also based on communications with pole owners and CUDs
    - Utility pole make-ready costs of approximately $10,400 are estimated for routes passing through served areas
    - Make-ready credits available through the Vermont Electric Coop and Green Mountain Power tariff riders were not included in this calculation; this program could reduce make-ready costs by as much as $15M overall
- Fiber will vary between 12- and 288-count based on the need in the area
- Underground fiber will be installed in the public right-of-way or in an easement on the side of the road
- The network will target up to 32 passings per secondary distribution aggregation point (distributed tap leg)

- Hub shelters will support network electronics with backup power generation, redundant cooling systems, robust physical security, and inert gas fire suppression systems

- If possible, the distribution plant network routes will avoid crossing major roadways and railways. (In Vermont, railroads owned by VTrans are able to be navigated across without much cost or burden, however, railroads owned by private companies are often extremely expensive and onerous to cross.)

6.4 FTTP Network Deployment Costs

The estimated cost to construct the outside plant portion of the proposed FTTP network is approximately $392 million, or $7,200 per passing. As discussed above, the base model assumes approximately 95-percent aerial fiber construction, based on the construction of existing utilities in the area. From our discussions with pole owners and other CUDs who have performed similar construction in the State, our base model determines an average fiber construction cost of approximately $30,000 per mile for FTTP infrastructure.

This estimate includes the following cost components:

- **Project Management** – encompasses overall project and contract management, including oversight of the construction and engineering contractor(s), equipment suppliers, and right-of-way agreements.

- **Engineering and as-Builts** – includes system level architecture planning, preliminary designs and field walk-outs to determine candidate fiber routing; development of detailed engineering prints and preparation of permit applications; and post-construction "as-built" revisions to engineering design materials.

- **Conduit and vault infrastructure –** consists of all labor and materials related to underground communications conduit construction, including conduit placement, vault/handhole installation, and surface restoration; includes all work area protection and traffic control measures inherent to all roadway construction activities.

- **Aerial infrastructure –** consists of all labor and materials related to aerial strand installation; includes tree trimming and all work area protection and traffic control measures inherent to all roadway construction activities.

- **Utility pole make-ready –** consists of relocations of existing utility pole attachments to provide clearance for a new attachment, utility pole replacements, and other remediation work required for compliance with code and the utility pole owner standards.

- **Fiber optic cables and components –** consists of the material and labor costs specific to the installation of fiber optic cables, taps, splice enclosures, and other related components, irrespective of the cable pathway (underground conduit or aerial placement).
- **Fiber splicing, testing, and documentation –** includes all labor related to fiber splicing of outdoor fiber optic cables.
- **Hub facilities and systems –** consists of the material and labor costs of placing hub shelters and enclosures; related hub systems (backup power generation, cooling systems, etc.); and terminating backbone fiber cables within the hubs.
- **Distribution network electronics –** includes all distribution-layer network electronics necessary to activate connections between the hubs and the subscribers, as described in Section 6.4.4.
- **Service drops –** consists of all costs related to outdoor fiber service drop installation, including outside plant construction on private property to an indoor or outdoor fiber termination point, typically a Network Interface Device (NID) attached to an exterior wall of the structure.
- **Customer premises equipment** – consists of all costs related to the installation and provisioning of the CPE, including testing and limited indoor cabling.

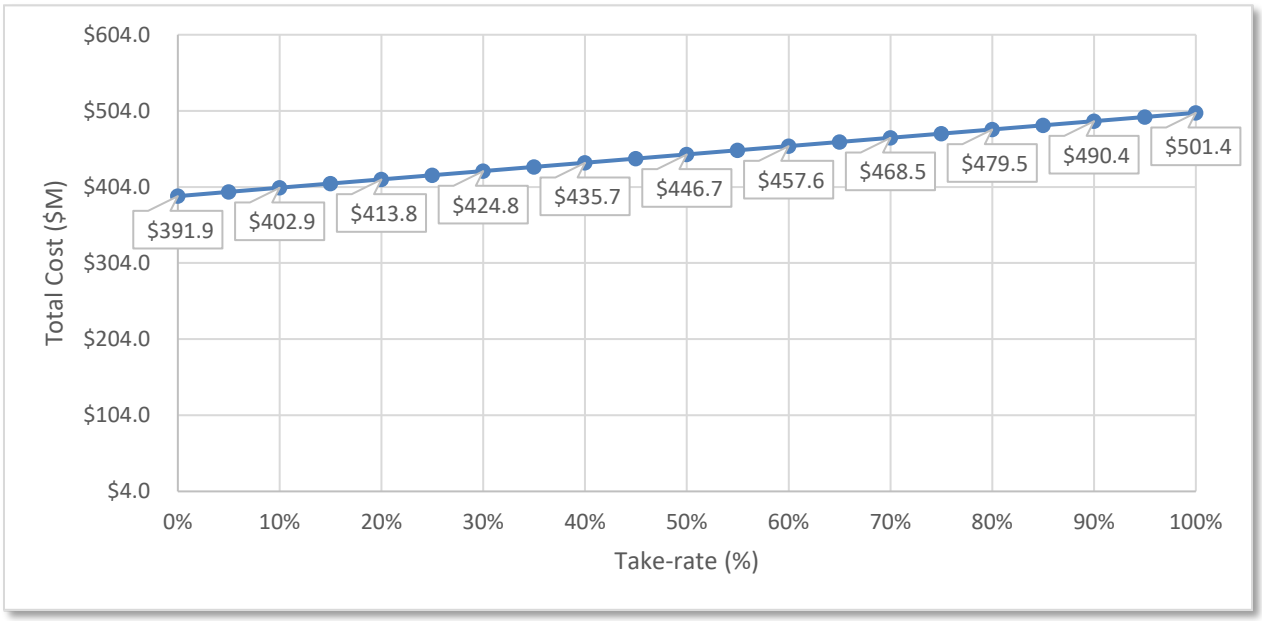
Table 24 provides a breakdown of the estimated FTTP implementation costs. (Note that the costs have been rounded.)

Table 24: FTTP Implementation Cost Estimates

Fixed Costs	
Project management	$1,850,000
Engineering and as-builts	$58,600,000
Conduit and vault infrastructure	$54,300,000
Materials	*$11,050,000*
Labor	*$43,250,000*
Aerial infrastructure	$122,200,000
Materials	*$31,900,000*
Labor	*$90,300,000*
Utility pole make-ready	$73,850,000
Fiber optic cables and components	$74,050,000
Materials	*$67,550,000*
Labor	*$6,500,000*
Fiber splicing, testing, and documentation	$4,400,000
Hub facilities and systems	$2,500,000
Outside Plant Subtotal	**$391,750,000**
Take-Rate-Dependent Costs (50% take-rate)	
Distribution network electronics	$4,050,000
Subscriber drop costs	$38,100,000
Customer premises equipment	$12,800,000
Total Implementation Costs	**$446,700,000**

Figure 20 illustrates the total implementation costs at take-rates up to 100-percent.

Figure 20: Estimated Network Implementation Costs at Varying Take-Rates



6.4.1 Deployment Scenarios

The actual cost to construct FTTP to every unserved premises in the state could differ from the estimate due to changes in the assumptions underlying the model. For example, if make-ready and pole replacement costs are too high, the network would have to be constructed underground—which could significantly increase the cost of construction. Further and more extensive analysis would be required to develop a more accurate cost estimate.

While anomalies and unique challenges will arise regardless of the design or construction methodology, the relatively large scale of this project is likely to provide ample opportunity for variations in construction difficulty to yield relatively predictable results on average.

We assume any underground construction will be done using an industry-standard approach for this type of environment, which consists primarily of saw-cutting a trench in the ground, or horizontal, directional drilling. The design model assumes a one to two 2-inch, flexible, High-Density Polyethylene (HDPE) conduit over underground primary distribution paths (hub to distribution splice points) and a single 2-inch conduit over secondary distribution path (splices to tap locations) to provide for initial needs with spare capacity for growth.

The amount of underground construction may vary from our data depending on the condition and availability of utility poles, particularly in unserved and less thoroughly documented areas of the service areas. To provide and estimated upper end cost, we estimate costs for a scenario in which 10-percent of the routes are constructed underground (90-percent aerial). Moreover, total serviceable passings in unserved areas may vary with the need to include those address points

designated as camp sites in the State's database. We examine fixed implementation costs, excluding take-rate dependent costs (distribution electronics, service drops, and CPE) as a range reflecting these variations in underground route prevalence and total passings, as shown in Table 25.

Table 25: FTTP Implementation Costs for Alternative Scenarios

Attribute	Implementation Cost Scenarios			
	Base Scenario – 95% aerial, camps included	Alternate A – 90% aerial, camps included	Alternate B – 95% aerial, camps excluded	Alternate C – 90% aerial, camps excluded
Total fixed implementation costs	$392 million	$439 million	$362 million	$406 million
Utility pole make-ready	$74 million	$70 million	$69 million	$65 million
Total route miles	11,097	11,117	10,291	10,317
Cost per mile (OSP only)	$29,600	$33,800	$29,400	$33,900
Total Passings	54,406	54,406	45,282	45,282
Cost per passing (OSP only)	$6,040	$6,900	$6,690	$7,670
Cost per passing (total)	$7,200	$8,060	$7,990	$8,970
Total costs (50% take-rate)	$447 million	$494 million	$407 million	$452 million

6.4.2 Central Network Electronics Costs

Incremental network electronics equipment to serve the unserved area will cost an estimated $15.0 million, or $350 per passing, also assuming on an assumed take-rate of 50 percent.[71] (These costs will increase or decrease depending on take-rate, and the costs may be phased in as subscribers are added to the network.) The network electronics consist of the distribution electronics to connect subscribers to the FTTP network, not including the electronics at the customer premises. The core electronics forming the provider backbone are less dependent on take-rate, but which will vary depending on the provider architecture. Table 26, below, lists the estimated costs for each segment.

[71] The take-rate affects the electronics and drop costs, but also may affect other parts of the network. A 35 percent take-rate is typical of environments where a new provider joins the telephone and cable provider in a service area.

Table 26: Estimated Central Network Electronics Costs (50% Take-Rate)

Network Segment	Subtotal	Subscribers (50% Take-Rate)	Cost per Subscriber
Core Electronics	$10.9 million	54,406	$200
Distribution Electronics	$4.1 million	27,203	$150
Central Network Electronics Total	**$15.0 million**	27,203	**$350**

Electronics are subject to a seven- to 10-year replacement cycle, as compared to the 20- to 30-year fiber optic cable plant.

6.4.3 Core Electronics

The core electronics manage the routing of the network traffic and provide connection to the backhaul link to the internet, or other ISPs in an open access model. The core electronics consist of high performance routers, which handle all the routing on both the FTTP network and to the internet. The core routers have modular chassis to provide high availability in terms of redundant components and the ability to "hot swap" line cards and modular in the event of an outage.[72] Modular routers also provide the ability to expand the routers as demand for additional bandwidth increases.

The cost estimate design envisions running networking protocols, such as hot standby routing protocol (HSRP), to ensure redundancy in the event of a router failure. Additional connections can be added as network bandwidth on the network increases. The core sites would also tie to the distribution electronics using 10 Gbps links. The links to the distribution electronics can also be increased with additional 10 Gbps and 40 Gbps line cards and optics as demand grows on the network. The core networks will also have 10 Gbps to ISPs that connect the FTTP network to the internet.

The cost of the incremental core routing equipment is approximately $10.9 million. These costs will vary depending on the provider's existing infrastructure, but are estimated to be in the ballpark of about $200 per subscriber. In addition, the network requires operational service systems (OSS), such as provisioning platforms, fault and performance management systems, remote access, and other operational support systems for FTTP operations. For a network of this scale, an OSS system costs approximately $100,000 to acquire and configure.

[72] A "hot swappable" line card can be removed and reinserted without the entire device being powered down or rebooted. The control cards in the router should maintain all configurations and push them to a replaced line card without the need for reconfirmation.

6.4.4 Distribution Electronics

The distribution network electronics at the hubs connect the subscribers to the FTTP network by connecting the backbone to the fiber that goes to each premises. These electronics are commonly referred to as optical line terminals (OLT). We also recommend deploying modular access network electronics for reliability and the ability to add line cards as more subscribers join in the service area. Modularity also helps reduce initial capital costs while the network is under construction or during the roll out of the network.

The cost of the distribution network electronics for the network is estimated at approximately $4.1 million at a take-rate of 50 percent.

6.4.5 Customer Premises Equipment and Service Drop Installation (Per Subscriber Costs)

Customer premises equipment is the subscriber's interface to the FTTP network and for GPON networks is referred to an optical node terminal (ONT). For this cost estimate, we selected CPE that both terminates the fiber from the FTTP network and provides only Ethernet data services at the premises (however, there are a wide variety of additional customer premises equipment offering other data, voice, and video services). The customer premises equipment can also be provisioned with wireless capabilities to connect devices within the customer's premises. Using the assumed take-rate of 50 percent, we estimated the cost for subscriber customer premises equipment will be approximately $12.8 million.

Each activated subscriber would also require a fiber drop cable installation and customer premises electronics, which would cost on average $1,870 per subscriber, or $50.1 million total—again, assuming a 50-percent take-rate.

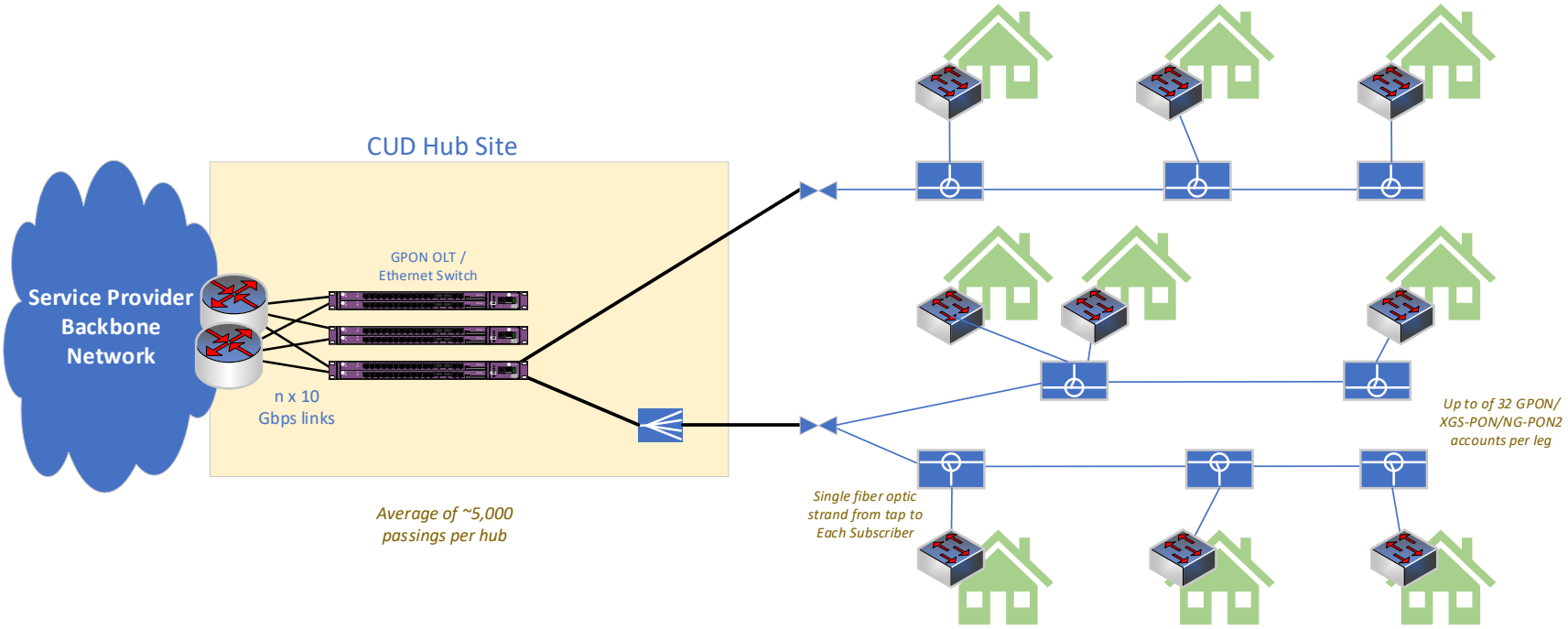
The drop installation cost is the biggest variable in the total cost of adding a subscriber. A short aerial drop can cost as little as $250 to install, whereas a long underground drop installation can cost upward of $5,000. We estimate an average of approximately $1,400 per drop installation.

The other per-subscriber expenses include the labor to install and configure the electronics, and the incidental materials needed to perform the installation. The numbers provided in Table 27, below, are averages and will vary depending on the type of premises and the internal wiring available at each premises.

Table 27: Per Subscriber Cost Estimates

Construction and Electronics Required to Activate a Subscriber	Estimated Average Cost
Service Drop Cable Construction and Materials	$1,400
Subscriber Electronics (ONT) and Installation	$470
Total	**$1,870**

Figure 21: High-Level FTTP Architecture



6.5 Operating Costs

Some of the ongoing costs of operating an FTTP network include fiber maintenance, fiber locating, pole attachment fees, equipment maintenance, and equipment replacement. These estimates include costs directly related to the maintenance and operations of the physical and network electronics layers of the network but does not include costs associated with higher layer services and other fixed administrative expenses.

Regular fiber maintenance includes any repairs, adds, moves, and changes required of the network. For example, if a roadway is widened a pole line may be moved or undergrounded, requiring the network owner to relocate this fiber. We estimate that 1 percent of the total capital costs is required annually for fiber maintenance, or $3.3 million.

In the few underground utility areas, fiber locating includes the marking of underground utilities as part of the state's DigSafe process. Each underground utility is responsible for locating and marking their utilities in the right-of-way. We estimate the cost at $1,800 per mile of underground construction annually for utility locates, or $1.1 million annually for the estimated 591 miles of underground plant.

For every pole that the fiber network attaches to, the network owner must pay the pole owner an attachment fee for using the pole. Pole attachment fees go toward the maintenance of the utility pole line. We estimate a pole attachment fee of approximately $4.7 million annually for approximately10,500 miles of aerial plant based on a $10 per pole cost as an approximate average of a range of rates. Pole attachment fees are estimated and would be negotiated with the pole owners as part of the pole attachment process (We adopted a $10 per pole cost as an approximate average of a range of rates.)

Equipment maintenance consists of hardware maintenance contracts required to receive technical support, replacement of failed equipment, and ongoing software/firmware updates. We estimate total annual maintenance costs of $2.1 million for core and distribution electronics.

In addition to equipment maintenance, equipment replacement is necessary on a periodic basis as product lines and technologies reach obsolescence. There are many approaches to handling equipment replacement, but one best practice is the network owner establishing an equipment replacement fund where it allocates yearly a portion of the necessary funds to replace the network electronics. We recommend planning on replacing the network electronics every 10 years, requiring the network owner to allocate approximately $1.5 million annually.

Table 28 summarizes the FTTP technical operating costs.

Table 28:Annual Fiber-to-the-Premises Technical Operating Costs

Description	Annual Cost
Fiber Maintenance	$3.3 million
Fiber Locating	$1.1 million
Pole Attachment Fees	$4.7 million
Equipment Maintenance Fees	$2.1 million
Equipment Replacement Fund	$1.5 million
Total	*$12.7 million*

7 Possible Structures for State Broadband Funding Program to Address Unserved Areas

The state of Vermont has an unprecedented opportunity to build resilient, long-term broadband infrastructure using federal stimulus money from the American Rescue Plan Act (ARPA).

With this opportunity comes the significant challenge of determining how to use those resources most effectively. Stakeholders across the state have been debating structures and strategies for using this funding at the same time as this plan has been in development and legislators and other stakeholders may decide the structure before this plan is finalized.

The recommendations below are based on best practices nationally, experience with public and private broadband efforts, and knowledge of the Vermont context.

7.1 Context for the Recommendations

This Plan's recommendations were developed in context of how Vermont has endeavored to close the broadband gap in recent years, and how this plan must supplement and accelerate existing plans.

For the past year, Communications Union Districts (CUD) have been developing feasibility studies and business plans, funded by the state's Broadband Innovation Grant program, to understand if and how it was possible to build broadband infrastructure in their communities that met the states 100/100 Mbps goals.

However, Vermont is in a wholly new situation now than it was a year ago. In late 2020, the FCC awarded $32.5 million in their Rural Digital Opportunity Fund (RDOF) auction to ISPs in Vermont to serve non-contiguous rural census blocks, in some cases with LEO satellite service but in most cases with FTTP infrastructure. These companies have up to six years to fully meet their obligations.

Across the state, these RDOF awards changed the business cases and planning work of CUDs, who needed to pivot to incorporate the plans of the winning bidders into the CUDs' own projections. In many cases, the FCC's awards, which are not ensuring that the last mile is built in Vermont, made the work of the CUDs harder in their attempts to guarantee service to every home.

In addition, the largest ILEC in the state announced that they were using private equity investment funds to build fiber to more than 200,000 premises in the state that already had access to cable. Providing Vermont residents choice and increased competition is undoubtedly a good thing; but once again it required CUDs reconsider their planning and trajectory mid-stream.

On top of the FCC RDOF awards, billions of dollars in new stimulus funding have been allocated to broadband expansion, which represent both an opportunity and a challenge. It is an opportunity because the state has money to actually address its broadband challenges for the long term. However, the vast amount of money allocated to broadband has caused a spike in demand for labor and materials that is unpredictable and challenging, especially for networks without a scale that would be enticing to vendors that have a choice of projects. These resources added to an already disrupted market as Covid-19 caused factory closures and other issues in the supply chain. Right now, there is a nine- to 12-month waiting period on orders of new fiber.

The reality is that CUD plans have had to be continuously adapted and reassessed based on changes to the broadband landscape due to the FCC's RDOF auction, the pandemic, great fluctuations in construction and materials costs, penetration rates, and ongoing announcements of new construction in targeted areas across the state. New private investment in and construction of fiber in Vermont is, in part, a testament to the legitimacy of the CUDs, which have spurred private entities to invest. This is good for Vermonters; more fiber broadband that gets the state closer to its goal of 100/100 Mbps is clearly welcome. That said, new investments in infrastructure continue to complicate the CUDs' planning process by requiring them to adapt and pivot their plans.

After a year of planning in a dynamic, ever-changing environment, CUDs are aware of the challenges they still face, and the fact that CUDs still have a long way to go and a lot of work ahead of them, especially for their mostly all-volunteer boards. CUDs are continuing to be careful in the planning, ensuring that any funds they have available to them will be used effectively and responsibly. Some newer CUDs have delayed finalizing their Broadband Innovation Grant business plans so as not to depart that program in a dynamic environment in which business plans need to continuously be updated.

This plan's recommended framework for disbursement of broadband subsidy recognizes that CUDs, being municipal entities that are mid-stream in their planning work, are the best vehicle for bringing broadband to the last mile, where private entities have seldom or never been willing to build. Without a profit motive, and with access to tax-exempt revenue bonds, CUDs will be integral to making stimulus money stretch as far as it can. That being said, CUDs still need considerable pre-development and pre-construction support to be as effective as they can be in delivering service to unserved and underserved premises.

It should also be noted that CUDs are in different positions and different phases in their planning processes. Some of the new CUDs (i.e., beside ECFiber) started their planning processes earlier, and have built up considerable expertise and momentum; others are newer to the work. This report's recommended framework for broadband funding is meant to accommodate all CUDs,

wherever they are in their planning process, however, the authority ultimately in charge of overseeing the program should build discretion into the process, or mechanisms that account for the varying stages of the CUDs to ensure that the authority is not holding back or delaying CUDs that are farther advanced in the process, nor letting CUDs that are just starting out fall behind.

Though some stakeholders have considered a hybrid framework that allows both CUDs and private ISPs or ILECs to compete over funding the same areas of the state. That framework presents challenges in that applications for funding from both public and private entities will be very difficult to compare, and moreover, will position CUDs and private companies against each other in a way that precludes constructive partnership conversations and the prospect of working together to reach a solution. Incentivizing CUDs and private companies to work together by encouraging public ownership of assets and private operation will result in bringing together the values expressed by public advocates and the state, like the need to reach the last mile, and the valuable experience and expertise of private network operators. Together, this framework will result in a win-win for public entities, private businesses, and the end consumer.

The recommended program is designed to continue to champion local decision-making, local control over solutions, and long-term consumer agency, while also creating accountability structures that are necessary for administering significant amounts of federal resources responsibly. The recommendations are not meant to add bureaucracy to the process or remove decision-making from CUD hands; instead, the recommended process is designed to ensure that all CUDs have the structure and support they need to meet the high thresholds of quality and responsibility asked of them as they develop broadband solutions that will ultimately require hundreds of millions of dollars of capital investment.

This plan's recommendation is to use Governor Scott's allocations for construction and pre-construction resources and the framework presented in H.360.

Between the publication of the Draft Telecommunications Plan and this Final Draft, Governor Scott signed a version of H.360 into law. The Vermont Community Broadband Board (VCBB) is responsible for enacting the H.360 legislation this year. As such, the recommendations and considerations presented in the Draft Plan remain relevant; they are included in Section 7.2 and Section 7.3 below, and are intended to be used by the VCBB and policymakers to ensure resources are used effectively and long-term goals are met. Section 7.4 contains additional considerations on H.360 as passed.

7.2 Distribution According to Governor Scott's Recommendation via H.360 Legislation

This plan recommends that resources should be allocated to CUDs as a right of first refusal where CUDs exist; ILECs and private companies are highly encouraged to partner with CUDs to provide

service and leverage the funds. CUDs should receive the resources with conditions and a comprehensive funding application and oversight process should be used to ensure accountability (a proposed process is described below).

Funding for construction and pre-construction should be proportional to the unserved and underserved premises in member towns, meaning premises not currently served by wired service that can achieve 25/3 Mbps, and not already funded at the gigabit low-latency tier via the RDOF auction. Premises funded under the Connectivity Initiative for fixed wireless service should be considered unserved; this equipment will be reaching the end of its lifespan as fiber is deploying in the next few years and as a long-term solution, fixed wireless will not meet the 100/100 Mbps minimum and cannot be upgraded to do so.

Because of the increased administrative burden and decreased leverage that would result from individual towns remaining independent of existing CUDs, towns should continue to be encouraged to join CUDs if at all possible. However, where a CUD does not exist, the state authority in charge of this program may assume control of that town's funding and direct procurement on that town's behalf, likely from the following options:

- Grouping some or all towns into a new district and running a procurement process on their behalf
- Providing subsidy to a neighboring CUD to extend their plans into the un-districted town
- Working with existing ILEC or CLEC entities to do line extensions to reach unserved premises or upgrade existing infrastructure

7.3 Suggested Grant Program Requirements and Priorities

The following conditions, processes, and parameters should be placed on the broadband funding so that solutions remain locally driven, standards, oversight, support, and expertise are provided by the state, and the long-term consumer interest is protected.

7.3.1 Obligation to Cover All Unserved and Underserved Addresses

Receipt of ARPA funding should obligate CUDs to provide service to all on-grid underserved and unserved addresses in their member towns. This would mean that if ARPA funding were not sufficient to build to every unserved and underserved premises, CUDs would need to commit to using follow-on funding, likely in the form of municipal revenue bonds or resources from a future federal infrastructure bill, to do so.

Of the premises that the PSD indicates do not have 25/3 Mbps service, 16.8 percent are considered "camps." Of these camps, a material portion may not be connected to the electrical grid. CUDs will determine which are on-grid during their pole data collection and network design.

Serving premises that are not on the electrical grid with wired broadband could cost hundreds of thousands of dollars per location, by either burying conduit for miles up a dirt road, or installing poles where there were none before (which homeowners often dislike since it requires clearing trees along the right-of-way). In the vast majority of cases, off-grid camps are seasonal and not residences where the owners want internet.

In addition, this requirement is not meant to preclude a CUD from having policies about "long drops," or installations where the premises is a significant distance away from the right-of-way. Standard installations can cost $1,400 per customer for premises near to the road; if a premises has utility poles along a mile long driveway, this installation could increase to $40,000 for that single customer. It is standard practice for ISPs to request special installation fees for premises farther than, for example, 400 feet off the right-of-way.

Lastly, a requirement to serve all unserved and underserved premises should have a deadline attached to be useful. We believe this timeline should be decided at the discretion of the governing authority based on market conditions at the time of the program launch. It may be the case that material production delays are reduced later this year; alternately, if a federal infrastructure bill passes with significant additional funding for broadband, labor and materials may become even harder to obtain.

7.3.2 Refinement of H.360 §8086 Funding Priorities

Section §8086 of H.360 dictates broadband funding priorities; this plan recommends these be refined and separated into requirements, which must be met to receive ARPA funding, and priorities, which are encouraged but not required.

Providing 100/100 Mbps service and targeting unserved and underserved premises as directly as possible should be considered a requirement, not a priority. (Note, this does not preclude CUDs from eventually building to all premises; it simply asks that CUDs prioritize unserved and underserved premises with this funding.)

In addition, meeting best practices for technical standards to ensure long-term, resilient broadband for decades to come, should also be a requirement. See Section 6.1.1, CUD Network Standards, for more information.

Other items in this section may be kept as priorities, not requirements, with the understanding that not all networks will be able to meet all priorities due to their financial, geographic, and legal constraints.

For example, because of the increased costs open access networks may require and barriers for likely partners, those arrangements may not be feasible for all networks, and indeed may counteract the goal of providing coverage to the last mile.

Net neutrality can serve as a priority for CUDs if they so choose. However, some potential partners for CUDs may be precluded by participation by corporate policies that don't allow for net neutrality. Local control and community decision making suggest that CUDs should have the option to develop plans and partnerships with or without net neutrality, with the choice to weigh that policy among others in determining a path forward.

In summary, the recommendation is for the following requirements and priorities:

- Requirements:
    - Provide service to unserved and underserved locations within the Communications Union District
    - Support broadband service that is capable of speeds of at least 100 Mbps symmetrical
    - Meet best practices for technical standards to ensure broadband infrastructure is resilient and secure
    - Build networks capable of supporting future public good services, like mobile wireless expansion and public safety use cases
- Priorities:
    - Provide consumers with services that adhere to pro-consumer values like net-neutrality, transparent pricing, no data caps, and data privacy
    - Utilize public-private-partnerships to ensure service quality is high
    - Provide consumers with affordable service options and support low-income or disadvantaged communities
    - Leverage lease payments on owned assets into a long-term funding source for digital skills, digital equity, and digital inclusion efforts

Finally, networks should be built with enough extra capacity to accommodate growth and multiple use cases (e.g. public safety or mobile wireless expansion), but the challenging economics of rural broadband suggest that open-access, which can add uncertainty to a business structure, should not be required. Rather, CUDs should have the opportunity to explore such arrangements as is locally desired and appropriate, such that they can weigh the benefits and complications of open access in addressing the trade-offs between benefit and risk.

7.3.3 Recommendation for a Phased Application Process

The state should establish guardrails and check-points around the use of ARPA funding for broadband, for several key reasons.

First, since passage of the American Rescue Plan Act (ARPA), counties and municipalities across the country have been inundated with inquiries from untested companies promising to serve those towns with broadband using ARPA funds. The scruples of some of these companies are clearly suspect based on the promises they are making to unaware local leaders, and the speed with which they claim to be able to work. Vermont is not immune to companies attempting to score a quick profit off of a community desperate for broadband.

Second, even credible, well run private companies that would and will make good partners to CUDs may try to take advantage of CUDs during the negotiation process, essentially by negotiating from a position of power and expertise with an entity that is still growing in sophistication. State guardrails and checks throughout the planning process are important junctures for additional reviews of CUD plans, and can in fact be part of a process that empowers CUDs to negotiate on a more even playing field with their private partners.

Though some CUDs have existing expertise around, for example partnership negotiations or fiber network operations, good public policy dictates that the state provide systems that will work for CUDs of all maturity. Though the authority of the broadband funding program should provide discretion or create mechanisms so that more advanced CUDs are not being held back unnecessarily, CUDs should be required to pass key thresholds to obtain funding that ensure funding is being used responsibly and that CUDs are following a process that empowers them to plan with confidence and negotiate from a position of knowledge and strength.

7.3.3.1 Phase 1: High-Level Planning

This phase is meant to allow CUDs to make improvements to their Broadband Innovation Grant business plans that reflect the extreme changes in the broadband landscape over the last year, and to begin to form high-level partnerships with potential providers.

We recommend that CUDs still in planning stages be awarded at least $50,000 from the Governor's pre-construction allocation to update existing business plans and execute high level partnership negotiation. This should be sufficient to allow the CUD to use their recalibrated business models to build a high level partnership framework with a private ISP.

This may involve publishing an RFI to understand the potential partners available, and then may require some negotiation with potential partners to refine a framework for a partnership.

The output of this phase should be that the CUD presents two items to the state: an updated business plan, and a Letter of Intent (LOI) with a private entity detailing a high level partnership framework.

The business plan should present 10-year pro-forma projections, a financially prudent path to meeting the state grant obligations above, and credible estimates for the cost to customers. In addition, if ARPA funding is projected to be insufficient to reach all unserved and underserved premises, the CUD should demonstrate a plan to secure follow-on funding to meet that need. Potential follow on sources of debt CUDs may pursue, like subordinate debt or municipal revenue bonds, will be significantly de-risked by the ARPA funds provided by the state.

The LOI should document the roles the CUD and the private partner will take on, the partnership structure and/or lease payment structure that will be pursued (see Section 9 for possibilities), and the values that the private entity is open to complying with (e.g., no data caps, net neutrality).

We do not believe at this time the CUD and private entities need to present a robust legal document, as those documents can require hundreds of thousands of dollars of legal fees to finalize. The LOI should be detailed enough to demonstrate that both partners are committed to working together in good faith to negotiate a partnership.

If these two elements are adequate, we recommend that the state award the CUD $750,000 of additional pre-construction dollars to facilitate the negotiation of robust legal agreements, and complete other planning needs.

7.3.3.2 Phase 2: Detailed Planning

This phase is meant to allow CUDs to fully execute partnership agreements and contracts, update pro-formas and business plans if needed, and create high-level network designs demonstrating how they will target unserved and underserved premises.

Note: the recommendation that CUDs be provided $750,000 during this phase does not constitute the sum total they will need for pre-construction work. It is the amount we feel will be sufficient for every CUD to negotiate a complicated contract with a partner, create a high level design demonstrating the CUDs' initial build paths, execute on complex financial planning, and fund administrative costs required to transition to the construction phase.

Each CUD may need $250,000 to cover expert legal support and financial advisory through the process of partnership negotiation. In addition, a high level design may cost in the range of $225/mile, which could amount to over $300,000 for the largest CUDs. In addition to that expense, financial advisory services, grant-writing or fundraising services, accounting, and project management services may be needed.

To advance from Phase 2 and secure additional pre-development funding, and construction grants, we recommend that CUDs present the following to the state:

- Signed partnership agreement with private operator
- High level network design demonstrating prioritization of unserved locations
- Pro-forma projections incorporating final contract terms and structure

Upon successful completion of Phase 2, we recommend CUDs become eligible to apply for additional pre-development funding, to perform a detailed design, execute a pole survey if needed, submit pole applications, and begin make-ready work.

After Phase 2, CUD awards are recommended to be the full amount eligible to the CUD, not a set amount by year, allowing recipients to build as much in early years as possible and secure follow-on funding (e.g., municipal revenue bonds) as soon as possible.

7.4 Additional Considerations for Enactment of H.360

Given that H.360 passed between the submission of the Draft Plan on May 10, 2021, and this Final Draft, this report provides comments on the final version of the bill that may help as the legislative mandates in H.360 are enacted.

H.360 as passed created the Vermont Community Broadband Board (VCBB), a five-member entity tasked with facilitating the expansion of broadband in the state. A major component of the VCBB's work is the oversight of the Vermont Community Broadband Fund, which may be used to provide pre-construction grants to CUDs, and construction grants and loans to CUDs and/or other eligible providers.

The foundational elements of the bill are sound and will serve the state well. The bill addresses many potential pitfalls identified during the legislative process. For example, the bill authorizes $20 million to $25 million in grant funding to be disbursed prior to the full formation of the board and leadership of the VCBB so as not to delay ongoing work.

The bill, by its nature, does not enumerate the exact and specific rules and protocols that will govern the execution of the work. As such, this report seeks to prompt the VCBB to consider the following four questions as the VCBB translates legislation into action.

1) **How can the VCBB establish more granular and precise rules for awarding funding so there is no ambiguity or contention about awards?**

H.360 as passed contains the following list of priorities that the VCBB may use to guide funding awards. Those priorities are as follows:

1. *Leverage existing private resources and assets, with a high priority given to partnerships between a communications union district and a distribution utility*
2. *Demonstrate project readiness*
3. *Provide broadband service that complies with the consumer protection and net neutrality standards established in 3 V.S.A. §348*
4. *Support low-income or disadvantaged communities*
5. *Promote geographic diversity of fund allocations*
6. *Provide consumers with affordable service options*
7. *Include public broadband assets that can be shared by multiple service providers and that can support a variety of public purposes*

These priorities reflect at a high level the ideals voiced by the legislature and stakeholders across the state; however, translating these priorities into clear scoring metrics that guide grant awards will require setting more granular and detailed rules that address, at a minimum, the following:

- Whether all priorities are weighed equally in scoring applications
- Whether the absence of any priority would disqualify a project
- Whether priorities that often come with increased costs (e.g., net neutrality or affordable service tiers) will be judged differently for CUDs that, by their geography, will have higher deployment costs
- How proposals will be compared if money is distributed on a rolling basis
- How the VCBB will approach asking for changes to proposals
- How the geographic diversity of allocations will be measured
- How applicants can demonstrate project readiness, especially in a volatile construction market

For the program to operate smoothly and without contention, the VCBB will need to be clear about how funding priorities translate into proposal review and scoring.

2) What would or would not be considered a conflict with a CUD's universal service plan, and how can the rules prevent fighting between eligible providers?

During the COVID-19 pandemic, CUDs were given veto power over certain deployments in their regions, like line extensions proposed by private ISPs. The intent behind that veto power was to

balance support of CUDs and their business plans with the reality that existing ISPs are in a good position to build quickly and, in some circumstances, are best able to reach certain underserved areas efficiently.

Per H.360 as passed, the VCBB will be responsible for navigating a similar tension in adjudicating whether private ISPs are applying for resources to serve areas in a way that conflicts with the CUD's universal service plan. The VCBB has an opportunity to imbue this adjudication process with clear protocols that minimize potential disputes and disagreements about whether funding should be approved or not. Questions the VCBB must answer so that CUDs and private ISPs have a clear understanding of the rules and protocols include:

- How should CUDs document their universal service plan?
- What happens if an eligible provider applies before the CUD has its universal service plan documented or finalized?
- How will the VCBB adjudicate a situation where a private provider claims or demonstrates it could serve an area within the CUD's plan faster, cheaper, or better than the CUD?
- How will the VCBB respond to a proposal from a private entity that affects but does not completely disrupt a CUD's "business case"?
- What is the burden of proof for showing a private application conflicts with a CUD's universal service plan, and what metrics should be evaluated? Does the CUD need to provide customer and financial models showing that providing grant money to a private company would impede their work? Or is it simply a matter of serving premises that are already in a CUD's plans?

Disputes between providers and CUDs over funding and over plans for shared territories could strain or impede partnership formation between entities that could otherwise be quite compatible and advantageous partners. The best-case scenario is that private ISPs and CUDs see and understand the mutual gain to be had by working together; the best framework for applying for resources will align incentives to promote such partnerships.

3) **How can the board ensure that resources are spent responsibly and monitored closely across the state?**

The consultants engaged to complete this report have seen, in Vermont and across the country, vendors and firms in the telecommunications space that are overpromising capabilities or outcomes or otherwise misrepresenting themselves to win contracts from municipal entities that have resources for telecommunications but not as much experience in the sector.

The challenge with providing a substantial amount of money before the VCBB, director, and support systems are fully established, is to ensure that resources are spent efficiently and responsibly.

Even if the multi-stage process described in Section 7.3 is not enacted, the VCBB should take an active role in ensuring the vendors and partners that CUDs ultimately intend to use are well vetted.

To do this, the VCBB should establish enhanced guidelines for CUDs to follow regarding the qualifications of its vendors. Municipalities must issue a request for proposals (RFP) in the event they wish to form a PPP as required in 24 V.S.A. § 1913; however there are no other explicit rules about what requirements or standards must be included in the RFP. The VCBB's procurement guidelines could include making sure the CUDs' RFPs ask respondents to include best practice indicators of experience and competency, such as:

- History of the company including years of experience and
- Biographies of key staff
- Experience with public clients
- Multiple references of prior clients
- Proof of insurance

Then, the VCBB should have access to vendor proposals and contracts as a condition of disbursement of resources, and should provide a secondary review of credentials before funding is distributed.

4) **How will the VCBB's work ensure the long-term sustainability of new networks, and what will the VCBB do if a new network does not achieve long-term sustainability?**

One key to deploying long-term, resilient infrastructure is ensuring the CUDs that will build and own the network are financially viable and self-sustaining for the long term. CUDs need to cover their debt service via leasing their assets and/or collecting customer fees, which will be a real challenge in the sparse, rural areas of the state. To that end, the funding and technical assistance decisions the VCBB makes should not compromise the goal of ensuring the long-term sustainability of the networks. In some cases, this may entail balancing the competing costs and values that will have financial impacts on the network, such as providing affordable service, facilitating open-access arrangements, or building quickly to reach unserved and underserved areas as fast as possible.

The VCBB and in some cases the Vermont legislature may need to enact mitigation strategies in the event a CUD does not achieve long-term financial stability. These strategies could include appropriating one-time additional subsidies or ongoing subsidies to a network, or the facilitation of a sale of the network to a private company similar to the ultimate recourse with Burlington Telecom.

7.5 Alternate Strategy: Aggregated Procurement Option

This plan is being developed at the same time as the legislature is working to design a funding program, and at a time when the rules for use of stimulus funds are being written by US Treasury officials. Given that context, this plan presents an alternate strategy by which the state could administer broadband infrastructure grants that can serve as a backup in the event that major changes necessitate a new plan. This strategy offers different advantages and disadvantages that could result in meeting the state's 100/100 Mbps goals.

An aggregated procurement strategy would mean that the state initiates a procurement process for part or all of the functions needed by the CUDs, including potentially finding a private operator partner. The aggregation leverages the scale of all the CUDs and the state's expertise in procurements and vendor oversight. Though this would remove some planning responsibilities from the CUDs, this could also be an efficient process from a time, resources, and expertise point of view, and in an environment where vendors and materials are highly sought after, larger contracts could interest additional bidders.

When New Zealand ran a country-wide procurement process to build a fiber network, it divided the country into regions that overlapped with electric utility regions. Though the utilities had largely not participated in residential internet before, they became an immediately credible entity to bid on serving their territories with internet. Intense competition, therefore, was set up between public electric utilities and investor-owned incumbents. In some instances, electric utilities won the bid, and in others, the investor-owned incumbent won, but had to make major concessions in the process, resulting in better service for constituents.

A similar process could be enacted in Vermont. Regions aligning with entities would ensure strong competition drove down state costs and increased concessions from private companies. The state would be in a better position to negotiate for lower construction costs and features like data privacy, net neutrality, and low-income subsidy tiers in a way that CUDs on their own may not have the leverage to do. In this way, the state could efficiently and effectively achieve many of the CUDs' stated goals on their behalf.

A variation on this aggregated procurement option would be one in which the CUDs could "opt out" of the state procurement by proving they have a credible and actionable plan of their own.

Having opted out, CUDs would then be responsible for serving their member towns and following the service requirements and obligations set by the state.

In this scenario, the state would set a date by which CUDs needed to present their individual plan to the state and indicate their desire to opt-out. Though this option would allow CUDs to maintain autonomy if they wanted, others that would prefer the state to handle the immense amount of work needed to plan a new network could bow out of the process and devote their energy to other activities like digital equity, inclusion, and skills development.

8 Recommended Resources and Support for State Program to Address Unserved Areas

For the state to effectively meet its goals of providing 100/100 Mbps service everywhere in Vermont, substantial resources must be applied to the planning and execution.

All new CUDs have accessed Broadband Innovation Grants, which are supporting feasibility studies to understand the viable paths a CUD may take, and business plans to guide the CUDs' implementation. The Vermont Community Foundation and other entities have also supplied resources to support CUD planning efforts that fall outside of the Broadband Innovation Grant scope.

Though the resources that have been allocated thus far are substantial and have been put to good use, based on what the project team has seen across the country, the typical amount of start-up support required to plan and execute new fiber networks of the size and complexity that CUDs are undertaking is likely significantly more.

8.1 Expected CUD Expenses

The Governor's proposed allocation for pre-construction support should be sufficient for CUDs' pre-construction needs; that said, we believe it prudent to outline the likely expenses CUDs may have in more detail so that CUDs and the authority governing them understand the likely pre-construction resource needs.

Legal support for partnership negotiation – In many cases, CUDs may be negotiating complex partnerships with private entities that have deep pockets and sophisticated legal resources at their disposal. CUDs should expect to devote significant time to the negotiation process, which can take months, and significant resources for the assistance of legal counsel during negotiations. Legal fees during complex public-private partnership negotiations can cost $250,000 or more.

Financial advisory services – Even if the current construction labor and materials market was not volatile and unpredictable, CUDs must retain professional assistance during partnership formation to ensure that their long term financial needs will be met. Further, these financial advisors can help the CUD plan follow-on funding, if needed, to ensure every on-grid unserved and underserved premises gets served. CUDs should not be in a position where an unforeseen change in costs results in being unable to meet debt service obligations, and good financial advisors may require $100,000 or more.

Vendor procurement – Vendors will need to be procured for the CUD throughout the process. Though not as challenging as negotiating a public private partnership, RFPs should be reviewed by experts to ensure they solicit accurate and quality responses, and vendor contracts should be reviewed by lawyers. CUDs may need to spend $50,000 for support during vendor procurement.

High-level design – The best way to validate the cost and materials estimates, and to prove the CUD has a plan to reach all unserved and underserved premises, is to create a high-level network design. This design does not need the accuracy and detail of a design suitable for construction and can even be based on road centerlines rather than utility poles; however, it should include route miles, strand counts, splitters, cabinets, central offices, fiber access points, and MSTs. This work can cost $200 to $250 per mile.

Pole data collection – Data about most utility poles in the state has been published and is available through the Vermont Geodata portal. This includes lat/long, pole height, attachments, and more. However, the CUD will still need to send people into the field to perform pole data collection. Considering the wealth of data available, CUDs may not need to hire people to collect detailed data from the beginning; for example, they may be able to use the pole data to submit pole applications, and then during the ride-out, collect any additional information needed. Regardless, CUDs should follow standards set by the Vermont CUD Association (VCUDA) to ensure uniform data collection.

In cases where CUD is partnering with an ILEC that already has sufficient data about their poles, this step may not be needed. If data collection is required, it may cost 20-25 dollars per pole, or $600-800/mile.

Pole applications – Often, the same entity that collects pole data can also help with pole applications. Fees in Vermont are a tariff rate of $10/pole/year.

Detailed network design – Every CUD will need a detailed network design and bill of materials before construction can begin. A quality, thorough design is critical to ensuring that construction happens smoothly, and if possible, it can be beneficial to use the same vendor for design and construction to increase continuity between these two steps. A detailed network design may cost $700-1000/mile. Note: if the same vendor is used to create the detailed design as creates the high level design, efficiencies may be secured.

Make ready – Make ready, or the process by which poles are prepared to have another attachment, will be a major cost center for CUDs before construction. During this process, older and weaker poles will need to be replaced, and in areas with existing attachers in the telecommunications space, other wires may be moved to create space.

Green Mountain Power and the Vermont Electric Coop have both offered tariff riders to offset make ready costs, specifically a $2,000 discount off of make ready costs for every unserved premises served. Even with this credit, CUDs can expect to pay potentially up to $2,000 per mile in areas without competitors (unserved areas) and $10,000 or more per mile in areas with existing cable or fiber providers.

8.2 Structure of State Support for CUDs

The project team wants to acknowledge the challenge of providing oversight to a public broadband entity while simultaneously regulating private operators.

Legislators and other public officials have proposed a variety of major changes to the way that CUD support and oversight be administered to address this, namely, restarting the Vermont Telecommunications Authority, starting a Community Broadband Authority, or placing CUD jurisdiction within the Agency of Commerce and Community Development. Another proposal is to house CUD oversight in an independent body within the Public Service Department, like the Clean Energy Development Fund.

The project team would like to document the challenges that must be met should a new authority be established to oversee CUD work.

One challenge is that the establishment of a new authority will take months, especially if a board must be formed first before a director is hired. Executive level searches take months, and if the authority's work is essentially on hold during this start-up window, CUDs may not have the full support they require.

Second, the new authority may not have access to the full extent of the institutional knowledge held by the Department of Public Service on broadband issues and CUD planning. Though some staff with great expertise will transfer, losses of collective knowledge may be inevitable as a new team is formed.

Third, the new authority may have to establish new relationships with institutional players and assets critical to the process, like private operators, CUD leadership, consultants, and legal counsel in the state (both public and private).

Lastly, if the new authority has a sunset window, as has been proposed, it may be even more challenging to find qualified staff, especially at a time when telecommunications experts are in significant demand around the country.

This report urges the state to allocate sufficient resources to the entity overseeing CUDs in line with what is typical for this work across the country. Planning telecommunications in Vermont costs just as much as anywhere else, and even though volunteers have been mobilized around the state to serve on CUD boards, significant expertise and financial support is critical to ensuring long term success. Mistakes made, delays, or inefficiencies introduced during the pre-construction process will have a ripple effect through the life of the network, and the state will do a disservice to their own efforts and to constituents by not providing CUDs the support they need.

9 Framework of Business Models and Negotiation Opportunities for CUDs

Vermont's Communications Union Districts have a range of options for business models to provide service, however, some models are better suited to the Vermont context than others. This plan does not prescribe models CUDs should use; rather, it presents a range of options—and outlines in more detail the potential models that likely will be most common.

Note that these examples are for illustrative purposes only. As discussed further in Section 9.3, partnership negotiation is a long and complex process. CUDs will require strategic input and review along the way from telecommunications consulting experts, financiers, and lawyers versed in contracts and telecommunications.

9.1 Potential Business Models

CUD business models will vary greatly depending on a range of factors, including but not limited to:

- The roles the CUD is comfortable taking versus the roles it prefers to contract
- The sources of financing available or expected to be included in the capital stack
- The customer base and likely final size of the CUD's market
- The services the CUD wants to offer in addition to data (e.g., phone service, television)
- The CUD territory's geographic proximity to existing potential operators
- The ILEC(s) and electric provider(s) in the CUD's territory

Each CUD may have a different business model, and it is beyond the scope of this plan to exhaustively document the permutations available to the CUDs. However, this plan outlines some of the most common models that would apply to the Vermont CUD context, and major decision points for the CUDs to consider that will affect their business models and ongoing operations.

It should also be stated that there is no credible scenario in which CUDs perform every aspect of network construction and operation themselves; even a nominally publicly operated network will use contract labor for pieces.

Given the experience, expertise, and assets of the CUDs, this plan assumes all CUDs will contract for the pre-construction (pole surveys, design) and construction (pole applications, make-ready, and stringing fiber) of networks. With the exception, perhaps, of pole data collection, the complexity of construction and pre-construction work is immense, and CUDs put their progress at extreme risk by attempting to execute the work themselves.

Because every CUD will leverage private vendors for some aspect of the build, it could be said that any model the CUD develops is a public-private partnership. This is not entirely a matter of semantics; CUDs and private companies alike are encouraged to closely consider the meaning of a "partnership." A true partnership is one in which both partners share decision-making, share risk, and share the potential upside. If the risk in a public-private transaction or relationship is solely held by the public entity, it is not a true or equal partnership.

That is not to say that CUDs may not want to pursue engagements with private entities that are simply transactional, fee-for-service arrangements. On the contrary, there are very good reasons to do so. What follows are the most likely models CUDs may consider.

9.1.1 Public Operation With In-House Staff

One scenario is that the CUDs operate the network themselves. At a high level, this would entail starting a new operator under the direct guidance of the CUD board by employing staff, purchasing equipment and office space, setting up in-house systems for network operations, and supplementing CUD-owned and controlled resources with contractors as necessary.

This scenario does not mean that current volunteer CUD representatives and leadership would be converted to paid employees and charged with running the networks. The first thing the CUD would need to do is hire qualified and experienced leadership, who would then build out a team. Many responsibilities below the leadership level, from customer service to installations and maintenance, could be contracted for to some extent on a fee-for-service or retainer basis. However, there are financial implications and customer experience tradeoffs to contracting for various network operations and the leadership and CUD would need to make a determination which roles made sense to hire for and which to contract for.

The potential upside to this option—as with any fully public service—is that the network would not have any profit motive, and could therefore *in theory* provide as inexpensive service to customers as possible. The extent of savings of this option to the end customer, however, is unknown and may not even amount to anything due to the lack of scale a new, small network operator would have. Private operators with existing customer bases would be able to spread their fixed costs, including equipment, assets, leadership salaries, and more, across more customers, which may negate any potential savings the CUD could see with fully public operation.

This option also places the risk of failure of execution on the CUD itself, which would in turn increase the risk of failure in the eyes of potential financiers. Financiers—like bond underwriters and banks—generally prefer to know that a trusted and experienced operator is in control of the network.

In discussions with CUDs to date, a publicly operated network has not been seriously considered, and in general, this is likely not to be the most expedient route for CUDs to take. This reports presents it here primarily for informational purposes and to put into context the benefits of using a private partner for network operations.

9.1.2 Vendor-Based, Fee-for-Service Network Operations

Instead of bringing on staff to operate a network or engaging in a true "partnership," a CUD could still rely on vendors to do all of the day-to-day work. This would entail contracting out essentially all network operations on a fee-for-service basis in a framework where the private entity doing the work would provide little to no investment and have little to no risk.

The potential upside to this option is similar to the last—which is that the network would not have any profit motive, and could as a result provide as inexpensive a service to customers as possible, minus the fees needed to be paid to the private operator to fulfill network operations needs. Again, if the CUD were to contract to vendors on a fee-for-service basis, they should have total control over the network pricing and policies. In addition, this is one of the more likely scenarios that CUDs may pursue, because this arrangement:

- Reduces the risk of failure by using an established, trusted entity for all work
- Will likely be deemed less risky by investors and financiers
- May better comply with the IRS rules for accessing tax-exempt financing, like municipal revenue bonds

One word of caution is that just because CUDs are entering a fee-for-service vendor relationship does not mean the private operator should not be consulted in the planning of the network, the construction, the modeling of the finances, and more. A fee-for-service operator can be a critical thought partner in designing the network to the right standards (the partner will want to operate a network similar to one they are used to already), vetting the CUD assumptions and models, and ensuring the network construction and launch are successful.

9.1.3 Public-Private Partnership

CUDs may also form a partnership with a private entity to perform network operations on their behalf and share the risk of the effort. In this case, the private partner should ideally contribute capital to the construction and assume some risk by agreeing to cover some debt service shortfalls. In doing so, they also earn the right to share in the upside if the network performs better than expected.

9.1.3.1 Variation A: Partnership With an Incumbent Local Exchange Carrier

Incumbent Local Exchange Carriers (ILEC) are private phone companies that receive a government subsidy to provide phone service to every premises in a region. Across the country, ILECs typically provide a DSL connection to every house in their footprint, though in some cases are deploying fiber to denser areas to provide faster internet, reduce their ongoing maintenance costs (their traditional copper infrastructure degrades much faster than fiber optic cables), and diversify their customer base as traditional landlines are disconnected.

CUDs should consider partnerships with the ILEC in their territory because these partnerships may allow CUD resources to extend the furthest. Because ILECs in Vermont already own space on the utility poles, they can often bypass make-ready work and pole applications by overlashing the fiber to their existing copper plant, thereby saving thousands of dollars per mile during construction. In Vermont, this may save $5,000 to $6,000 per mile in unserved areas, though if the partnership extended into areas with more pole attachments and therefore greater make-ready costs, this partnership could save CUDs $10,000 to $15,000 per mile in those areas.

Another point of potential savings by partnering with an ILEC is that they will have immense additional assets, from equipment to personnel, already in the CUD territory that can be easily leveraged. This would reduce the operating costs associated with running the network (essentially it would allow the ILEC to spread existing fixed costs over more customers), potentially resulting in cheaper end prices to subscribers.

However, there are important drawbacks to consider with this model. By overlashing to copper on the ILEC's owned space on the poles, CUDs would have a harder time disentangling themselves from the partnership in the event of default or at the end of a contract term. This challenge could be mitigated with strong and clear contract language detailing the CUD's rights of use in the event of default or non-renewal, but it presents an additional layer of complexity to a potential dissolution of the partnership.

In a variation on this model, a CUD could also partner with another incumbent, such as the local cable company. A cable broadband provider would bring to the table many of the same advantages as an ILEC, though the cable company would not be able to overlash in rural areas, as these companies tend not to have existing plant or services outside population centers.

9.1.3.2 Variation B: Partnership With a Competitive ISP

CUDs may also partner with (or contract with on a fee-for-service basis) a competitive ISP to provide service to customers. A partnership of this nature also has a few trade-offs.

In this scenario, the CUD would need to pay make-ready costs and pole data collection because neither the CUD nor the partner would have this already. In Vermont, Green Mountain Power

and the Vermont Electric Coop have created a tariff rider program to offset the make-ready costs required to reach underserved premises; that said, it is unlikely that these tariff riders would be able to offset make-ready costs completely in underserved areas, and they would not apply to any future overbuilding CUDs may pursue.

Though the dissolution of a public-private partnership with any CUD is challenging, it may be the case that it may be easier for the CUD to transfer operations to a new competitive ISP in the event of a non-renewal of contract with the previous partner.

Lastly, depending on where the competitive ISP is based, it may not have as many existing assets (equipment, personnel, office space, central offices) in the region. Starting or growing a presence in a new area would increase their costs, which may in turn require increasing costs to the end user.

9.1.4 Private Network Extended with Public Support

In some instances, it may not make sense for the CUD to own broadband infrastructure. For example, the CUD may not want the ongoing responsibility of asset ownership, or they may be in an area with almost complete coverage already (e.g., in many Chittenden County towns). In these instances, the CUD may be able to enact a deal with a local ISP to subsidize the extension of their network to reach un and underserved premises. This could be in small, discrete areas (e.g., line extensions), or a deal could be reached over a larger area that essentially matched enough CUD funds with private investment to make building to all unserved and underserved areas worthwhile.

Obviously, if the CUD alone paid for infrastructure, the CUD should own the infrastructure; if it were to contribute a smaller percentage to a larger capital project, the CUD may not need, want, or be able to take an ownership stake in the assets.

The goal of this type of arrangement would be for the CUD to pass through some funding in a way that obligates the private operator to, at a minimum, cover all on-grid premises. Ideally the CUD can exact more concessions as well, based on the CUD priorities (e.g., low-income service subsidies or values like transparent pricing or unlimited data).

The benefit to this arrangement is that, in some instances, it is much cheaper to pay a little bit for an existing provider to extend their network than to build and start a new network to serve disparate premises. In addition, for CUDs who do not seek long-term involvement in the provision of broadband service, this method would relieve them of ownership of assets and therefore long-term responsibilities.

However, if receipt of state funding obligates CUD to cover all on-grid premises, and the CUD does not have sufficient subsidy to cover all premises in their region this may not be a viable

route because the CUD would not own the infrastructure, and therefore not have a long-term revenue generating asset.

9.1.5 Open Access

An open access model is structured to create the potential for competition over the network—and open access can be required as part of any of the models described above. The challenge with open access is that it complicates the economics of network ownership through the very competition that it is intended to create – by reducing the likely revenues for any given provider and thus potentially reducing interest in the opportunity. For CUDs that value open access, this model can and should be considered, with full analysis of the financial and partnership implications.

There are two primary technical approaches to open access that CUDs may wish to consider. First, in a dark fiber infrastructure approach, the CUD would focus its efforts on building out the fiber and leasing strands of fiber to one or more lessees. Second, in an alternative model, open access would be provided over lit communications circuits rather than physical assets.

That said, there is no universal understanding of what is meant by "open access." Generally, the term refers to an arrangement in which multiple entities can access the same physical infrastructure, thus enabling broadband competition over one physical network—a far more efficient means of delivering competition than requiring all entities to build their own networks as a path to competing in a given market.

In a more focused sense, what advocates of open access mean by this term are rules to require an asset owner to sell or lease an asset at reasonable and often pre-determined rates, terms, and conditions. After all, it could reasonably be expected that every asset owner would have a price at which it would voluntarily be willing to sell access—the key is that the rates and terms are standardized and reasonable, thus facilitating the competitive environment that is one of the goals of open access.

But its critical to understand that the economics of open access are more complex than that, particularly for a CUD that is seeking partnership with a private entity that has to build a business case for taking on the risk and cost of network operations and other elements of its arrangement with the CUD. The prospect, even if remote, of having to share a finite market with competitors changes the business case for the CUD's partner, potentially increases the risk, and likely changes the terms under which that partner will enter into the arrangement with the CUD. Stated otherwise, a requirement of open access may come with costs to a CUD—costs that the CUD may or may not wish to undertake, based on its goals.

And it is also important to note that the willingness of a network owner to lease access over its network does not mean that there will be willing lessees for that access. Even if the CUD's partner agrees to open the network to its competitors under certain terms, those competitors may not be interested in the opportunity, given the costs of entering the market and need to share the limited revenues associated with a low-density, competitive market.

Critically, we note that this issue is very complex, even as the underlying policy goal—enabling competition—is highly desirable. As an illustration of that complexity, the following is a handful of examples of how open access arrangements could be implemented, and the challenges that must be met in doing so.

1) Open access regulation similar to Regional Bell Operating Companies (RBOC)

One commenter in this proceeding[73] suggested employing a definition of open access that pertains to the potential requirement that infrastructure owners provide network capacity to competing entities akin to the wholesale access requirements imposed by federal law on the Regional Bell Operating Companies (RBOCs). In Vermont, these wholesale requirements now only apply to the provision of copper assets by Consolidated Communications, Inc (CCI). These provisions require CCI to offer access to a specified set of Unbundled Network Element services (UNEs). This access is afforded though the CCI wholesale tariff,[74] subject to the review by the Vermont Public Utility Commission (PUC). The methodology for determining the rates in this wholesale tariff is Total Element Long Run Incremental Cost (TELRIC)[75]. These services are subject to the CCI Performance Assurance Plan (PAP), a service quality plan, where CCI pays penalties if it provides poor quality.

This kind of regulation could be implemented in Vermont by requiring entities that own publicly-financed fiber networks to maintain a tariff, subject to PUC oversight, modeled on the CCI wholesale tariff.[76] This would presumably also include a Performance Assurance Plan. This would likely include identification and definition of specific UNEs, which cost methodology to employ (potentially TELRIC), then the specific costs for the UNEs based on the chosen methodology.

If an entity like the legislature or the VCBB required publicly funded fiber to have a tariff, litigation risk could occur at any of these junctures:

[73] In its comments, the Vermont Access Network (VAN) referred to Open Access Broadband Defined: https://en.wikipedia.org/wiki/Broadband_open_access.

[74] The CCI wholesale tariff is in its Statement of Generally Available Terms, www.tariffs.net/consolidated/tier.asp?cid=3804.

[75] TELRIC, FCC, https://www.fcc.gov/document/application-telric-pricing-loop-conditioning-review.

[76] It should be noted that the CCI Statement of Generally Available Terms no longer includes dark fiber as an available UNE due to federal litigation.

- **Establishing the wholesale tariff.** Questions that need to be answered to establish the wholesale tariff include, is it reasonable to impose this requirement? Does the entity, either legislature or VCBB, have the authority to do this, and does it unfairly change the RFP process? Is the RFP really an open RFP if it imposes these additional requirements, especially since the concept of "open access" has not been defined when the RFP is conducted?

- **Determining rates.** TELCRIC is one basis for setting rates, though there are many others. The experience with the 1996 act, concluding 10 years later in the Triennial remand order, shows that there are many different perspectives on this and that it is a complicated question.

- **Determining the exact conditions and protocols of assets provided.** The determination of the assets and conditions included in the wholesale tariff is a complicated question. Is it just "dark fiber by strand mile"? Is it between specified locations (central offices) or is it any requested segments? Can a requestor demand splice points wherever they want? Who pays for these splice enclosures? Who is responsible for network outages caused by these slice places? There are many questions here that could take years to sort out, and once a methodology is for determining rates, and the set of elements that need to be priced separately is sorted out, then the companies themselves must calculate the rates according to that methodology and issue tariffs.

- **Enforcement and performance.** There may be litigation about whether the companies correctly followed the methodology and prepared the tariffs. This will also include terms and conditions of service, such as time periods for installation, service quality plans, and penalties for failure to perform.

However, beyond litigation, a major challenge this presents is that the private ISP partners may be reluctant to agree to operating a network with this arrangement, or require greater compensation to participate, due to increased risk. That risk comes in two primary forms.

First, if the CUD retains dark fiber or that fiber is available at a wholesale rate, private ISPs may have to compete with their CUD partners for contracts with, say, enterprise clients or for telecommunications tower backhaul.

Second, that arrangement also leaves open the possibility of other providers leasing fiber strands to cherry pick the more ideal towns or neighborhoods. CUD partners will be required to serve everyone, and agreements are being crafted that require the private provider to lease the whole

network. New entrants on to the network that are not beholden to these obligations present a business and competition risk to the first partners on the network.

2) State of Vermont network

Another example to consider and understand is the access afforded by the State of Vermont fiber network.[77] The Vermont Telecommunications Authority (VTA) deployed fiber in several areas of Vermont. The VTA, and now the State as its successor, makes the service available to all providers. The VTA considered the costs to deploy the network, performed a market rate analysis, and eventually arrived at a set of prices, published on the PSD website. These prices were sufficient to gain some pre-construction interest in the network. However, there generally has been limited interest in the network after its transfer to the State. This may be related to the very limited best-effort service quality terms afforded by the standard state lease.

This kind of regulation could be implemented in Vermont by requiring entities that own publicly-financed fiber networks to offer fiber based on the rates, terms, and conditions of the State of Vermont fiber network. This has the advantage of being easily implemented, however, it has the significant disadvantage in that it is unclear whether the rates, terms, and conditions offered by the State currently are reasonable, either reasonably related to cost or reasonably related to market rates. Determining these rates is not an easy task, and significant risk can be introduced in setting rates too high and not getting any usage interest, or too low and not sufficiently covering costs.

3) NTIA BTOP Interconnection

Another example to consider are the interconnection obligations imposed by the National Telecommunications and Information Administration (NTIA) in its 2011 Broadband Technology Opportunities Program (BTOP),[78] including this key provision:

> *Recipients shall provide access to BTOP-funded facilities at any technically feasible point along the network (without exceeding current or reasonably anticipated capacity limitations). This duty includes, at a minimum, the physical interconnection of the recipient's facilities to a requesting party's facilities for the exchange of traffic. In addition, recipients shall connect to the public Internet directly or indirectly and provide requesting*

[77] "Fiber Optic Cable," State of Vermont Department of Public Service, https://publicservice.vermont.gov/content/fiber-optic-cable.

[78] "Fact Sheet: Broadband Technology Opportunities Program: Nondiscrimination and Interconnection Obligation," Broadband USA, Nov. 10, 2010, https://www2.ntia.doc.gov/files/Interconnection_Nondiscrimination_11_10_10_FINAL.pdf.

> *parties with an ability to connect to the Internet. Rates and terms for interconnection shall be reasonable and nondiscriminatory.*

Theoretically these obligations were subject to review and enforcement by the NTIA. In fact, the PSD is not aware of any example of a company successfully receiving access under these provisions, and enforcement of these rules has proved extremely challenging.

This kind of regulation could be implemented in Vermont by requiring entities that own publicly-financed fiber networks to adhere to interconnection obligations similar to those specified by the NTIA. To improve performance of this regulation, the terms should clearly define what is meant by "reasonable," require parties to keep a public wholesale price list and network map, and provide authority to some entity to adjudicate disputes.

9.2 Lease Agreement Structures

There are a variety of methods by which a CUD may lease fiber they own to a private operator or enact a fee-for-service arrangement.

For partnerships in which the private entity is also contributing capital or assuming risk, lease arrangements that allow for some upside in exchange for that risk may be most viable to all parties. In the case of a simple fee-for-service vendor relationship, a preferable arrangement would provide predictable fees to the ISP for their services and allow the CUD to insulate against risk.

CUDs that use debt financing to reach unserved premises will need lease arrangements that cover their debt service to the greatest degree possible. Determining whether that is possible, and to what extent and with what kinds of assurances, will be the key point of negotiation for many CUDs.

Lease structures that prioritize predictability and stability to the CUD, and may provide significant upside to the private operator if the CUD is not involved in setting customer prices, include the following:

- **ISP receives all customer revenue and leases fiber from the CUD at a set per mile per month basis**
    - This model provides predictable revenue for the CUD, but no possibility of upside if the network generates more revenue than expected
- **ISP receives customer revenue and pays the CUD a fixed amount based on CUD's debt service**

- This scenario would allow the CUD to know with certainty how much it could cover of its debt service. The rate would likely be variable and subject to regular reviews, with pre-agreed-upon mechanisms for changing the rate as debt changes

Lease structures that may provide more upside to the CUD include the following:

- **CUD receives all customer revenue and pays ISP a fixed fee for services based on a predictable metric**
    - Commonly, fee could be per customer per month served, with additional fees for installations, network maintenance, and other services performed

Lease structures that may provide more balance and shared upside include the following:

- **CUD or ISP receives customer revenue and pays the other a percentage**
- **ISP receives revenue and pays CUD per customer, or per customer *and* per passing, each month**
    - By charging a larger fee per customer *and* smaller per passing, both entities are incentivized to convert passings to customers and thereby both will share in the upside

These are highly generalized, simplified explanations of what will ultimately be complicated contractual arrangements. Agreements will need robust review by legal counsel and potential underwriters to manage risk and ensure that the project is financeable.

10 Addressing Demand-Side Broadband Issues

Though much of the attention of this report and recent legislative activity in Vermont has been devoted to supply-side broadband challenges, i.e., increasing the presence of broadband infrastructure, demand-side issues are an equal component of ensuring broadband access and equity across the state. Closing the gap in access across the state must be accompanied by addressing issues like affordability, digital skill building, and digital equity for the state to maximize their investment in expanding broadband access.

Digital equity, digital skill building, and affordability are all a result of the historical challenges of our state and country around poverty, lack of racial equity, lack of education equity, housing discrimination, and more. Addressing those challenges at a systemic level is not the goal of this report; however, increasing access to broadband and to the internet via digital skill building programs, subsidies for low-income Vermonters, and digital equity should be a concern of all stakeholders involved in telecommunications in the state.

Many CUDs are already planning and discussing how they will incorporate affordability programs into their network plans. Unless the FCC's Emergency Broadband Benefit Program subsidy of $50 per month for those who qualify for Lifeline is made permanent, it is recommended that CUDs continue to work together to devise a privately operated system for all of Vermont. This will remove the need to fund subsidies through state government, thereby removing arguments about how to raise subsidy funds. Equal Access Broadband, a nonprofit, has begun planning and designing a system that could be used by all CUDs.

As was discussed in the state's Covid-19 Response Telecommunications Recovery Plan, Comcast, Charter, and other providers currently offer low-cost service to eligible Vermonters, and these programs are likely to continue to be available. Between the CUD efforts and those of existing providers, there is a path towards having every low-income Vermonter have access to a provider with a subsidized program.

Digital skill building refers to the technical ability of people to use and access internet functions successfully. As was discussed in the state's Covid-19 Response Telecommunications Recovery Plan, the pandemic exposed great digital skill building gaps in our society as teachers, doctors, town officials, religious leaders, and others spent significant time on virtual events troubleshooting technical barriers being experienced by the general population.

Successful digital skill building programs are provided on a local basis, usually in person, between trusted community members. Libraries are a great resource for digital skill building programming—and CUDs as well can play a huge role as CUD members and volunteers can do outreach and training in the communities they know best. There are many options for curriculum

that can be found online for educators and volunteers, with some notable ones including the National Digital Inclusion Alliance[79] and Digital Learn.[80]

The "Broadband Corps" idea presented in the state's Covid-19 Response Telecommunications Recovery Plan provides another option to promote digital skill building at scale in Vermont. Though this was proposed in the context of the pandemic, the idea could be revisited in conjunction with new infrastructure builds as a way to employ Vermonters to support CUDs, train their neighbors in technology usage, update the state's data for mobile broadband coverage, and ensure Vermonters can take full advantage of increased connectivity.

Lastly, digital equity (and digital inclusion) looks at ways that historically marginalized groups have less access to broadband and the benefits of the internet than groups that are not historically marginalized. There is a significant gap in home ownership between white Vermonters and black, Indigenous, and people of color (BIPOC) Vermonters, with 72 percent of white Vermonters owning a home compared to 48 percent of BIPOC Vermonters.[81] This translates to digital inclusion issues because non-home owners tend to move more frequently, may need to pay installation fees for broadband, and need to go through the hoops of installation more frequently—like changing the address and payment information, and sometimes having to negotiate with the landlord to make changes to the house (e.g., drilling through a wall to feed a cable or fiber line).

Language barriers also present a challenge to digital inclusion, especially for new Vermonters and ESL learners. Certain cities and towns like Burlington, Winooski, and Brattleboro have large populations of non-English speakers; however, non-English speakers live all across the state. With Governor Scott's stated intention to welcome more refugees[82] and desire to be as welcoming as possible comes a responsibility to make sure that online services are being provided in multiple languages, or that interpreters are available to help people navigate the digital world.

Another clear shortcoming in digital inclusion is with incarcerated Vermonters. Often, incarcerated individuals have limited access to technology and receive little to no digital skill building training. Especially in instances of lengthy sentences, many formerly incarcerated people leave with no understanding of how to use technology that has advanced immensely during their

[79] "The Digital Inclusion Startup Manual," National Digital Inclusion Alliance, https://startup.digitalinclusion.org/.
[80] "Tools and Resources for Trainers," Public Library Association, https://training.digitallearn.org/.
[81] Ellie French, "New Bill Would Create Fund to Help BIPOC Vermonters Own Land," *VTDigger*, April 13, 2021, https://vtdigger.org/2021/04/13/new-bill-would-create-fund-to-help-bipoc-vermonters-own-land/.
[82] Kit Norton, "Scott Calls on U.S. State Department to Send More Refugees to Vermont," *VTDIgger*, March 18, 2021,https://vtdigger.org/2021/03/18/scott-calls-on-u-s-state-department-to-send-more-refugees-to-vermont/.

time of incarceration. This leads to significant challenges with basic online functions like registering for classes, gaining new skills, searching for jobs, and corresponding via email.

In addition, the prices incarcerated Vermonters are charged to make phone calls are much greater than prices charged for non-incarcerated Vermonters.[83] Incarcerated Vermonters pay almost 7 cents per minute for long distance, and 4 cents for local calls. Incarcerated Vermonters have no choice of phone service; the state should ensure that the prices charged incarcerated residents are in line with the actual cost of providing phone service and not overly inflated.

Especially if significant grant money is available to public entities like CUDs to build broadband networks, this funding can be parlayed into an ongoing revenue source to support affordability, digital skill building, and digital equity programs. Though the grant money should be used for building infrastructure, public ownership of that infrastructure will result in an ongoing revenue stream that can be used to fund these programs. CUDs should ensure that their lease agreements with private operators are sufficient to cover the amount of subsidy the CUDs plan to provide as well as support the additional digital skill building and equity programs that make sense for each community.

[83] "Vermont State Prison Phone Rates and Kickbacks," Prison Phone Justice, https://www.prisonphonejustice.org/state/VT/.

11 Recommendations to Improve and Expand Mobile Service

Cellular voice and data service expansion has been varied across the state in recent years. AT&T's ongoing FirstNet deployments have increased coverage in a few towns, as well as new roaming agreements between major carriers and VTel. However, other expansion plans and programs have not been successful. For example, proposed tower construction in several towns has been protested by constituents of those towns, and in some cases blocked entirely, suggesting that deployments were not planned with adequate input from local municipalities. In addition, neutral-host, small-cell deployment by CoverageCo in 2016 and 2017 ultimately was not profitable and so dissolved.

As the state considers future deployment methods and conversation continues about neutral-host and small-cell deployments, it is worth noting and learning from the reasons why the CoverageCo deployment did not succeed:

1. The first radios deployed were along driving corridors, and usage was 5x less than anticipated due to Vermonters talking less while driving than the national average, and soon after, the legislature enacted a moratorium on talking on the phone while driving.

2. Many initial radios were deployed using DSL as backhaul, which proved to be unreliable and insufficient, leading to poor customer experiences.

3. The refusal of one of the major carriers in the state to allow its subscribers to roam on the network led to decreased usage.

The problems listed above resulted in the majority of deployments losing money every month; clearly, an unsustainable operation.

The company pivoted their deployment strategy to focus on locations with cable or fiber backhaul, and in locations where the radios could serve residential clusters. This strategy relied on field organizing to find households, businesses, churches, and other entities willing to place a receiver on their structures; however, many were happy to do so to bring service to their neighborhood. Highly reliable and functional sites were put up, for example, at Coburn's General Store in Strafford, Kedron Valley Inn in South Woodstock, and on the steeple of the Hartland Unitarian Universalist Church. These sites became profitable — however, CoverageCo was not able to pivot fast enough to install enough profitable sites to overcome the number of sites losing money month to month. This suggests that should an attempt be made to use neutral-host small cells again, the focus should be on residential neighborhoods with fiber backhaul.

The overall challenge in Vermont is that, as evidenced by the above examples, not every technology or deployment method is right for every town. As such, the state needs a deployment strategy that accounts for great differences in local preference and viability.

11.1 Request for Proposal Strategy

The governor has suggested using $25 million in American Rescue Plan Act of 2021 (ARPA) funds to improve mobile voice and data coverage. As the state considers how to improve and expand mobile service for Vermonters, we recommend the following Request for Proposal strategy. A version of these recommendations was also shared with Governor Scott's administration upon its request for input on how $25 million of Vermont's ARPA allocation could be used to improve cell service over the next two years.

This plan recommends a Request for Proposals strategy that does not dictate one particular technology and deployment mechanism, but measures impact and makes awards based on demonstrated impact and viability, and alignment with state goals. This will allow the state to consider a range of options and weigh their cost, benefits, and achievability.

As part of an RFP process, the state should include the requirements that proposals and plans must satisfy. For example:

- Plans should target areas currently unserved by any carrier
- Plans shall not involve state ownership or ongoing upkeep of any infrastructure
- Plans must be achievable within two years, taking into account permitting processes and backhaul connections

The state may also indicate that proposals will be given extra points for certain outcomes, e.g.:

- Points will be awarded for total road miles and premises served that were previously unserved
- Points will be awarded for inclusion of multiple mobile network operators
    - Note, proposals must contain LOIs documenting the agreed-upon participation of carriers
- Points will be awarded for plans that are demonstrably resilient, including features such as backup power and diverse backhaul
- Points will be awarded for the amount of private capital committed to the work

Lastly, proposals should demonstrate that the viability of the project has been thoroughly vetted from a technological point of view and a community perspective. This could mean, for example, that the company must supply propagation maps with all assumptions listed and able to be vetted for accuracy, as well as letters from relevant select boards stating their belief that proposed tower locations would be satisfactory to constituents.

This RFP process will also arm the state with data on what is achievable under different models, which will be key to ongoing policy development and decision making. For example, if a neutral-host proposal states an ability to serve X amount of unserved road miles, but a non-neutral host model can reach 2X, the department will be able to do more informed planning for future cell coverage expansion efforts.

11.2 Update Mobile Voice and Data Service Maps

Key to ensuring that a $25 million cell service subsidy process—or a similar process for other amounts—meets the needs of Vermonters is having updated maps. The current data along major roadways are largely from 2017, though some crowd-sourced volunteer data was collected last year. Between 2017 and now, new FirstNet towers have been erected, and roaming agreements have been established between providers like AT&T and VTel. The state may undertake a data collection exercise by providing cell service measurement devices to state employees who travel the roads (like State Police, road crews, or otherwise), with the goal of updating state data and adding smaller roads to the database.

Though the propagation maps created for this report also help in identifying major gaps, the analysis was performed with a range of assumptions due to incomplete or proprietary data. The most accurate data on cellular voice and data coverage can best be obtained by field measurements, like drive tests.

11.3 Possibility of Collaboration with Green Mountain Power

In interviews, Green Mountain Power officials expressed an interest in being involved in expanding mobile voice and data service in the state. This collaboration could make mobile broadband deployments more efficient and should be explored as part of any mobile voice and data deployment programs initiated by the state. Specifically, there may be an opportunity to leverage existing utility poles, connections to the power grid, and even backhaul owned by GMP or others on the pole to deploy cellular radios. GMP stated that a particular point of focus could be designated “resiliency zones” in Vermont where the utility is already planning on making grid upgrades, including upgrades to the telecommunications aspects of power delivery.

11.4 Wireless Siting via V.S.A. 30 248a

The State of Vermont has established a process for siting or expanding wireless facilities, like radio towers, under 30 V.S.A. **§**248a. This statute provides a framework for assessing wireless

siting, and is well crafted to expedite non-controversial deployments, and provide a mechanism to surface and assess potentially competing interests or concerns with the more potentially controversial deployments. The 248a process also can assess and resolve wireless siting issues in a less expensive and less onerous way than the alternate route of using Act 250 to pursue new deployments. As such, 30 V.S.A **§**248a should be renewed at the next required juncture.

11.5 Health Concerns about Mobile Wireless Technologies

Many Vermonters have expressed concern in public comments and input sessions about possible adverse health effects of 5G radios and other wireless technologies. The FCC's guidelines for evaluating human exposure to RF signals were first established in 1985. The current guidelines were adopted in August 1997 in FCC OET Bulletin 65.[84] The guidelines are expressed in terms of Maximum Permissible Exposure (MPE) to electric and magnetic field strength and power density.

While recognizing the FCC's role in establishing standards related to radio frequency (RF) exposure, the state should continue to monitor the health impacts of wireless technologies by closely following trusted scientific inquiry and research from regulatory bodies and health experts. Any conclusive findings of health impacts should be considered while shaping telecommunications policies and deployments.

[84] "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields," OET Bulletin 65, edition 97-01, https://www.fcc.gov/general/oet-bulletins-line#65.

12 Recommendation to Support Public Safety Communications

Over the next 10 years, public safety communications will likely benefit from improvements to LMR communications, better coverage and capacity from LTE providers, and a proliferation of public safety broadband applications.

12.1 Land Mobile Radio

Public safety communications standards bodies and supporting organizations continue to strive to improve land mobile radio (LMR) networks. Due to the mission-critical nature of public safety networks, these upgrades and enhancements take a long time. A case in point is P25's evolutionary history. A major equipment manufacturer beta tested its P25 products in neighboring New Hampshire for more than a year in the early 1990s but did not complete the phased installation of the network until several years later. Public safety is just now reaping the benefits of P25's interoperability, digital voice capability, and other features 30 years later.

Vermont's state, local, and regional agencies and organizations should continue to upgrade their LMR networks to enhance coverage, capacity, features, and interoperability according to their service areas and operational needs. FirstNet and other LTE/broadband networks will not supplant LMR until they can provide performance in these capacities equal to or greater than LMR systems.

Importantly, local public safety entities may need legislative support to adequately maintain their LMR systems. Upgrades are expensive, and if there are no federal sources of funding to support local LMR systems, the general assembly should consider funding these networks to keep them as modern and robust as possible.

12.2 Wireless Broadband Technology

As with LMR, broadband technology standards bodies and organizations continue to improve broadband for public safety and other consumers. 5G is in its infancy with limited deployment across the country and will take some time to be prevalent. Public safety broadband communications enhancements historically have lagged enhancements enjoyed by commercial consumers due to public safety's mission critical requirements. However, AT&T is contractually bound to roll out 5G to public safety along with its commercial offerings and the other carriers appear to be following suit. Although some public safety requirements such as mission critical voice/data/video will require additional development, public safety will, hopefully, enjoy technology upgrades alongside commercial users.

The coverage offered today by FirstNet and other carriers for broadband communications is lacking in many areas, including in Vermont. The carriers are continuing to add towers, add small wireless facilities, and upgrade existing radio sites to expand coverage and enhance capacity. In addition, mobile cellular infrastructure such as cells on wheels (cows), cells on drones/wings (also

cows), cells on light trucks (colts), and other "deployables" offer the ability for public safety to fill in coverage and capacity gaps for planned and unplanned events. However, until a carrier can prove that coverage and capacity is seamless and ubiquitous throughout a public safety agency's jurisdictions, LMR should be the communications mechanism of choice.

In addition, communications funding has always been an issue for public safety. As noted, to take advantage of broadband communications offerings, public safety agencies must foot the bill for both LMR networks and LTE (on their way to 5G) subscription services and devices. This can be a challenge for many agencies, especially smaller agencies with fewer dollars to spend. If a Vermont public safety agency chooses to include broadband in its cadre of communications means, it should take advantage of discounts offered by carriers today with the hope that they will continue into the future.

12.3 Applications

Having an application strategy based on Vermont's emergency communications goals and initiatives will be key to selecting useful and reliable applications for different use cases. Using the same application among various agencies (such as with push-to-talk applications) will solve interoperability issues before they begin. In the sections below, we recommend considerations for public safety and emergency communications. Application choices will also be driven by broadband network coverage and capacity in an agency's jurisdiction—if there is inadequate access to the network, an application is useless.

12.3.1 Push-to-Talk and Other Public Safety Applications

Push-to-talk (PTT) applications and their ability to interoperate among wireless carrier networks and between LTE and LMR networks are at the forefront of public safety discussions. Some PTT applications, mission-critical PTT (MCPTT), are based on the 3GPP communications standards and others are over-the-top (OTT) applications. There is a risk that public safety agencies will select PTT products that are not interoperable and thus will not allow for seamless communications on scene. In addition, carriers may not allow PTT products to be interconnected even if they are compatible. As the implementation of the standards and the (primarily political) situation between carriers and their interoperability evolves, the hope is that agencies will have a PTT solution that works regardless of network. In the meantime, Vermont public safety agencies, both state and local, should select a compatible PTT solution.

Other public safety broadband applications include tools that support situational awareness, video surveillance, forensic intelligence, mapping, dispatch solutions, device security, building layouts, messaging, user priority elevation, and more. Both AT&T and Verizon have an "app store" for public safety users. FirstNet has a certification and verification assessment for applications listed in their catalog.

12.3.2 Other Public Safety Broadband Networks

Each of the major carriers (AT&T, T-Mobile, and Verizon) currently has its own public safety offerings with associated coverage, feature sets, and pricing available in Vermont. Although the FirstNet network has the greatest visibility, Vermont should continue to monitor the other carriers' progress and enable public safety agencies to choose which network fits their needs.

12.3.3 Leveraging 5G in Public Safety

Vermont emergency communications would benefit from maintaining relationships with not only AT&T's FirstNet representatives, but each of the wireless carriers to understand their roadmaps for 5G and integrate that into planning efforts. In addition, CISA, SAFECOM, NCSWIC, and NPSTC continuously monitor and research 5G in public safety.

5G is expected to enhance the data capabilities of public safety networks including Internet of Things (IoT) applications such as environmental monitoring devices located throughout an area, drones deployed on-scene, vehicle-to-vehicle communications, and numerous smart city applications. The promised speeds of 5G allows for this information to be used for situational awareness during an incident as well as day-to-day use cases like traffic stops. Currently and in the near future wireless carriers will have hybrid networks migrating toward predominantly 5G networks in 10 to 15 years.

At the federal level, CISA's Next Generation Network Priority Services (NGN-PS) is an acquisition program that will enable users to have priority voice, data, and video communications as the communications networks evolve. Much of their technical and operational research focus is on the use of 5G in many use cases. In addition, the National Public Safety Telecommunications Council has committees and working groups focused on public safety IoT, spectrum, and interoperability that are constantly touching on the impact and implications of 5G on public safety networks and applications.

12.4 Spectrum

With wireless communications technologies enabling faster speeds, public safety and non-public safety entities alike are protective of their current holdings and hungry for more. Public safety should continue to protect their spectrum allocations as the public safety 4.9 GHz spectrum is currently at risk and other bands may be at risk in the future.

12.4.1 Current Public Safety Spectrum

As in any wireless communications market, spectrum plays a major part in public safety communications. Spectrum distribution by the FCC continues to provide both opportunities and challenges for public safety. Table 29 lists spectrum allocated to public safety as of May 2021. With the exception of the 700 MHz broadband, the 4.9 GHz, and the 5.9 GHz bands, public safety spectrum is primarily used for land mobile radio communications. The 700 MHz broadband is the

Band 14 spectrum leased by the FirstNet Authority to AT&T. 4.9 GHz and 5.9 GHz are used for other public safety connectivity such as a wireless LAN for incident scene management, mesh networks, wi-fi hotspots, video security, and permanent fixed point-to-point/multipoint links for services or backhaul. Non-traditional public safety entities, such as utilities and commercial entities, and the federal government may enter into sharing arrangements with eligible traditional public safety entities to use the 4.9 GHz band in support of their missions regarding homeland security and protection of life and property.

Recently, the FCC has requested input on a change to the 4.9 GHz spectrum which would permit states to lease some or all of its spectrum to third parties. Some of the public safety community opposes this change including NPSTC which says "that the band needs to be preserved for public safety use". If this change does indeed occur, the Vermont representative must ensure that public safety of Vermonters is considered first for the use of this spectrum.

Table 29: Public Safety Spectrum[85]

Frequency Range	Common Name	Bandwidth Available for Public Safety
25-50 MHz	**(VHF Low Band)**	6.3 MHz
150-174 MHz	**(VHF High Band)**	3.6 MHz [non-contiguous]
220-222 MHz	**(220 MHz band)**	0.1 MHz
450-470 MHz	**(UHF Band)**	3.7 MHz [non-contiguous]
758-769/788-799 MHz	**(700 Broadband)**	22 MHz (11 MHz x 11 MHz) [contiguous]
768-775/798-805	**(700 Narrowband)[1]**	14 MHz (7 MHz x 7 MHz) [contiguous]
806-809/851-854 MHz	**(NPSPAC Band)**	6 MHz (3 MHz x 3 MHz) [contiguous]
809-815/854-860 MHz	**(800 MHz Band)**	3.5 MHz (1.75 MHz x 1.75 MHz) [non-contiguous]
4940-4990 MHz	**(4.9 GHz Band)**	50 MHz [contiguous]
5850-5925 MHz band	**(5.9 GHz Band)**	75 MHz [contiguous]

[1] This includes 2 MHz of guard band.

12.4.2 Additional Future Spectrum Possibilities

Vermont public safety can also consider the use of unlicensed or leased spectrum that is not traditionally public safety, for non-mission critical uses, including private LTE networks. Utilities,

[85] "Public Safety Spectrum," Federal Communications Commission, February 23, 2021, https://www.fcc.gov/public-safety/public-safety-and-homeland-security/policy-and-licensing-division/public-safety-spectrum.

school districts, and other public and private entities are building private LTE networks for applications such as monitoring electric distribution lines in the field for breakage and providing student connectivity for at-home distance learning.

The FCC recently modified its rules on two blocks of spectrum—2.5 GHz Educational Broadband Service (EBS) and Citizens Broadband Radio Service (CBRS).

Unallocated EBS spectrum is scheduled to be available in many parts of the country through a planned 2021 auction and, more immediately, to those who apply to the FCC for Special Temporary Authority during the COVID epidemic.

The CBRS general authorized access (GAA) spectrum can be obtained via registration with a dynamic spectrum assignment system. There is also CBRS licensed spectrum recently auctioned as priority access spectrum with DISH, Windstream, cable operators and some smaller providers having obtained CBRS priority access licenses (PAL) in Vermont.

Other unlicensed spectrum is obtainable—the 900 MHz, 2.4 GHz, and 5 GHz bands are classified as unlicensed spectrum—but only the 5 GHz band has channel widths capable of delivering broadband speeds to a reasonable number of simultaneous users on a broadband network.

12.5 Funding Opportunities

There are ongoing and new funding opportunities for the state's emergency communications agencies and departments to consider. The primary funding sources are the FEMA HSGP and the Emergency Management Performance Grants. These are discussed briefly below.

The best source of information regarding available federal funding assistance for public safety communications is found in the "List of Federal Financial Assistance Programs Funding Emergency Communications" [86] developed by SAFECOM. SAFECOM has also published a comprehensive Guidance on Emergency Communications Grants[87] which we encourage the state to review in detail and incorporate into their emergency communications funding strategy. CARES Act and ARP Act funding has increased the available funding of the established programs so there are more opportunities in the near-term for receiving these grants and loans.

[86] "List of Federal Financial Assistance Programs Funding Emergency Communications," Cybersecurity & Infrastructure Security Agency, April 2021, https://www.cisa.gov/sites/default/files/publications/List%20of%20Emergency%20Communications%20Financial%20Assistance%20Programs_DRAFT_04-14-2021_508.pdf.

[87] "SAFECOM Guidance on Emergency Communications Grants: Fiscal Year 2021," Cybersecurity & Infrastructure Security Agency, https://www.cisa.gov/sites/default/files/publications/FY%202021%20SAFECOM%20Guidance_Final_508.pdf.

In addition, the State should consider other grant and loan federal opportunities that are focused on broadband such as the USDA's ReConnect and the NTIA's new Broadband Infrastructure programs. Including public safety connectivity of patrol stations, fire houses, PSAPs, radio towers, internet of things devices, and other potential end point boosts an application's chance of success. Public safety agencies, at the state and local level, should work closely with other departments to look for opportunities for a joint application that will help provide funding for public safety connectivity. Federal programs from the USDA, USDOT, NTIA, and the FCC can all be considered. These agencies have received additional appropriations for their legacy and some new programs that focus on expanding broadband primarily to unserved locations throughout the country. Grant funds and loans are available for broadband infrastructure and other technical services. Vermont emergency communications departments should continually monitor these agencies and the latest version of the SAFECOM funding materials.

Public safety in Vermont can also benefit from Department of Public Service broadband grants and should seek opportunities to partner with applicants to provide new or upgraded connectivity; for example, VTel was awarded close to $2 million to upgrade their equipment which in turn benefits FirstNet system users when they roam onto VTel's network.

12.5.1 FEMA Funding Programs

The Federal Emergency Management Agency (FEMA) Homeland Security Grant Program (HSGP) supports three interconnected grants that are intended to enhance national preparedness capabilities: The State Homeland Security Program (SHSP), the Urban Areas Security Initiative (UASI), and Operation Stonegarden (OPSG). Of these, the SHSP and UASI hold the greatest promise for funding connectivity initiatives. SHSP in particular presents the most opportunity for rural connectivity projects. The estimated total funding has been increased for the HSGP to $1.12 billion for fiscal year 2021. The state may want to consider these grant opportunities to support the SCIP goals of continuing the deployment and use of P25, interoperability among state and local agencies, interoperability with federal border agencies and Canada, and developing a TICP and FOG.

SHSP and UASI are intended to support the implementation of State Homeland Security Strategies to address the identified planning, organization, equipment, training, and exercise needs at the state and local levels to prevent, protect against, respond to, and recover from acts of terrorism and other catastrophic events. States must spend at least 25 percent of SHSP funds toward law-enforcement, terrorism-prevention-oriented planning, organization, training, exercise, and equipment. Broadband deployment could satisfy these requirements. The period of performance is three years.

OPSG supports enhanced cooperation and coordination among Customs and Border Protection (CBP), United States Border Patrol (USBP), and federal, state, local, Tribal, and territorial (SLTT)

law enforcement agencies to improve overall border security. SLTT law enforcement agencies use their inherent law enforcement authorities to support the border security mission and do not receive any additional authority as a result of participation in OPSG. Being a border state, Vermont border counties (as well as counties contiguous to the border counties and the counties contiguous to those – essentially the 10 northernmost Vermont counties) are eligible to participate in this program. A proposed project must clearly address two national priorities—enhancing information sharing and cooperation among federal agencies, including DHS, and addressing emergent threats.

For all HSGPs, grantees are expected to consider national areas for improvement (identified in the 2019 National Preparedness Report), which include improving cybersecurity and recovery-focused core capabilities, integrating individuals with access and functional needs, enhancing the resilience of infrastructure systems, and maturing the role of public-private partnerships. Broadband deployment is consistent with several of those priorities. Projects must align with the Statewide Communications Interoperability Plan (SCIP) and the National Preparedness Report. Proposed projects would also benefit from being aligned with the National Emergency Communications Plan.

The State Administrative Agency (SAA) is the only entity eligible to submit HSGP applications to FEMA, including those applications submitted on behalf of UASI and OPSG applicants. All 56 states and territories and the District of Columbia are eligible to apply for SHSP funds.

Emergency Management Performance Grants (EMPG) focus on all-hazards emergency preparedness. EMPGs are given to intra- and inter-state emergency management systems that encourage partnerships across all levels of government and with non-governmental organizations. Grants are given "for the purpose of providing a system of emergency preparedness for the protection of life and property in the United States from all hazards and to vest responsibility for emergency preparedness jointly in the federal government and the states and their political subdivisions." The fiscal year 2021 appropriation is $355 million.

A single state application is accepted from the State Administrative Agency (SAA) or the State's Emergency Management Agency (EMA) on behalf of state, local, or Tribal emergency management agencies. States and territories receive base amounts of the total available funding and remaining funds are distributed based on population. There is a 50 percent state cost match requirement.

12.5.2 NG911 Funding

An immediate priority for the 911 Board is the identification of a reliable and sustainable funding mechanism for the statewide 911 program. The 911 program is supported by the Vermont Universal Service Fund (VUSF) which is currently experiencing significant revenue shortfalls which

impacted the 911 program in fiscal year 2021 and are expected to impact FY22 as well. While solutions to the immediate problem are currently being finalized at the legislature, the Board looks forward to working with the both the legislature and the administration to identify and implement a long-term solution that will ensure a dedicated, reliable, and sustainable revenue source moving forward.

The 911 Board may get some relief from the federal government if the latest infrastructure bill that would provide $15 billion in federal funds to pay for 911 centers nationwide to be upgraded to NG911 passes. While all public-safety organizations support the notion of NG911 funding, there are some disagreements within the community about some language in the legislation. If the infrastructure bill does not pass, there is consensus that public safety will continue to find an avenue for this legislation.

12.6 Reducing In-Home Telecommunications Vulnerabilities

An often-overlooked public safety vulnerability is consumer telecommunications equipment's reliance on grid-based electrical power. Fiber optic or coaxial cable, and even DSL in some cases, are fundamental in the delivery of broadband and voice-over-internet-protocol services into consumer's homes. However, in the absence of a back-up power source, these technological platforms can cease to function during a power outage at the consumer's location. This vulnerability must be considered in Vermont, where extreme weather events such as winter storms can cause power outages that last hours to days.

For context on this vulnerability, the original public switched telephone network (PSTN) was designed and deployed parallel to the commercial electric power network. The PSTN relied on analog signals transmitted over copper wires and telephone sets at consumer locations. The copper pairs serving each customer could carry sufficient electrical power for operation regardless of the state of the commercial electrical power network. Even in the face of a power outage, as long the PSTN network was uncompromised, telephone service remained intact. While many consumers still subscribe to traditional voice service over copper pairs (i.e., the PSTN), these services increasingly rely on remote terminals that require their own backup power and are thus susceptible to service disruptions during power-outages.

This Plan presents three mitigation strategies to reduce the digital connectivity vulnerabilities created by home telecommunications equipment reliant on grid power.

1. **Encourage providers to go above and beyond compliance regarding battery backup systems**

Per FCC rules, providers such as those supplying voice-over-internet-protocol services must inform their consumers that their systems may not work during electrical power outages and offer battery backup options.

In light of the state's goal for universal access to digital services, providers could be encouraged to go beyond compliance with these rules. For example, providers could be encouraged to offer additional or longer-lasting battery backup systems, and/or provide more customer education on the issue.

2. **Encourage vulnerable or concerned consumers to adopt alternative communications means or power supplies**

Vulnerable or concerned consumers should be encouraged to consider adopting alternative or additional communications means to reduce potential instances of communication disruptions. Depending on availability, these could include mobile wireless services or copper-pair telephone service. While adopting alternative or additional communications tools does not address the vulnerabilities of digital connections on their own, consumer education and empowerment around alternatives could be an effective part of the overall solution.

3. **Ensure that electrical power network improvements are targeted at vulnerable areas**

Because digital services require commercial power, the most effective solution to this vulnerability is to minimize commercial electrical power outages. While this is a complex task, the path toward minimization should include identifying and working to mitigate outages in especially vulnerable areas: those areas where a concentration of locations have access to digital services (and thus where there is likely to be a high adoption rate for these services) and where there is low availability of mobile wireless service in the event of an outage. Green Mountain Power's initiative to clear ash trees from rights-of-way (because ash trees killed by emerald ash borers could fall on power lines) is a strong example of a program being implemented to proactively forestall potential electrical outages.

12.7 Continuous Emergency Access Regulations

The Continuous Emergency Access (CEA) rule in Vermont dictates that LECs provide a continuous phone connection capable of calling 911, even if the customer has discontinued their phone subscription. The rule was first instituted to ensure dormitories had access to 911 service even if students did not order phone service or were in transition between houses. The rule was last updated in 2002.

The primary challenge with CEA today is for VoIP phone providers. Unlike landlines, which simply require a phone jack and a phone, VoIP systems also require installation of a router and access

to power. Because of this, compliance with CEA rules can be more expensive and challenging for these providers.

As ISPs and ILECs deploy fiber broadband and offer VoIP products, and as mobile voice coverage increases, regulators should revisit this rule to determine the impact of evolving technologies on residents' ability to access 911 services and other public safety communications.

13 Recommendation to Support PEG

Vermont has more than two dozen Access Management Organizations (AMO) providing public, educational, and governmental television (PEG TV) services. These AMOs serve as platforms across the state for local news, coverage of local government, educational content, art and music content, school functions, local sports, and community-generated content. PEG's locally tailored coverage and operations are of great import to the state. Within a national and regional media landscape that continually shifts away from local coverage and outlets, PEG stands as a bastion of localism.

Recently, PEG's community functions and importance have been reinforced by the Covid-19 pandemic. As documented in the "Covid-19 Response Telecommunications Recovery Plan" released by the Vermont Department of Public Service in December 2020, during the pandemic, PEG stations have been tasked with providing crucial communications resources for Vermonters. This has included:

- Ongoing emergency management updates, including access to government press conferences, related to the Covid-19 pandemic.
- Production and technical support to stream and archive public meetings and events. This involves working with community members and institutions to facilitate best use of virtual meeting tools.
- Delivery of education programs for students and adults, including live-streamed distance learning opportunities, graduations and school ceremonies, and school sports coverage.
- Election coverage, including candidate forums, information on absentee ballot casting, and town meeting feeds.
- Production of community-meeting events and open forums, including anti-racism demonstrations, theater performances, and local fundraising events.

Over the course of the pandemic PEG viewership has been steady or increasing. In many cases, the Vermont community's engagement with PEG resources has increased significantly, with stations reporting spikes in Facebook views, YouTube views, and Google website traffic. For example, GNAT saw a 71.6 percent year-over-year increase in Facebook video views from the July-to-September period in 2019 to the July-to-September period in 2020. BCTV saw a 197 percent increase in YouTube subscribers added from January to March 2020 compared to the same period in 2019; and CAT-TV saw a 75 percent increase in quarterly web traffic from April to June 2020 compared to April to June 2019. All the data collected and stakeholders interviewed,

both for the "Covid-19 Response Telecommunications Recovery Plan" and this plan, underscored the importance of PEG in generating meaningful and valuable local content.

Despite the importance of PEG services and increasing community engagement with them, PEG stations have seen a five-year downward trend in revenues. This is in part due to decreases in cable franchise fees and declining cable subscribership, which peaked in 2017.[88] They also face greater pressure on their existing technical capacities, as the growth in demand for coverage of an increasingly wide array of events is stretching staff thin. Stations report spending increased time on digital management and training of local community members on digital technology, and have had to adapt to health protocols in the actual filming and production of events during the pandemic. Additionally, pressure concerning funding is particularly acute for some stations as there is a wide range of operating budgets for individual PEG stations.

Given its vital importance yet uncertain future regarding funding source, it is clear the state must consider all options to make support for AMOs stable, predictable, and ideally more uniform across stations.

PEG funding concerns are covered extensively in the Agency of Commerce and Community Development's report, "Analysis of the Financial Viability for Public, Educational and Government Access Television in Vermont," prepared by Berkshire Telecommunications Consulting in February 2021.[89]

The Berkshire report puts forward five policy options through which the state could provide financial support for PEG. As described in the report, those options are:

1. A gross revenue tax on cable revenues for PEG capital costs.
2. A streaming video charge.
3. Modifying the Vermont Universal Service fund by raising the rate.
4. A charge on each attachment to a utility pole.
5. A multipart option that includes a pole attachment charge plus modifications to the Vermont Universal Service Fund, changes to the method of funding PEG capital costs, and repeal of the Telephone Personal Property Tax.

[88] Mike Wassenaar and Lauren-Glenn Davitian, "Quick question on public comment on VT Plan," December 15, 2020, email.
[89] Peter Bluhm and Dr. Robert Loube, "Analysis of the Financial Viability for Public, Educational and Government Access Television in Vermont," Berkshire Telecommunications Consulting, February 7, 2021, https://legislature.vermont.gov/assets/Legislative-Reports/Report-2021-02-07.docx.pdf.

The Berkshire report acknowledges and this report affirms that the proposed funding sources do carry some legal risk for the state, especially if the state were to be an early mover in adopting a novel form of revenue generation for PEG.

The pole attachment tax proposed in the Berkshire report provide an interesting carrier-neutral revenue stream that acknowledges the need to be technology-neutral as the convergence of telecommunications technology continues. However, outside of any legal risk that strategy may carry, it also may counteract the state's efforts to support deployment of telecommunications. An additional $10 per pole per year fee, for example, could ultimately cost CUDs and their customers $250,000 to $500,000 per year.

The proposed tax on streaming services provides a mechanism to augment the traditional source of revenue (cable subscriptions) with a source that has been replacing cable in viewership. A dedicated tax on streaming services has been proposed elsewhere in the US, and if that proves to be viable in other states, Vermont may consider adoption as well.

Ultimately, adopting a new tax in any of the methods proposed by the Berkshire report entails a complicated tax and legal analysis. Though it is beyond the scope of this report to provide a full legal analysis of that report's findings, it should be reiterated that any option will carry litigation risk and a robust risk assessment would be required if the state were to pursue a path as an early mover on new taxation mechanisms.

Lastly, another option not discussed at length in the Berkshire report is simply funding AMOs from the general fund. Though there can be political challenges to this and finding a dedicated revenue stream reduces the need to allocate money yearly in seeming competition with many other worthy causes.

14 Legal Analysis

This section comprises a legal analysis of four topics related to the Plan:

1. Open access
2. Net neutrality
3. Extending electric easements to telecommunications
4. Carrier of last resort (COLR) / eligible telecommunications carrier (ETC)

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14.1 Open Access

14.1.1 Overview

In the communications field, the term "open access" can have many meanings, but it most often refers to a business model under which a wireline network is built and operated for the benefit of multiple service providers, which can each access the network on a non-discriminatory basis and provide competitive services. [90, 91] The term "neutral host" is most often used to describe a wireless network that an entity builds and operates to provide non-discriminatory access and support to wireless service providers. The operator of the physical network is itself not necessarily (although could be) a service provider.

Open access and neutral host models will not always be feasible. But proponents believe that they can simultaneously provide multiple benefits to multiple stakeholders. This may include accelerating buildouts and decreasing time to market for service providers: spurring and supporting robust competition among service providers, thereby enhancing consumer choice; increasing facility-owner revenues while decreasing service-provider costs; increasing the efficiency of maintenance; making it easier for facility owners to obtain financing, by reducing their dependence on the success of a small number of service providers; and decreasing the number and intensity of disputes with neighbors by minimizing duplication of support structures.

[90] More precisely, "[a]n open-access network refers to a horizontally layered network architecture in telecommunications, and the business model that separates the physical access to the network from the delivery of services. … In an [open access network], the owner or manager of the network does not supply services for the network; these services must be supplied by separate retail service providers." Wikipedia, "Open-access network," last mod. August 17, 2020, https://en.wikipedia.org/wiki/Open-access_network (accessed November 9, 2020).

[91] "Open access" should not be confused with "open Internet," the umbrella term used by the FCC to describe a set of principles also known as "network neutrality." Network neutrality refers to an obligation of retail service providers to enable users to access Internet services and information provided by other entities on a neutral, nondiscriminatory basis.

In the case of public networks in particular, open access networks may be able to serve well in circumstances where exclusive arrangements between a government-owned network and a private service provider may not be legally permissible or advisable.[92]

As the State considers its longer-term broadband options, it is likely to find that there are several potentially viable public, private, or mixed models for broadband development and that the feasibility of any particular model will depend on the circumstances involved. Given the sheer number of possibilities, we cannot here anticipate and analyze all of the potential legal issues that might be involved. We will therefore concentrate on the key legal issues that the State may need to address in deciding whether to support open access and neutral host models.

The State can support open access and neutral hosting in several ways: (1) it can try to use its regulatory powers to compel networks to open up; (2) it can seek to provide open access network or neutral hosting itself, using the fiber and other assets that it owns or controls; (3) it can make the fibers and other assets the State owns or controls available to other entities that agree to provide open access or neutral hosting; (4) it can offer grants, loans, or other subsidies to public or private entities that agree to provide open access or neutral hosting; or (5) it can combine elements of these options. We now turn to the legal issues that these approaches may implicate.

For convenience, in the remainder of this discussion we refer to open access and neutral host networks collectively as "open access" networks.

14.1.2 Federal Law

Federal statutes and regulations do not directly address open access networks as they are described above, but various aspects of federal law may come into play as Vermont, or a unit of local government, considers supporting such networks.

First, the Fifth Amendment of the U.S. Constitution prohibits the federal government from taking a person's property without just compensation, and the Fourteenth Amendment prohibits state governments from doing so. For example, in *Gulf Power v. Federal Communications Commission*, 187 F.3d 1324 (11th Cir.1999), the Eleventh Circuit held the FCC's regulations authorizing cable companies to make attachments to privately-owned utility poles were lawful because they also provided for just compensation. Similarly, in *Loretto v. Teleprompter Manhattan CATV Corp*., 458 U.S. 419 (1982), the Supreme Court applied the same rationale in upholding a New York statute that required landlords to permit cable companies to install facilities on their property without paying more than the amount determined by a state commission to be reasonable. To be sure,

[92] Jordan Arnold and Jonathan Sallet, "If We Build It, Will They Come? Lessons From Open-Access, Middle-Mile Networks," Benton Institute for Broadband and Society, December 2020, https://www.benton.org/sites/default/files/OAMM_networks.pdf.

the law in this area is complicated and highly nuanced, but the underlying principle appears to be well established – i.e., a regulation that provides for open access must also provide for just compensation to the owner of the property thus opened. Moreover, even if the state does provide for just compensation, its methodology for determining just compensation may well face protracted legal challenges.

Second, while the State of Vermont may have authority to compel open access to existing networks, provided that it provides for suitable compensation, adversely affected parties would undoubtedly argue that federal law explicitly or implicitly preempts the State from doing so. We are not aware of any case that has addressed this precise issue, and it is uncertain how any future case would turn out. One thing is certain, however: such a State requirement would be vigorously challenged, and it might take many years for the courts to reach a final decision.

Third, even if the State believes that it has ample authority to require open access, it should carefully consider the pros and cons of doing so. If the State's main goal is to spur deployment of *new* broadband networks, requiring owners of *existing* networks to open them up may not achieve that goal and, indeed, may discourage investment in future networks. This is a complicated matter that requires careful study.

In this regard, the FCC's experience with unbundled network elements (UNEs) may be instructive. In the Telecommunications Act of 1996, Congress found that the telecommunications industry was highly concentrated and anticompetitive. Congress sought to remedy this situation by, among other things, requiring incumbent local exchange carriers (ILECs) to provide competitors unbundled access to portions of their ILEC networks at wholesale rates.[93] In 2003, the FCC exempted network elements supporting Fiber-to-the-Home from its UNE rules, finding this necessary to remove disincentives to the deployment of advanced telecommunications facilities in the mass market.[94] For the same reason, the FCC soon afterward also exempted network elements supporting Fiber-to-the Curb deployments.[95] Over time, as "intermodal competition" has increased, the FCC has essentially dismantled the UNE process altogether – at least in urban areas.[96]

[93] *See* 47 U.S.C. § 251(c)(3).
[94] *In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, ¶ 278, 18 FCC Rcd. 16978, 2003 WL 22175730 (rel. September 17, 2003).
[95] *In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, ¶ 2, 19 FCC Rcd. 20293, 2004 WL 2347593 (rel. October 18, 2004).
[96] *See In the Matter of Modernizing Unbundling and Resale Requirements in an Era of Next-Generation Networks and Services,* WC Docket No. 19-308, Report and Order, FCC 20-152, rel. October 28, 2020.

To be sure, one can question whether the FCC made the right decisions for the right reasons in addressing UNEs, and some of the FCC's conclusions may not necessarily apply to Vermont today. But the extensive factual and policy questions that the FCC asked are well worth studying.

Further complicating matters is the fact that the FCC's authority with respect to broadband Internet access service – which is fundamental to the open access approach – has waxed and waned over the past ten years. As discussed above, the current FCC maintains that Internet access service is an "information service" over which the FCC does not exert regulatory jurisdiction.[97] That could well change when under the Biden Administration or as a result of Congressional action.

In short, reliance upon governmental fiat to bring open access networks into existence carries with it a substantial risk of protracted litigation based on federal law (and possibly state law, as described below), with the outcome uncertain at best.

But while an open access *mandate* by the State may be problematic, the State could conceivably take steps to *encourage* open access networks by other, less coercive means. For example, the State may be able to provide open access to some of the fiber optic cables and related assets that it owns or controls in various locations across Vermont. Or it may be able to make such assets available to entities that will, in turn, make them available to third parties on an open access basis. The State could also explore whether it makes sense as a policy matter to tie State broadband grants or financing to the open access model – i.e., in exchange for State funding, providers would agree to operate on an open-access basis.

While federal law may have little to say about how the State uses fiber and other assets that it has funded exclusively itself, the State must be attentive to conditions that apply to assets that it has acquired in whole or in part with federal funds. For example, subject to the conditions and procedures set forth in 23 C.F.R. § 710.403, a state can give other entities access to currently unused assets that the state acquired for transportation purposes in whole or in part with funds from the Federal Highway Administration (FHWA). The state must ordinarily charge fair market value for such access, and it must use the proceeds for transportation purposes. These requirements do not apply, however, if the state can demonstrate to the FHWA's satisfaction that "an exception is in the overall public interest based on social, environmental, or economic benefits, or is for a nonproprietary governmental use."[98]

[97] *In the Matter of Restoring Internet Freedom,* WC Docket No. 17-108, Declaratory Ruling, Report and Order, FCC 17-166, released January 4, 2018.
[98] 23 C.F.R. § 710.403(d) and (e).

In short, before making the fiber and other assets that it owns or controls available to other parties, the State of Vermont must ensure that doing so is consistent with federal law or other terms and conditions that apply to them.[99]

14.1.3 Vermont Law

Vermont has a "takings clause" similar to the one in the U.S. Constitution. That is, Chapter I, Article 2, of the Vermont Constitution prohibits the government from condemning private property without adequate compensation.[100] As a result, the arguments under federal law both for and against mandated open access discussed above could also be made under Vermont law. In short, Vermont can arguably require open access, as long as it provides for suitable compensation, but whether it should do so is a question requiring careful study.

Opponents of an open access mandate may also argue that the State lacks authority to regulate Internet access networks, and thus has no authority to impose an open access requirement. Here as well there are arguments and passionately-held views on both sides of the issue. So, an effort by the State to mandate open access could well result in years of time-consuming, burdensome, and costly litigation.

Rather than rely upon its regulatory authority, the State may be able to use fiber optic cable networks that it owns or controls in various locations across Vermont to advance open access. Doing so through non-regulatory means can be of great assistance as the State seeks to make broadband Internet services available to every resident in Vermont. While a government entity cannot take control or ownership of privately-owned fiber optic cable, or individual strands within a company's fiber optic cable, without providing for fair compensation in exchange, the State nonetheless has a variety of opportunities to control fiber optic networks in Vermont.

For one thing, the State itself has deployed networks of its own fiber optic cables for its own purposes and has the right to construct further State-owned networks. To the extent that these State-owned fiber networks have excess capacity, the State can make them available to broadband providers.

The State also leases or licenses fiber optic strands in cables that have been deployed by third parties, which again it can make available for use by other broadband providers.

The State has potential opportunities to acquire further rights to fiber optic cables in Vermont. In addition to simply paying for such rights, the State can exchange rights to use State

[99] Restrictions may also appear in bond instruments, franchises, pole attachment agreements, and many other kinds of contracts.

[100] "That private property ought to be subservient to public uses when necessity requires it, nevertheless, whenever any person's property is taken for the use of the public, the owner ought to receive an equivalent in money." Vermont Constitution, Ch. 1, art. 2.

owned/controlled fiber for the right to use third-party fiber. Likewise, when the State provides grants or financing to construct fiber optic cables, it can seek to reserve for itself the right to use some of the fiber strands in such network.

Finally, as noted above, the Vermont Constitution contains certain eminent domain rights.[101] To that end, Vermont, like most other states, permits the use of eminent domain *on behalf of* a telecommunications utility (and other public utilities) to obtain access to necessary rights-of-way.[102] Entities that have received a CPG from the PUC, and that demonstrate the necessity of the condemnation, may exert a right of eminent domain as to the property of another private entity. The valuation of eminent domain by public utilities is established by the PUC.[103]

Eminent domain, however, may be of limited use. While state law may permit the use of eminent domain on behalf of a telecommunications utility, we are unaware of any instance in which a government entity has condemned private telecommunications facilities for the purpose of putting such facilities to its own use, or for government-directed economic development initiatives. Indeed, Vermont law specifically prohibits a "governmental or private entity" from taking private property through the use of eminent domain "if the taking is primarily for purposes of economic development."[104]

14.2 Net Neutrality

14.2.1 Overview

At the most general level, the term "network neutrality" refers to a principle under which a broadband Internet access service does not degrade or favor its customers' ability to access and use particular online services. According to network neutrality advocate Mozilla, "net neutrality prevents ISPs from leveraging their market power to slow, block, or prioritize content – ensuring that users can freely access ideas and services without unnecessary roadblocks. Without these rules in place, ISPs can make it more difficult for new ideas or applications to succeed, potentially stifling innovation across the internet."[105]

[101] Vermont Constitution Ch. I, art. 2 ("That private property ought to be subservient to public uses when necessity requires it, nevertheless, whenever any person's property is taken for the use of the public, the owner ought to receive an equivalent in money.").
[102] 30 V.S.A. § 110.
[103] 30 V.S.A. § 112(4).
[104] 12 V.S.A. § 1040. Note, however, that Section 1040 does not affect "the authority of an entity authorized by law to use eminent domain for the following purposes: …public utilities, including entities engaged in the generation, transmission, or distribution of electric, gas, sewer and sewage treatment, or communication services." *Id.*
[105] Amy Keating, "Reinstating Net Neutrality in the US," The Mozilla Blog, March 19, 2021, https://blog.mozilla.org/blog/2021/03/19/reinstating-net-neutrality-in-the-us/.

Over the past decade or so, the network neutrality concept has become a regulatory and political flashpoint, waxing and waning with the various political changes in Washington D.C. Over the years, network neutrality has driven a larger debate about the role of federal and state regulators with respect to advanced communications services. Unfortunately for Vermont policymakers who may wish to enshrine network neutrality in some form, the issue remains unresolved and unpredictable, and promises to remain so for the foreseeable future.

14.2.2 An Abbreviated History of Network Neutrality

The term "network neutrality" was first coined by Columbia University law professor Tim Wu in a 2003 paper.[106] In 2005, the Bush-era FCC issued a policy statement – not a rule – that ISPs should not block legal content or prevent customers from accessing their chosen Internet connections, using applications and services of their choice.[107]

Relying upon its 2005 Policy Statement, the FCC in 2008 ordered Comcast to stop interfering with customer connections using the peer-to-peer file sharing service BitTorrent. Comcast sued the FCC and won, with the D.C. Circuit Court of Appeals holding that the FCC had overstepped its bounds and did not possess authority to enforce the Policy Statement.[108]

In 2010, the Obama-era FCC first attempted to enshrine net neutrality principles as a legally enforceable Order, rather than a mere Policy Statement.[109] The FCC was sued again, this time by Verizon, and in 2014 the D.C. Circuit ruled in *Verizon Communications Inc. v. FCC* that the FCC's net neutrality rules were in the nature of common carriage regulation.[110] Therefore, the court reasoned, the FCC did not have authority to impose net neutrality rules on Internet service because it was not classified as a common carrier "telecommunications service" under Title II of the Communications Act.

The *Open Internet Order.* In March 2015, the Democratic-controlled FCC under Chairman Tom Wheeler did just that, asserting regulatory jurisdiction over "broadband Internet access service"

[106] Tim Wu, "Network Neutrality, Broadband Discrimination," *Journal on Telecommunications and High Technology Law*, December 5, 2001, http://www.jthtl.org/content/articles/V2I1/JTHTLv2i1_Wu.PDF.
[107] "In the Matter of Appropriate Framework for Broadband Access to the Internet over Wireline Facilities," CC Docket No. 02-33, Policy Statement, FCC 05-151, rel. September 23, 2005.
[108] *Comcast Corp. v. FCC,* 600 F.3d 642 (D.C. Cir. 2010).
[109] "In the Matter of Preserving the Open Internet," GN Docket No. 09-191, Report and Order, FCC 10-201, rel. December 23, 2010.
[110] *Verizon Communications v. Federal Communications Commission,* 740 F.3d 623 (D.C. Cir. 2014).

("BIAS") [111] by reclassifying it a "telecommunications service" subject to Title II.[112] Alongside that determination, the *Open Internet Order* imposed a set of network neutrality rules on BIAS – while foregoing regulation of BIAS for most other purposes.

The *Restoring Internet Freedom Order.* Following the 2016 general election, the FCC came under Republican control, led by Chairman Ajit Pai. In January 2018, the Pai FCC released its *Restoring Internet Freedom Order,* which reversed the *Open Internet Order* and re-reclassified BIAS from a Title II common carrier "telecommunications service" to an unregulated Title I "information service."[113] The *Restoring Internet Freedom Order* held that BIAS is an "information service" not subject to FCC Title II jurisdiction, and therefore the FCC was without authority to promulgate or enforce most network neutrality rules.[114]

In adopting the *Restoring Internet Freedom Order,* the FCC stated that it intended to free ISPs from unnecessary regulatory burdens and to allow them to pursue additional revenue streams. The FCC also found that existing legal and regulatory regimes, primarily under the administration of the Federal Trade Commission (FTC), would be sufficient to govern any ISP behavior that impeded on the openness of the Internet.[115]

The *Restoring Internet Freedom Order* also purported to block states and local governments from enacting legislation addressing network neutrality.

Mozilla v. FCC*.* In a case known as *Mozilla v. FCC,* twenty-two states (including Vermont) and several Internet companies mounted a legal challenge to the *Restoring Internet Freedom Order's* rollback of the prior *Open Internet Order.*[116] In October 2019, the Court of Appeals for the D.C.

[111] The FCC defines "broadband Internet access service" as a "mass-market retail service by wire or radio that provides the capability to transmit data to and receive data from all or substantially all Internet endpoints, including any capabilities that are incidental to and enable the operation of the communications service, but excluding dial-up Internet access service," "In the Matter of Protecting and Promoting the Open Internet, Report and Order on Remand, Declaratory Ruling, and Order," 30 FCC Rcd. 5601 (F.C.C.), 2015 WL 1120110, ("Open Internet Order"), at ¶ 187; *aff'd*, *United States Telecom Association v. FCC*, 825 F.3d 674 (D.C. Cir. 2016).
[112] Id.
[113] "In the Matter of Restoring Internet Freedom*,"* WC Docket No. 17-108, Declaratory Ruling, Report and Order, and Order, FCC 17-166 (rel. Jan. 4, 2018)("Restoring Internet Freedom Order").
[114] While removing all of the Open Internet Order's rules governing the business practices of ISPs, the Restoring Internet Freedom Order retained transparency requirements that would theoretically allow consumers to understand the business practices of their ISP and oppose the practices with which they disagree: Properly tailored transparency disclosures provide valuable information to the Commission to enable it to meet its statutory obligation to observe the communications marketplace to monitor the introduction of new services and technologies, and to identify and eliminate potential marketplace barriers for the substantially reduces the possibility that ISPs will engage in harmful practices, and it incentivizes quick corrective measures by providers if problematic conduct is disclosures improve consumer confidence in ISPs' practices while providing entrepreneurs and other small businesses the information they may need to innovate and improve products. *Id.,* at ¶ 215.
[115] *Id.*, at ¶ 140.
[116] *Mozilla Corporation v. Federal Communications Commission,* 940 F.3d 1, (D.C. Cir. 2019).

Circuit ruled in favor of the FCC, relying on the Supreme Court decision in *National Cable & Telecommunications Ass'n v. Brand X Internet Services* to hold that the FCC acted within its authority to classify Internet services – yet again – as an unregulated "information service."[117]

While the *Mozilla* decision ruled that the FCC had sufficient authority to reclassify BIAS for purposes of federal regulation, the D.C. Circuit ruled against the FCC on the issue of whether the FCC could block state and local net neutrality regulation.[118] As we discuss in greater detail below, this aspect of the *Mozilla* holding has become crucially important, as states have become emboldened to implement net neutrality legislation on their own, and the focus of net neutrality legal battles has shifted to state net neutrality laws (particularly in California)[119]

2021. Following the 2020 election, the Biden FCC[120] is under significant pressure to take action with respect to network neutrality. Presumably, this would require a return to the Wheeler-era re-classification of broadband Internet access service as a Title II "telecommunications service." Thus far, however, the FCC has not undertaken any concrete action in that direction, nor has Acting Chairwoman Jessica Rosenworcel announced any plans to reinstate federal net neutrality rules. No action is likely on the issue until President Biden successfully appoints a fifth FCC Commissioner, which could take months, at least.

Nor has the issue been a significant priority in Congress. The 50-50 split in the Senate, the Biden Administration's focus on infrastructure (including broadband infrastructure) and other significant spending programs, and the pending California litigation all suggest that Congress is unlikely to enact meaningful net neutrality regulation before the 2022 midterm elections.

In the meantime, net neutrality stakeholders are closely watching a legal challenge to California's net neutrality law, which promises to serve as a test case for the viability of state-level net neutrality regulations.

[117] *National Cable & Telecommunications Association v. Brand X Internet Services,* 545 U.S. 967 (2005).
[118] The court also accepted three other petitioner challenges, holding that the FCC's failure to consider the impact of the Order on public safety, pole attachment regulation, and the federal Lifeline program necessitated a remand of the Order on those points. The FCC issued a remand Order in October 2020, for which a reconsideration petition is pending. (WC Docket No. 17-108.)
[119] To date, seven states have adopted some form of net neutrality laws (California, Colorado, Maine, New Jersey, Oregon, Vermont, and Washington). Nine states have introduced net neutrality bills during the 2021 legislative session, according to the National Conference of State Legislatures.
[120] Until President Biden appoints – and the Senate confirms – a replacement FCC commissioner, the FCC, led by Acting Chairwoman Jessica Rosenworcel, will continue to operate under a 2-2 stalemate between Democrat and Republican members.

14.2.3 California Net Neutrality Litigation

While *Mozilla v. FCC* was pending before the D.C. Circuit in 2018, the State of California passed the California Internet Consumer Protection and Net Neutrality Act of 2018, which would implement net neutrality regulation for ISPs operating in California.

The U.S. Justice Department sued California on the basis of the 2017 *Restoring Internet Freedom Order's* apparent preemption of state or local net neutrality regulation. Both sides agreed to hold off from further action or enforcement of the law until the court decision in *Mozilla.*

As noted above, the 2019 *Mozilla* decision upheld most of the FCC's actions in the *Restoring Internet Freedom Order,* but the court ruled that the FCC had overstepped its bounds in attempting to limit state or local net neutrality regulation. In essence, the court reasoned that if the FCC determined that it lacked jurisdiction to regulate the service, it also lacks authority to preempt state and local governments from doing so.

With a favorable court opinion in the *Mozilla* case, the California litigation resumed, with the parties briefing the question of whether the law should be suspended while the case is heard. On February 23, 2021, Judge John Mendez of the U.S. District Court denied a motion by ISP trade associations and others seeking a preliminary injunction against California's enforcement of the law.[121] (Interestingly, as part of his oral ruling Judge Mendez called on Congress to resolve the net neutrality debate.)

The ruling on the preliminary injunction was appealed to the Court of Appeals for the Ninth Circuit, where it is pending. No decision is likely for several months.

Whatever the outcome of the pending Ninth Circuit decision, that is not the end of the story as to California's net neutrality regulation. For one, the scope of the case at present is limited to whether the district court erred in denying the ISPs' motion for a preliminary injunction. While the Ninth Circuit decision will be an important indicator, the court is not deciding whether California's law is legally enforceable (yet). If the appeals court reverses the District Court and allows a preliminary injunction to issue, then the courts will be called upon to the consider the issue on the merits.

If the California law appears likely to be upheld – which could involve a multi-year legal battle – the large ISP trade associations may well acquiesce to Congressional action implementing some form of *consistent* net neutrality regulation.[122] From the large ISP perspective, a single set of federal rules, while not ideal, may be preferable to a disparate patchwork of net neutrality rules

[121] *American Cable Association et al. v. Becerra,* No 2:18-cv-02684 (E.D. Cal.)
[122] Casey Lide, "State Net Neutrality Laws May Lead to Federal Legislation," The National Law Review, March 1, 2021. https://www.natlawreview.com/article/state-net-neutrality-laws-may-lead-to-federal-legislation.

across the country. Another advantage of Congressional action would be that Congress could address net neutrality without categorizing BIAS as either an information service or a Title II telecommunications service.

14.2.4 Vermont

On February 15, 2018, after the FCC eliminated net neutrality principles as part of the *Restoring Internet Freedom Order* (and around the time California adopted its own wide-ranging network neutrality law), Vermont Governor Phil Scott issued an executive order requiring all Internet service providers that have contracts with State agencies to abide by net neutrality principles.[123]

On May 22, 2018, Vermont enacted a law – Act 169 – that provided for issuance of a "certificate of net neutrality compliance" to qualifying ISPs,[124] and required ISPs to obtain certification as a condition for State procurement contracts. Notably, unlike California, the Vermont law does not require net neutrality as a general matter, for all ISPs operating in the State.

Broadband industry associations sued Vermont in October 2018 to stop the Vermont law, but, similarly to California, they and the State agreed to delay litigation and enforcement of the law until after a decision in the *Mozilla* case.[125] While the California litigation restarted after the 2019 *Mozilla* decision, Vermont agreed in 2020 to continue to hold fire on its own net neutrality rules. The parties recently agreed again to continue staying litigation until the Ninth Circuit resolves the question of the California law's viability.[126]

To sum up, the net neutrality policy debate is effectively on ice nationwide while the Ninth Circuit considers the California law. While FCC or Congressional action could happen in the meantime, state or local government regulatory action on net neutrality appears not to be a viable option.

14.2.5 Vermont's Near-Term Options.

While Vermont has been among the forefront of states in adopting network neutrality regulation, the State of Vermont has stipulated in court that it will not enforce Act 169 until the California net neutrality litigation is resolved. From a regulatory perspective, then, there is little to discuss or consider until such time. That does not mean, however, that the State and local governments are entirely without options to promote net neutrality principles in the State.

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[123] "Internet Neutrality in State Procurement," State of Vermont Executive Department, Executive Order No. 2-18, February 2018, https://governor.vermont.gov/sites/scott/files/documents/EO%2002-18%20-%20Internet%20Neutrality%20in%20State%20Procurement%20-%20Final.pdf.

[124] Act 169 (2018).

[125] *American Cable Association et al. v. Scott,* No. 2:18-cv-00167-CR, Stipulation Regarding Temporary Stay of Litigation and Injunction Barring Enforcement of Executive Order No. 2-18 and Act 169, (D. Vt.)

[126] *American Cable Association et al. v. Scott,* Order Regarding Temporary Stay of Litigation and Injunction Barring Enforcement of Executive Order No. 2-18 and Act 169, filed May 3, 2021.

Network neutrality as a condition for broadband support funding. To this point, the discussion has focused entirely on network neutrality *regulations* by federal or state government entities. While Vermont cannot enforce its state neutrality law until the California litigation is resolved, might the State include a net neutrality provision as a condition for the receipt of broadband support funding from the State? The legal answer is not entirely clear in the abstract, but the State should anticipate a challenge following any attempt to do so.

Conditioning the receipt of funds on certain conduct is not the same as an outright regulatory requirement, yet it remains a time-honored method to encourage certain conduct. For example, in 1987 the U.S. Supreme Court held that, while Congress may lack the power to impose a national minimum drinking age of 21, Congress could validly use its spending power to indirectly encourage state action to obtain uniformity in the States' drinking ages.[127]

For federal funds, the Supreme Court has articulated limitations on the federal government's authority to offer federal grant funds to states and localities that are contingent on the recipients engaging in, or refraining from, certain activities. The Court has held that, for federal funding conditions to be permissible, they must:

(1) be unambiguous as to the consequences of participation in the federal funding program,

(2) be germane "to the federal interest in particular national projects or programs,"

(3) not be barred by a separate constitutional provision, and

(4) "not go so far as to functionally coerce funding recipients, leaving them with no choice but to comply with a federal directive."[128]

While these requirements are instructive, they are not directly applicable to the State of Vermont. In the event the State considers whether to impose a network neutrality requirement as a funding condition, we recommend that further analysis be undertaken to more precisely identify the applicable principles under Vermont law.

Regardless of the legal prospects, the State should expect any funding that is explicitly tied to a net neutrality condition to be challenged, possibly by the same entities that instituted the litigation against Act 169. In light of the State's and the challengers' stipulation that they would

[127] *South Dakota v. Dole,* 483 U.S. 203 (1987).
[128] Congressional Research Service, "The Federal Government's Authority to Impose Conditions on Grant Funds," March 23, 2017; s*ee South Dakota v. Dole,* 483 U.S. 203, 211 (1987).

not pursue further action on net neutrality regulation until the California litigation is resolved, the court may potentially take a skeptical view of the State's imposition of such a condition.

It also is worth noting that a net neutrality funding condition could lead some ISPs (especially the large national ISPs) to reject or opt not to pursue any State funding that may be available, with potentially negative consequences for the policy objectives of such funding efforts.

Network neutrality as a contractual requirement. Might the State or a local government—including a Communications Union District—include a net neutrality provision as a condition in a contract with an ISP? This seems feasible, but whether it is advisable is impossible to determine without reviewing the particular facts.

As an initial matter, note that we are referring here to *negotiated* arrangements, in which both parties to the agreement have a realistic option of opting not to execute the agreement. We are aware of nothing that would prohibit the inclusion of a net neutrality requirement as a negotiated term in a partnership or service contract.

Whether it makes sense to do so depends on the local situation. For example, a large national ISP is extremely unlikely to agree to adhere to meaningful network neutrality requirements as a condition of providing wholesale communications or other services to a CUD. On the other hand, many smaller regional or local service providers already agree to network neutrality principles, and may be perfectly willing to agree to net neutrality requirements (and indeed, may wish to tout that fact as a competitive feature). For CUDs, the question may come down to whether a net neutrality contractual requirement meaningfully limits the CUD's options with respect to potential service provider partners.

From the State's perspective, the best course for the present may be to undertake no action at all. CUDs and others might, however, include network neutrality conditions as part of negotiated contracts with service provider partners, if doing so is a priority and if the service provider is willing to agree to such terms.

14.3 Easements

14.3.1 Overview

Electric utilities of all kinds can potentially play a significant role in accelerating the deployment of broadband in Vermont. One of the many ways they can do this is to enable communications service providers (including themselves) to take advantage of electric easements to the private properties over, under, or through which their facilities run. Electric easements are governed by state law. Vermont does not currently have statutes that comprehensively deal with this issue, and Vermont's courts have to date addressed only some of the relevant issues. In the meanwhile, during the last two years, a number of other states have enacted legislation on when and how

electric easements can be used for communications purposes. We recommend that the Vermont legislature consider doing the same.

14.3.2 Use of Electric Easements for Communications Purposes – The Key Issues

An electric easement is an agreement giving an electric utility the right to use a private property owner's land for specified purposes. Often, electric easements were written decades ago, long before the parties contemplated use of the property in question or communications purposes in addition to the original electric utility purposes. As advanced communications services and capabilities have become increasingly important, a number of key issues have emerged. These include, but are not limited to:

- Can an electric easement that does not expressly mention communications also be used for communications that support the utility's core electric services?
- Can such an easement also be used to support commercial communications services?
    - Does it matter whether the additional use for commercial communications purposes would not create a substantial additional physical burden on the property? If so, what does the term "substantial" mean?
- Assuming that the electric utility could itself use its easement for communications purposes, can the electric utility convey its right to a third-party communication service provider?
- If an electric easement can be used for commercial communications purposes, does the property owner have a right to additional compensation? If so,
    - How should the compensation be measured – e.g., at fair market value or something else?
    - Should the right be to a one-time payment or to an ongoing fee?
- Does a one-time payment result in perpetual easement rights?

In the pages that follow, we will address each of these issues.

14.3.3 Recent Legislative Activity in Other States

During the last three years, numerous states have enacted or considered bills to remove obstacles to the ability of electric utilities to provide broadband in unserved or underserved rural

areas, particularly electric cooperatives.[129] Here are some of the most noteworthy features of the laws passed in 2019 or 2020:[130]

- They all clearly and unambiguously authorize cooperatives, and in some cases all electric utilities, to use, or allow others to use, electric easements for commercial communications purposes.

- They typically declare that a property owner's only remedy is for damages, measured by the difference in the fair market value of the property before and after the use for commercial communications purposes; some of the statutes state that assessment of damages must take into account the potential *increase* in property value as a result of the deployment of broadband to the area.

- They generally prohibit any consideration of evidence of past, current or future revenues or profits derived or to be derived by an affiliate or other broadband operator from providing broadband services.

- They typically state or imply that once an electric easement holder has made a one-time payment of damages (if required), its rights run with the land for the duration of the easement.

- Some statutes state that no notice to property owners is necessary because use for commercial communications purposes imposes no additional burden on the property; other statutes provide a process for electric easement holders to provide notice to property owners and for the property owners to claim any injuries they believe they have suffered

[129] *e.g.*, Minnesota (HF1885, SF946); Missouri (HB321); New Mexico (SB360); North Carolina (SB517); Ohio (SB8); Oklahoma (HB1123); Oregon (HB2654); Vermont (H.360); West Virginia (HB2002); and Wyoming (HB14).
[130] *e.g.*, Ala. Code § 37-16-4; Ariz. Code § 10-2151; Colorado R.S. § 40-15-601 et seq; MS Code § 77-17-11; SC.Code § 58-9-3000 et seq.; Tex. Util. Code § 181.048; VA Code § 55.1-306.1

- Some statutes say that electric easements that do not expressly address communications uses should be read to allow any uses that are not expressly prohibited
- Some statutes bar class actions

Naturally, property owners are not pleased with these statutes, and some court challenges have emerged.[131] To our knowledge, no court has yet ruled on the validity of these statutes.

14.3.4 Current Situation in Vermont

Chapter I, Article 2 of the Vermont Constitution, entitled "Private property subject to public use; owner to be paid," provides "That private property ought to be subservient to public use when necessity requires it, nevertheless, when any person's property is taken for the use of the public, the owner ought to receive an equivalent in money." Neither this provision nor any existing Vermont statute offers meaningful guidance on how to answer the questions about electric easements discussed above. A bill working its way through the Vermont legislature (H.360) would take a small step in the right direction, but it does not go very far:

> Sec. 19. UTILITY POLES IN EASMENTS ACROSS PRIVATE PROPERTY Utility easements and State rules regarding utility rights of way and pole attachments shall include as an authorized utility use the installation of fiber for purposes of providing broadband service to the public. Such use of the utility easement and right of way serves the public good and facilitates the construction of broadband networks as contemplated in this act.

In the meanwhile, the courts of Vermont have addressed some, but not all, of the questions posed above. The leading Vermont case is *Grice v. Vermont Electric Power Company, Inc*., 184 Vt. 132, 956 A.2d 561 (2008). In that case, the Vermont Public Service Board (1) granted a petition by Vermont Electric Power Company (VELCO) for condemnation of an easement to run an electric transmission line over a portion of the property owned by the Grice family, and (2) denied VELCO's request to add excess fiber-optic capacity to its transmission line, to enable it to swap such capacity for access to fiber capacity to support its core electric functions in other areas.

The Supreme Court of Vermont upheld the Board's condemnation decision and overturned its denial of VELCO's request to deploy excess capacity. We focus on the latter ruling here. In its opinion, the Court stressed two main points—that VELCO's excess fiber capacity would serve its

[131] Complaint, *Grano v. Rappahannock Electric Cooperative*, CA No. 3:20-cv-65 (W.D.Va. filed October 28, 2020), https://www.inversecondemnation.com/files/filed-petition.pdf.

core electric purposes, and that installation of the excess fiber capacity would not pose any additional physical burden on the Grice's property. In support of its first point, the Court stated:

> [T]here is … no evidence to contradict VELCO's assertion that its purpose in acquiring the excess capacity is to trade for capacity in other areas where VELCO does not have fiber-optic wires. As VELCO explains, the communications capacity it derives will be used to further its public purpose of providing reliable electrical service throughout the state. This incidental benefit derives from and does not interfere with the public use of the line. Thus, the benefit VELCO will accrue from this increased capacity is incidental to and consistent with the line's primary purpose of providing increased capacity and reliability to the electrical-transmission network in the state.[132]

The Court explained its second point as follows:

> We disagree that VELCO is taking more than it would need to accomplish its legitimate propose. As the Board found, VELCO must install an OPGW [optical ground wire] in the corridor to maintain the safety and reliability of the network. The only question is whether VELCO can install twenty-four or seventy-two fibers within the wire. Installing seventy-two fibers in the OPGW increases the diameter of the OPGW by a dimension nearly imperceptible to the naked eye, and does not take any more property from the Grices than the OPGW with twenty-four fibers. The increased capacity and ability to trade excess capacity generated from the seventy-two fibers does not expand the taking and imposes no additional burden to the easement and therefore is allowed as an incidental benefit to the public good served as the primary purpose of the condemnation action.[133]

The *Grice* decision thus did not address several important questions, including: What if VELCO had not wanted to swap its excess fiber capacity for capacity elsewhere to be used for VELCO's core electric business, but had simply wanted to use the excess capacity to provide or enable other entities to provide commercial communications services? What if VELCO's use of excess fiber had not been "incidental," but had been a significant or even a primary purpose? What if VELCO's excess fibers had in fact expanded the taking and increased the physical burden on the Grice's property? How much of an expansion or increase would have been necessary to change the Court's decision? If VELCO owed anything to the Grice family, how much would that have been, and how would payment of that amount have affected VELCO's long-term rights?

Stakeholders in broadband projects, including investors, must have clarity and certainty to be able to make rational decisions. Until they have reliable answers to these and other questions

[132] *Grice*, 184 Vt. At 149, 956 A.2d at 574-75.
[133] *Grice*, 184 Vt. At 149-50, 956 A.2d at 575.

surrounding the use of electric easements for commercial communications purposes, broadband investment in Vermont will be less than optimal.

14.3.5 Recommendation

Given the uncertainties about electric easements under current Vermont law, including the questions left unanswered by the Vermont Supreme Court in the *Grice* case, we recommend that the State study the legislation that other states have recently enacted or are considering to address these issues. If the State decides to enact similar legislation, we recommend that it consider applying the legislation to all electric easements, not just those held by electric cooperatives.

14.4 Carrier of Last Resort (COLR)/Eligible Telecommunications Carrier (ETC)

14.4.1 Overview

In general, competitive local exchange carriers and providers of broadband services, including Communications Union Districts (CUD), do not have an obligation to service to all of the potential customers within their service territory. As explained in further detail below, this obligation to serve has generally been imposed only on the incumbent providers of local exchange services, including on the successors of the incumbents.

However, as CUDs become more ubiquitous within Vermont as contemplated in this report, two basic questions arise with regard to the obligation to serve. First, can incumbent providers that are currently obligated to serve customers within some or all of their service territory be relieved of this responsibility by shifting this duty onto a CUD or other competitive provider? Second, under what circumstances can a CUD become obligated to serve customers?

To answer these questions, a brief overview of the obligation to serve is in order. To that end, the obligation to serve customers generally arises in one of two ways.[134]

The first avenue giving rise to the obligation to serve is generally known as the "carrier of last resort" or "COLR." The concept of COLR dates back centuries and applied to common carriers and enterprises such as inns, coaches, ferries and railroads.[135] Accordingly, common carriers were required to provide services to all customers as long as there was enough space, the fee was paid, and there were no reasonable grounds to refuse to do so.[136]

[134] This section addresses the obligations to provide telephone and broadband service. Although not addressed in this section, similar types of obligations to serve may, in certain circumstances, also arise for cable TV operators.
[135] Sherry Lichtenberg, "Carrier of Last Resort: Anachronism or Necessity?," National Regulatory Research Institute July 2016, https://pubs.naruc.org/pub/FA85B978-00A3-862C-5E8D-9E10816FA7DB.
[136] Id.

COLR has also been applied to utility services, including, for example, the electric sector and telecommunications services. As such, a telecommunications service provider that is designated as a carrier of last resort/COLR is generally required by law or regulation to make its service available to all customers located within its designated service territory.[137] This COLR obligation is particularly important in rural and underserved areas, where the cost of service may be high.[138]

The concept of the COLR obligation for telecommunications services was established through the Communications Act of 1934, as amended by Telecommunications Act of 1996, which required that nationwide, regulated telecommunications services be made available to everyone:

> A nationwide, regulated telecommunications network available to… to all the people of the United States, without discrimination on the basis of race, color, religion, national origin, or sex, a rapid, efficient, Nationwide, and world-wide wire and radio communication service with adequate facilities at reasonable charges,… for the purpose of the national defense, for the purpose of promoting safety of life and property through the use of wire and radio communication….[139]

The Telecommunications Act of 1996 further mandated that:

> Customers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including interexchange service and advanced telecommunications and information services, that are reasonably to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas.[140]

Historically, incumbent carriers that generally operated as a monopoly were designated as the COLRs within their service territories.[141] These incumbents included the former Bell System operating companies. As such, as carriers of last resort, these incumbent carriers were required to offer phone service to all potential customers within their service territories.

The second avenue that can impose an obligation to serve arises through the federal universal fund program.[142] This program was created, at least in part, in order to provide financial assistance to COLRs with respect to their obligation to serve all customers, including low-income

[137] Id.
[138] Id.
[139] Communications Act of 1934, 47 U.S.C. § 151.
[140] Telecommunications Act of 1996, 47 U.S.C. § 254.
[141] Sherry Lichtenberg, "Carrier of Last Resort: Anachronism or Necessity?," National Regulatory Research Institute July 2016, https://pubs.naruc.org/pub/FA85B978-00A3-862C-5E8D-9E10816FA7DB.
[142] 47 C.F.R. Part 54.

customers in rural, high cost areas. To accomplish this, Congress established the concept of "Eligible Telecommunications Carriers" (ETC).[143]

ETCs are generally facilities-based telecommunications companies that provide basic phone (and since around 2016, broadband) services and have been designated as an ETC by the applicable state commission or the FCC.[144] Designated ETCs are then eligible to receive federal universal service funding.[145] In some instances, carriers may also be required to have and/or seek ETC designation in order to qualify to special federal fund programs, including the Lifeline program for low-income consumers, the recent Rural Digital Opportunity Funds ("RDOF") grant program, and the Connect America Fund.[146]

Like a carrier that has been designated as a COLR, ETCs are also generally required to offer services to all customers within the service territory for which they receive the federal universal funds.[147]

Historically, COLRs of telecommunications services were also generally designated as ETCs and vice versa. Accordingly, whether as a COLR or as an ETC, any telecommunications provider designated as such is obligated to offer its services to all customers within its service territory.

14.4.2 Vermont

Turning now to Vermont, it is first important to understand the distinction between so called, "dominant" and "nondominant" carriers, as articulated under Vermont law.[148]

A dominant telecommunications carrier is defined as a carrier that possesses "the ability to set prices in the relevant geographic and functional market for a particular service, taking into consideration: (1) whether any competitor(s) offer a sufficient quantity of similar or equivalent services; (2) whether there is reasonable ease of entry into the market for providers of these services, and (3) any other relevant indicator of market power."[149] In its rules, the PUC classified the 10 incumbent local exchange carriers that existed in Vermont as of January 1, 2002 as dominant carriers.[150]

Conversely, a nondominant telecommunications carrier are all other carriers that have not been designated a dominant carrier. Enabling legislation allows the PUC "modify, reduce, or suspend"

[143] 47 U.S.C. § 214(e).
[144] 47 C.F.R. § 54.201.
[145] Id.
[146] *Rural Digital Opportunity Fund Phase I Auction,* Public Notice, DA 20-1422 (Dec. 7, 2020).
[147] 47 C.F.R. § 54.101.
[148] e.g., 30 V.S.A. § 227c; PUC Rule 7.500.
[149] PUC Rule 7.505.
[150] PUC Rule 7.505.

the requirements generally imposed on carriers with respect to nondominant providers.[151] To that end, the PUC has substantially reduced or eliminated various regulatory requirements on nondominant carriers. For example, unlike dominant carriers, nondominant telecommunications carriers are not required to file tariffs with the PUC.[152]

The PUC has also provided for a mechanism whereby the PUC could, after a hearing, on its own motion or pursuant to a petition, find that a dominant carrier should be reclassified as a nondominant carrier, and conversely, that a nondominant carrier could be reclassified as a dominant carrier.[153]

With regard to obligations to serve, Vermont does not appear to have any applicable state statutes or rules that would impose COLR obligations on carriers. Instead, in its regulatory proceedings, the Vermont Public Utility Commission (PUC) has recognized and maintained such an obligation on the incumbent service providers.[154] As described above, these incumbents are generally considered to be dominant carriers under Vermont law.

Likewise, the incumbent carriers in Vermont have all been designated as ETCs and receive federal universal support funds. Accordingly, as noted above, regardless of any COLR obligations that may have been imposed on the Vermont incumbents by the PUC, these carriers are all required to offer their services throughout designated areas because of their ETC status. Indeed, the PUC has recognized this link between COLR responsibilities and the obligations that arise as an ETC – that is, the PUC has acknowledged that under both concepts, the provider has the obligation to offer its services to customers within its service territory.[155]

The PUC has also stated that there may be circumstances where an incumbent provider could be relieved of some of its COLR responsibilities and that such responsibilities could then be imposed on the CLECs.[156] However, it does not appear that the PUC has specified the conditions under which this could happen.

Aside from the question of COLR, which as of yet appears to have only been imposed on the incumbent or dominant providers in Vermont, the PUC has been clear that both dominant and

[151] 30 V.S.A. § 227c(a).
[152] PUC Rule 7.506.
[153] PUC Rule 7.505.
[154] *Investigation into New England Telephone and Telegraph Company's tariff filing re: Open Network Architecture,* PUC Docket No. 5713 (Order dated February 4, 1999).
[155] Id at pg. 77.
[156] PUC Docket No. 5713 (Order dated February 4, 1999) at pg. 122.

nondominant carriers can be designated by the PUC as an ETC, and thereby be eligible to receive the federal universal service funds.[157]

CUDs can, therefore, access federal universal service funds by seeking designation as an ETC. Likewise, certain grant funding may be available to telecommunications carriers, including CUDs, that carry with it a requirement that carrier seek designation as an ETC.[158]

As such, whether or not a carrier is considered to be a COLR by the PUC, if that carrier seeks designation as, and becomes an ETC (and thereby eligible to receive federal universal support or other federal funds), the ETC designation itself carries with it certain obligations to make service available to all customers within the designated area. Bring this altogether, it does not appear that the PUC has provided clear guidance as to when an existing carrier of last resort in Vermont could be relieved of its obligations to offer services throughout its service territory and instead shift this responsibility onto another carrier such as a CUD.

Nonetheless, given that the PUC has established a distinction between dominant and nondominant carriers, it is possible that the PUC could base such a decision on whether the PUC decides to redesignate the CUD to be dominant carrier, which in turn could hinge on the degree to which the CUD was providing services within its service territory.

Independent of an incumbent's desire to shift COLR obligations onto a CUD, if a CUD or other CLEC seeks to be designated as an ETC in order to take advantage of the benefits provided to ETCs, then the CUD/CLEC would then necessarily take on the obligations to serve as required under the universal service rules. In this way, a nondominant ETC carrier like a CUD may functionally have the same obligations to serve customers as a dominant COLR.

In these circumstances, once a CUD/CLEC has been designated as an ETC, it is possible that a carrier that has COLR obligations may seek to use this in an effort to be relieved of such obligations. However, it is difficult to quantify the likelihood of a carrier being willing to give up its ETC status and forgo the funding that it receives under the universal service program and/or other federal funding programs in order to be relieved of the obligation to serve.

Nonetheless, CUDs that seek ETC status should be aware of the obligation to offer service to all customers within the designated service territory. Likewise, the CUDs should be mindful of the possibility that once they have the obligation to serve all customers as an ETC, the incumbent/ dominate carrier may at some point seek to reallocate the COLR obligations onto the CUD.

[157] 30 V.S.A. § 227d.
[158] Rural Digital Opportunity Fund ("RDOF") Phase I.

Appendix A: 2021 Online Residential Survey

The following sections highlight results of the online survey of 920 households in Vermont.

Do you use the internet (also known as "going online") at all on any computer or phone from your place of residence?

Almost all (99 percent) respondents who provided an answer said they use the internet from their place of residence, as shown in Figure 22. Internet usage is expected to be high among online survey participants.

Which of the of the following internet services do you or other household members currently use?

Overall, 97 percent of respondents indicated having some internet access—either a home connection or via smartphone. Specifically, nearly three-fourths of respondents have both a home internet connection and a smartphone. Another 19 percent have a home internet connection only, and 6 percent have a cellular/mobile connection only (see Figure 23).

Figure 22: Use the Internet at Home

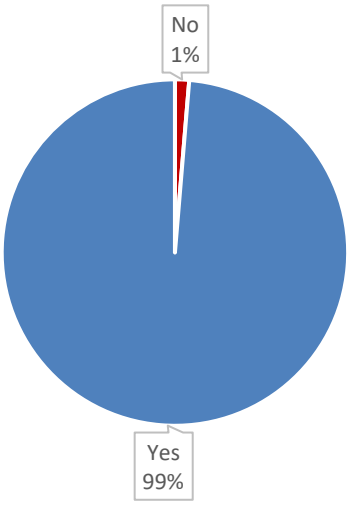
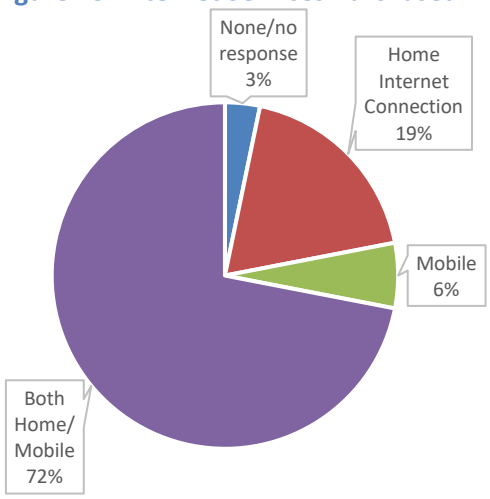
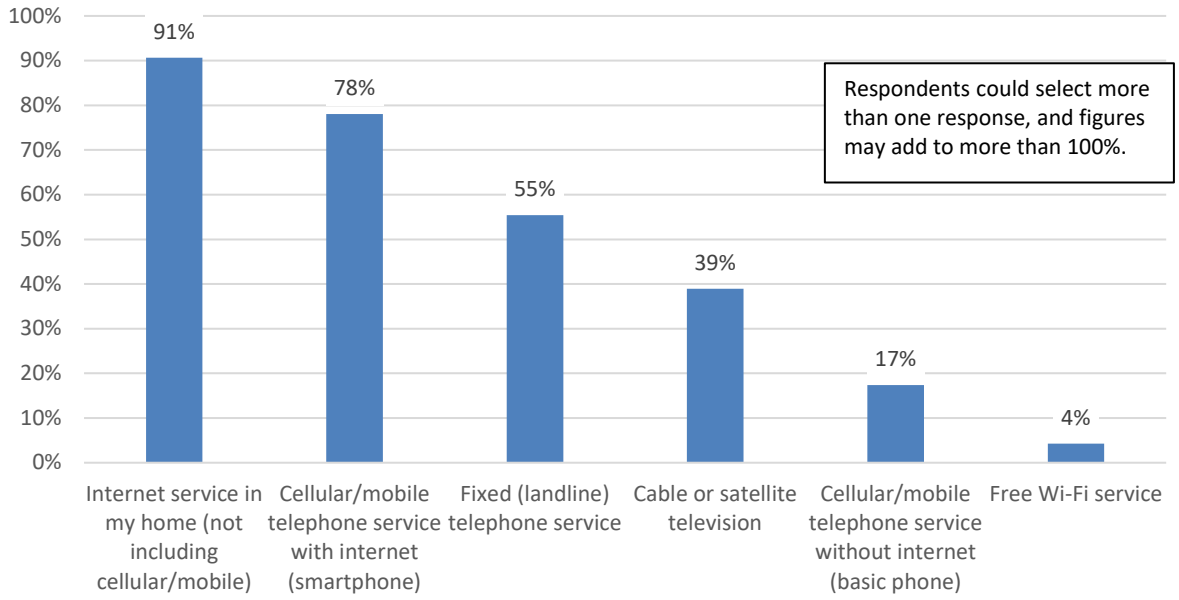


Figure 23: Internet Services Purchased



Saturation of communications services currently purchased for the household is illustrated in Figure 24. Overall, 91 percent have internet service in the home and 78 percent have cellular/mobile telephone service with internet. Fewer households have landline telephone service (55 percent), cable/satellite television service (39 percent), cellular/mobile telephone service without internet (17 percent), and free Wi-Fi service (4 percent).

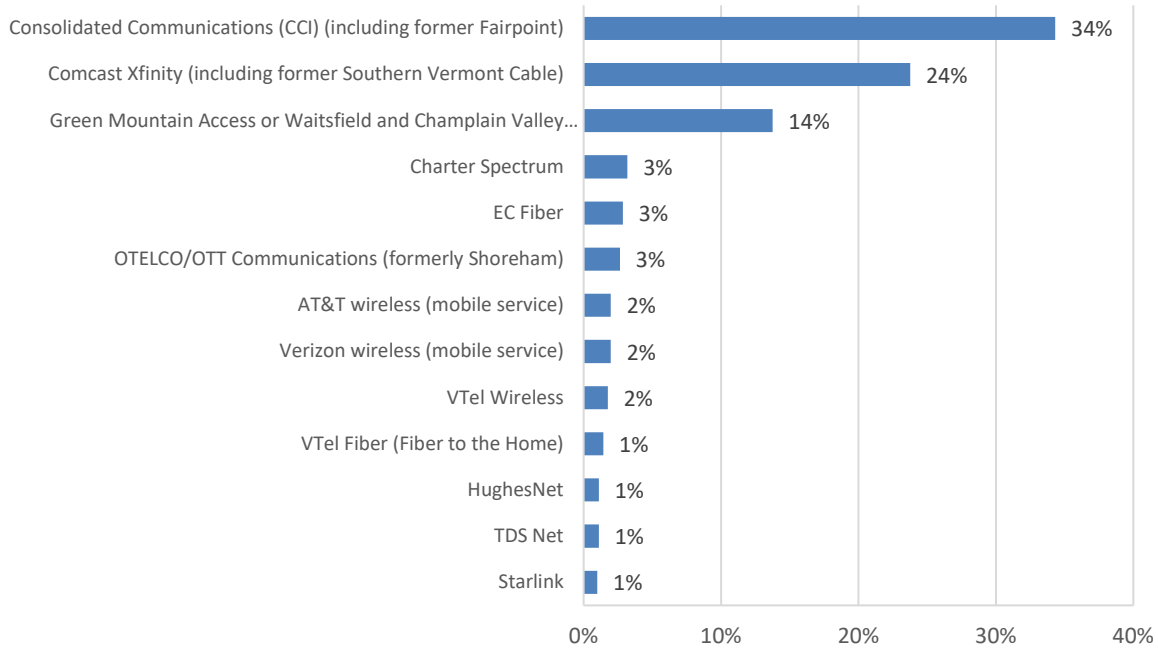
Figure 24: Communication Services Purchased



If you use the internet in your home, who is your primary internet service provider?

Participants use a variety of internet service providers, with Consolidated Communications (CCI) used by 34 percent of respondents and Comcast Xfinity used by 24 percent of respondents. Another 14 percent of respondents subscribe to Green Mountain Access or Waitsfield and Champlain Valley Telecom (see Figure 25).

Figure 25: Internet Service Providers Used



If you were to move in the next year, how important would these factors be in selecting a place to live?

Respondents were asked to evaluate how important various factors would be in selecting a place to live. Average rating scores are highlighted in Figure 26, while Figure 27 shows detailed responses. The most important factor among those evaluated is availability of internet connection at any speed, with 71 percent of respondents saying this is extremely important.

Figure 26: Importance of Internet Service Factors in Selecting a Place to Live (Mean Ratings)

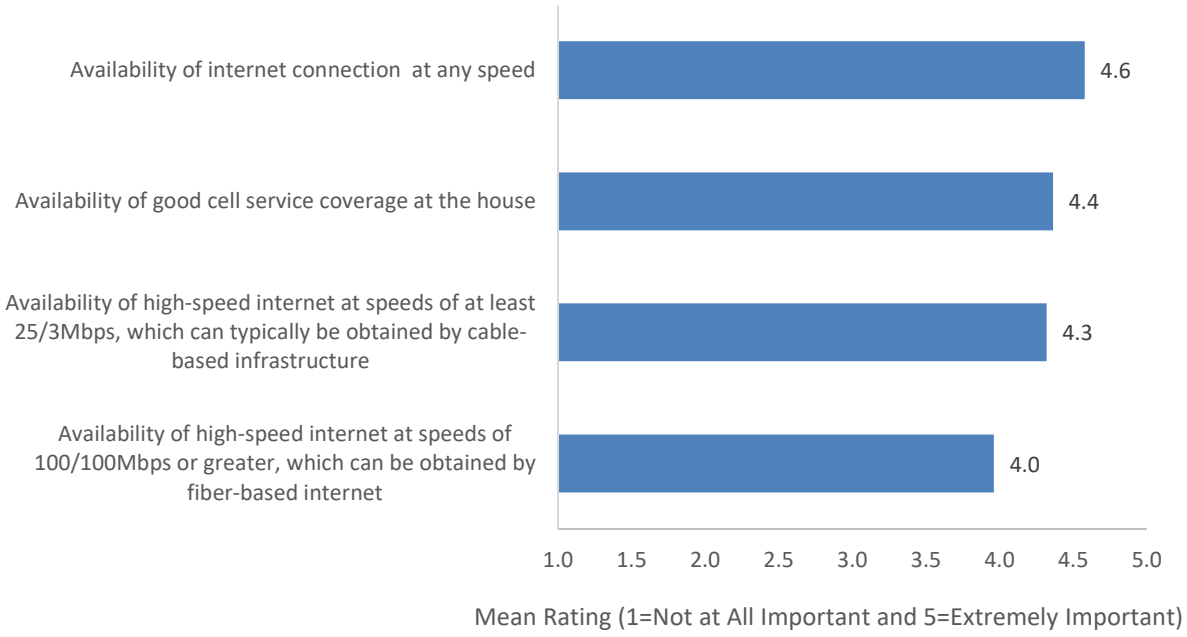
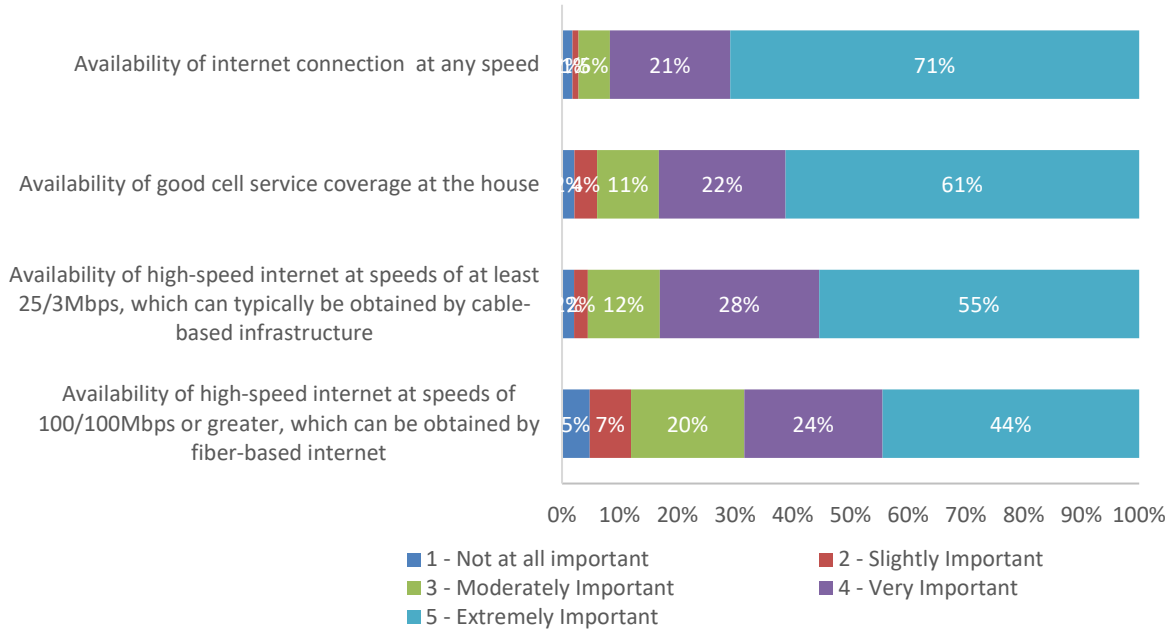
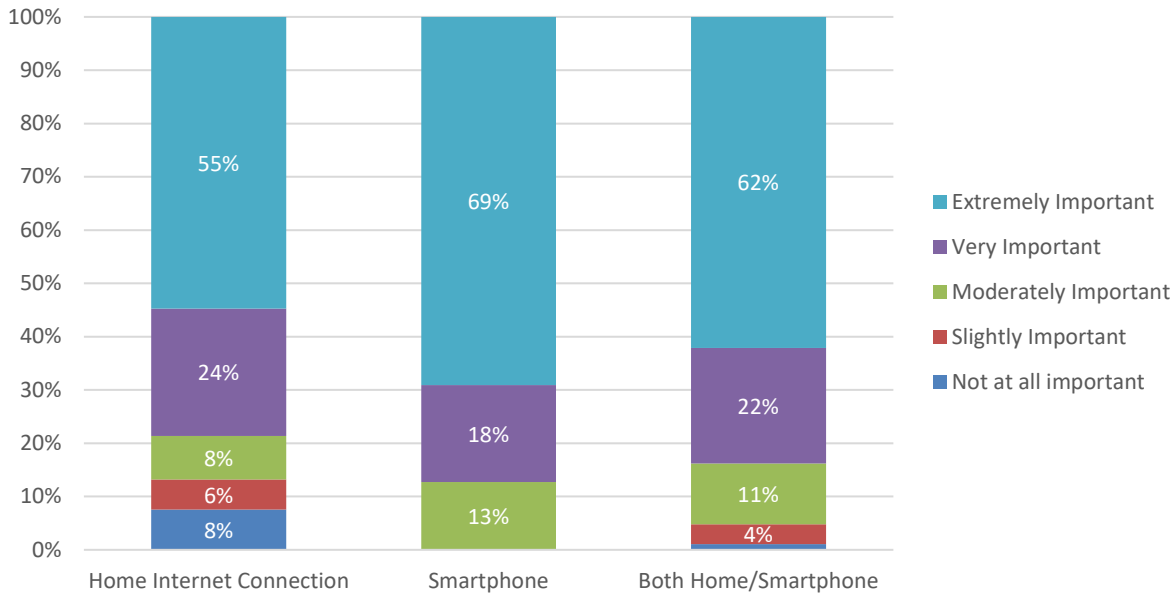


Figure 27: Importance of Internet Service Factors in Selecting a Place to Live



Overall, six in 10 respondents said that the availability of good cell service coverage at the home would be extremely important in selecting a place to live. As may be expected, home internet users without cell phone service placed somewhat less importance on this factor compared with those with a cellular/mobile connection only or those with both home internet and cellular/mobile internet (see Figure 28).

Figure 28: Importance of Availability of Good Cell Service Coverage in Selecting a Place to Live by Internet Service Type



Other factors would be somewhat less important to respondents when selecting a place to live, but still very important overall. More than one-half of respondents said that availability of high-speed internet of at least 25/3 Mbps (e.g., cable-based) would be extremely important, and 28 percent said it would be very important.

Additionally, 44 percent of respondents said that availability of high-speed internet of at least 100/100 Mbps (e.g., fiber-based) would be extremely important, and 24 percent said it would be very important.

Imagine you were to move in the next year. Please indicate to what extent you disagree or agree with the following statements about the availability of internet service. I would prioritize moving where I could:

Respondents were most likely to agree with the statement they would prioritize moving where they could get internet speeds that meet their needs, regardless of what type of infrastructure

was available, with 49 percent of respondents strongly agreeing and 37 percent agreeing. Subscribing to an owned or locally controlled internet provider is less likely to be a key factor in prioritizing where to move, with 47 percent of respondents neutral on this issue (see Figure 29 and Figure 30).

Figure 29: Agreement with Statements About the Availability of Internet Service If You Were To Move in the Next Year (Mean Ratings)

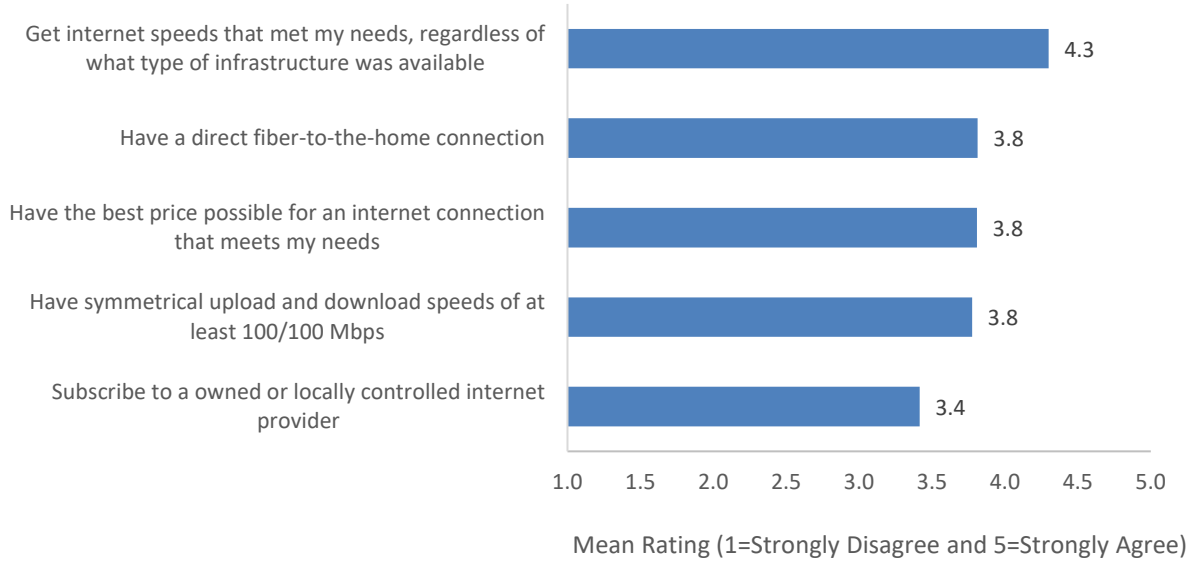
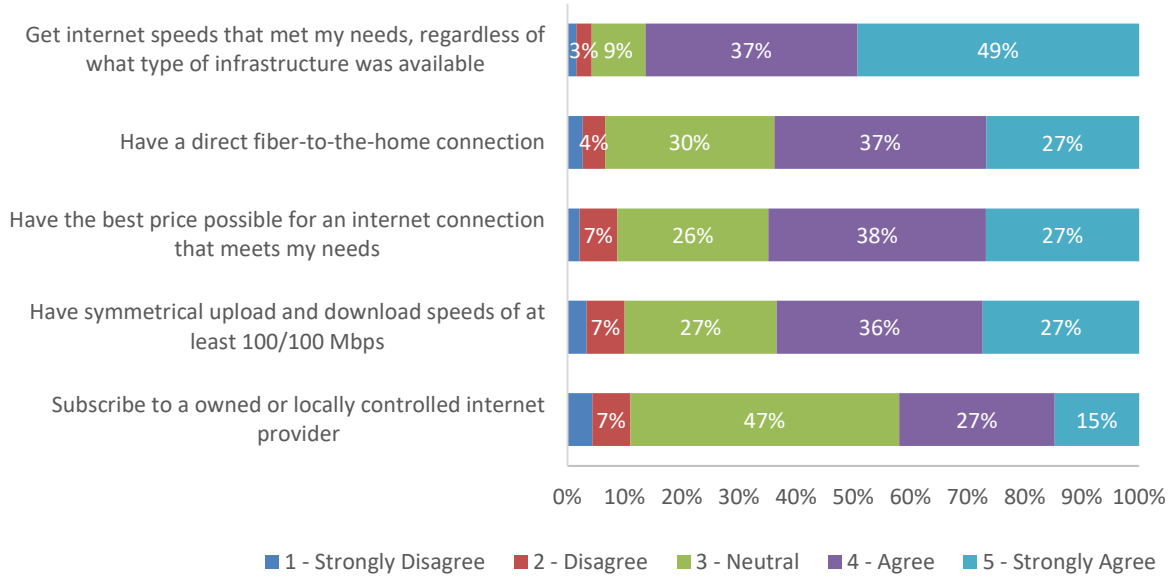


Figure 30: Agreement with Statements About the Availability of Internet Service If You Were To Move in the Next Year



Please indicate the level of importance you place on the following aspects related to internet connectivity.

Privacy is one of the key aspects of internet service, with 69 percent of respondents saying it is extremely important that their ISP will not collect or sell data without permission (see Figure 31 and Figure 32). Also, 53 percent of respondents said that net neutrality is extremely important.

Figure 31: Importance of Aspects of Internet Connectivity (Mean Ratings)

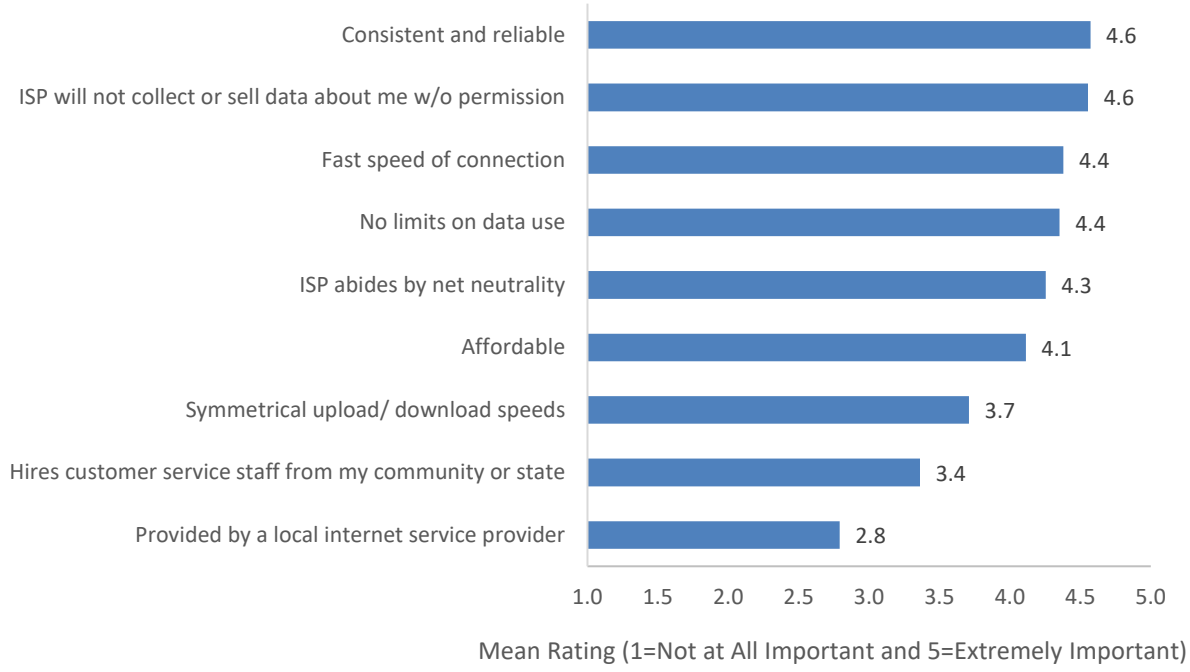
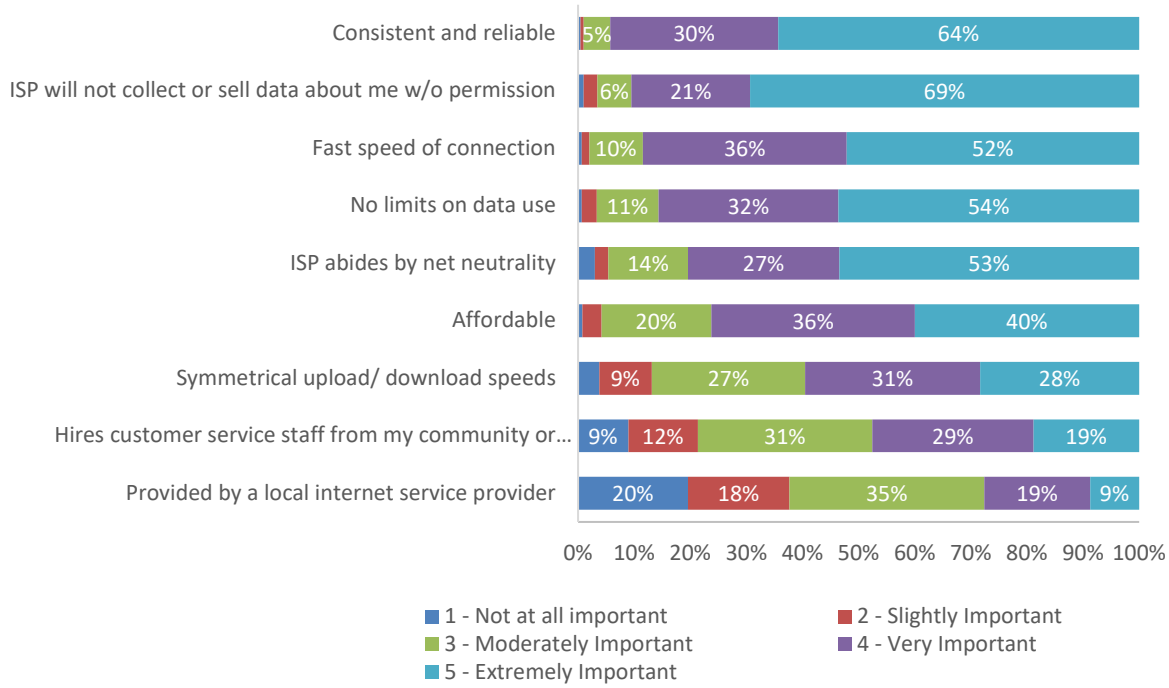
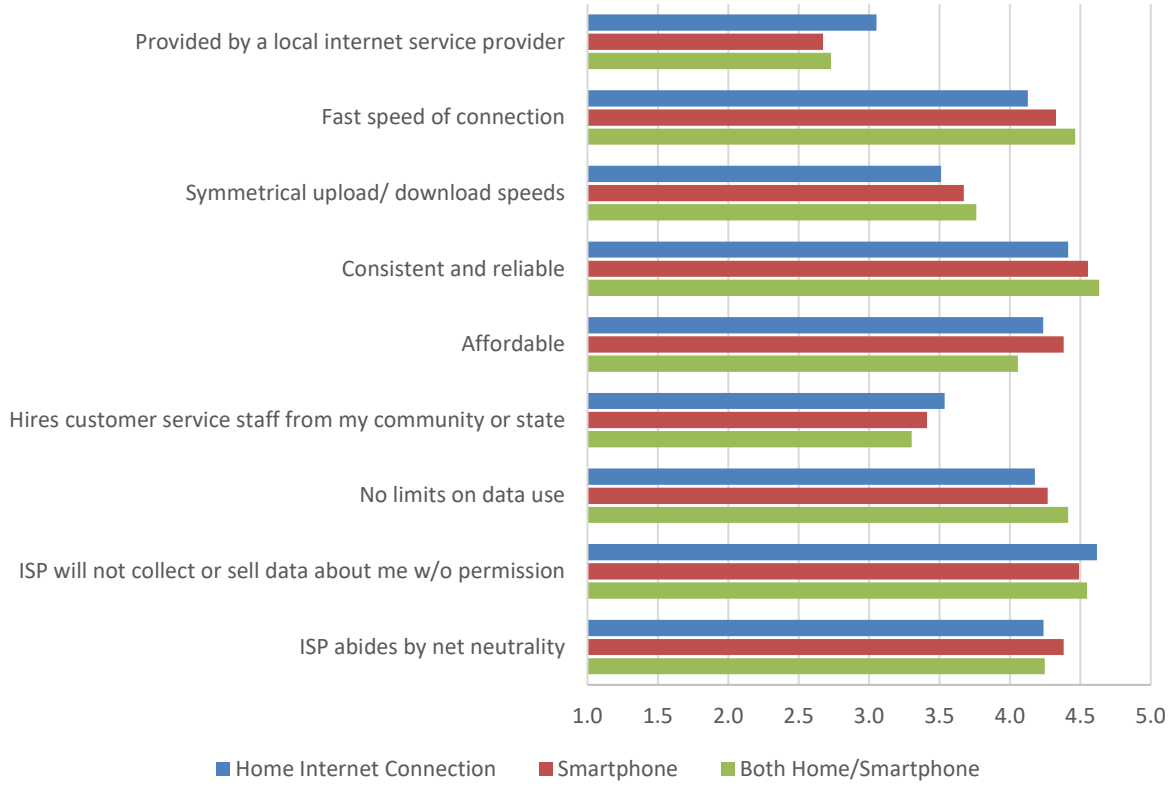


Figure 32: Importance of Aspects of Internet Connectivity



Other important aspects of internet service include speed and reliability of service. Specifically, 64 percent of respondents said consistent and reliable service is extremely important. Another 52 percent of respondents said having a fast connection is extremely important, and 54 percent said having no limits on their data usage is extremely important. These aspects are somewhat less important to those with a home internet connection only, compared with those with cellular/mobile internet service (see Figure 33).

Figure 33: Importance of Aspects of Internet Connectivity by Internet Connection Type



Now, please rank the following in order of importance when considering an internet service provider (with 1 being most important).

The highest ranked aspects when selecting and ISP are consistent and reliable service (average ranking of 3.1) and fast connection speed (average ranking of 3.3.) The lowest ranked aspects including hiring customer service staff locally (average ranking of 6.3) and having a local ISP (average ranking of 6.4), as shown in Figure 34. Consolidated Communications customers ranked symmetrical speeds and consistent/reliable service higher than did Comcast Xfinity customers (see Figure 35).

Figure 34: Average Ranking of Internet Service Aspects

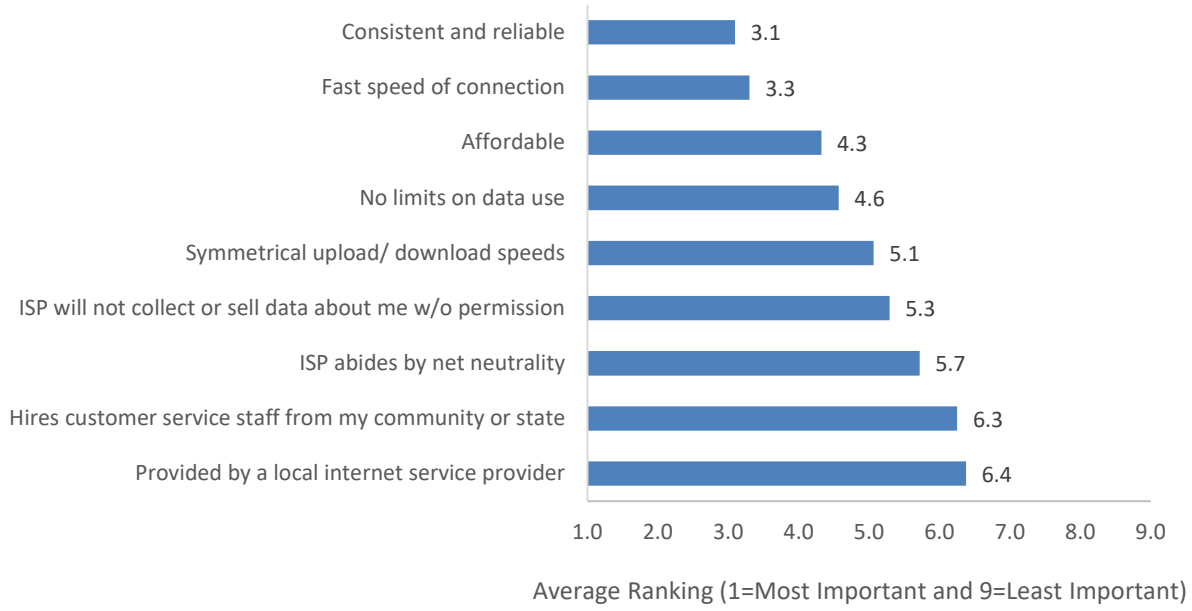
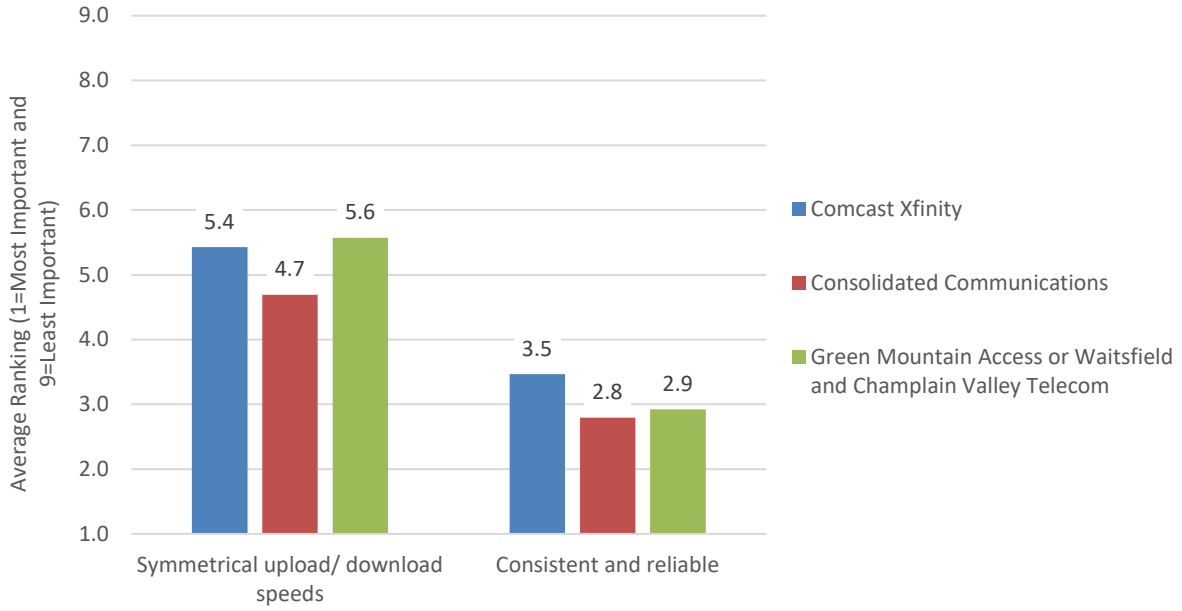


Figure 35: Average Ranking of Internet Service Aspects by Internet Service Type



Would you be willing to pay more for service from an Internet Service Provider that guaranteed net neutrality? Privacy protection?

More than four in 10 respondents would be willing to pay more for service from an ISP that offered net neutrality (42 percent) or privacy protection (45 percent), as shown in Figure 36 and Figure 37. However, a sizeable share of respondents was unsure or needed more information before deciding if they would be willing to pay an ISP more for net neutrality (37 percent) or privacy protection (28 percent).

Figure 36: Willing to Pay ISP More for Net Neutrality

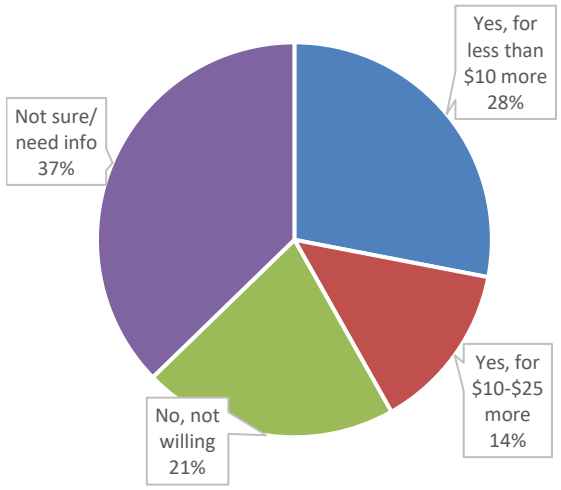
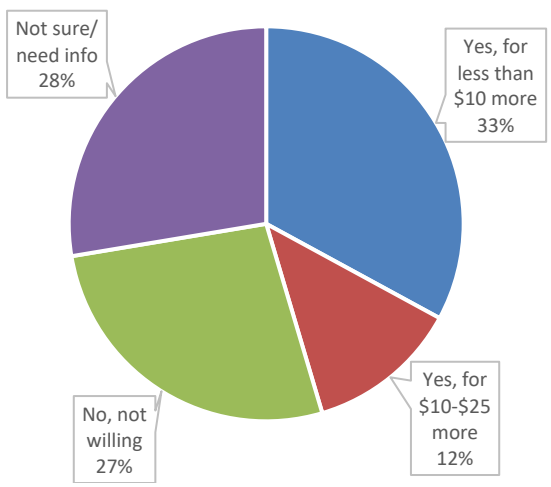


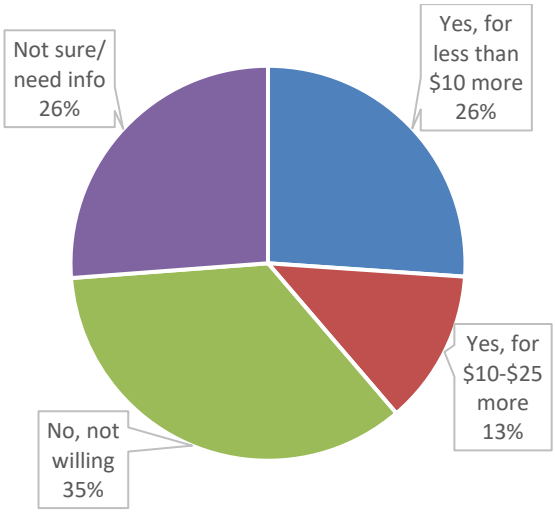
Figure 37: Willing to Pay ISP More for Privacy Protection



Would you be willing to pay more for upload/download symmetry?

Four in 10 respondents would be willing to pay more for upload/download symmetry, while 35 percent would not and one-fourth are unsure or would need more information (see Figure 38).

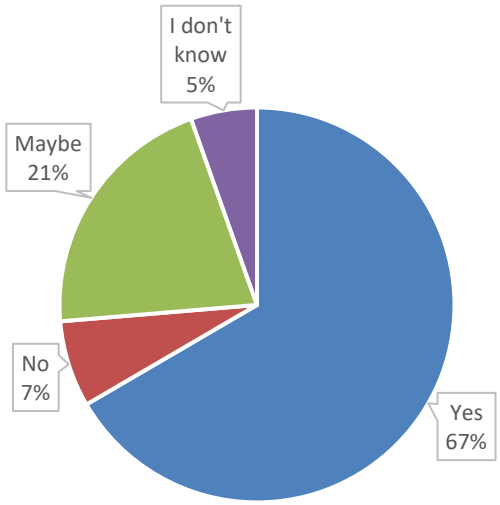
Figure 38: Willing to Pay ISP More for Upload/Download Symmetry



Are you in favor of allowing municipalities to use taxpayer-funded bonds, as towns often do with road repairs, to build broadband infrastructure?

Two-thirds of respondents are in favor of allowing municipalities to use taxpayer-funded bonds to build broadband infrastructure (see Figure 39). Another one-fourth of respondents said maybe or they do not know. Just seven percent of respondents are not in favor.

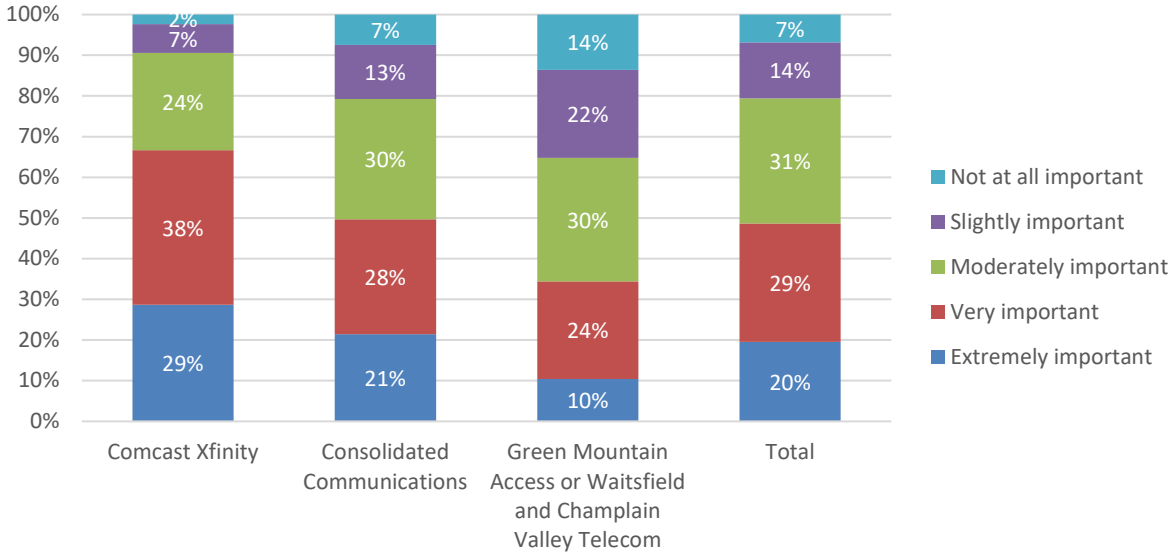
Figure 39: In Favor of Allowing Municipalities to Use Taxpayer-Funded Bonds to Build Broadband Infrastructure



How important is it for you to have more than one choice of internet provider that provides broadband speeds sufficient to meet your needs?

Approximately one-half of respondents said that having a choice of internet service providers is very (29 percent) or extremely (20 percent) important, and another 31 percent said it is moderately important. This factor is more important for Comcast Xfinity customers compared with others (see Figure 40).

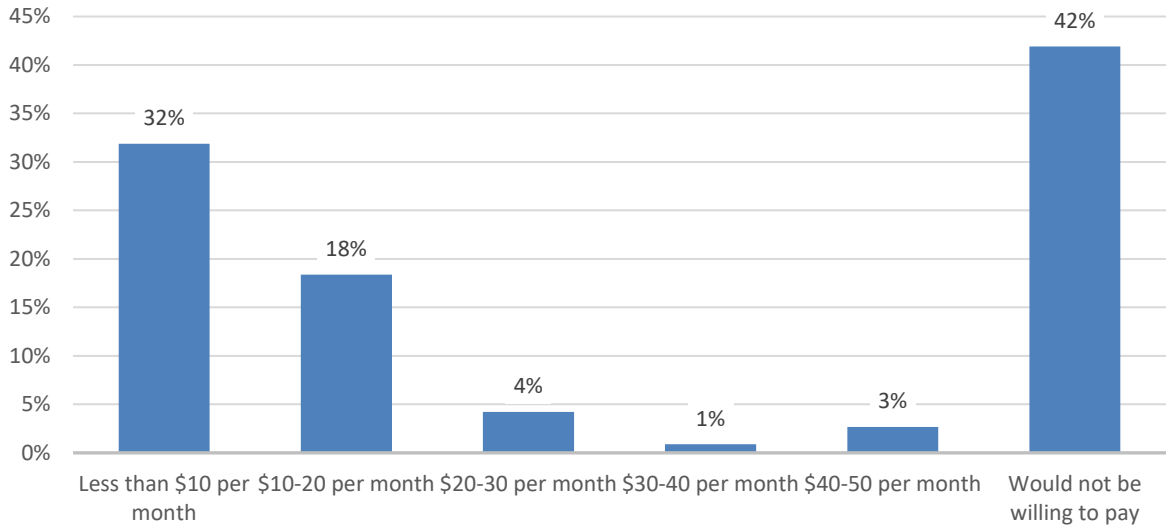
Figure 40: Importance of Having More Than Once Choice of ISP



How much more would you be willing to pay a month to ensure your community had a choice of multiple internet providers?

As illustrated in Figure 41, more than one-half of respondents would be willing to pay a monthly fee to ensure the community had a choice of multiple internet providers, while 42 percent would not be willing to pay a fee. Specifically, 32 percent would be willing to pay less than $10 per month, and 18 percent would pay $10-20 per month. Few respondents would pay more than $20 per month.

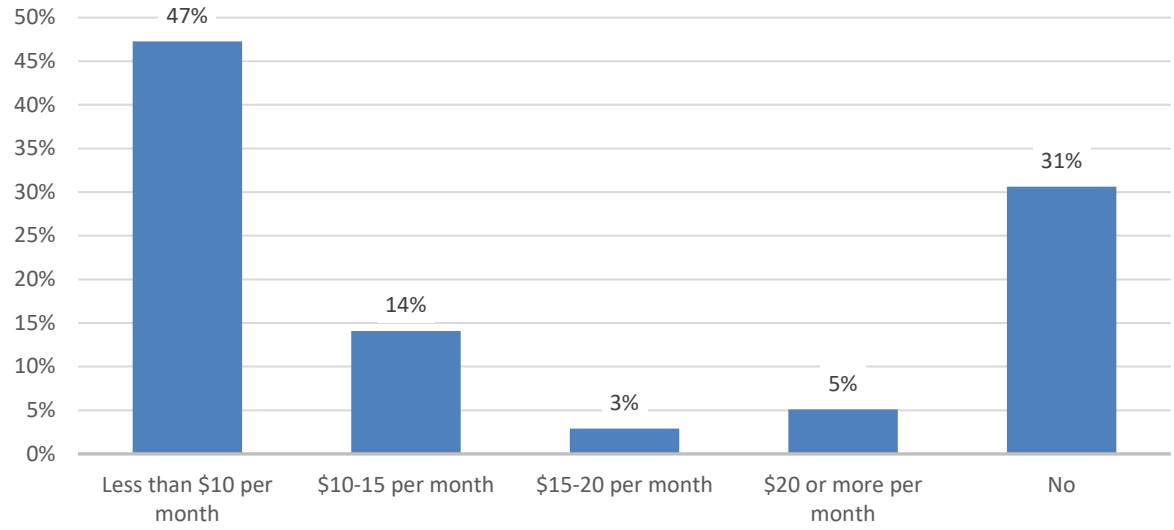
Figure 41: Use of Internet Connection for Various Activities



Would you be willing to pay a mandatory, monthly surcharge on your electric bill to allow your electric utility to build broadband for all unserved Vermonters?

Seven in 10 respondents would be willing to pay a surcharge on their electric bill to help build broadband for unserved Vermonters; however, 47 percent would pay less than $10 per month. Just 22 percent of respondents would be willing to pay $10 or more per month (see Figure 42).

Figure 42: Willing to Pay Monthly Surcharge on Electric Bill to Build Broadband



Please rank your agreement with various statements about cell service in Vermont.

Nine in 10 respondents agreed or strongly agreed that cell coverage is important to improve for economic development/business reasons and is important to improve for public safety reasons. Eight in 10 respondents agreed or strongly agreed it is important to improve for quality of life reasons (see Figure 43 and Figure 44).

Figure 43: Agreement with Statements About Cell Service (Mean Ratings)

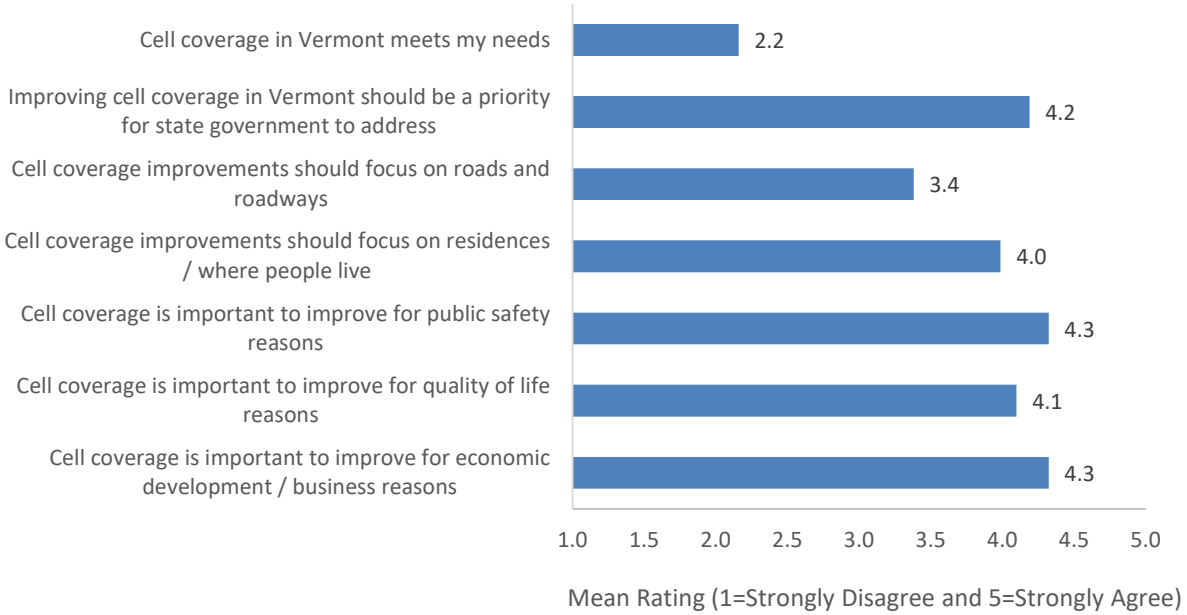
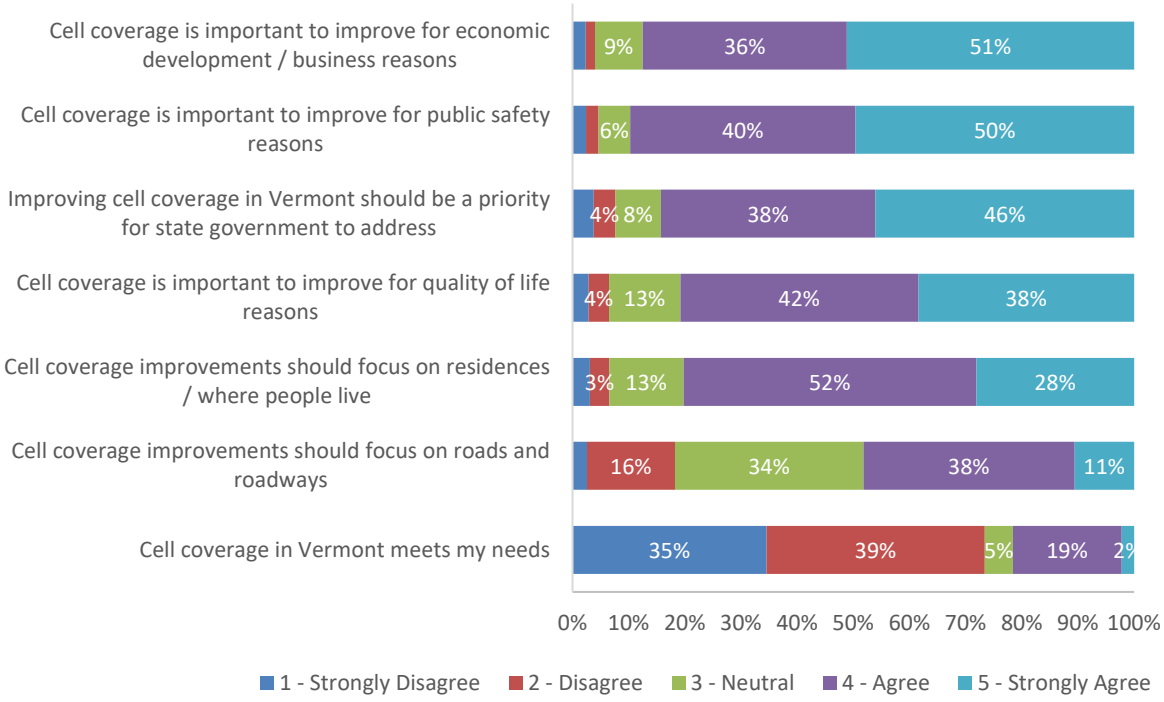


Figure 44: Agreement with Statements About Cell Service



Only one-fifth of respondents agreed or strongly agreed that cell coverage in Vermont meets their needs, while three-fourths disagreed or strongly disagreed. Most respondents (84 percent)

agreed or strongly agreed that cell coverage in Vermont should be a priority for state government to address.

Eight in 10 respondents agreed or strongly agreed that cell coverage improvements should focus on residences or where people lived, while fewer (49 percent) agreed or strongly agreed that improvements should focus on roads and roadways.

Please rank the following statements in order of importance (with 1 being the most important):

The highest ranked statement is "I would like the state to pursue the most efficient way to increase cell coverage regardless of the method of deployment" (average ranking of 1.8), with 48 percent of respondents ranking this as most important. In contrast, 75 percent of respondents ranked "I don't believe that cellular coverage needs to be improved at all" as fourth (average ranking of 3.5), as shown in Figure 45 and Figure 46.

The middle tier of statements suggests that many respondents would like to avoid building new cell towers at all costs (average ranking of 2.2), while others would like to see new cell towers built to improve cell coverage in the state (average ranking of 2.4).

Figure 45: Average Ranking of Statements About Cell Coverage and Infrastructure

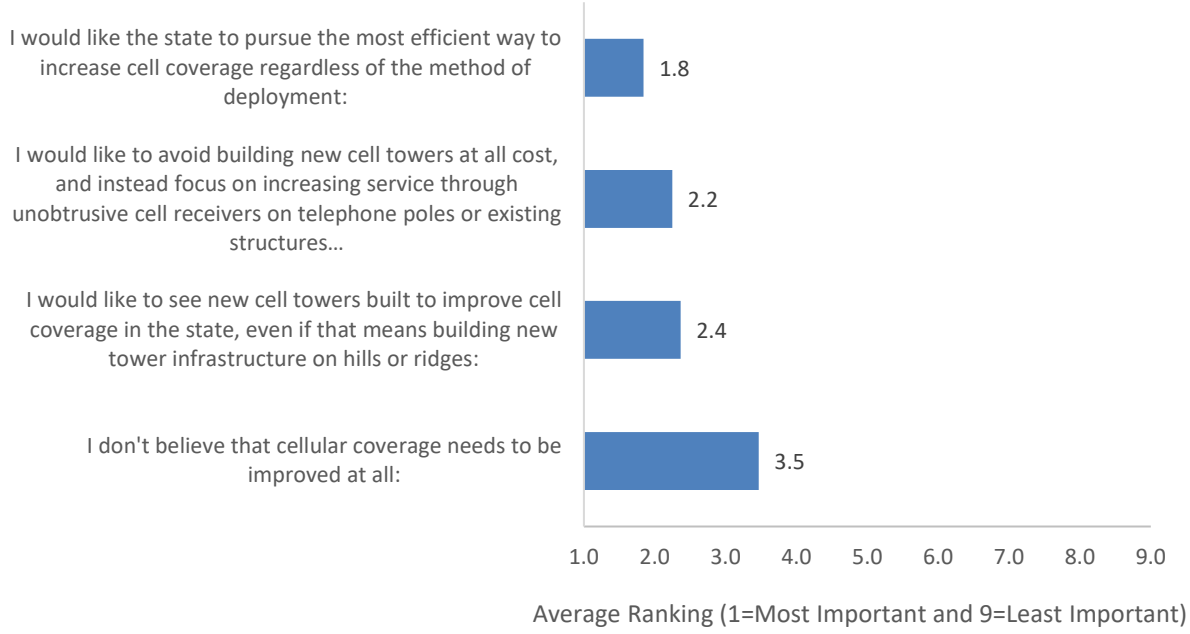
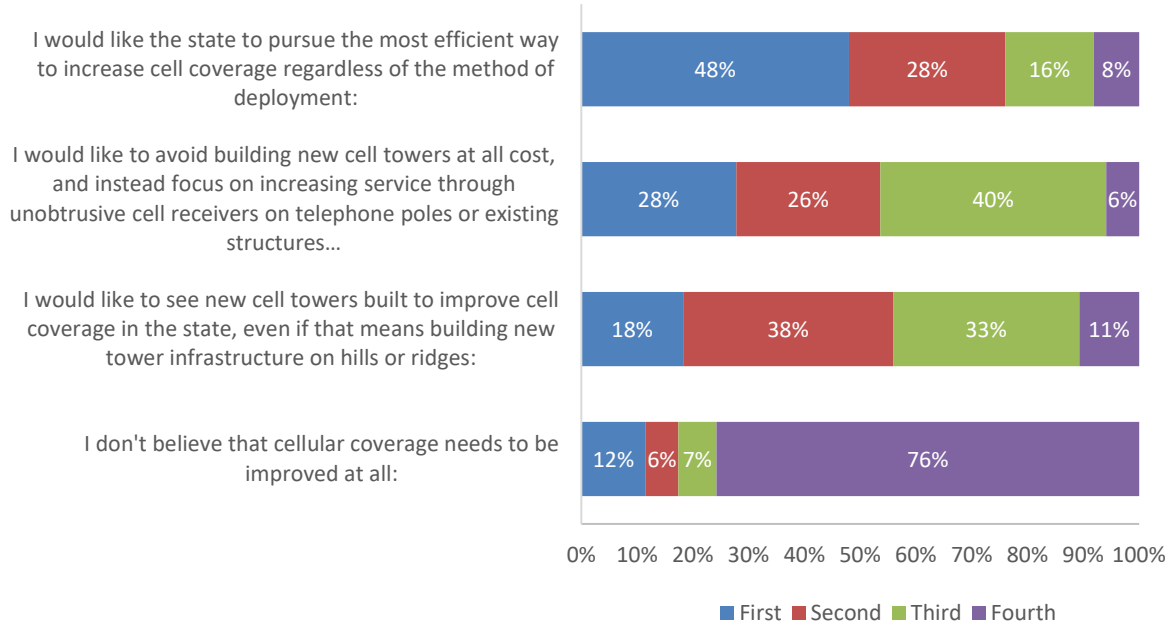


Figure 46: Ranking of Statements About Cell Coverage and Infrastructure

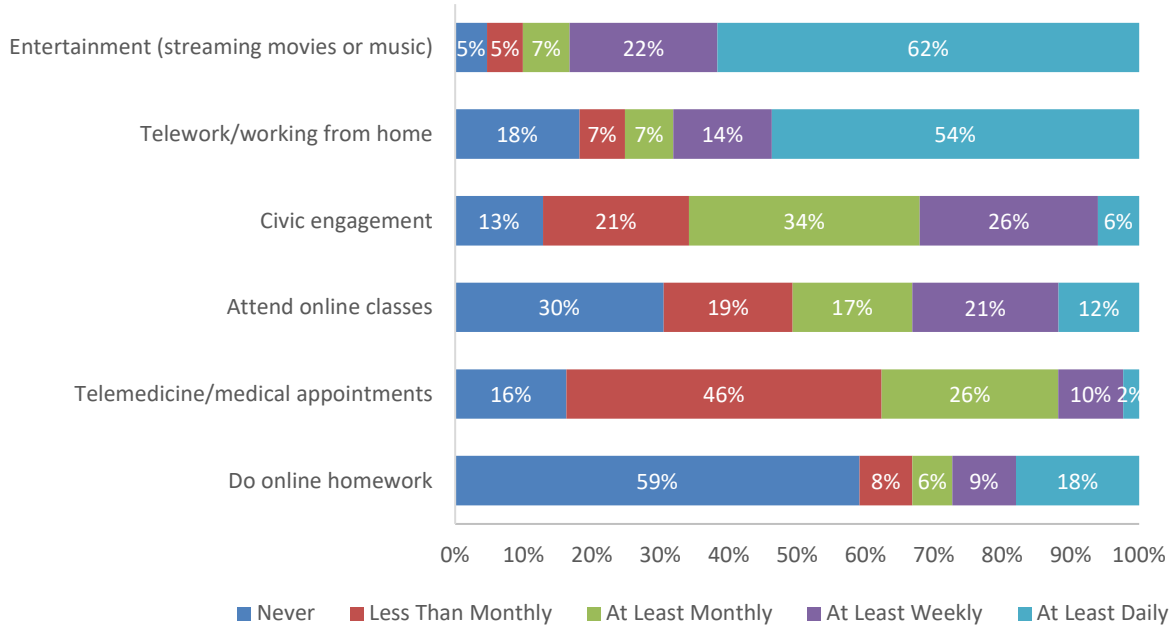


How often do you or someone in your household engage in the following activities?

As shown in Figure 47, most households have a member who engages in entertainment (62 percent) or telework (54 percent) daily. Civic engagement occurs at least weekly or daily for one-third of households. Nearly one-half (46 percent) of respondents said a household member engages in telemedicine less than monthly, and 26 percent do so monthly.

Most households never engage in online homework (59 percent), but a segment of respondents said a household member does so at least weekly (9 percent) or daily (18 percent). One-third of households have a member who attends online classes at least weekly (21 percent) or daily (12 percent).

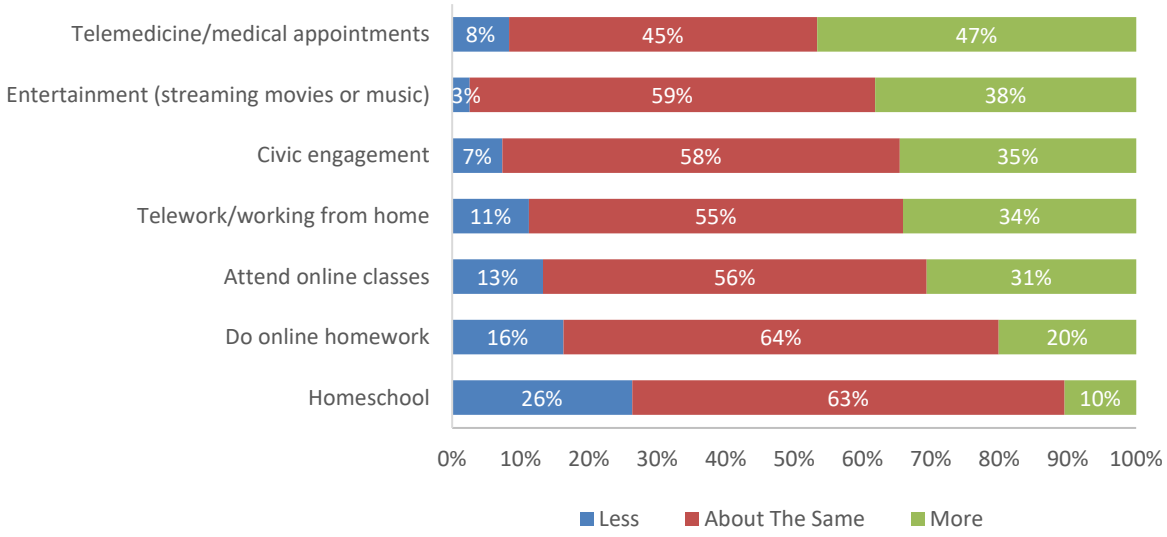
Figure 47: How Often Engage in Various Activities



Do you anticipate doing more, less, or about the same amount of these internet-based activities in the coming years:

Most respondents anticipate their usage of the internet for various activities to remain the same in the coming year, as highlighted in Figure 48. However, nearly one-half (47 percent) of respondents anticipate their use of the internet for telemedicine to increase. A sizeable share anticipates their use of the internet for entertainment (38 percent), civic engagement (35 percent), telework (34 percent), and online classes (31 percent) to increase. Most respondents anticipate doing about the same amount of online homework and homeschooling online, but 26 percent expect to do less homeschooling.

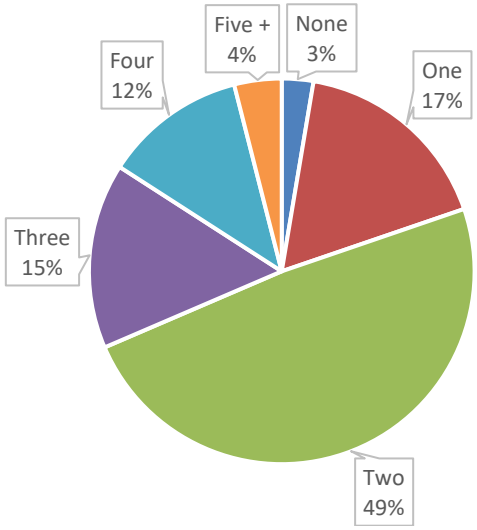
Figure 48: Change in Engagement in Internet-Based Activities



At peak usage times in your household, how many people in your household need to be online for work, school, and other activities at the same time?

One-half of households have two members who need to be online during peak usage times, while 15 percent have three household members and 16 percent have four or more members online. Another 17 percent of respondents have just one household member who needs to be online during peak usage times (see Figure 49).

Figure 49: Number of Household Members Online During Peak Usage Times

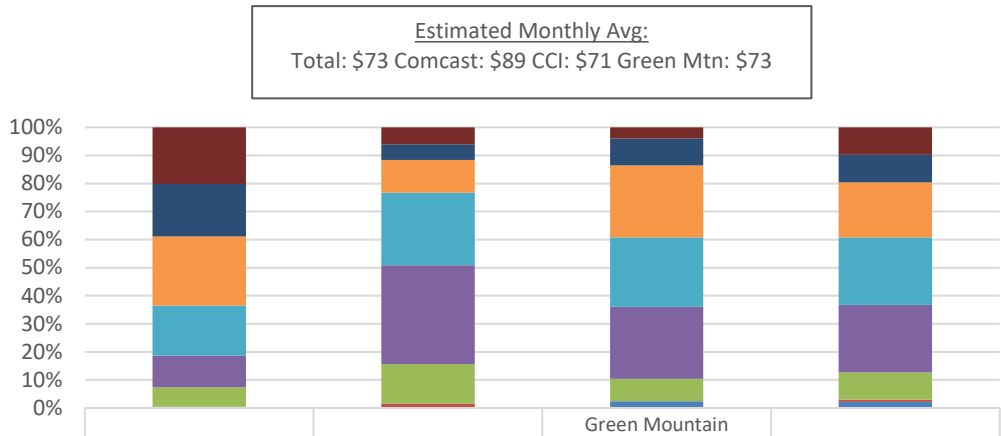


Please estimate how much your household pays PER MONTH for your home internet service (not including television or phone service).

Respondents were asked to give the cost of their home internet service, as shown in Figure 50. The estimated monthly average cost for internet service is $73 overall, $89 for Comcast Xfinity,

$71 for Consolidated Communications, and $73 for Green Mountain Access or Waitsfield and Champlain Valley Telecom. Forty-four percent of respondents pay between $61 and $100 per month for their internet service. Another 20 percent pay more than $100 per month, and just 13 percent pay less than $40 per month.

Figure 50: Reasons Decided Not to Use the ABC for Students Free Internet

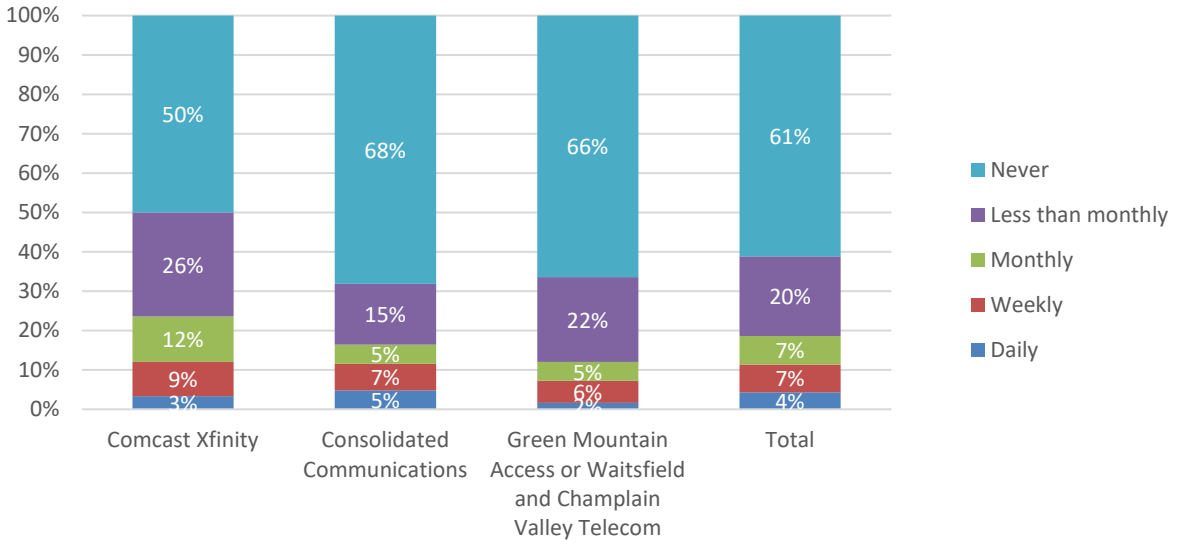


	Comcast Xfinity	Consolidated Communications	Green Mountain Access or Waitsfield and Champlain Valley Telecom	Total
More than $120	20%	6%	4%	10%
$101 to $120	19%	6%	10%	10%
$81 to $100	25%	12%	26%	20%
$61 to $80	18%	26%	25%	24%
$41 to $60	11%	35%	26%	24%
$21 to $40	7%	14%	8%	10%
$11 to $20	0%	2%	0%	1%
$0 to $10	0%	0%	2%	2%

How often do you watch Public Educational, Governmental (PEG) TV (also known as Local Access or Community TV) content?

Nearly four in 10 respondents watch PEG programming, including one in 10 frequent viewers who watch weekly or daily. Comcast Xfinity subscribers are more likely than CCI and Green Mountain Access or Waitsfield and Champlain Valley Telecom subscribers to watch PEG TV (see Figure 51).

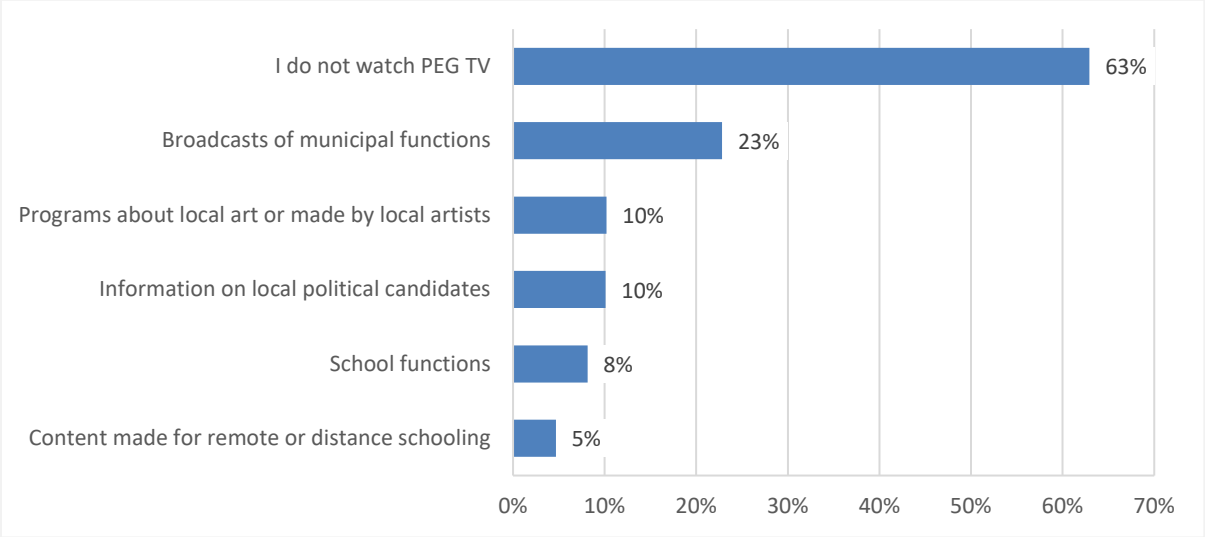
Figure 51: How Often Watch PEG TV Content



What type of PEG TV content do you access?

The most frequently accessed PEG content is broadcasts of municipal functions (cited by 23 percent of respondents). One in 10 respondents access programs about local art or made by local artists, and 10 percent access information on local political candidates. Additionally, eight percent of respondents access programming about school functions, and five percent access content made for remote or distance learning (see Figure 52).

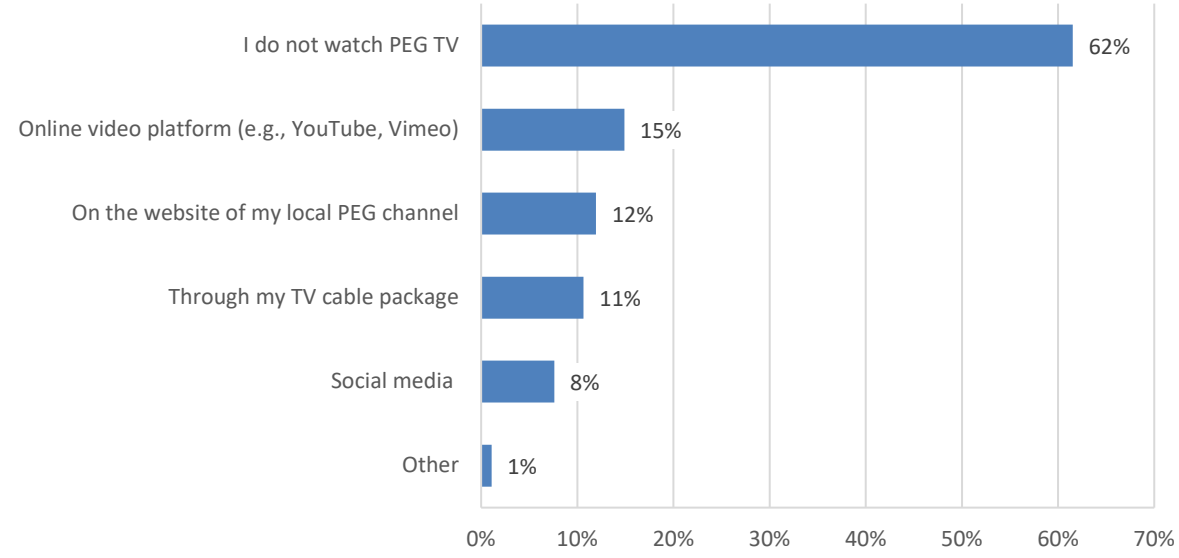
Figure 52: Type of PEG Content Accessed



Through what medium did you want the PEG TV content?

Although most respondents (62 percent) indicated they do not want PEG TV, those who do use a variety of media to access content (see Figure 53). These include online video platforms (15 percent), on the website of the local PEG channel (12 percent), through their TV cable package (11 percent), and social media (8 percent).

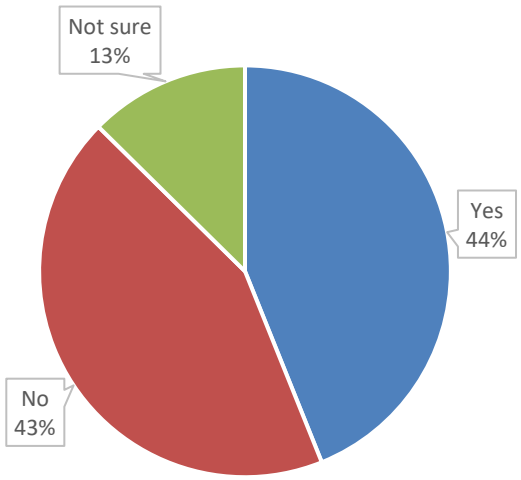
Figure 53: Medium Used to Watch PEG TV Content



Are you aware of the state's emphasis on Communications Union Districts, which allow towns to work together to provide internet service, as a way to improve broadband access in unserved areas around the state?

Overall, 44 percent of respondents were aware of the state's emphasis on Communications Union Districts as a way to improve broadband access to unserved areas around the state. Another 43 percent of respondents were unaware, and 13 percent were unsure (see Figure 54).

Figure 54: Aware of Communications Union Districts



Appendix B: 2021 Online Business Survey

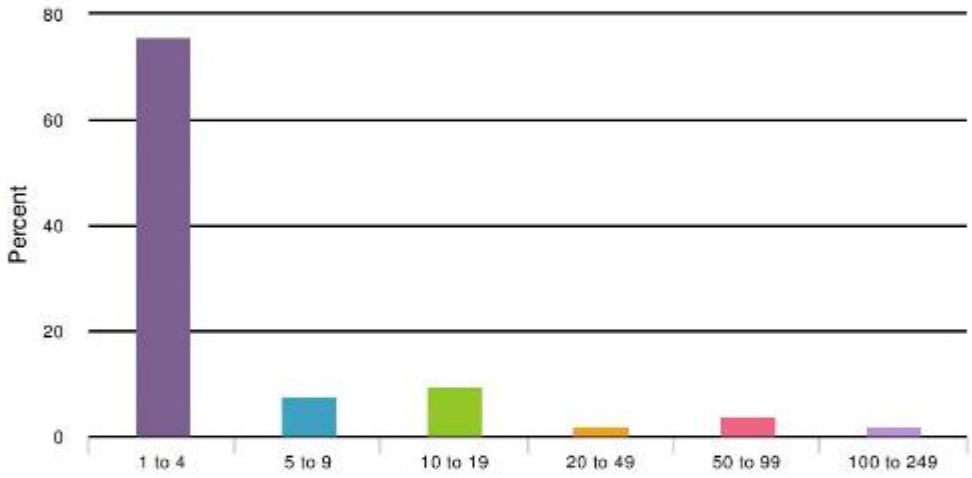
Report for Vermont Telecommunication Plan Business Survey

Response Counts

Completion Rate:	**56.7%**	
	Complete	55
	Partial	42

Totals: 97

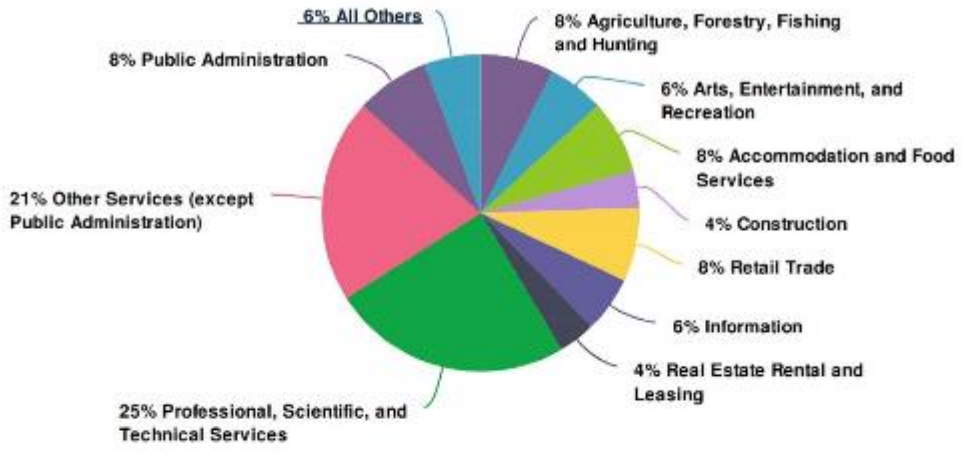
3. How many employees does your business employ in Vermont?



Value	Percent	Responses
1 to 4	75.5%	40
5 to 9	7.5%	4
10 to 19	9.4%	5
20 to 49	1.9%	1
50 to 99	3.8%	2
100 to 249	1.9%	1

Totals: 53

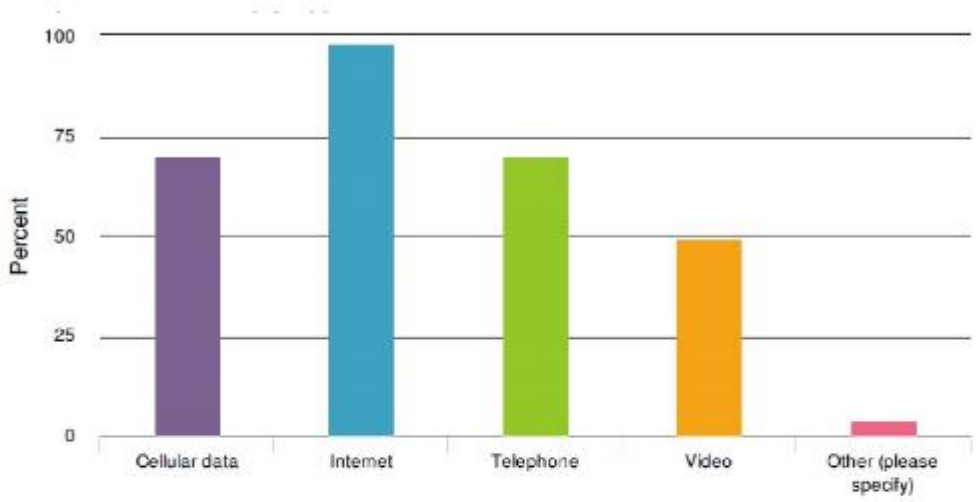
4. What sector best describes your business?



Value	Percent	Responses
Agriculture, Forestry, Fishing and Hunting	7.5%	4
Educational Services	1.9%	1
Health Care and Social Assistance	1.9%	1
Arts, Entertainment, and Recreation	5.7%	3
Accommodation and Food Services	7.5%	4
Construction	3.8%	2
Retail Trade	7.5%	4
Information	5.7%	3
Finance and Insurance	1.9%	1
Real Estate Rental and Leasing	3.8%	2
Professional, Scientific, and Technical Services	24.5%	13
Other Services (except Public Administration)	20.8%	11
Public Administration	7.5%	4

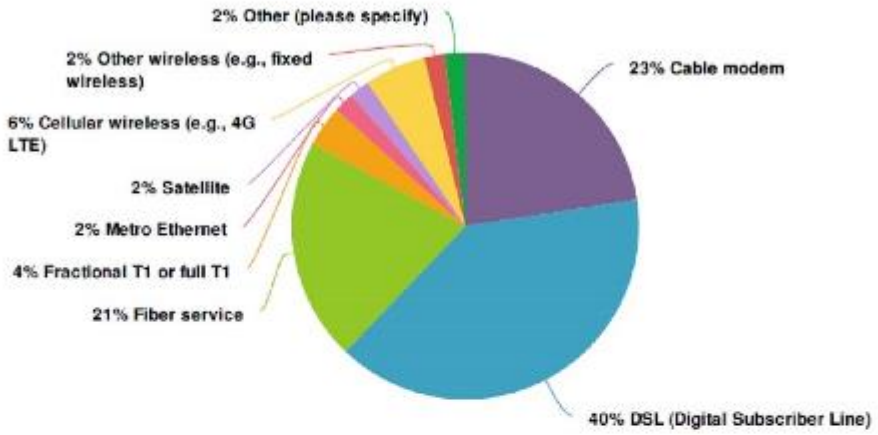
Totals: 53

5. What connectivity services do you use at your PRIMARY business location? (✔ all that apply)



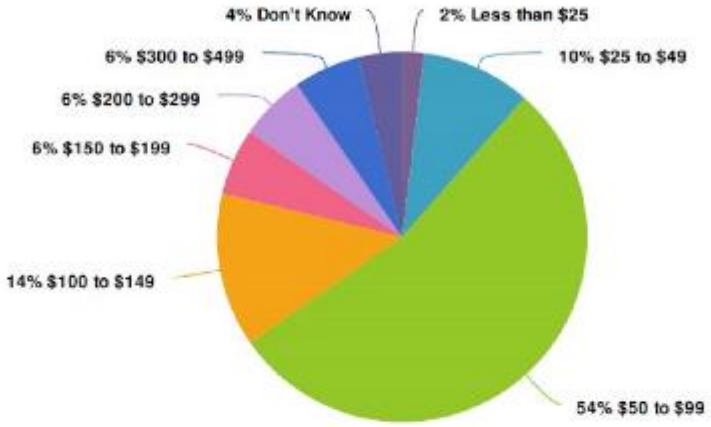
Value	Percent	Responses
Cellular data	69.8%	37
Internet	98.1%	52
Telephone	69.8%	37
Video	49.1%	26
Other (please specify)	3.8%	2

6. What do you use for your primary internet connection? (Please indicate the way the building/office is connected to the internet, not the internal Wi-Fi wireless or internal building cabling.)



Value	Percent	Responses
Cable modem	22.6%	12
DSL (Digital Subscriber Line)	39.6%	21
Fiber service	20.8%	11
Fractional T1 or full T1	3.8%	2
Metro Ethernet	1.9%	1
Satellite	1.9%	1
Cellular wireless (e.g., 4G LTE)	5.7%	3
Other wireless (e.g., fixed wireless)	1.9%	1
Other (please specify)	1.9%	1
	Totals:	53

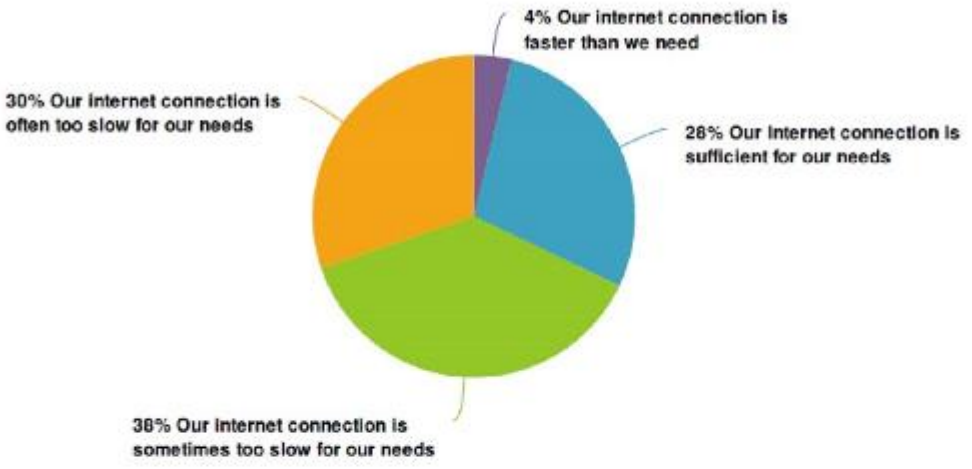
7. Thinking just about Internet Service, approximately how much do you pay PER MONTH for internet service at your primary location? (Do not include charges for telephone lines, data circuits, etc.)



Value	Percent	Responses
Less than $25	1.9%	1
$25 to $49	9.6%	5
$50 to $99	53.8%	28
$100 to $149	13.5%	7
$150 to $199	5.8%	3
$200 to $299	5.8%	3
$300 to $499	5.8%	3
Don't Know	3.8%	2

Totals: 52

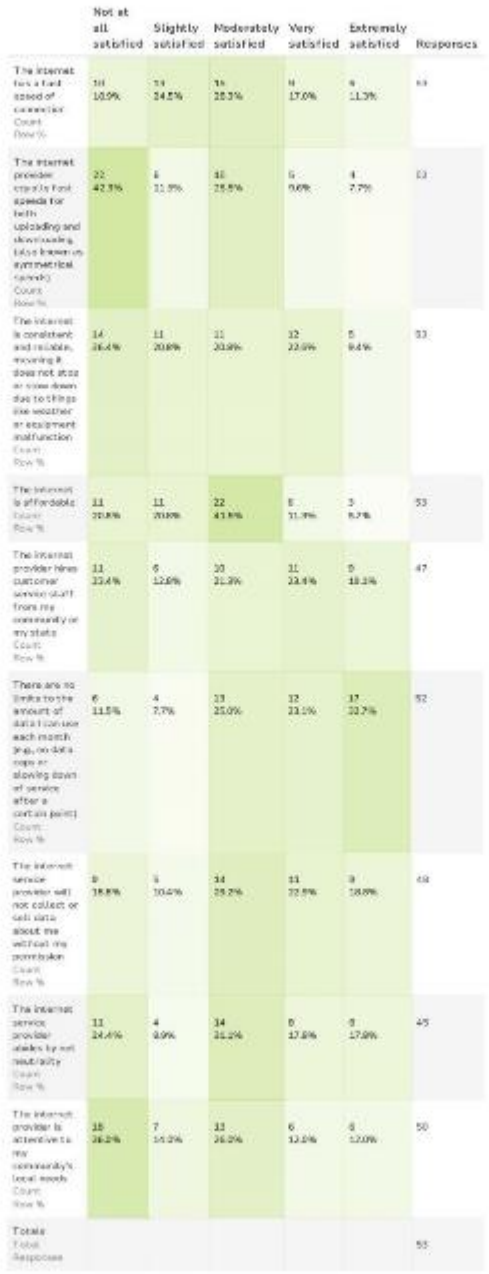
8. How would you characterize the speed of your internet connection in relation to what your business needs to operate efficiently?



Value	Percent	Responses
Our internet connection is faster than we need	3.8%	2
Our internet connection is sufficient for our needs	28.3%	15
Our internet connection is sometimes too slow for our needs	37.7%	20
Our internet connection is often too slow for our needs	30.2%	16

Totals: 53

9. How satisfied are you with the following aspects of your current business internet service?

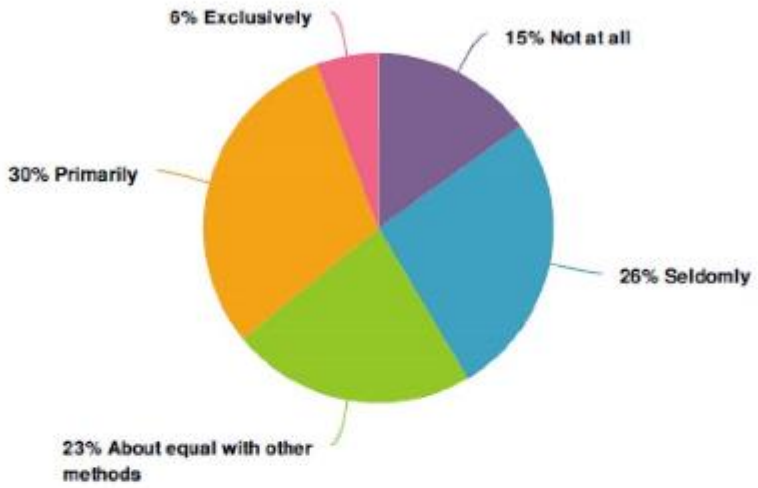


	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Extremely satisfied	Responses
The internet has a fast speed of connection Count Row %	10 18.9%	13 24.5%	16 30.2%	9 17.0%	6 11.3%	53
The internet provider typically has speeds for both uploading and downloading (also known as symmetrical speeds) Count Row %	22 42.3%	6 11.5%	16 30.8%	5 9.6%	4 7.7%	53
The internet is consistent and reliable, meaning it does not stop or slow down due to things like weather or equipment malfunction Count Row %	14 26.4%	11 20.8%	11 20.8%	12 22.6%	5 9.4%	53
The internet is affordable Count Row %	11 20.8%	11 20.8%	22 41.5%	6 11.3%	3 5.7%	53
The internet provider hires customer service staff from my community or my state Count Row %	11 23.4%	6 12.8%	10 21.3%	11 23.4%	9 19.1%	47
There are no limits to the amount of data I can use each month (e.g., no data caps or slowing down of service after a certain point) Count Row %	6 11.5%	4 7.7%	13 25.0%	12 23.1%	17 32.7%	52
The internet service provider will not collect or sell data about me without my permission Count Row %	9 16.9%	5 10.4%	14 29.2%	11 22.9%	9 18.8%	48
The internet service provider abides by net neutrality Count Row %	11 24.4%	4 8.9%	14 31.1%	8 17.8%	8 17.8%	45
The internet provider is attentive to my community's local needs Count Row %	18 36.0%	7 14.0%	13 26.0%	6 12.0%	6 12.0%	50
Totals Total Responses						55

10. As a business, please rank the following in order of importance when considering an internet service provider (with 1 being the most important):

Item	Overall Rank	Rank Distribution	Score	No. of Rankings
My internet has a fast speed of connection	1		259	41
My internet is consistent and reliable, meaning it does not stop or slow down due to things like weather or equipment malfunction	2		228	39
There are no limits to the amount of data I can use each month (e.g., no data caps or slowing down of service after a certain point)	3		228	45
My internet is affordable	4		213	42
My internet service provider abides by net neutrality	5		211	47
My internet is provided by a locally controlled company	6		210	43
My internet can provide equally fast speeds for both uploading and downloading (also known as symmetrical speeds)	7		206	44
My internet provider hires customer service staff from my community or my state	8		196	42
My internet service provider will not collect or sell data about me without my permission	9		190	44

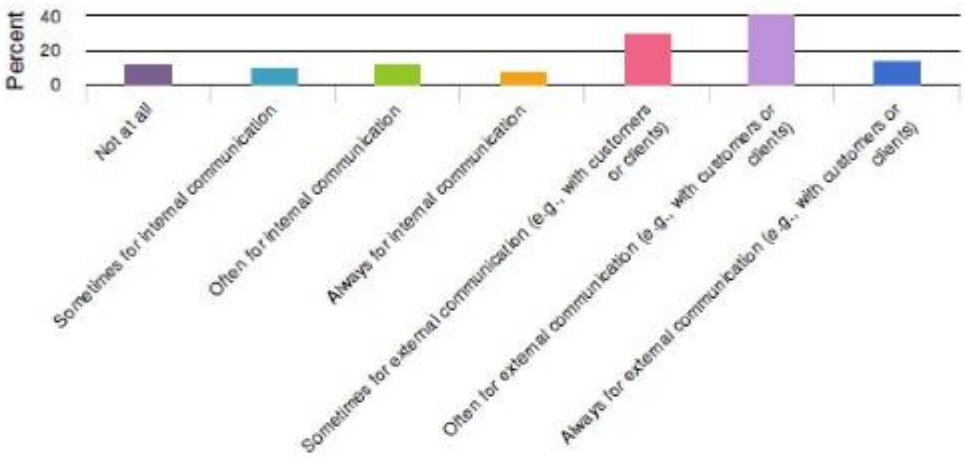
11. To what extent does your business use online platforms to sell goods or services online or engage in online marketing and promotion?



Value	Percent	Responses
Not at all	15.1%	8
Seldomly	26.4%	14
About equal with other methods	22.6%	12
Primarily	30.2%	16
Exclusively	5.7%	3

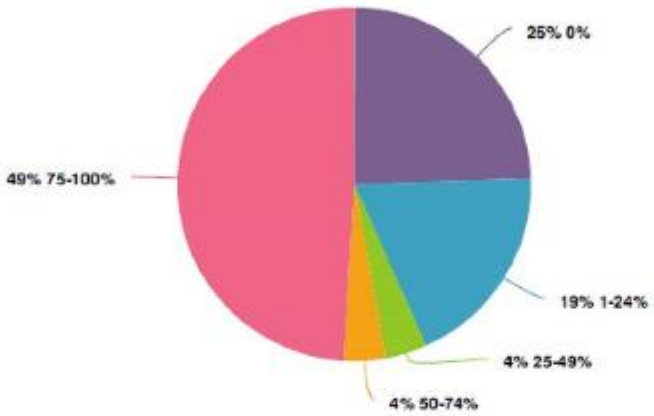
Totals: 53

12. To what extent will your business use video conferencing to communicate AFTER the pandemic? (check all that apply)



Value	Percent	Responses
Not at all	11.3%	6
Sometimes for internal communication	9.4%	5
Often for internal communication	11.3%	6
Always for internal communication	7.5%	4
Sometimes for external communication (e.g., with customers or clients)	30.2%	16
Often for external communication (e.g., with customers or clients)	39.6%	21
Always for external communication (e.g., with customers or clients)	13.2%	7

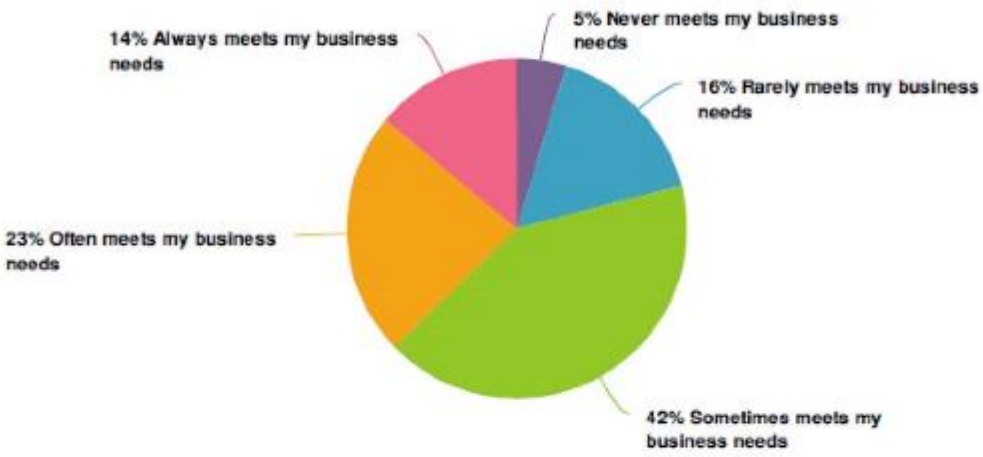
13. What percent of the time do your employees work remotely ("work from home"), in aggregate, today (DURING the pandemic)?



Value	Percent	Responses
0%	24.5%	13
1-24%	18.9%	10
25-49%	3.8%	2
50-74%	3.8%	2
75-100%	49.1%	26

Totals: 53

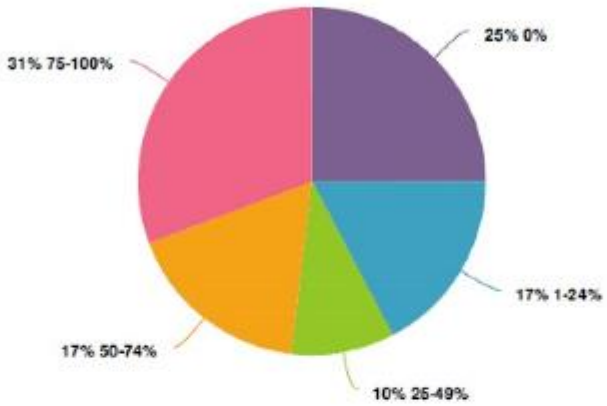
14. Thinking about all of your employees who have been working from home, has their internet connections at home met your business's needs?



Value	Percent	Responses
Never meets my business needs	4.7%	2
Rarely meets my business needs	16.3%	7
Sometimes meets my business needs	41.9%	18
Often meets my business needs	23.3%	10
Always meets my business needs	14.0%	6

Totals: 43

15. Thinking about your operations over the next 5 years, what percent of the time do you expect your employees to work remotely ("work from home"), in aggregate?



Value	Percent	Responses
0%	25.0%	13
1-24%	17.3%	9
25-49%	9.6%	5
50-74%	17.3%	9
75-100%	30.8%	16

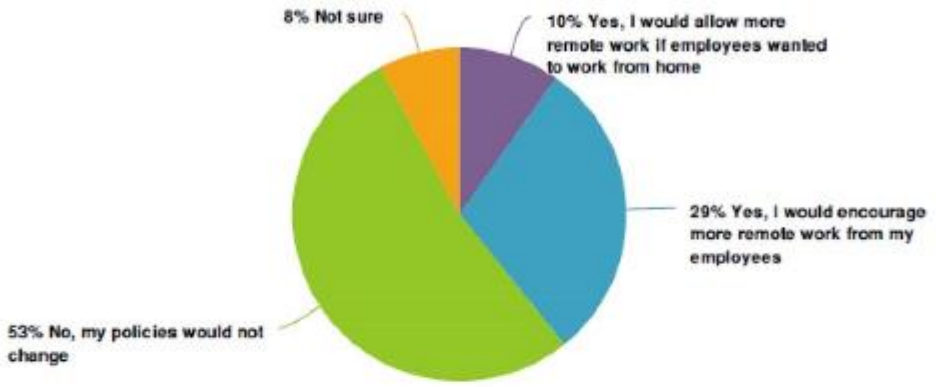
Totals: 52

16. Do you feel that expanding the ability for employees to work from home is or would be a net benefit to your business?

Value	Percent	Responses
Yes	52.9%	27
No	19.6%	10
Neutral	23.5%	12
Not sure	3.9%	2

Totals: 51

17. Would your organization's policy about remote work change if you knew all of your employees had great internet connections?



Value	Percent	Responses
Yes, I would allow more remote work if employees wanted to work from home	9.8%	5
Yes, I would encourage more remote work from my employees	29.4%	15
No, my policies would not change	52.9%	27
Not sure	7.8%	4

Totals: 51

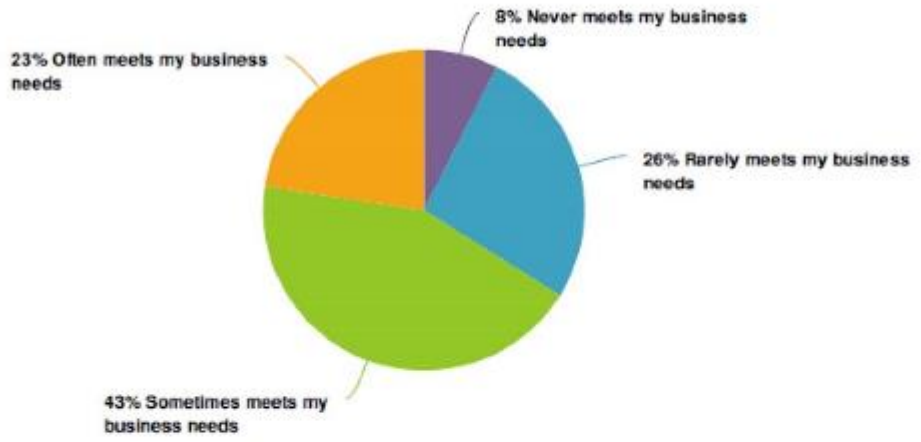
18. Thinking about the totality of your employees' use of broadband and computers, please characterize the relative significance of the following technology problems, in your experience.

	Not at all significant	Somewhat significant	Moderately significant	Very significant	Extremely significant	Responses
Inadequate broadband service at your business Count Row %	9 17.6%	5 9.8%	10 19.6%	10 19.6%	17 33.3%	51
Inadequate residential broadband service at your employees' homes, or your customers Count Row %	4 8.0%	7 14.0%	13 26.0%	11 22.0%	15 30.0%	50
Low quality of computing devices owned by employees or others crucial to your business Count Row %	20 40.0%	7 14.0%	10 20.0%	11 22.0%	2 4.0%	50
Inadequate skills in using computers and broadband on the part of employees or customers Count Row %	16 32.0%	13 26.0%	10 20.0%	7 14.0%	4 8.0%	50
Inability of employees and customers to avoid cyberthreats, scams, and misinformation Count Row %	12 23.5%	9 17.6%	12 23.5%	8 15.7%	10 19.6%	51
Totals Total Responses						51

19. How important is good cell coverage to your business's operations in the following contexts?

	Not at all important	Somewhat important	Moderately important	Very important	Extremely important	Responses
During your employee's commute to and from work Count Row %	11 21.2%	8 15.4%	5 9.6%	17 32.7%	11 21.2%	52
While your employee is at home Count Row %	5 9.6%	3 5.8%	11 21.2%	18 34.6%	15 28.8%	52
While your employee is at work Count Row %	3 5.8%	5 9.6%	13 25.0%	9 17.3%	22 42.3%	52
While your employee is conducting business-related travel Count Row %	3 6.3%	2 4.2%	8 16.7%	11 22.9%	24 50.0%	48
Totals Total Responses						52

20. How often does cell coverage in Vermont meet your business's needs?



Value	Percent	Responses
Never meets my business needs	7.5%	4
Rarely meets my business needs	26.4%	14
Sometimes meets my business needs	43.4%	23
Often meets my business needs	22.6%	12
	Totals: 53	

Appendix C: 2021 Municipal Leaders Survey

10 Year Telecommunications Plan Municipal Telecommunications Survey Report

Response Counts

1. Name

2. Title

Response
Select Board Chair
Selectboard Chair
Town Manager
Town Administrator
Administrative Assistant
Chair Cabot Selectboard
Chair, Selectboard
City Manager
DVCUD board rep
Select Board Member
Selectboard
Selectboard chair
Town Clerk
ZA
select board member

3. Municipality

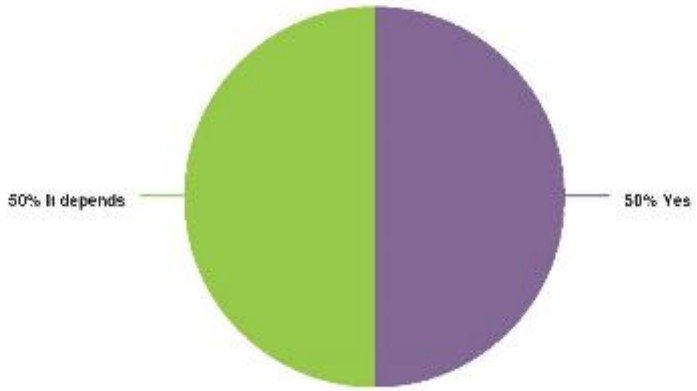
4. Please indicate the level of importance your municipality places on achieving the following telecommunications goals. (1 is "not important" and 5 is "critically important")

	1	2	3	4	5	Responses
Bringing wired broadband (cable or fiber) to businesses Count Row %	0 0.0%	1 3.6%	2 7.1%	8 28.6%	17 60.7%	28
Bringing wired broadband (cable or fiber) to residences Count Row %	1 3.6%	0 0.0%	0 0.0%	3 10.7%	24 85.7%	28
Expanding mobile cellular service to businesses Count Row %	0 0.0%	1 3.6%	7 25.0%	5 17.9%	15 53.6%	28
Expanding mobile cellular service to homes Count Row %	0 0.0%	1 3.6%	6 21.4%	7 25.0%	14 50.0%	28
Expanding mobile cellular service along roadways Count Row %	1 3.6%	2 7.1%	3 10.7%	4 14.3%	18 64.3%	28
Expanding mobile cellular service at locations identified as challenging coverage areas for first responders Count Row %	1 3.6%	1 3.6%	2 7.1%	4 14.3%	20 71.4%	28
Expanding mobile cellular service in natural recreational areas such as State Forests Count Row %	4 14.3%	3 10.7%	9 32.1%	6 21.4%	6 21.4%	28
Totals Total Responses						28

5. Please indicate your community's level of agreement with the following statements related to cell towers.

	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Responses
Our community opposes cell towers in all locations within our municipality Count Row %	10 35.7%	5 17.9%	9 32.1%	2 7.1%	2 7.1%	28
Our community is open to cell towers in our municipality as long as they are visually unobtrusive and blend in with the landscape Count Row %	0 0.0%	2 7.1%	4 14.3%	10 35.7%	12 42.9%	28
Our community is not open to highly visible cell towers in our municipality but would be open to small cell solutions such as equipment placed on buildings Count Row %	2 7.1%	3 10.7%	3 10.7%	9 32.1%	11 39.3%	28
Totals Total Responses						28

6. Would your selectboard likely allow town/municipal property to be used either free of charge or via easement in order to bring cell service to the region?



Value	Percent	Responses
Yes	50.0%	14
It depends	50.0%	14

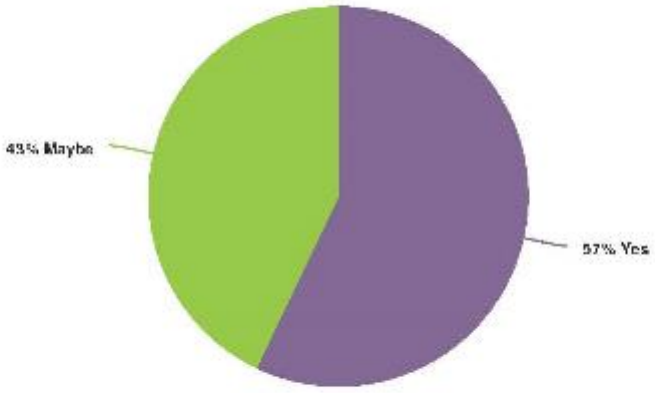
Totals: 28

7. Are there municipal buildings, ideally with a fiber connection, where your selectboard would likely be willing to attach small cell infrastructure in order to bring cell service to that location? This would typically be a 4-foot antenna with some additional equipment inside the building.

Value	Percent	Responses
Yes	50.0%	14
No	7.1%	2
It Depends	42.9%	12

Totals: 28

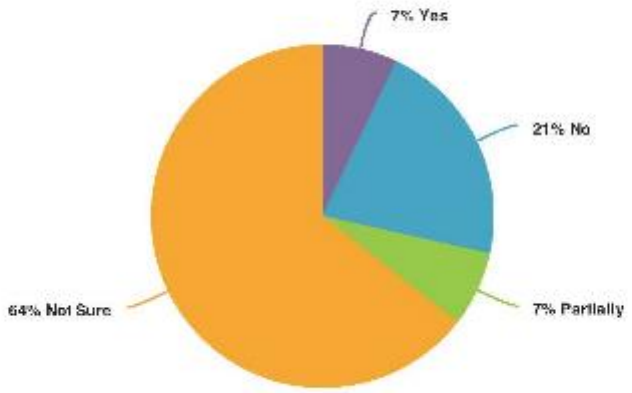
8. Would your selectboard allow employees (likely road crews or police officers) to carry devices in their vehicles that measure cell service so that as they drive, the state can collect better data on mobile signal availability?



Value	Percent	Responses
Yes	57.1%	16
Maybe	42.9%	12

Totals: 28

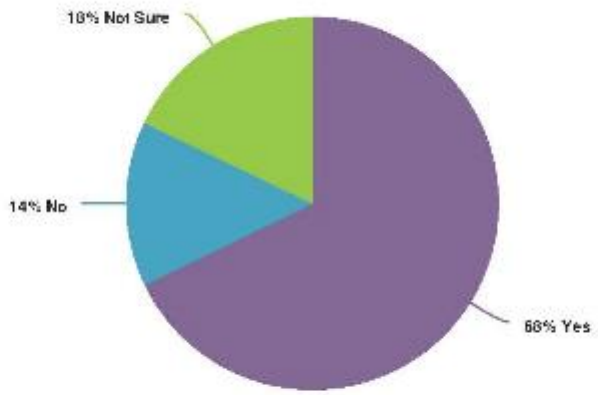
9. Do first responders in your municipality use the AT&T Firstnet system and AT&T equipment?



Value	Percent	Responses
Yes	7.1%	2
No	21.4%	6
Partially	7.1%	2
Not Sure	64.3%	18

Totals: 28

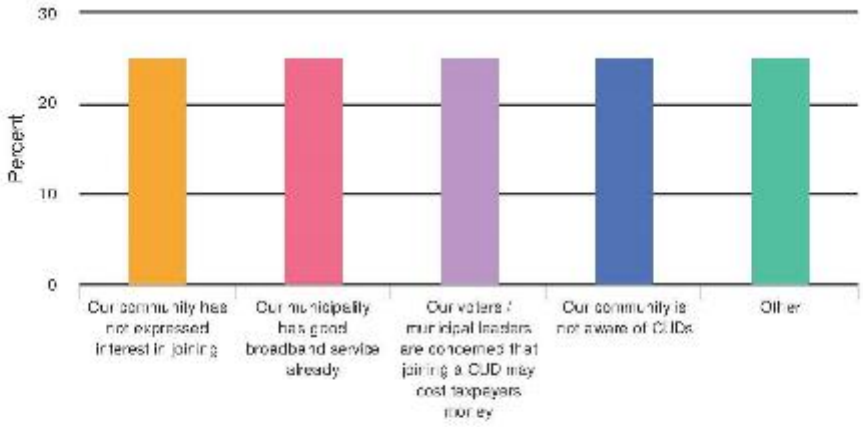
10. Is your municipality a member of a Communication Union District (CUD)?



Value	Percent	Responses
Yes	67.9%	19
No	14.3%	4
Not Sure	17.9%	5

Totals: 28

11. If no, please select the reason(s) your municipality has not joined a CUD

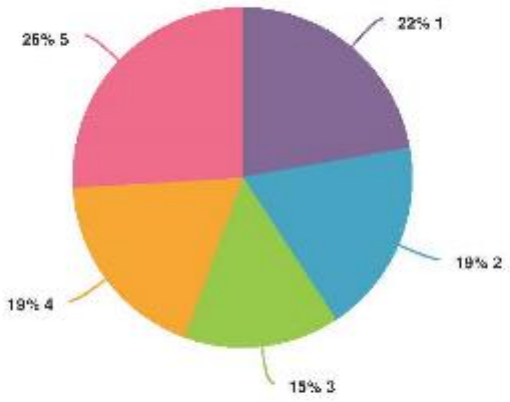


Value	Percent	Responses
Our community has not expressed interest in joining	25.0%	1
Our municipality has good broadband service already	25.0%	1
Our voters / municipal leaders are concerned that joining a CUD may cost taxpayers money	25.0%	1
Our community is not aware of CUDs	25.0%	1
Other	25.0%	1

12. Please indicate the level of importance your municipality places on the following topics when considering a plan for expanded broadband in your community. (1 is "not important" and 5 is "critically important")

	1	2	3	4	5	Responses
Solving the broadband problem as fast and efficiently as possible Count Row %	1 3.6%	0 0.0%	2 7.1%	10 35.7%	15 53.6%	28
Providing a say for voters in the broadband options available Count Row %	0 0.0%	2 7.1%	13 46.4%	9 32.1%	4 14.3%	28
Ensuring broadband options include net neutrality Count Row %	1 3.6%	2 7.1%	8 28.6%	5 17.9%	12 42.9%	28
Ensuring broadband options include no data caps, or other consumer priorities Count Row %	1 3.6%	1 3.6%	8 28.6%	9 32.1%	9 32.1%	28
Ensuring new broadband infrastructure built using state or federal dollars is publicly owned Count Row %	0 0.0%	3 11.1%	8 29.6%	5 18.5%	11 40.7%	27
Creating a public option for broadband service to my community Count Row %	0 0.0%	4 14.3%	8 28.6%	8 28.6%	8 28.6%	28
Ability to access capital specifically for CUDs Count Row %	1 3.6%	0 0.0%	11 39.3%	5 17.9%	11 39.3%	28
Totals Total Responses						28

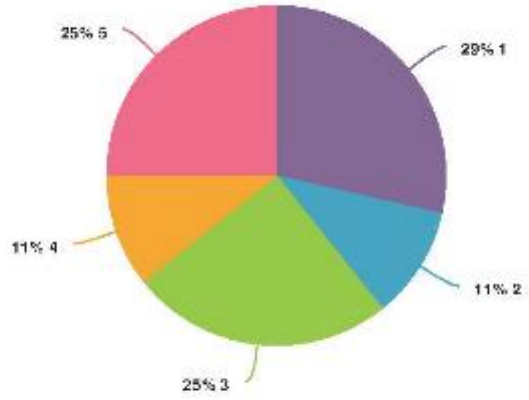
13. How important is Public Access Television in your community? (1 is "not important" and 5 is "critically important")



Value		Percent	Responses
1		22.2%	6
2		18.5%	5
3		14.8%	4
4		18.5%	5
5		25.9%	7

Totals: 27

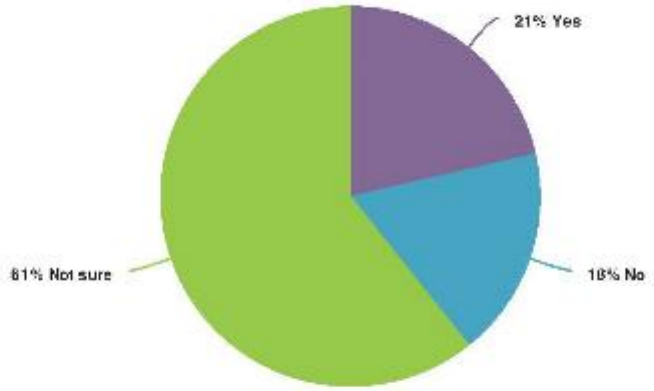
14. How important is Public Access Television in your community specifically for providing voters access to municipal public meetings and deliberations? (1 is "not important" and 5 is "critically important")



Value	Percent	Responses
1	28.6%	8
2	10.7%	3
3	25.0%	7
4	10.7%	3
5	25.0%	7

Totals: 28

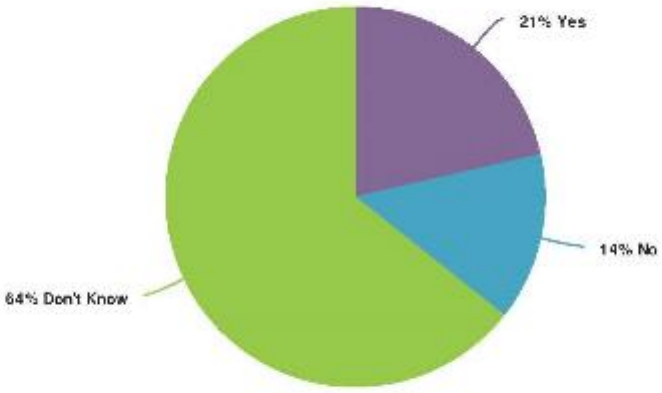
15. If necessary to keep Public Access Television Networks viable, do you think voters in your municipality would be willing to support a small line item in the town budget (i.e. $1 per resident) to support your local PEG station?



Value	Percent	Responses
Yes	21.4%	6
No	17.9%	5
Not sure	60.7%	17

Totals: 28

16. Would your selectboard or community likely support state legislation to allow municipalities to use general obligation bonds to support building broadband infrastructure (similar to what New Hampshire has recently passed)?



Value	Percent	Responses
Yes	21.4%	6
No	14.3%	4
Don't Know	64.3%	18

Totals: 28

Appendix D: Stakeholder Input Provided for This Plan

State Agencies and Departments

- Agency of Commerce and Community Development: Kenneth Jones: *Economic Analyst*
- Agency of Education: Jess DeCarolis, *Student Pathways, Division Director* and Lisa Helme, *State Coordinator of Education Technology*
- E-911: Barb Neal, *Board Director*
- Department of Libraries: Jason Broughton, *State Librarian* Joshua Muse, *Library Consultant – Library Technology,* Thomas McMurdo*, Assistant State Librarian*
- Agency of Digital Services – IT Shared Service: Frank Costantino, *ERP Director*
- Public Safety: Terry LaValley, *Director of Radio Services*
- Agency of Transportation: Costa Pappis, *Policy and Planning Manager*
- Department of Buildings and General Services: Marc O'Grady: *Deputy Commissioner*
- Department of Public Service: Robert Fish: *Rural Broadband Technical Assistance Specialist*
- Racial Equity Advisory Panel: Xusana Davis, *Executive Director of Racial Equity*
- Department of Disabilities, Aging, and Independent Living: Megan Tierney-Ward, *Deputy Commissioner,* Kate Parrish, *Vocational Rehab Coordinator of Deaf and Hard of Hearing Services*
- Department of Agriculture: Anson Tebbetts, *Secretary of Agriculture, Food and Markets*
- Center for Geographic Information: John Adams, *Director*
- Department of Housing and Community Development: Josh Hanford, *Commissioner*

Communications Union Districts

- ECFiber, FX Flinn
- NEK Community Broadband: Evan Carlson, Kristen Fountain, Christine Hallquist
- Southern Vermont CUD: Jeff Such, Sheila Kearns
- Otter Creek CUD, Bill Moore
- Deerfield Valley, Ann Manwaring
- Maple Broadband, Magna Dodge

Internet Service Providers

- Consolidated Communications: Erik Garr, *President – Consumer-Small Business Unit*
- Vermont Telephone Company: Sam Coleman, *Network Engineer*
- Vermont Telephone Company: Michel Guité, *President*
- AT&T: Owen Smith, *President – Maine, New Hampshire, and Vermont*
- ValleyNet, Carole Monroe and Stan Williams
- Waitsfield Champlain Valley Telecom / Green Mountain Access, Roger Nishi, *President*
- Starlink: Mary Evlins

Utilities

- Vermont Electric Power Company: Kerrick Johnson, *Chief Innovation and Communications Officer, Dan Nelson, Vice President, Technology*
- Vermont Public Power Supply Authority: Ken Nolan, *General Manager*
- Green Mountain Power: Liz Miller, *VP, Sustainable Supply and Resilient Systems, Chief Legal Officer*
- Vermont Electric Cooperative: Andrea Cohen, *Manager Government Affairs and Member Relations*

Healthcare Sector

- Bi-State Primary Care Association: Helen Labun, *Director of Vermont Public Policy*
- Vermont Program for Quality In Health Care, Inc.: Hillary Wolfley, *Associate Director*
- AARP: Philene Taormina, *Director of Advocacy, AARP VT*
- The University of Vermont Health Network: Todd Young, *Network Director of Telehealth Services*

Elected Officials

- Representative Timothy Briglin

Other Stakeholders

- Berkshire Telecommunications (author of PEG TV study): Peter Bluhm, *Consultant*
- Equal Access Broadband, Holly Groschner
- CCTV Center for Media and Democracy: Lauren-Glenn Davitian, *Executive Director*
- Vermont League of Cities and Towns: Ted Brady, *Executive Director*

- Vermont Principals Association: Jay Nichols, *Executive Director*
- Vermont Chamber of Commerce: Betsy Bishop, *President*
- Vermonters for a Clean Environment: Annette Smith, *Executive Director*
- Vermont Technical College: Patricia Moulton, *President*
- Vermont Council on Rural Development: Paul Costello, *Executive Director*
- Vermont Community Foundation, Dan Smith, *Executive Director* and Sarah Waring, *VP for Grants and Community Investments*

Note: Input and information from interviews performed by the project team during the preparation of Vermont's Covid-19 Response Telecommunications Recovery Plan in fall 2020 was also used to inform this 10-Year Telecommunications Plan. For a full list of everyone interviewed for the Covid-19 Response Telecommunications Recovery Plan, please refer to that document, which can be found on the Vermont Public Service Department's website.[159]

[159] "Covid-19 Response Telecommunications Plan," CTC Technology & Energy and Rural Innovation Strategies, December 2020, https://publicservice.vermont.gov/sites/dps/files/documents/VT%20Emergency%20Telecom%20Plan_Final_Dec%202020.pdf

Appendix E: Alignment of Plan to Statement of Work

The following summarizes the ways in which this 10-Year Telecommunications Plan satisfies the requirements set forth by the state in the agreed upon Statement of Work for this report (Attachment A, Contract # 41275)

1. ***Ten year overview of expected future requirements for telecommunications services***
    - **See Section 4, 10-Year Technology and Usage Trends**

2. ***Survey of Vermont residents and business***
    - **See Section 2, Telecommunications Challenges and Needs in Vermont**

3. ***An assessment of the current state of telecommunications infrastructure.***
    - **See the following sections:**
        - **Section 1, Executive Summary**
        - **Section 2, Telecommunications Challenges and Needs in Vermont**
        - **Section 3, Identified Broadband Gaps in Vermont: Overview of Service Based on State Broadband Mapping and Testing**

- ***An assessment, conducted in cooperation with the Agency of Digital Services ("ADS") and Agency of Transportation ("AOT") of State-owned and managed telecommunications systems and related infrastructure and an evaluation***
    - ***See the following sections:***
        - **Section 2, Telecommunications Challenges and Needs in Vermont**
        - **Section 5, Technology Assessment and Recommendation for Fiber for Unserved Areas**
        - **Section 6, Infrastructure Design and Costs for Unserved Areas**
        - **Section 13, Recommendation to Support PEG**

- ***Assessment of opportunities for shared infrastructure***
    - ***See the following sections:***
        - **Section 7, Possible Structures for State Broadband Funding Programs to Address Unserved Areas**
        - **Section 11, Recommendations to Improve and Expand Mobile Service**

- ***PEG television analysis***
    - ***See the following sections:***
        - **Section 2.2.2, Public Comment**

    - **Section 13, Recommendation to Support PEG**

- ***Assessment of status, coverage, and capacity of telecommunications networks and services***
    - ***See the following sections:***
        - **Section 2, Telecommunications Challenges and Needs in Vermont**
        - **Section 3, Identified Broadband Gaps in Vermont: Overview of Service Based on State Broadband Mapping and Testing**

- ***An analysis of alternative strategies to expand broadband and increase network resiliency***
    - ***See the following sections:***
        - **Section 5, Technology Assessment and Recommendation for Fiber for Unserved Areas**
        - **Section 6, Infrastructure Design and Costs for Unserved Areas**
        - **Section 7, Possible Structures for State Broadband Funding Programs to Address Unserved Areas**
        - **Section 8, Recommended Resources and Support for State Program to Address Unserved Areas**
        - **Section 9, Framework of Business Models and Negotiation Opportunities for CUDs**

- ***Emergency communications initiatives and requirements***
    - ***See the following sections:***
        - **Section 1, Executive Summary**
        - **Section 2.4, Public Safety**
        - **Section 12, Recommendation to Support Public Safety**

- ***Analysis of regulatory and legal barriers facing state action***
    - ***See* Section 14, Legal Analysis**

- ***Initiatives to advance state telecommunication policies and goals***
    - ***See the following sections:***
        - **Section 1, Executive Summary**
        - **Section 5, Technology Assessment and Recommendation for Fiber for Unserved Areas**
        - **Section 6, Infrastructure Design and Costs for Unserved Areas**

  - **Section 7, Possible Structures for State Broadband Funding Programs to Address Unserved Areas**
  - **Section 8, Recommended Resources and Support for State Program to Address Unserved Areas**
  - **Section 9, Framework of Business Models and Negotiation Opportunities for CUDs**
  - **Section 10, Addressing Demand-Side Broadband Challenges**
  - **Section 11, Recommendations to Improve and Expand Mobile Service**
  - **Section 12, Recommendation to Support Public Safety**
  - **Section 13, Recommendation to Support PEG**
  - **Section 14, Legal Analysis**

- *The contractor's team shall participate in weekly conference calls with the Department of Public Service staff.*
  The contractor's team has participated in weekly conference calls as well as additional meetings with the Department of Public Service staff.

- ***Public Comment Draft and Final Draft of Report****.*
  The contractor has worked closely with the Department of Public Service in pursuit of adherence to all relevant timelines and statutes.

Appendix F: Public Comments Received

Responses to online form question: Broadband Policy: What do you want the state to consider when forming the Vermont 10 Year Telecommunications Plan?

People need internet service for work and school. It is hard to believe that living on a main road, we are forced to pay extra for satellite service due to no internet access in my area.
Service to be treated as a utility and regulated as such. If Gov. Scott hopes to have younger, working age groups to move to VT; lack of high speed internet will be the deal breaker. VT's youth need access in their homes at affordable prices for working parents. Service to be available in all rural areas in VT, treat as you would other utilities.
Expanding and improving Broadband should be the state's top priority from an economic development standpoint.
Continue to look at the future sustainability of community media in Vermont.
My broadband through Consolidated DSL has been no better that 200kbs download. Starlink {Elon Musk} recently changed the game - my satellite broadband is now 200-300 Mbs with almost no down time. Maybe better than fiber if we ever see it. And cheaper. Technology has been changing faster than state government is capable of reacting. Your 10 year plan will probably be out of date within the first five years. You are going to need a faster plan to keep up with the private sector. I understand that you are considering replacing the state's 50 year old mainframe computer - Private business replaces their computers every 5-10 years. Do you know any business trying to operate on Windows 98? Many of us are trying to operate on internet speeds barely above dial-up.
there is a lot of talk of cable and upgrades to fiber. You seem to have forgotten the amount of copper / DSL out there. I have lousy DSL, maxed at 12mbps though I rarely get it and pay a ridiculous amount to Waitsfield Cable for the inferior connectivity. I pay less in a rental I own in Burlington for 200mbps! CRAZY. include upgrading this in the cost estimates so we with unreliable DSL get some consideration.
Reliability over affordability. Don't forget about the little roads, cover all 911 addresses. Trusting the CUDS.
Transparency of information and research. Affordable access for all. Maybe build where there is no access and expand to where access is already available, therefore those of us that live in rural VT can get service sooner rather than wait, as we have already been doing for years. Share information via local papers, as well as other platforms such as online.
Any plans to expand broadband must include and integrate resilient E911 service that is not interrupted during power outages, particularly for people with needs and the disadvantaged. I also share the concerns expressed by Jonathan Gibson, regarding ensuring public access to information. Public disclosure of telecommunication information is fundamentally necessary to ensure the reliability and resilience of Vermont's telecommunication systems, the cost-efficient and accountable expenditure of public funds, and the safety and welfare of Vermont citizens.

I offer these comment on behalf of the Vermont Public Interest Research Group and our 50,000+ members and supporters statewide. VPIRG intends to offer more comprehensive comments on the final draft version of the plan. However at this stage we'll offer that we generally support the high-level recommendations contained in the draft. That is, we continue to believe that the state must pursue policies that will deliver affordable, reliable, consumer-friendly internet service capable of at least 100mbps symmetrical service to every Vermont address. And we believe the best way to achieve that goal is through fiber deployment via the state's Communications Union Districts. We also appreciate the plan's recognition of PEG TV's importance for education and civic engagement, and the challenges these stations face. We support the recommendation that the state work to identify a sustainable revenue source to support these organizations. Finally, we will note one topic that we believe is absent from the plan – and this is an analysis of what public safety vulnerabilities a transition from line-powered communications infrastructure to non-line powered technologies poses. As has been already stated, VPIRG does strongly support the state's rapid adoption of fiber-to-the-home broadband for every Vermont address. However, in a state with poor cell service – reliance on non-line powered technologies for voice service means many Vermonters can be left without the ability to make emergency calls in the event of a sustained power outage. There are solutions to this – including but not limited to better consumer education, financial and technical support for battery backup solutions, and improved outage reporting requirements. Some of these solutions are even currently being deployed. This is acknowledged in the plan in section 4.1.1 – and is somewhat addressed by the recommended CUD network standards; but we'd encourage the planners to address this issue in more detail.

One can recognize the large task to establish a 10 year telecommunications plan particularly given the State's experience during COVID-19. Thank you for doing so. The current document is in many ways what one might expect as a consultant's proposal rather than a Vermont plan to be put in action. To be other than a "plan on the shelf," this document as a guider of action needs to offer real insight as to the obstacles to be overcome and how Vermont's Public Service Board is addressing these through inquiry and process. Some of the potential obstacles are even pointed out. Two that I speak to in these comments are on page 15. The first deals with broad band. "In addition to universal accessibility throughout the state, affordability in both installation and ongoing subscription costs were of great concern. The importance of network resiliency in the face of events like storms, a need for awareness around differing levels of climactic impact among broadband technologies, and general disappointment in the track record of for-profit internet service providers were also expressed." The overall plan rests on the availability of reliable electricity. Vermonters who live in areas that have lost power for a week at a time, know well how fragile modern life becomes when there is no electricity. That the Public Service Board reports no inquiry process within the plan for dealing with broad and deep power outages is an oversight that really needs to be amended. The 10 year plan will affect every person and household in the state in some way. We cannot have the plan rest on something that goes away when we most need it. We need for the Public Service Board to study the problem and offer Vermonters its recommendations for reducing and/or overcoming the dangers of power outages, particularly in winter. Vermonters need recommendations from the PSB that are fully thought out, safe, affordable and take into account climate change and rural Vermont life. Many of us remember and continue to live the fiasco offered by VTEL et al during the change to fiber optics. During their first extended power outage, customers recognized quickly how rather than progress how poorly the new system functioned: 'batteried' units with no off switches in their cellars were live for only a few hours. We need to learn from that situation at least not to increase a difficulty during an emergency.

Duncan Cable TV PO Box 685 Wilmington, VT 05363 6/4/2021 As the owner/operator of Duncan Cable TV, (DCTV) in Wilmington, Vt., I wish to offer the following comments in areas I believe the Vermont Tlecommunications plan must address. I have written my comments which I feel are vital to the overall success of Vermont's efforts to build out Broadband, Fiber to the Home (FTTH) in the remaining areas of our state which have remained extremely economically challenging to construct. The first area which has contributed significantly to our inability to affordably buildout the small, remaining areas of the 2 towns we serve is personal property taxation. History Duncan Cable TV like all other Cable companies licensed to sell service in Vermont, have always paid local and now state wide property taxes on it's personal property. This category includes cables, including fiber optic cables, distribution equipment and other numerous types of technology we have in service. Over the last 49 years, we have never enjoyed any tax break when it comes to annual personal property taxation. On the other hand, Telephone companies have been exempt by statute from having to pay any personal property taxes. This Telephone company exemption has been in place since the 1930's. Currently In today's world of “connectivity”, the long standing boundaries defining what types of services a Cable Broadband company vs Telephone DSL company sells, have for the most part melted away. Telephone companies now offer Video content like Cable and Cable companies now offer Telephony like phone companies. Consequences of inconsistent property taxation policy As noted for decades in the Vermont Telecommunications Plan, Vermont's requirement that Cable TV Broadband providers must pay local and state personal property taxes on their equipment while DSL Telco's are exempt, is unfair and an impediment to Broadband Cable companies fully building out their served areas. For example, a 4 million dollar investment in DCTV's Broadband FTTH network results in approximately a $108,000/yr personal property tax bill. A 4 million dollar investment in a telco's DSL FTTH network results in a $ 00 property tax bill. It's worth mentioning that Telco's and other property tax exempt entities are not bogged down every spring filing Vt Property valuation forms and related, calculated information to state and local lister boards. Nor are they bogged down each year when appealing grand list values is necessary. Doubling down on inconsistent property taxation policy Fast forward to today's CUD proposals, they, along with their potential partners, are seeking personal property tax exemption and offer Telecommunications services in direct competition to existing Vt. Broadband Cable providers who do not receive the same exemption status. Extending property tax exemptions to CUD's and their partners such as Washington Electric for example, will only serve to tilt the already unfair playing field in favor of some new providers over other legacy providers without real justification for doing so. Solution All telecommunications providers must be treated equitably when it comes to personal property taxation. It is my understanding that the Vermont Department of Public Service agrees with this position. This Vermont Telecommunications Plan should include a clear path to where any and all Vermont providers of telecommunications services, both wholesale and retail must pay local and statewide personal property taxes in a fair and equitable manner, with no exceptions. CUD's CUD's must be required to compete for any funding opportunities with existing FTTH providers like Duncan Cable TV through an application process which is merit based. The Department best knows, from day to day experience, important considerations such as: Existing experience in the town where the app is being made, Experience and customer service record with the VDPS, Financial worthiness as demonstrated over many years of service, Other previous commitments in the town as it may relate to a company's deserving nature. Solution The new revised plan should provide a clear, specific and merit based process which paves the way for the buildout of Vermont Broadband ubiquity. Thank you for this opportunity to comment on this important issue.

New State-funded FTTH deployments should be designed to be Active Optical Network (AON) GigE networks, not Passive Optical Network (PON), to allow for the greatest speeds available to end users, greatest overall network capability, and CUD flexibility over time to change ISPs if needed. Limiting the State's goals to 100/100 Mbps would leave Vermont Telephone Company as the sole GigE FTTH network in Vermont. AON GigE is the "future-proof" design standard. It would be unfortunate for the State to invest hundreds of millions in fiber with the goal of a "future-proof" broadband solution, but have it deployed based on less than optimal design. Regarding AON v PON reliability, all fiber systems require electricity at both ends. Any interruption in that will necessitate the use of batteries, generators, or other alternate energy source, in order to continue operating. This is true of both passive and active systems. In this there is no difference. As for a gain in reliability against a fiber cut: a fiber cut will affect both types of systems in nearly the same way, which is to say that if the path of the fiber is broken anywhere between the serving office and the customer, then service will be interrupted. Active systems are often actually more resilient here in that if the fiber cable is partially-damaged in an active system it will only affect the customer attached to the damaged strands, versus potentially impacting 32, 64, or more that could be impacted by a damage to a fiber in a passive system. Another other area of reliability-gain in an active system is that each fiber strand connects to an individual transceiver. A single transceiver failure in an active system will affect a single customer versus 32, 64, or more in a passive system. These transceivers in the serving office are also where the referenced increase in power consumption occurs in an active system. Each active transceiver typically consumes up to 1 watt of energy (each serving a customer), and the calculated per-customer power consumption in PON is in the 0.8 watt range. Even if you want to deploy passive systems today you should still construct the fiber plant as if you were planning to deploy active… and then use the passive if/when you need to in the central office or at the end of low-count fiber cables. Active is the simple, off-the-shelf, solution whereas passive requires specialized equipment. Cost savings for electronics and the future technology development will be greater with active because it's technology that is being used in virtually every home, campus, office, and data center today. If there's money to build fiber in the first place, do not limit yourself in the way you build it (regardless of what electronics are chosen today or down the road). A network of fiber laid out to support passive won't, in most cases, easily be able to migrate to an active model without a lot of additional costly fiber construction. A network of fiber laid out to support active can easily support a passive model if preferred. There are really no drawbacks to an active design other than the incremental cost increase for materials. The labor (other than the splicing itself) is the same, and you've built an infrastructure that has a much lower chance having to be re-designed/rebuilt down the road. In the interim ~5 years expected for FTTH to be built out universally, nearer term solutions for improved broadband access are needed. Fixed wireless offers the benefit of improved broadband speeds via technology that can be deployed quickly, allowing CUDs an immediate solution to offer to their member residents while CUDs are deploying FTTH. Fixed wireless technology is currently capable of delivering several hundred Mbps to end users, and will soon be capable of 100/100 Mbps.

Comment submitted via e-mail to DPS 6/5/21, 4:22 pm Please let me know if any of these submissions are not accessible, and I will resubmit in another format. Jonathan Gibson Shrewsbury, VT 05738 802-492-3665 Comments: Attachment A Best Practices for Maintaining 911 Continuity (Oct. 11, 2019) Attachment B Concluding Memo to PUC, particularly Section B relating to Best Practices (Nov. 3, 2019) Attachment C Shrewsbury Selectboard letter to Commissioner Tierney, January 16, 2019

Fiber-to-the-premises at every Vermont E911 address by January 1, 2022.
providing equal access to all....state and local buildings to provide free public access
Real broadband for back road communities!! Support for CUDs who are accountable to the whole community - not acceptable to have major corporations decide which customers are not profitable enough to provide service. This is an absolutely critical piece of infrastructure as someone who works from home and has kids using internet for school.
The State must prioritize those of us who live rurally on back roads. Where I live we pay $146/month for internet with Consolidated Communications. They have not invested in upgrading lines on our road for many years. We have two modems each with a speed of 7/1 which isn't technically Broadband. It is totally unacceptable and made for such a difficult year of schooling and working from home with a family of 5. Vermont needs to do better.
Please consider: 1) That broadband is always increasing in speed so we need the plan to include the ability for the speed to increase. 2) Cost needs to be AFFORDABLE to every Vermonter. 3) when people live far off the public road there needs to be an affordable way to bring broadband into them. 4) EVERY Household in VT needs To have access to affordable broadband before the end of 10 years.
Fiber connections ONLY! To all homes and businesses.
There should be pressure on providers to extend lines. We are less than a mile from Comcast lines and extending to us would also serve many other customers. I am a furniture makers and have taught woodworking in the past and would like to teach through streaming video but that is impossible with the service that we have.
Bring access to free wifi to all federal & state funded affordable housing sites
We who live in rural towns need true broadband internet--and please do not trust private providers for information on who has it now. We were promised a much better service than we're getting with DSL but there is no other option. We need fiber optic! And in a sparsely populated area private enterprise is not going to upgrade service unless it gets large incentives.
First and foremost: The HEALTH and well being of the flora, fauna and humans who abide in Vermont together. In other words, take a look at the decades long studies on the effects of radiation on LIFE cells, and ask yourselves: is this for the greater good? Or is there a more nefarious agenda meant to destroy humanity before the god AI? And this is a very real consideration, given the 20k satellites beaming who knows what on us because there is no accountability, and no oversight - and all of sudden we have a pandemic at the same time. So. Slow the heck down, and take a breath. This can NOT be about 'faster communications'. People have always shown up where they needed to be when they needed to without the surveillance, big brother, AI model of what we SHOULD be doing. And its worked for millions of years. Put LIFE first with a fine toothed comb, every single word of the

way, clearly and transparently: NO LIFE SHALL BE HARMED BY DEPLOYMENT OF ANY TELECOMMUNICATIONS DEVICE. Consider it that simply put.
This should be a top priority, especially in rural areas!!!
There are people - like us - living on dirt roads in Vermont that cannot complete work from home without driving out to search for decent internet 20 minutes from home. This limitation, especially during the pandemic, has caused loss of income.
Access to affordable, reliable internet & cell service is critical for people in rural areas such as Franklin & GI counties. While the pandemic has made it clearer it has been a problem before the pandemic started. It needs to happen ASAP. While build outs are happening, temporary alternatives should be implemented - mobile solutions such as school buses at local sites, etc.
Use Star Link. It's the cheapest option by far. The coverage will be solid in another year.
Highspeed access EVERYWHERE. I mean 200mps up/down at a minimum. Work is very difficult with low broadband rates. Small towns like ours can't be ignored over rich "flatlander" towns like Stowe, Woodstock, Burlington… Also, rates need to be reasonable, there needs to be options for vendors and folks who can't afford it should be provided with free internet (once THOROUGHLY VETTED to prevent fraud).
Please expand broadband coverage and ensure adequate signal quality. Please consider affordability: Xfinity offers a program for income-eligible families which broadband affordable at a flat rate and accessible whereas other companies such as Consolidated Communications are more expensive for families that live where Xfinity is not available.
that all people have access and that the companies who are to supply this service provide a fee that is not subject to change based upon amount of use-
Increase speed to the "last mile" homes. My internet speed is 1.5 MPS. Consolidated, my provider has said that I do not qualify for an upgrade. I am paying the same price as people who are getting faster speeds!
Get broadband to those without first. Even if it is 25mb it is still better than end of the line DSL or nothing at all. We don't even have cell coverage where we could use a hotspot.
Vermont needs to create a Broadband network that is accesible and reliable to all areas in vermont w/o exception. It is unacceptible to me and and everone in my neighborhood that we don't have reliable access to internet, cell phone access, etc. And, this should have been started 10 years ago not now. It appears that Vermont was asleep at the wheel while the rest of the country was moving forward. VT should be looking at a 2-3 plan to get basic and reliable internet, tv and cell service.
Reliable internet should be considered a utility in the same scope as clean drinking water and heat. This should be defined as having at LEAST 25 MBPS Download speeds, 5 MBPS Upload, with a lag/ping at or below 45. Outages should be below 1 hour downtime per month. We live on a dead-end road in Waltham VT and have been turned down for service by

ALL ISPs except Consolidated Communications, which after years is only able to offer us 10 MBPS Down, 1 Up, ping over 60, and the internet goes down almost daily. Fiber surrounds us on route 7, there are several ISPs who service our neighbors with fiber and high speeds who refuse to come down our road, despite the 10 homes that would willingly pay for it.
Ensure reliable and affordable access for all residents. Consider charging extra or fees for lodging/tourists.
Affordable and available to all Vermonters
That everyone should be able to get high quality internet service. I pay a ridiculous amount for satellite internet (thats all I can get) and its not good service.
Like electrification, telecommunications and broadband must be built out to the most rural areas of Essex County. Do not rely on the private companies. They will not come for us because they won't, because they cannot profit. We are Vermonters, too. The NEK does not end in Newport or Island Pond, it goes all the way to the NH border and we need the equity of other areas of VT in far Eastern Essex County. My Selectboard will NOT join the NEK Broadband CUD and is taking a very conservative and suspicious approach that the CUD will wind up costing out tiny town a lot of money, and they are not sure it is the solution. We need support and organization in this area. Our students had difficulty reaching remote learning, and had difficulty paying for Broadband. Consolidated Communications is the only provider that will come to my home and most in our area. They will not participate in the relief of the Emergency Broadband Benefit. The poorest, and most remote people of the state cannot benefit from a program made for us. It is time for Essex County to get the equity it deserves.
Avoid private companies for expanding broadband access. Comcast for example won't lay down new lines unless it's profitable for them, has instituted data caps, pushes modem rentals onto customers for extra fees, and privacy concerns of what they use your data for. Public broadband like town initiatives have proved while expensive means the service is there for the residents and provides competition. Spectrum and Comcast for example will line out where to monopolize their infrastructure so there's few locations with both competing against each other. Expansion into 5G towers with cell service based modems would help make last mile delivery easier. Especially in difficult to reach areas for laying fiber down.
Availability of good high speed internet at affordable prices without need of a land line
Affordability & Full, Equitable Access Needs for education, public health and safety, lower income access, business activity, social connectedness... Elimination of dead zones--100% access regardless of location, income level, etc. This should be like Sen. George Aiken's REA. Environmental and health impacts of improving Broadband service Progressive rate structures Availability of special rates for elderly, disabled, low income
High speed fiber to the doorstop for all Vermonters. There is a de facto monopoly.
To provide good options to Vermonters living in rural areas. To consider latency as much as upload/download bandwidth. To avoid giving all the power and responsibility to monopoly ISPs (Comcast) so there's competition.

-Fiber to the home available to all businesses and residences in Vermont -Competition in Fiber providers -Encourage community, cooperatively, & employee owned providers
Not just broadband ACCESS but also speeds, costs and reliability. Our current access is poor, but at least we have it. The speed barely allows us to do our remote work. To remedy this, we don't even have a solution. We're waiting for Starlink access, but this isn't affordable for most Vermonters. We need access that isn't affected by weather conditions.
Getting access to EVERYONE--the "last mile" problem is huge but necessary to overcome. VT cannot grow or even sustain itself economically without accessible broadband. As a young person, why would you stay in or move to VT if you can't get effective internet access to enable you to do your work?
Service for everyone
Affordability, helping underserved areas get connected, develop the plan with public libraries involved, equitable for all.
Upload and download speeds have not kept up to date with my provider. This causes buffering, depending on how many are using at the time.
Many remote workers cannot locate in our area due to poor internet service. During covid, students and parents have been at a disadvantage if they live here. My own children visit less frequently because they do not have good reliable service in my house, and it is a huge disincentive to them relocating here.
Extending broadband service to those homes who currently do no have it is more important than improving locales that already have access to broadband services. Once all homes are connected, then companies can work on improving existing connections. If both can occur at the same time, great. I need more than this dial-up connection.
Make it better
Availability and affordability of broadband services. Broadband needs to be defined, ideally as a minimum of 50mbit service. Ideally 100mbit should be the longer target for 10 years, most cities are already at gigabit+ speeds. But most Vermonters are only able to get 5/10/15mbit services in many communities (if any at all)
Underground , fiber.
Promoting competition in fiber rollout.
Bring broadband to under-served areas. The larger towns and cities already have broadband that runs rings around the 7/1 DSL which is the fastest available in my part of Monkton (not to mention that it slows to a crawl whenever it rains or the wind blows hard). I work for a company that is out of state, and often have to drive to a public broadband WiFi access to participate in video conferences, and my kids online schooling is full of freezes and pauses.

Universal access. Some towns have multiple phone companies
We need to expand broadband greatly! It is amazing how being one house around a corner can cut you off from the option of having broadband. We are two houses from on company and one house from a second. It will cost us thousands to run it to our house for the privilege of paying huge fees to use it.
More access in rural areas, improved offerings for rural areas.
We need more reliable and more up to date broadband and broadband access for families, people in the work force especially those who work from Home.
Affordability especially for basic service, choices for providers to maintain competition, choice in methods for access (wired vs non), data privacy, availability to all Vermonters— even in low and remote population areas, and freedom to change carriers.
We need Fiber Optic with Internet speeds a Minimum of 200 Mbps download and 100 Mbps upload. Ideally, we should be able to achieve a download speed of 1Gbps and upload speed of 500 Mbps (but I don't want to appear to be too "greedy"). If we want to attract new families and companies to Vermont (and keep our talented graduates in Vermont), we must be able to provide adequate and fast broadband access. DSL speeds are just not "cutting it". Presently, we have DSL with 13.7Mbps download and 0.74Mbps upload speeds. Fortunately, we do not have any schoolchildren needing the Internet for remote learning, nor anyone working remotely from home. It is beyond our means ($$$) to have fiber optic connected to our home from the main line on Bristol Road.
Access to high speed Internet from small towns
The concept of universal phone service was important many years ago. I believe this concept extends to broadband now given how dependent our economy and social lives are on having access to the internet. I would love to see ubiquitous, high quality, reliable, affordable service available to all.
Equal, efficient, effective connection for all people in all areas of the state. No blind spots, spotty or slow access--at reasonable cost.
Broadband access for everyone, including public options that are less expensive than private ones now available.
Accessibility Equity Treating it like electricity-everyone needs to be able to get it
Equal, affordable, and quality connections for all Vermonters. Also to build for the future by making expansion of the system viable by planning for growth before implementation.
Please make fiber optic broadband the primary and secondary goal for all households, organizations and businesses in Vermont. Fiber is the fastest, most reliable, and technology proof option available. It not only will it save money in the long run over other stop gap

measures, but it is the most environmentally sound broadband option, contributing the least amount of GHG emissions to the climate crisis in the short run and in the long run compared to other options such as Starlink, cable and satellite hook ups.
Statewide cell service with creative antenna siting
Please consider as part of the plan, hardening and storm proofing any new or upgraded sections of the ground and pole system. Ideally, running cable and or fiber underground when possible.
Please ensure all the roads have adequate broadband. Rounds Road does not meet the high speed standard.
Affordable pricing. Universal connectivity. Climate-friendly and sustainable solutions. No eyesores
Improved service and coverage of internet and phone service at real speeds not 5mbps
Similar to the rural electrification initiatives from the late 19th and early 20th century, the amount of capital required to get high-speed synchronous internet connectivity to every household can be intimidating. The network connectivity benefits for VT will be similar to the benefits of electrification. It will be a draw to potential new VT residents and a strong incentive for existing Vermonters to stay. The CUD model is unique in the country, in a very good way. VT can lead the nation in equitable and responsible connectivity for everyone. Please keep the CUD funding active.
Additional funding and support for community access television stations and statewide broadband accessibility.
Regard it as a utility. Include ongoing Consumer education.
I serve as an alternate on the governing boards of the Southern VT and the Deerfield Valley Communication Union Districts. I feel that it is imperative that every citizen has access to affordable and reliable broadband internet access. The internet has evolved into an essential communications infrastructure. Individuals without access to this infrastructure are put at a significant disadvantage to their peers both domestically and globally. The recent COVID-19 pandemic has further illustrated the necessity of the internet for access to economic, educational, health, and social services. I also feel that the current definition of broadband at 25 megabits per second download by 3 megabits per second upload is inadequate for access to the services previously mentioned. Many of the current and proposed cable, DSL, and wireless solutions function at or below this minimum standard and do not offer a long-term solution. While expensive, fiberoptic cabling to the premises is likely the best future-proof option. I would like to see the state focus on supporting the development of a fiberoptic network that will deliver reliable and affordable broadband internet access to every individual who would like to like to have it.
In order to have a good paying job in Vermont, every house needs two things, electricity and reliable, affordable, high-speed internet connection.

As a resident of Putney, I am a volunteer governing board member of the 21-town Deerfield Valley Communications Union District (DVCUD). The reason I'm volunteering for this project is that the values of the communications union district (CUD) reflect my values, which I believe are in the best interest of the public. The pandemic revealed in stark terms the cruel inequity of one neighbor being able to stay home and rely on her/his Internet connection to safely and effectively work and attend school, while a mile down the road, another neighbor's poor connectivity created a very real barrier to employment and/or education, and ultimately, to her/his safety. CUDs are designed for and committed to providing what private firms have not been able or willing to do--offering a future-proofed product to every last address. Even those consumers fortunate enough to get decent speeds from one cable provider at whatever price is charged will benefit from having more than one choice, as competition improves affordability. Due to the rural nature of Vermont, we can't rely on the private sector alone to solve our connectivity problems; it must be a public-private partnership. Nine CUDs around the state have been formed for this reason; telecommunications policies should favor and support CUDs as a key component in bridging the digital divide.
Commitment to provide fiber optic service or equivalent web speeds to all residences and business locations in Vermont.
I will submit this separately
Broadband that is fast, symmetrical, reliable, affordable, and available to everyone, ASAP, with prompt, skilled, friendly customer service 24/7. As much as possible, rely on CUD's to ensure that everyone is served and served well AND affordably. The big, national, for-profit ISP's have failed to deliver. Let's not be fooled again.
fiber optic only. no wireless. Outlaw satellite transmission.
The plan should strive to support affordability and ensure public funds are reinvested in the kind of local telecommunication companies that prioritize customer support and reasonable pricing. Having affordable 1 Gbit/s up & down Internet speeds at our small TV studio makes all the difference in our ability to serve the public information quickly. We would like to see more investment in both broadband infrastructure and online/hybrid meeting tools for towns and volunteer boards.
Be sure current upload and download standards are met for everyone in Vermont and that a mechanism is in place to assure everyone who wants service can afford it.
Invest in Broadband. It's an issue of equity. Figure out how to do it affordably and thoughtfully. Involve the community in decisions around best cell tower placements and try to go on phone poles if possible. This issue has been talked about for years and still, nothin. Hope you do a better job of it than the survey. It was buggy and indecipherable in places.
The importance of making broadband available to all unserved communities. The pandemic has demonstrated how crucial reliable Internet access has become.
Everyone relies on broadband and it will solve equity issues and help with our carbon reduction goals due to less commuting - it's as important as electrical service.

Sorry for the communication problems this afternoon. It is a sign however of the issues, especially we in the rural areas of Vermont have, getting decent Internet service. I pay for 25/3 from Comcast and almost never get it. Talking to Comcast has proven to be a waste of time. If they cannot deliver even 25/3 why should I pay more and still get lousy Internet? I am extremely technical too. I understand what is happening. Imagine all of the people around me and elsewhere in Vermont that do not understand. It is even worse for them. Everything that F.X. Flynn said today I would repeat. Relax, he said it very well so I will not repeat it :-) . Let me add some additional comments. 1. In order to give people and businesses in our rural areas the same services and opportunities people and businesses in the cities get, we need to give rural businesses and residents Fiber To The Premises (FTTP) with all that means. Starlink and its brethren including the cable and phone companies are bandaids, some better some worse, to getting rural areas competitive with the cities. Rural areas are much less FTTP economically well off than cities. A much higher proportion of them cannot afford to pay the prices for Internet the city dwellers and businesses can. All of this leads to our CUDs needing grants not loans. Every dollar spent by a CUD increases the rates their customers will have to pay. Paying back loans and interest will significantly increase the charges their customers have to pay. My mother-in-law is an ECFIBER customer because, several years ago, my wife and I loaned ECFIBER money to bring her Fiber. She went from Dish service to full symmetric Internet in one step that also gave her cell coverage. She cannot afford to pay the bill for ECFIBER's service because ECFIBER had to get loans from individuals and the Municipal Bond Market to get where they are today. That will not work for many rural premises and startups. Our CUDs need the grants to make sure they can deliver Internet at a reasonable cost. I keep saying $25 for 25/25 which is clearly affordable to many more people. I hope we can deliver that starting service at that price. I know Vermont does not have the $400M required to build out FTTP throughout Vermont. It is looking like perhaps Federal Internetification might be in the cards now the way Electrification was in the early part of the last century. I hope so. I hope DPS, the Vermont Legislature and the Vermont administration will all put the money we keep hearing about from the Federal government in the frugal hands of our CUDs right away and with as few strings as possible. Most of our CUDs are in, or close to, the make ready step which is the precursor to building out the network. Please give us the $400M and we will get it done. Another thing that would help CUDs keep our user rates down is to tell our electric companies to lash CUD fiber to their electric wiring on the poles and not charge CUDs for their use of the poles. Since CUDs are municipal organizations too, it is perfectly reasonable for CUDs not to pay the electric utilities.This would let CUDs start delivering Internet much much sooner and at a much lower cost. Without the annual pole rental charges CUDs can continue to keep their customer rates low. Once CUDs have built out their networks, they can generate revenue and stand on their own financially. The money CUDs get from grants and continuing from their revenue will be spent here in Vermont where it will circulate according to economist's estimates 6 or 7 times. The money Comcast gets goes to Pennsylvania and CCI's goes to Illinois never to recirculate in Vermont. An important benefit CUDs bring to their member towns is the opportunity to teach students and interested residents how to install, maintain and run Fiber Internet networks. Fiber networks will be used for at least 20 years and most of the estimates I have seen say 50 years. Having been involved with technology for 50 years I have seen how fast technical innovation happens so I am being more conservative than the prognosticators.

Think of every student and person who has that next great idea in whatever field you can think of. What is the first question they ask when they want to start somewhere? It is the same question every home buyer asks now. Yes, you are correct, it is, "what is the Internet like here?" When the CUDs have finished their FTTP to every premise, the answer is, "you can get world class best Internet here plus look around you at all of the other benefits,

especially in this epidemic world." I hope that is enough to help you understand with what we in rural Vermont are up against and how to help even things out now. These are my opinions. While I am currently the chair of the Lamoille FiberNet Communications Union District, what I wrote above has not been voted on by the Governing Board of LFCUD so they are not from LFCUD itself. Thank you for listening.
Better range
If this pandemic taught us anything it should emphasize the need for broadband!
Vermont should increase broadband access to every part of the state without treading on the individual rights of the people who live here.
Where companies extend lines into areas, the public should recoup the benefits of those services. Both communities when they lend the right of way to broadband distributers and community members in gaining access to a service in a cost effective and accessible way. In other words, if one provider is in an area, the price point should reflect industry norms not 'what the market should bear' prices. If the broadband provider is using the public rights of way, that share should be recouped by the community and used to offset related service costs.
Support Local Television Stations
Universal access is top priority - to allow everyone the opportunity to work remotely, access telemedicine, and for educational opportunity for children and adults.
Support community access television.
Please support local access tv. It offers important information that you can’t find anywhere else.
Public access and locally owned and controlled broadband. Not for profit.
Broadband infrastructure is as essential to life in Vermont as electricity, police, and transportation infrastructure. Ideally the state (perhaps logically thru the VT Department of Public Service) should be responsible for initiating, constructing, and maintaining necessary broadband infrastructure to every Vermonter, and then leasing access by profit driven organizations to this infrastructure, with appropriate conditions and requirements to see that it is used in ways the benefit Vermonters. Provision of high quality, state of the art, broadband should be provided by the State of Vermont in order to best benefit all Vermonters, instead of being provided by commercial entities with the goal of making a profit, which often comes at the expense of service to all Vermonters where/when it would be more costly. Profit maximizing does not provide incentives that line up well with the broadband public interest needs of all Vermonters.

Use fiber optics and wired services directly to businesses and homes whenever possible. Please no 5G wireless! Explore research on the health effects of new technologies before installing them.
fiber to the home, avoid as much wifi as possible
I would like to see the State supporting regional, local, and "hyper-local" uses of broadband and media technologies to keep communities informed, connected and engaged. This should be done through partnerships with community-based service providers and/or institutions - ideally, independent non profit organizations.
Improve broadband service so that all of rural vermont has internet access.
All Vermonters need access to 21st-century communications technology. Without it, people will not be able to sustain a living wage in Vermont and will continue to move to other states. Without fiber infrastructure and access to it, people in Vermont are stuck with second-class Internet. Slow speeds are becoming obsolete and prices for internet access are rising. Slow networks cost more than fiber: https://www.eff.org/deeplinks/2020/06/why-slow-networks-really-cost-more-fiber Every Vermonter should have the option for home internet that provides 100 Mbps download and 50 Mbps upload capacity. If Vermont does not prioritize delivering future-proofed infrastructure to all people, our ability to make full use of the 21st century Internet will be limited.
Everyone, in every corner of the state, needs to have access to broadband. The service is as fundamental as the need for electricity was in the 1930s, which led to the Rural Electrification Act. The state, insuring such service, would actually help strengthen our state's economy. If businesses knew reliable broadband service is univerally accessible throughout Vermont, those businesses could boost their concerns statewide.

Responses to online form question: Cell service, public safety, and public access television. What do you want the state to consider when forming the Vermont 10 Year Telecommunications Plan?

Cell service is spotty and it would be nice to have better. I have no opinion on the rest.
Cell service must be improved for Vermonters. Phone companies are charging higher fees for land lines to eventually discontinue service. Vermonters enjoy outdoor activities, cell service is imperative in case of emergencies.
The 10 year plan needs to emphasize how vital PEG stations are to the communities they serve. This became even more evident during the pandemic when municipalities turn to them to help hold public meetings. The current funding mechanisms are out of date with the way technology has evolved. This plan needs to ensure PEG stations have the resources to sustain themselves and meet the needs of their community.
It is important for the 10 Year Plan to speak directly to the value of PEG, the importance of public access to commercial features of the public network, and the need for new

partnerships and creative solutions to we work through new ways to structure communications fees and taxes to support public uses of cable and telecommunications networks.
I died in September 2013. If the heart attack happened in Harwood High School I would not be typing this because cell phones don't work there. Because it happened in Burlington, cell phone communication saved my life, along with some other lucky coincidence. The point being that landlines are the lifelines from an older generation but they have become the dinosaurs of this wireless telecommunication generation. The state's 10 year plan is already 10 years late in trying to keep up with changes in technology. Can the legislature react fast enough to keep Vermonters out of the dark ages? You evidently don't even have people with the talent to create a consistent survey when question 2 scrolls down and q
Cell service is terrible. the state needs to invest in getting more coverage. how can people work from home if they have slow internet AND non-existent cell coverage. and you can't drive and keep a connection at all. this needs to be fixed. As for PEG, it is important but needs to move from the cable captive delivery. all stations should stream and the state should provide some funding for ROKU players, Apple TV etc. having a public record of public activity is critical.
Trust recommendations of the CUDS.
Cost. In Europe, Central America and Asia I paid $10 a month per line. Here, $65 a month and service is often terrible. Just switched from US Cellular to Verizon and much better. Was stuck in a us cellular contract and did not have service to call for help during allergic reaction. Luckily got a text off and it was seen by receiver. Regulations for companies that if service is inadequate you can leave company without insane cost
Similarly, any plans to replace line-powered phone service with non-line-powered fiber-optic phone service as part of broadband installation must preserve resilient E911 service so that it will not be interrupted during power outages. This is essential particularly for people with needs and the disadvantaged.
I offer these comment on behalf of the Vermont Public Interest Research Group and our 50,000+ members and supporters statewide. VPIRG intends to offer more comprehensive comments on the final draft version of the plan. However at this stage we'll offer that we generally support the high-level recommendations contained in the draft. That is, we continue to believe that the state must pursue policies that will deliver affordable, reliable, consumer-friendly internet service capable of at least 100mbps symmetrical service to every Vermont address. And we believe the best way to achieve that goal is through fiber deployment via the state's Communications Union Districts. We also appreciate the plan's recognition of PEG TV's importance for education and civic engagement, and the challenges these stations face. We support the recommendation that the state work to identify a sustainable revenue source to support these organizations. Finally, we will note one topic that we believe is absent from the plan – and this is an analysis of what public safety vulnerabilities a transition from line-powered communications infrastructure to non-line powered technologies poses. As has been already stated, VPIRG does strongly support the state's rapid adoption of fiber-to-the-home broadband for every Vermont address. However, in a state with poor cell service – reliance on non-line powered technologies for voice service means many Vermonters can be left without the ability to make emergency calls in the event of a sustained power outage. There are

solutions to this – including but not limited to better consumer education, financial and technical support for battery backup solutions, and improved outage reporting requirements. Some of these solutions are even currently being deployed. This is acknowledged in the plan in section 4.1.1 – and is somewhat addressed by the recommended CUD network standards; but we'd encourage the planners to address this issue in more detail.
On page 15, "Also echoing calls for affordable broadband, respondents expressed a strong desire for cell service to not only be universal, but affordable. It was mentioned that a lack of reliable cell service in the state necessitates the maintenance of a traditional landline in addition to a cell phone, thus creating extra expense." Living in an area subject to VTEL's short term battery without cell service within a power outage, these are matters of real concern. Telecommunications are eating a larger percentage of budget and a power outage can become a life and death situation in a hurry. We must look at the underlying plan assumptions realistically. We know we will lose power. The question becomes, how can we deal with it in ways that serve Vermonters and keep them safe. These need to be included in the plan and really discussed with Vermonters. More effort needs to be made to include a broader demographic for comment.
New State-funded FTTH deployments should be designed to be Active Optical Network (AON) GigE networks, not Passive Optical Network (PON), to allow for the greatest speeds available to end users, greatest overall network capability, and CUD flexibility over time to change ISPs if needed. Limiting the State's goals to 100/100 Mbps would leave Vermont Telephone Company as the sole GigE FTTH network in Vermont. AON GigE is the "future-proof" design standard. It would be unfortunate for the State to invest hundreds of millions in fiber with the goal of a "future-proof" broadband solution, but have it deployed based on less than optimal design. Regarding AON v PON reliability, all fiber systems require electricity at both ends. Any interruption in that will necessitate the use of batteries, generators, or other alternate energy source, in order to continue operating. This is true of both passive and active systems. In this there is no difference. As for a gain in reliability against a fiber cut: a fiber cut will affect both types of systems in nearly the same way, which is to say that if the path of the fiber is broken anywhere between the serving office and the customer, then service will be interrupted. Active systems are often actually more resilient here in that if the fiber cable is partially-damaged in an active system it will only affect the customer attached to the damaged strands, versus potentially impacting 32, 64, or more that could be impacted by a damage to a fiber in a passive system. Another other area of reliability-gain in an active system is that each fiber strand connects to an individual transceiver. A single transceiver failure in an active system will affect a single customer versus 32, 64, or more in a passive system. These transceivers in the serving office are also where the referenced increase in power consumption occurs in an active system. Each active transceiver typically consumes up to 1 watt of energy (each serving a customer), and the calculated per-customer power consumption in PON is in the 0.8 watt range. Even if you want to deploy passive systems today you should still construct the fiber plant as if you were planning to deploy active… and then use the passive if/when you need to in the central office or at the end of low-count fiber cables. Active is the simple, off-the-shelf, solution whereas passive requires specialized equipment. Cost savings for electronics and the future technology development will be greater with active because it's technology that is being used in virtually every home, campus, office, and data center today. If there's money to build fiber in the first place, do not limit yourself in the way you build it (regardless of what electronics are chosen today or down the road). A network of fiber laid out to support passive won't, in most cases, easily be able to migrate to an active model without a lot of additional costly fiber construction. A network of

fiber laid out to support active can easily support a passive model if preferred. There are really no drawbacks to an active design other than the incremental cost increase for materials. The labor (other than the splicing itself) is the same, and you've built an infrastructure that has a much lower chance having to be re-designed/rebuilt down the road. In the interim ~5 years expected for FTTH to be built out universally, nearer term solutions for improved broadband access are needed. Fixed wireless offers the benefit of improved broadband speeds via technology that can be deployed quickly, allowing CUDs an immediate solution to offer to their member residents while CUDs are deploying FTTH. Fixed wireless technology is currently capable of delivering several hundred Mbps to end users, and will soon be capable of 100/100 Mbps.
Comment submitted via e-mail to DPS 6/5/21, 4:22 pm Please let me know if any of these submissions are not accessible, and I will resubmit in another format. Jonathan Gibson Shrewsbury, VT 05738 802-492-3665 Comments: Attachment A Best Practices for Maintaining 911 Continuity (Oct. 11, 2019) Attachment B Concluding Memo to PUC, particularly Section B relating to Best Practices (Nov. 3, 2019) Attachment C Shrewsbury Selectboard letter to Commissioner Tierney, January 16, 2019
Cell service and public safety are the same challenge necessitating full outdoor coverage and best-available location determination. Public-access television is being subsumed by live-streaming, as covid-19 pandemic remote webinars and meetings have demonstrated.
providing access for all major vendors ...ensure that towers are maintained even when the power grid goes down. (couple years ago when washington electric and others in the area lost power, the att tower near fairlee was on generator and apparently ran out of fuel....so i had no cell service....lots of people don't have land lines so communication is then lost.
Cell service is very important, though broadband can help cover where cell service is weak. I'm concerned about emergency communication strategies - when there's a disaster or if some infrastructure is compromised/overwhelmed, is there an emergency communication plan for emergency response services, community information, etc? Montgomery has had trouble with VFD communications in the past due to our mountainous terrain. Many of us are on cellular only communication, which is vulnerable to overwhelm and interruption of service. Some emergency communication planning would be valuable as part of our planning.
Broadband for all! Broadband needs to be classified as a critical Public Utility. This is our modern day version of the Rural Electrification Act of 1936.
We may want to consider underground wires in some parts of the state so that there is consistent service. Trees knock over powerlines and in some parts of the state this could last many days. When looking at Public Safety we need to ensure that the broadband Is as reliable in the woods, as it is in the urban areas
Fiber connections are safe, secure, and as fast as any while posing no threats to health and safety. Many millions of dollars have been allocated for this, FINISH the Fiber connections!
Public access television should be continued and promoted. I believe the lack of promotion keeps it from getting the traffic that it would otherwise have from school groups and other citizen led projects. There are questions of health risks pertaining to 5G cell service. This needs to be explored before Vermont commits to having 5G in the state.

Covid has taught us how critical it is for connecting electronically with the communities we live in. These services, just like housing and healthcare, should be considered basic human rights.
Cell service is vitally important everywhere, and in many places we drive today it comes and goes, often disappearing for miles. What is NH doing that VT needs to do? We always seem to have service when traveling to visit NH relatives. Planning for expanded cell service is a must. If there's a serious accident in one of the many dead zones, people could die for lack of ability to call for help. In the 21st century such poor communication infrastructure is a scandal.
Those that I want to talk to, know how to get hold of me via my landline. As an EMF sensitive person, cell phone tower safe zones are of huge concern, as once I leave where I live, I am inundated, by meter, until I arrive home again. It can be a debilitating experience I have to do weekly that I often delay until the last possible moment, to do. The State Capitol, in particular, is highly radiated with these wifi waves by meter. Anyone exposed all day will experience symptoms, even if they don't recognize them: headache, fatigue, nausea, mind fog, exhaustion, diabetes for starters. Public safety is about preservation and NURTURING of Life. Wifi kills and mutates everything it touches, ALL the DNA it touches. Unequivocally. Public access television is more important than ever for fringe free speech rights. Preserve it, fund it, deregulate it. And yes, make the out of state telecomms pay for it.
Internet And cell assess throughout the State
Because we live on a dirt road in Sandgate, there were months at a time in the last year when we literally had no internet, cel or landline service and were completely cut off while Consolidated Communications tried to solve the problems with cable from the 1970's (according to tech crews). We had no way to call the fire department or ambulance or get or send emergency calls, let alone upload files for work or do video meetings. It took 2 days (until I went to town for milk to find out that my 98 year old mom had been taken to the ICU with a serious illness. CC says better internet is available but the tech guys who work up here says it is not - not enough pairs in the old cables. CC is installing fiber optic cable on our road - but only to homes who are willing and able to pay thousands of dollars for it - it stops short of where we live. Obviously it can be done, but only for those fortunate to have enough thousands of dollars to pay for it.
People in rural areas need the cell & internet service noted above immediately so they can access critical services; health & mental health care, human services; supports, educational supports and all the other supports that are supposed to be available to them. Especially in the rural counties of Vermont where transportation is lacking, reliable, accessible, and affordable cell and internet access is critical at all times.
Use VOIP. Cell towers in VT aren't a good option.
Cell towers everywhere. Public safety. Roxbury has no police and it's like the wild west here. More police, more police more police. Public access TV - no comment. Don't have a TV.
Limit 5g due to health and environmental impact. Broaden quality cell signal coverage. Make the access affordable for all.

all suppliers of service offer the same basic service to all
Close the cell service gaps. I live in a spot where there is cell service surrounding me, but not at my house. I have to I have to drive 1-2 miles away (depending on which direction) from my house to get cell service.
1)Broadband 2)Cell service
I have an idea, how about cell service, TV service, reliable internet. Start by getting rid of Consolidated - they are the worst, their service is CRAP! And there is no competition. WTF! We can fly to the moon and back but can't get basic communications services. Vermont has failed the people. Go ask my neighbors what they think. Two thumbs down. In summary, Broken, Broken, Broken, Vermont is Broken.
I do not care about these three components at this time. Focus on Internet connectivity please.
Cell service should be reliable and available throughout the state, including rural areas. A handful of years ago, my dog was hit by a car on Route 100. Of course, she shouldn't have been off leash, but she ran off unexpectedly, and was hit by a car. There is was no cell service and the driver (who thankfully stopped and tried to get help) had to find a nearby residence to ask to use a phone to call us. The time spent finding access to a phone could have been critical to live saving services. This happened to a dog. Imagine if it happened to a child.
Cell service should be more reliable for all. We should be able to continue access to television by antenna. Satellite television is expensive and there is no regulation on the providers.
When schools went remote I had to bring my children to work with me so they could use the internet service there. The service available at my home is expensive and unreliable. It definitely would not have worked for 3 school aged children to be on the internet at the same time for school. If we pay for the service it should be quality service. We should have choices and access to quality internet.
I live on a state paved road within eyesight of a town of over 2,000 people in NH and cannot get cell signal. This is unsafe.
4G/LTE should be available 99% of Vermonters with the phasing out of 3G with a push towards 5G so it can be used for home broadband internet connections because of its speed.
More cell towers for those of us who live outside cities/towns in the more rural communities
Affordability & Full, Equitable Access Needs for education, public health and safety, lower income access, business activity, social connectedness... Elimination of dead zones--100% access regardless of location, income level, etc. This should be like Sen. George Aiken's REA. Environmental and health impacts of improving Broadband service Progressive rate structures Availability of special rates for elderly, disabled, low income The future of direct and representative democracy

No comments regarding this portion.
Broad coverage
-public access television is hugely valuable and should be easily available on the internet. -public safety: allow access through the internet to things like 911. -Cell service: not a high a priority with fiber to the home and public safety access through the internet. Competition in cell providers & not charging by data usage would be major improvements.
I do not have experience with this area.
Again, accessibility in as many areas as possible. Just having access is a safety issue these days. public access television is less important to me than cell service to everyone.
Stronger signals throughout the state
We need to keep the public access tv stations! They do a lot to make sure people stay informed about local government and cover programs that people might have missed. We obviously need better cell coverage, but we also need landlines because they work even when the power is out and that is a public safety issue.
Increase the number of cell service towers. Since the Champlain islands are relatively flat, the cell coverage in my area is poor. The cell tower my phone uses is located off broad Acres Rd in Colchester. Typically i have zero to 2 bars in only select areas of the house, at best.
Cell service in our house is terrible, even with Verizon and ATT, which are supposedly the best carriers in our state. I have to sit in a fixed location and still drop calls. I would like to discontinue paying for my landline but fear I would not have good connection in case of emergency. We need cheaper options and better cell service throughout the state.
Improved cell service coverage and public safety are codependent. Not sure how public access television is connected to these two ideas.
Dead in my area
Celluar service areas need to be widened and increased speeds with 4G/LTE rollout across the state as a minimum. As we also push into the next-gen 5g services in the state. Still way to many areas served by 3G or no coverage at all.
Cell Service statewide, removal of telephone poles
Focus on getting decent rural 4G coverage before focusing on 5G.
Cell service used to be good in my part of Monkton. Every 5 years or so, it gets messed up and it takes months of calling to convince Verizon to even look at whether there is a problem.

Hold wireless carriers feet to the fire about their reliability. It's one thing to have a dead spot because they don't have the infrastructure. It's another to have cell service that works well for 5 years, then shifts to having a poor signal. It makes planning work related calls a real problem.
Universal access
Expand cell service! We have these ugly telephone poles every where but we worry about how cell towers look?
More coverage, and better coverage on areas currently lacking service or limited service.
We need more reliable cell service. Public access television is incredible and needs to stay and public safety needs to be a top priority as well
Broader access to towers, especially for emergency calls. Everyone should have the ability to access a tower to call 911, even if they don't use the carrier. More scam protections. More privacy protections. More protection of elderly and other sensitive or vulnerable customers. Easier to identify and block scammers. Access to broadcast television and radio. Access to emergency services. Maintaining telecommunications infrastructure for reliability and performance across new and old technology. Not having to buy a new device to maintain service all the time.
ALL residents of Vermont need to have cell phone service, regardless of how remote they are. It is imperative that Public Safety (eg. law enforcement, fire and rescue services) be able to provide aid to the residents of their respective towns. This means that everyone should be able to quickly contact (E-911 ?) from wherever they are, and there should be NO "dead areas" where assistance is unable to be summoned.
Reliable maintenance of service.
Cell service is important because to the ways people need, especially emergency, contact on roads and in the woods (hiking, skiing, etc.) Public access television is also a vital part of our communities.
The same as above. It should be available and function effectively to all at reasonable cost.
Reliable cell signals throughout the state. Public options to make it more affordable.
Cell service needs and public access tv and access to radio public notifications are necessary everywhere
Cell service: Again I would like to see equal, affordable and quality connection for all of Vermont. Currently I would rate the cell service in Vermont as a whole to be very poor. There are islands of service for those who live in a larger city but outside Burlington, for example, there is little to no cell service. Public Safety: The state has learned a lot over the last year. A

way to capture what went right and what could have been done better is a must. Another outbreak may be a while in coming but it will happen. Also, I would include pollution from agriculture as a public safety issue. The runoff of chemicals and manure into the air and waterways must be dealt with, along with the safety of the farm workers. Dealing with dairy issues is the proverbial '3rd rail' in Vermont but it must be honestly looked into. Public Access Television: It needs to be expanded beyond cable services.
Again, please encourage the state of Vermont to invest in the most reliable and environmentally sound options even if they are more expensive than other options that rely on technologies that will become obsolete within a decade or two and have the greater environmental impact especially with regard to climate change. We must act to adopt the most climate friendly option in all we do, at all levels, or all our efforts will be wasted when society is destroyed by climate instability and the resulting environmental catastrophes.
Cell service needs to be available everywhere in the state. If satellite internet is a good option then don't spend resources on a land based system
Public safety and public access have incrementally improved over the past 10years. If the progress continues those items should be fine. Cell service needs to have a more precise map to identify weak and dead spots, time of day for those conditions and calls out service available 3g, 4g, or 5g. If any.
Even small scale cell service would be beneficial, even if the type that is small hotspots along utility poles. On Rounds Road near our property, there is zero cell service which is dangerous.
Emergency and disaster communications plans and procedures for all. Funding for public access television content creators of all generations. School, educational, skill development, culture, history and civics programming. No intrusive or unsightly cellular equipment. Coordination for planning and implementation with other infrastructure projects for cost savings and compatibility.
Cell service in VT is a joke. I live in Middlebury and drive to North Ferrisburgh every day, three call drop minimums on Route 7. At home on South St Extension most Verizon calls drop in under three minutes. It is embarrassing calling elsewhere from Vermont as calls are always dropping or with really poor reception.
Mobile carriers have received billions in federal and state funding over the years, spending a portion of that to increase infrastructure as intended. Support their efforts to increase mobile service coverage, but be wary of providing financial incentives. Please keep the geographic beauty of VT intact, approving of towers, right of ways, and other physical expansion in ways that support VT's natural beauty.
My name is Paul Snyder, Executive Director of Northwest Access Television. Founded in 1999, NWA-TV currently serves 13 villages and towns in Franklin County, Vermont. Our services have proven even more important during the pandemic. From providing technical support for our municipal boards to free streaming of high school sports for families to watch safely at home when they couldn't attend games in person, these are just a couple examples of how we have kept our community connected throughout the pandemic. Our community media center is also part of a statewide network, Vermont Access Network. We pool our resources for join projects, such as the Vermont Media Exchange and the recently

launched Vermont Community Television Channel. VAN members also actively partner to find new revenue alternatives to replace quickly declining cable funding. For the purposes of the 10-Year Telecommunications Plan, I am writing in support of The PEG Study. This assessment of PEG funding alternatives was recently completed for the Vermont Legislature in January 2021. This study merits close consideration by Vermont legislators and regulators. I urge the State to consider the recommendations, which outline Vermont's authority to modernize the state's telecommunication tax structure and create a path forward to ensure the future sustainability of PEG access and community based communications and community media in Vermont.
Public access television is critical to an informed and engaged community. Supporting community 'television' s' relevance and continuation of a free speech platform impacts the health of the state's communities.
I would like to see the state work to expand cellular service to unserved and underserved geographic areas.
With all the mountains in Vermont, cell service everywhere will probably be impossible. Public access television will require broadband access, which is possible if every house has an internet connection.
Submitted separately
Improve cell service with maximized 5G coverage.
My name is Cor Trowbridge, I am the Executive Director of Brattleboro Community Television. BCTV was founded in 1976 and is the designated community media center for eight towns in southern Windham County. Our membership structure allows anyone who lives, works, volunteers, or attends school in Windham County to join BCTV and create or submit local programming. Since the Pandemic started, demand for BCTV's services has been higher than ever, especially for recording and archiving municipal meetings, live streaming sports events and performances, and helping residents share views and vital information on our cable and YouTube channels. BCTV is part of a statewide network of public access stations, known as the Vermont Access Network or VAN. As VAN members, we recognize and appreciate Vermont's long history of support for public, educational and government access media which is recognized in years of Certificates of Public Good decisions. VAN members pool resources and share programming through the Vermont Media Exchange and on the recently launched HD Vermont Community Television Channel. We are actively partnering to find new revenue alternatives to replace rapidly declining cable funding and maintain our level of service to the community. For the purposes of the 10-Year Telecommunications Plan, I am Speaking in support of The PEG Study. This assessment of PEG funding alternatives was recently completed for the Vermont Legislature in January 2021. The PEG Study was funded in 2020 through Act 137 (CRF/ Section 19) by the Legislature and can be incorporated as findings of the 10-Year Telecommunications Plan. The PEG Study recommends a way for the Vermont Legislature to modernize its telecommunications taxes and describes the authority of the State to rationalize its public benefit structure including PEG, E-911 and Universal Service. The report recommends revenue solutions to address the steady decline of cable franchise fees, the primary source of funding for Vermont's 25 community media centers. We understand that the future will require

a more diversified approach to funding and the Study is an important step in that direction. Thank you for this opportunity to comment on the Telecommunications Plan, and for the support of the Legislature and the people of Vermont in funding the study.
In our more rural places, where long-lasting power outages are not uncommon, Cell service, OR land-line phone service that is not connected to the internet, is a safety issue for people who cannot afford generators.
The Telecommunications act of 1996 bans towns from rejecting projects based on human health issues. We can still consider the effects on wildlife and pollinators. saferemr.com is a clearing house of peer reviewed studies on the subject. Consider the state of NH report released in the Fall of 2020. Wireless should be banned statewide.
Whether we are streaming Underhill's planning commission hearing live, archiving the video of the latest "Racism in America" talk organized by Rev. Dr. Arnold Isidore Thomas of Jericho's Good Shepherd Lutheran Church, or helping students film videos about local roads' histories, MMCTV is one of the non-profit community media centers in the state giving voice to Vermonters. Vermont has a robust network of 25 centers like us, who share information of public bodies, non-profit organizations, and individuals. We ask that the 10 Year Telecommunications Plan pave the way for community media to evolve alongside technology and the state's media infrastructure, whether it be endorsing the shift (finally!) of our channels from Standard Definition to High Definition on cable, or taking on recommendations of the recent PEG Study (funded through Act 137) that offers solutions for our long-term sustainability.
Public access television is increasingly critical to keeping informed about local issues. It needs a funding stream that is reliable and can provide the money it needs to maintain and improve the way it delivers programming.
With print media and local community papers nearly gone, it is critical to preserving our democracy and maintaining the fabric of our local communities to invest in public access television. Over the past couple of years I have seen our local provider GNAT-TV take on a greater role in delivering important local news coverage that is not found anywhere else. I find out about events on their bulletin board and really appreciate their local political rep forums and select board meetings and original programs. In five years of BASIC Comcast service, a package that included PBS, GNAT and a lot of filler crap channels (my 700 lb life, etc), our family bill went from $80 to over $207. Think of that increase, nearly double and for nothing more. We can't afford that anymore. Thankfully we were just allowed to return to internet service without losing our email address and we purchased a router and antenna. I wish there was more competition in the state for service. The best thing that has come out of Comcast is the deal where they have to give a certain percentage to public access TV and now that is threatened because of Comcast's predatory pricing habit. Please preserve what is good - Access TV and find a new way to fund it if necessary. And please, get on with this age old promise to increase broadband service but act like you are spending your hard earned dollars to get it done.
Public access television performs a vital service, enabling access to information and performances that could be unavailable to disabled residents during "normal" times, and to all residents during pandemic or other times of disaster.

I value locally produced media, youth media education, gavel-to-gavel coverage of local meetings, community video archives, and the way Public, Educational and Government Access helps to knit our community together.
With Fiber Internet everywhere in Vermont, cell coverage all over Vermont will be much easier as the CUDs can rent a fiber to each cell company. That will encourage competition in the cellphone market which can only be a good thing, just the way local Fiber will encourage competition in the Internet marketplace. Once Fiber is ubiquitous public safety and public access television will likewise be able to deliver their services better locally and, as a big plus, all over Vermont.
I love our Local Access Television, it's been a live saver before and during COVID, pls continue to support them.
Being a senior citizen with limitations I am not able to be as involved in my community and state government as I would like to be. Having public access television helps me stay connected. To me it not only a convenience, but a necessity.
I want more public access tv funding to sustain open access tv such as Ch 17 Center for Media and Democracy. Public funding will enable cctv.org to continue production of diverse programs giving points of view from Vermont's population. It's good to have government programs and it's equally as good to have different opinions expressed from community producers and independent video journalists. This public funding should be enough to pay a tv staff of professionals plus pay for equipment and rental of studio space without being beholden to oligarchs' money. This public funding is especially needed as newspapers close down or are taken over by one political party and the interests of that political party.
Where cell towers are built, regulation should insure that competitors can share infrastructure to avoid unsightly duplication. People need to be able to pick up a device, call for service to E911 and be located without violations of personal privacy. As landline phones disappear, E911 costs need to be shifted to cell service providers. Public access television is short hand for non commercial community media services that serve communities with affordable video production services, media education, job training, support for local democracy and more. Historically supported on the back of cable franchise fees, this broad set of services, needs to be supported into the future in locally based, non commercial enterprises. Going beyond the cable TV channel, but not forgoing that still important location for sharing curated community specific content.
Make information accessible to all.
Public access television is critical to preserving access to local government for all Vermonters. Given that fewer people are subscribing to cable - there need to be additional funding streams created - perhaps fees from ISPs, too?
My Name is Martin Cohn and I am a Board member of Brattleboro Community Television (BCTV). BCTV provides community media services to southern Windham County (i.e. Brattleboro, Guilford Vernon, Dummerston, Jamaica, Newfane, Putney, and Townshend) on two cable systems. Since the Pandemic, BCTV services have proven even more important by enabling residents to participate in municipal government meetings. Vermont has a long history of support for public, educational and government access media, seen through 40

years of PEG funding and regulation, and more recently, support and recognition by the Vermont Legislature. In 1976, BCTV became the first PEG access channel in Vermont. BCTV is primarily funded by small percentage of the cable subscription fees paid to cable companies by subscribers in BCTV's viewing area. BCTV is part of a statewide network, Vermont Access Network that pools resources for joint projects, such as the Vermont Media Exchange (VMX) and the recently launched Vermont Community Television Channel. VAN members also actively partner to find new revenue alternatives to replace quickly declining cable funding. For the purposes of the 10-Year Telecommunications Plan, I am writing in support of The PEG Study. This assessment of PEG funding alternatives was recently completed for the Vermont Legislature in January 2021. This study merits close consideration by Vermont legislators and regulators. The PEG Study was funded in 2020 through Act 137 (CRF/ Section 19) by the Legislature and administered by the Agency of Community Development (ACCD) and written by Berkshire Consulting Group. The PEG Study findings can be incorporated as findings of the 10-Year Telecommunications Plan. Since cable companies may shift their business model from the traditional cable channel service to a streaming video model for customers who buy the company's broadband service, under existing funding mechanisms, PEG stations budgets may be uncertain. While stations can employ possible efficiencies, supplemental governmental funds are essential. Beyond the obvious solution of providing appropriations from the General Fund, the PEG STUDY offers options including: 1. A gross revenue tax on cable revenues for PEG capital costs. 2. A streaming video charge. 3. Modifying the Vermont Universal Service fund by raising the rate. 4. A charge on each attachment to a utility pole. 5. A multipart option that includes a pole attachment charge plus modifications to the Vermont Universal Service Fund, changes to the method of funding PEG capital costs, and repeal of the Telephone Personal Property Tax. Community access television is still relevant in a media landscape with hundreds of radio, television, and online video channels. The reason is simply that it's accessible to all and its reach is worldwide.
Support and strengthen public access tv. Cable providers should be required to have an accurate Guide of what is on the public access channels just like they do for commercial channels.
Preserve public access, public safety communications and develop a not for profit cell service.
Cell service, public safety, and public access television should all be controlled within the lens of how to best serve all Vermonters, not the profit motive. It is in the interest of all Vermonters to have excellent cell service and public safety everywhere throughout Vermont for everyday needs as well as in the event of an accident or emergency, This is often in conflict with for-profit goals and thus for profit goals should not trump the State of Vermont serving it's citizens. For profit television and social media policy are driven by incentive to maximize their profit goals, rather than to best serve broader public goals of helping citizens in our Republic with representative democracy become well informed about issues and candidate choices so we citizens can make well informed and more effective decisions about all kinds of issues.. Public access television is better suited to this than profit motivated entities and thus Public Access Television should be strengthened. This approach would be very compatible with State of Vermont ownership/control over broadband infrastructure, that's use is leased out to profit motivated organization's use, subject to restrictions and conditions that serve our public interests.

Cell towers located away from populations to insure safety from non-ionizing radiation. Bring back television towers for those in the state who prefer using antennas to access television or who cannot afford the high prices of cable companies.
Study the latest real research on the risks of cellphone use. Get wifi out of our schools.
Elaborating on #2 above, PEG Access / Community Media providers are best suited for this work. The work on could be subsidized through connection fees placed on broadband providers. Currently, cable TV subscribers subsidize PEG Access / Community Media, while those organizations provide an increasing amount of their services outside of traditional cable television. PEG Access providers are likely best suited for deploying community-based broadband services and engagement but there must be a better funding source to support that work. This could be organized from a "top - down" approach, through the Vermont Access Network (VAN), which represents the 25+ PEG Access providers Statewide.
Improve cell service and towers to eliminate dead zones and drop out. To continue supporting Public Access Television and providing funding as needed to implement the waning funding from Comcast. Public Access is very important in Vermont as so many newspapers have gone under and it is often the only way community members find out what is going in their town government, schools and other civic organizations.
Public Access television provides an easy means for Vermonters to express their voice on issues that are important. Vermont's unique communities and local-centric values make public access stations reliable and one of the last non-commercial outlets to share ideas and voice opinions. There are no other outlets organized to provide this service to Vermont cities and towns. Additionally, the educational services, community outreach and municipal services that PEG stations provide are essential as a space for free speech and free expression that is not controlled by Technology monopolies.
Reliable and consistent cell service must be available throughout the state. It is a matter of public safety, enabling everyone access for help when needed; for reaching people in time of need. The recent need to reach everyone with information about the pandemic is a perfect example of why such services -- broadband, cell service, public access TV - are needed. In addition to getting healthcare information out there, schools needed students to have access for virtual learning. These are fundamental services that the state must plan for, must fund. Unfortunately, commerical television/cable is driven by profit concerns, and these corporations are not particularly interested in providing services, information that must reach the public for healthcare, for education, for civic responsibilities. Commerical services cannot be depended upon for any sort of societal services. Public access TV, specifically, meets the communication needs of citizens -- civic involvement of such events as council meetings -- that cannot be ignored or minimalized. The public via state investment must protect our democratic principles and must make sure people are safe. That requires a comprehensive telecommunication plan that addresses such needs.

Public comments received via Email, Phone, & at Public Comment Sessions:

The draft plan itemizes an estimate of 54,000 addresses that are unserved or underserved and not included in RDOF-subsidized areas. Two points:

1. Not all cable providers offer 25/3 service to all customers. This is true in DVFiber's service area.The PSD should clarify which addresses are actually served at FCC minimum speeds by each cable provider.
2. The count of 54,000 is itemized. A count in the overview presentation is 7,000 lower -- 47,000 -- and not itemized. Getting the count right is critical. Please confirm your sources

Section 4.1.5.2 -- Low Earth Orbit Satellites -- is generally accurate but makes the unsubstantiated claim that, "In general, LEO satellite service appears to be a good option for Vermont premises that currently only have access to DSL or traditional satellite. There are thousands of camps and off-grid premises in the state that could benefit from Starlink's service for the long term, and some Vermonters are already enjoying improved service via Starlink."

This statement ignores Starlink's own guidance that a completely uninterrupted view of the sky at an angle of 50 degrees all around the satellite dish is necessary for the service to function as designed. Reports of knowledgeable reviewers emphasize this point. As a simple rule of thumb, the Starlink dish must be as far away from the nearest structure, tree, or other obstruction as that object is tall. The absolute worst places for Starlink systems will be in wooded areas. The rural locations that lack adequate broadband are much more likely to be wooded than the city or suburban areas that are more likely to have adequate options.

The description of "Camps" at the top of page 98 is inaccurate and misleading: "We note that these totals include 9,126 addresses identified in the State's database as "camps," which range from unimproved properties without power, to larger buildings off the electrical grid powered by solar energy, that are improved buildings. We created a design that excluded the camps, which reduced the needed cable plant mileage by 795 miles, or seven percent of the total."

DVFiber will absolutely not exclude camps as passings and customer locations. In fact, "camps" can include substantially improved buildings that are on a par with any other residential structure. In Halifax, the average value of the structures on properties labeled "camps" was about two thirds of the average value of the structures on other residential properties when I last looked. This result was consistent across quartiles of valuation. My home, in which we invested substantially and is on the grid, and a nearby home that dates to colonial times and is owned by a family that have lived here for generations were both among those properties listed as "camps" at last inspection.

Possibly these mistakes have been corrected already. If not, please review and revise.

- Figure 14 would have us believe that the cost per passing for a fiber network ranges between $10K and $20K and the cumulative cost per passing for a wireless network would be substantially higher. Either the data or the labels are wrong.

- Table 22 suggests that DVFiber would have to construct 1,232.24 miles of network to reach 6,455 passings (about 5 passings per mile) when in fact we need about one third fewer miles to reach about 50% more uncabled passings. The proportion of passings to miles (about 5:1) that is attributed to DVFiber is about the same as the proportion that is attributed to all CUDs in total. I suspect the draft reported a mile

count that would be needed to serve every location, served and unserved, and then included "unserved" addresses but excluded "underserved" addresses.
I see the need for details on priority of 911 call completion assurance in all Community Broadband designs, and similarly, resilience of cable infrastructure for VoIP voice over IP, where power outage vulnerabilities and limited battery supply at amplifiers result in substantial numbers of subscribers not being able to call 911 until that's fixed. Overall 911 system reliability, including Regional dispatch. When towers lose power radio, dispatch towers lose power. If fiber Cuts between radios and transmitter antennas lose power or Fiber cuts sever backhaul. Public Safety is put at risk and I see no real details of those types of resiliency designs. Requirement for diverse routes on all cellular backhaul to assure 911 call completion. We do have jurisdiction over Tower permits and as most 911 calls are coming in via cellular, we have jurisdiction to make requirements for diverse routes and backup power on those radio, cellular radio towers. Appropriate, use of the VCOM Statewide radio channels, what can they be used for? How should that be shared?. How should those details be shared with emerging and existing regional dispatch authorities? The universal service fund, earmarked dedication for the connectivity fund is unnecessary, especially when the fund is running short unable to support current, 911 expenditures. Effective public participation. Several requests for made for a paper copy of the plan on paper. This is the first time that paper versions of the plan were not made available. It's unrealistic to expect people to read a hundred 200 Page, document on a small screen, much less retain or integrate much of it. The background knowledge of the general public has atrophied in the time the department has failed to complete a plan so that onus and responsibilities on the department to re cultivate, that general, public awareness of different technologies, different choices policies in order to be able to make informed participation in these telecommunications planning hearings and process. Integrated planning for cellular Broadband. Wireless microwave resilience and Community media. This is not discussed in the plan. In the draft plan. It is inefficient ineffective to plan each of those in a silo. Required production of information by carriers when it's requested under 30 VSA, 202d versus 202e Shoreham being an example, fiber upgrades using A-CAM funding limited number of addresses. Fiber route Statewide can and could should, and could have been requested under 202d not subject to Non-disclosure agreement. CUDs use of Trade Secrets looks appears the case law indicates that you can have sovereign immunity or you can have Trade Secrets, but you can't have both some discussion of whether The claims of Trade Secrets potentially specious claims are Trade Secrets by CUDs. Even extending to the non-disclosure agreements themselves. Or discussions related to asking municipalities for a share of their ARPA Money, where no contract is being negotiated. That's going on as we speak, where CVFiber claims to be eligible for executive session.

Host remote isolation, remediation. Strategies rules. Why do we not even inform the public of which telephone exchanges are subject to host remote isolation and therefore block 911 calls and how are we going to require Consolidated to participate? Disclose the routes that are vulnerable. Participate in community Broadband, fiber planning, and possibly Help fund or at least lease fibers within a fiber route to create route diversity from those remotes back to that host and eliminate that Host Remote isolation Vulnerability.

The need for a unified poles database, utility poles, database Statewide for accurate, attachment billing, accurate, double pole, removal enforcement, and even accurate pricing for pole attachments. These are not supposed to be a revenue Source. Supposed to be revenue-neutral, just including the costs of Maintenance and as more attachees get on a pole. Everyone existing attaches rate should be going down. I suspect that's not the case.

Pole attachment, hygiene, and obligation for enforcement of the national electrical Safety Code. This is something that's been grossly, neglected by the Department and the Public Utility Commission.

A Statewide, fiber inventory is necessary. All fiber available for lease and its protection statuss

Rules are necessary for mission-critical, fiber splice can opening. I witnessed a splice can behind Montpelier City Hall being opened by a FirstLight technician, which had loose fibers hanging outside of the trays and vulnerable to breakage those very same fibers, could easily have been carrying the police and capital west dispatch fiber, ethernet to dispatch towers. But yet not every fiber Splice can technician should be allowed to go unsupervised in to splice Cannes where mission-critical fibers are present.

The VELCO fiber model as a resilient Statewide managed mesh architecture. Should the CUDs choose compatible equipment and triangulate to two of the existing Roadm, multiplexers in the VELCO network. We can accomplish both The fiber and mess mesh resiliency simultaneously.

The neutral host strategy to address 911 roaming, call back currently at AT&T user is allowed to use a Verizon tower to call 911 but the calling number does not transfer similar vice versa. Whereas in a neutral host arrangement those numbers would transfer to the 911 Enabling Call back. Often a battery dies, a cell, can get disconnected, a person can need to hang up and call a family member. The 911 dispatcher call taker cannot call back If that person came in through the non-primary hosting carrier tower,

All public safety all cell tower, all tower, permits 248a, permits, and otherwise should offer a right of first refusal for Public Safety, antennas and equipment on all poles and Towers.

I see nothing in the draft plan about contingency plans, to address, fiber, optic, cable, and material shortage. And still stay on track for our 2024 for statutory goal.

Disaster preparedness, which fiber routes are most frequently interrupted? What can be done to create Geographic diversity to protect those routes? Which sites need to be restored first after a major storm just breaks a lot of fiber and what of the protocols and rehearsing those protocols such as making sure that everyone who does need to get to these sites to restore

these towers quickly has the right access permissions at equipment to get there, even in the winter.

Small cells should be, prioritized for resilience where power goes out more frequently, interrupting voice, both VoIP voice over IP service and potentially fiber breaks themselves, small cells, especially with resilient backhaul diverse routed, or microwave can be the make the difference between life and death in such areas where presently no cell coverage exists.

We should be promoting and designing high performance Network demonstration projects showing off what an ultra-low latency fiber network can can offer.

Next Generation Vermont interactive television using open source software, high-definition signal high quality audio possible uses by the legislature, the courts, the state colleges prior to Plumbing apprenticeship. Program. And the nursing program were utilizing VIT.

Statewide local program, origination and Statewide channel, on both cable and web, is a project that should involve the access media organizations, All Points of origination on existing cable system should be identified cataloged. And any fiber connected site could potentially be a point of origination for Statewide broadcast this type of design, including high performance network between Public Access stations should be very high priority.

Next pandemic. Preparedness strategies and plans. We've totally bungled this one with zoom and YouTube. And Citizen participation blocked in legislative process. It seems that now would be the time to put media and Telecommunications plans in place for the next pandemic Wi-Fi as a utility and all Town centers. Both as a immediate pandemic response and as a emergency resilience response with special attention paid to the speed of the backhaul, the resiliency of the backhaul And the availability of backup power.

Cyber assault preparedness. Strategies for malicious intrusions or hacks by the Russians, the Chinese or even domestic what are our strategies to protect key assets?. Computer mapping databases, what options do we have to potentially disconnect from a national attack and yet still maintain media assets such as GIS datasets need to remain available.

Should the state fund and equip AMOs with low power FM stations as a backup option for community emergency information access should all cable and internet connections be down?.

And finally, how should Vermont be spending the $53 million accrued from spectrum sales, that Vermont educational television sold. What is arguably the public's spectrum originally held by the state colleges or the University of Vermont that $53 million in spectrum sales, should not be left to just the board of Vermont, Educational Television but discussed and debated as a public engagement process and discussion. Thank you.

DVFiber and SoVTFiber, both represented by and violating public records laws by colluding for billable hours with Primmer and Piper attorney Elijah Emerson may be intending to pursue H.360 public broadband funds to help Consolidated build uneconomical areas within the CUDs by colluding with the Department's consultant CTC/RISI to recommend the Ten Year Telecommunications Plan include statements that CUDs be allowed to ignore or individually

negotiate exceptions to Vermont statutes on net neutrality, open access, competitive choice and mobile wireless priority in telecom planning investments.

It will be interesting to see if CCI lawyers will reject provisions of grant conditions of H.360 requiring reversion of ownership of publicly funded fiber asset in the event a CUD or other grantee is sold or bankrupt. I suspect the open access requirements would also be a problem and possibly a deal breaker for Consolidated as it is private equity fueling the CCI build they may need to keep their options open to flip it as did Oak Hill Capital Partners with Sovernet, ssubsequently aggregated with all other Oak Hill acquired competitive NY/New England fiber properties becoming FirstLight, sold to Paris based Antin Infrastructure Partners.

What does Vermont's open access rights to built fiber $30M+ grant from the VTA to build Sovernet fiber even mean today? Why is that clear explanation of terms, conditions and prices not laid out in the Ten Year Telecommunications Plan?

The Department intends to apply this August on behalf of the state for NTIA funding in partnership with an ISP, either Consolidated or possibly ValleyNet proposing to serve the maximum number of addresses, again likely ignoring the state's net neutrality law, competitive choice and open access statutory policy and goals found in 30VSA 202c.

CVFiber executive committee met yesterday and entered executive session to discuss not contracts but non binding MOUs with member town in an effort to convince towns to commit a portion of their ARPA funds to CVFiber while making no firm committments to build by date certain in those towns. This had been made clear in a prior governing board meeting and thus the executive session held was in violation of open meeting laws.

With regard to Public Safety Communications systems, Mr. Dunne commented last evening that Public Safety Communication systems are in pretty good shape. And apparently, this must be referring to state level systems because Televate has recently completed a draft report for central Vermont communities indicating that the Land Mobile Radio Systems, which are over 30 years old, are at risk of failure. They are reportedly obsolete, and in need of replacement, So Chittenden County is similarly working on a consolidated dispatch plan. They, however, have not done a technology needs assessment, similar to what Central Vermont has undertaken. Windham County is similarly, pursuing a regional consolidated dispatch plan, This draft ten year telecommunications plan does not appear to have addressed these fundamental issues of how these regional plans shall be crafted, interoperability testing conducted and coordinated. What criteria they will need to meet in order to fit and interoperate with state systems and federal systems? P.25 only? So the elements of the Telecommunications for Public Safety, include everything from the caller in need of help, having either landline copper or voice over IP or cell coverage to actually reach out and make a call for help. Coverage. We now know how spotty cell coversge is, how unreliable poorly maintained copper services are and how vulnerable to outages cable VoIP and fiber phone service is to power outages. Also vulnerable are Host-Remote circuits lacking diverse route protection, cell tower backhaul absent diverse route or diverse media protection and CUD internet based phone servive with switching happening who knows where and possibly lacking any redundancy whatsoever for Vermont subscribers. FirstNet proposed wireless coverage and made commitments in Washington yet Vermont has no enforcement powers to hold AT&T to those commitments. Televate has found no coverage where AT&T claimed to have built coverage. Even after five years of buildout, they still only planned to have achieved about 76% coverage and that is only one carrier. Ermonts tourists and residents utilize all major cell carriers and require similar coverage. Where is the chapter in the Telecommunications plan to achieve ubiquitous mobile wireless coverage with all or most

national carriers? Further comments on the draft 10-year telecommunications plan regarding Public Safety communications. A Statewide plan for a planning framework is necessary to guide local initiatives at Regional Dispatch Communications planning processes. Central Vermont. Chittenden County and Windham County are all proceeding to redesign and modernize their Regional Public Safety Communications. This is typically analog land mobile radio. Central Vermont has hired the same company that the Department of Public Safety used in the FirstNet evaluation and in the FirstNet validation. And that company, Televate has tentatively concluded that the regional radio system being used by Central Vermont communities for dispatch is at end of life and requires replacement. Alternatives having been discussed are trunked radio system or simulcast radio system or both. A key question, which has yet to be answered is when a regional system is established, where does that function failover to in the event of loss of a dispatch facility. The failover question drives the need for interoperability. And interoperability on this scale, requires a Statewide architecture, such that Franklin could fail over to Chittenden, or Essex, or to Orleans, or Central Vermont to st. Johnsbury or Windham to Bennington, for instance. Combining Systems is impossible without strict adherence to standards and interoperability requirements or rules. None of this seems to be addressed in the Telecommunications plan. Whereas, these are million dollar Investments that are being made today and require interoperability with State systems. So in the absence of a single unified State system, in the hundred, 200 million dollar range, these Regional systems need Guidance and standards established in the state 10-year telecommunications plan to guide their decisions and their Investments. One such scenario being considered is Central Vermont, which is currently CapWest or Capital West, being dispatched out of the Montpelier Police Department, could fail over to Saint Johnsbury when they're new Dispatch facility is built provided compatible consoles, CAD systems, radio transmitter equipment that can access the frequencies used by both or alternatively, a single unified simulcast system that spans from the Green Mountain Range, Lincoln Peak, etc., all the way over to the Connecticut River. And then in day-to-day operations is run as if it were two separate simulcast systems by the Saint Johnsbury and CapWest dispatch facilities. But were either one of those to fail, the full load of calls, possibly even including serving as a Public Safety Answering Point (PSAP) would need to be able to be accommodated at the single site and the radio transmitters for the area with the failed facility, have to be accessible through the network, from the failover facility. This type of guidance is fundamentally necessary in a telecommunications plan. Similarly, in a disaster situation, either or both of these systems have to be able to access State radio resources and the Statewide VCOM radio channels, potentially the state microwave network in a post hurricane scenario or ice storm scenario, much of the aerial fiber around the state will have been damaged and most communication circuits will be inaccessible including backhaul to cell towers. So these LMRsystems have to be designed for rapid repair and ultimate resilience.

“I believe that the draft plan falls far short of the statutory requirements. I think it’s somewhat absurd to suggest that we’re going to make it optional for CUD’s to choose whether they want to do open access or net neutrality. These are statutory foundational documents… they’re foundation principles in statute- competitive choice and open access is our state policy- is our state goal. It’s the job of this plan to define a path to implement it as quickly and as ubiquitously as possible. And it’s not one where you pick and choose which goals and policies you like and make them optional. That’s not what the plan- that’s not what the contract requires, not what the statute requires. I think the plan is vastly deficient in that regard.

I'd also like to point out that the Magellan plan said that we have a competitive market for middle mile fiber, which discredited its findings. It was also based on the electric utilities becoming ISP's and so- to reference that document is an error. It's building on sand.

I concur with Christine's comments that the accuracy of our base data, which we like to brag about, is all suspect and it says so on every one of the Department's maps- that we don't stand behind this data, that we got it from the carriers themselves, and it's somewhat absurd to be spouting it as if it were accurate.

The potential uses of the VELCO network, the dense wave division multiplexers that are scattered all over the state on resilient rings- is not covered in this plan, whereas that may be the most immediate and available capacity that the CUD's could build off. And we risk making a grave error of not answering that question up front because if we build on that same architecture with the same manageable equipment, we would have both resiliency, capacity, and central management, and rerouting capability in the event a fiber breaks- around another path. Even if it has to go many miles around another route, that network is designed for that kind of thing.

Similarly, the microwave network and its role in public safety failover and hurricane response or ice storm response- whether or not we should upgrade the microwave network and rely on that or backhaul for 911 calls at least if not other stuff.

The neutral host and mobile wireless chapter is really a farce. The neutral host strategy is- you can't ask a- you can't put our an RFP and ask the one vendor who was granted a huge advantage of $25 million in NTIA funds for FirstNet and an additional $30 M worth of spectrum (if not greater than that), to then put a competing proposal in or ask their main roaming partner in Vermont, VTel, who might be a nice, or appropriate neutral host operator, to compete against AT&T in such an RFP- that's just a fundamentally flawed concept. This example, this draft plan is an example where a vendor compromises their engineering integrity to accommodate a political perspective of a dysfunctional agency. I think it's a fraud upon the public to have charged three quarters of a million dollars for the two plans combined from this team.

The statewide fiber design is necessary, it's in the bill, it's not mentioned, it may have come too late to make it into this draft because it was part of Conference Committee negotiations- but a statewide resilient fiber design would accommodate all built fiber that's got public funds or ratepayer funds, which would include VELCO, would include Consolidated's CAF II funded middle mile fiber, would include FirstLight from our Sovernet investments. So a statewide design thereby minimizing or reducing the expectations of the CUD's to have to build middle mile and long-haul infrastructure- I think we're greatly exaggerating the capacity and the skill, even the available materials and management teams it would take to turn the CUD's into fiber-building contractors or management operators. So by utilizing existing experienced utilities, especially ones that already have infrastructure, or could quickly build infrastructure with existing crews and trucks- is the only way that we're going to get this done. And I think that should have been fleshed out in this plan.

Other people have mentioned that open access, competitive choice, 100 symmetric- a gaping flaw in this plan that is not optional- the plan is required to address each of the 202c goals and lay out a strategy to achieve those goals. This plan addresses a strategy to assert, to serve fiber eventually to everyone who doesn't already have cable, but the cable there is where the fiber does not exist are also required to have a strategy to reach and serve those areas in this plan. That's been ignored. That's a fundamental deficiency. The CUD's universal service plan

should include every address that's not served with fiber if we're going to reach the 100/100 goal by 2024. I hear talk or I see press releases that suggest that we'll do this in 10 years. I'm sorry, that wasn't an option- the statutory goal is 2024, the funding is available- you don't have the option of choosing to take 10 years when the statute says we will have fiber to every home by 2024. I just think the fundamental premise, the arrogance of the, of the political manipulation and compromise of this plan, is ghastly.

The EBS spectrum, the connectivity division has been required for 5 or 6 years to inventory all available spectrum in the state that's held by instrumentalities and analyze it's best and applicable use toward deployment of broadband. That's not done in this plan and it hasn't been done by the Department in the last 5 years.

The legal analysis is all suspect and flawed and compromised by hiring an attorney who is on the board and an operating board member of ValleyNet, who is an ISP and a fiber builder under contract to ECFiber and Lyme Fiber and others- but yet claims to be a non-profit not subject to public records act, and therefore not accountable. But you can't have a legal analysis that fits the agenda of a vendor operating in this space underpinning your legal analysis in a 10-yr Telecommunications Plan. I'm referring to attorney Montroll there.

The statute requires effective public participation. I find it very disingenuous to announce that this is the second of three hearings when no-one knew about or showed up to the first hearing. You can't call it a hearing. This is not the second hearing, this if the first hearing that anyone was notified about- and many were notified by my actions not yours.

The estimates of cell phone coverage 91.9% on class 1 roads is farcical and inaccurate to a laughable degree.

There's no realistic analysis of finding of the role of deployment interim fixed wireless as a strategy to provide broadband service above 25/3 until fiber can reach these customers. And it's potential benefit of also deploying mobile broadband simultaneously. That is one of the most economical strategies we could pursue and that and a neutral host model having all carriers share the costs of that infrastructure and support the fixed wireless being deployed and even owned by the CUD's. And yet that is entirely missing. The earlier interim plan that cost $475k poo-poo's the idea of using fixed wireless by saying it takes too long to site towers. As if no one in the Department or the contractors had been aware that a waiver on tower building permits had been passed in the prior legislation. I find that a ghastly oversight that undermines the credibility of this whole product and process.

Anyway I believe this plan is so deficient it cannot be adopted. It's main role is to establish and guide decisions via CUD's and agencies and especially the PUC in evaluating the incentive reg plan next summer. This plan needs to be built upon, improved upon, and finished- which it is far from now. It cannot be adopted as is and 3 years lapse and another compromised incentive reg plan [cell service is cutting out here].

I wish we could potentially gain access to Consolidated's middle mile fiber [poor reception]. Build in this amount of years with this amount of money. And to fund infrastructure with public money it's perfectly logical that we would seek to not only access that fiber, but allow Consolidated to roam on other state-built fibers in the interest of supporting competitive choice. We can't just selectively throw inconvenient or fearful impacts of competitive choice away because the CUD's would rather have a monopoly. When the statute says the Department and the Plan is to support competitive choice- end of sentence.

I think that we've compromised this entire process and I had great hopes when I succeeded in getting the legislature to allow private contractor to do it- but the Department has compromised this contractor and further compromised their own integrity in this product. I'll leave it at that for right now.

I will try to not cover the same issues I covered last time except for one. Still calling this the third hearing while the first was not warned and no one showed up- it's a farce to call that one a hearing.

With regard to FirstNet and cell coverage- relying on any one carrier for a publicly funded or supported cell infill strategy is misguided in that we are a tourism-dependent state and we do not want to say we're only open for business if you're a Verizon customer, or only if you're an AT&T customer. People need to speak to their friends and family on all networks. That's an argument why neutral host is the only cost-effective strategy that we should be pursuing.

Similarly, I've learned recently that 911 calls- if you make a 911 call from a Verizon phone, you're picked up by an AT&T tower- your calling number is not relayed to the 911 call answer location- the PSAP. That means when the call is disconnected or the person having an emergency needs to make another call, the PSAP caller cannot call that person back because the number was not relayed with that type of missing roaming feature. Again an argument for the neutral host.

Priority of 911 call completion in the design of these community networks. These community fiber networks have become increasingly vulnerable to both fiber cuts and power outages and to not be designing with the public safety grade resilience to assure that 911 calls go through or conversely having small cell wireless coverage in the same areas such that there is a fallback strategy to reach help in the event of a fiber cut or power outage. These are issues that really should be addressed in the plan.

Requirements for diverse routes. Again, I believe we're over playing the pre-emption and the fear of litigation. The FCC has been explicitly clear in their 2014 statement of policy- that when it comes to 911 calling reliability, they share jurisdiction with states- they do not pre-empt. That means that every 248a application should be reviewed for diverse backhaul and backup power with extended run time to make sure a single fiber cut… we had one fiber cut in south Burlington on Halloween two years ago which disconnected 23 Verizon cell towers. That should not have been allowed to happen. We do have jurisdiction based on that 911 call completion to require diverse route backhaul off a cell tower.

Similarly, public safety failover. We rely on ethernet to reach transmitting towers. I've got a challenge another statement- 'Public safety, we're in pretty good shape'. And contrast that with Televate's analysis for central Vermont which said our system is at risk of failure. Our radio system is 30 years old and at risk of failure. How we're being told it's in pretty good shape and therefore no design or attention has been paid in this plan is a serious question.

Appropriate use of the VCom statewide radio channels that we invest many millions in 10 or 11 or $13M.

The earmark for Universal Service Fund is currently unnecessary for the connectivity division in light of all this federal broadband money, so while 911 is being short- has a shortfall and we're still insisting on taking that connectivity fund off the top. 911 used to have a higher

priority than connectivity in the fund. That's again- these are the issues that really are supposed to be fleshed out in this plan.

I'm going to quote one section from 202d. It said the State 'In developing the Plan, the Department shall address each of the State telecommunications policies and goals of section 202c of this title, and shall assess initiatives designed to advance and make measurable progress with respect to each of those policies and goals. The assessment shall include identification of the resources required and potential sources of funding for Plan implementation.' That is fundamentally not in this draft. I'm going to repeat that we need to continue to push for our money's worth on this.

I just want to point out that the last meeting- the first one, you're calling it the second- started late and ended early. So to have a meeting where you're using half of it with a slide deck and then compressing all the public comments into 20 or 25 minutes is pretty uh… it's never been done this way before. There were no paper copies made available despite multiple requests. It almost seems intentional to diminish the public participation. Most people can't or won't read a 150 page document on a computer screen. To not publish any paper copies even on request is quite absurd. It's self-defeating as far as mandatory public participation- effective public participation.

Under 202d, the Department is empowered to require information from the carriers. I've made a recent request of the department- did RISI or the Department on RISI's behalf make requests to the carriers of whatever information on- for instance- shoreham's fiber buildout, OTelco's fiber buildout in Shoreham, or locations and available capacity for fiber for lease around the state. Those, unlike 202e under the Connectivity Division, those are not voluntarily disclosed- they're mandatory. They are not subject to nondisclosure agreements. If we did not do that, we fundamentally crippled this draft plan from the get-go. I want to point out that distinction because, in prior years, the same request was made and the Department made no request under 202d authority to ask for information from the carriers.

Host remote isolation has been mentioned in Mr. Dunne's comments. If you allow the carriers to keep secret which remotes are subject to isolation by a non-diverse protected route from that host switch to that remote, you've basically made those public more vulnerable to being unable to call 911. And similarly, you've disempowered planning for a CUD who might want to build fiber sooner on a route that would allow or provide strands for Consolidated to close that host-remote vulnerability or provide a diverse route from that remote back to the host switch. This capitulation to over-broad secrecy and not warning the public and anyone in these exchanges is prone to having their calls isolated within the exchange and not being able to call 911. That is not public advocacy. I call that as an explicit area that should be fleshed out in the plan.

Contingency plans to address the fiber and materials and manpower shortages, or skilled labor shortages. It's clear that we do have a 2024 goal to accomplish 100/100 to every address in the state and that strategy is not laid out in this draft plan. This plan addresses those without cable service, but it does not address customers up to fiber speeds.

CoverageCo- there's about 10 sites that were built under the CoverageCo project with solar panels, generators, some of them have satellite phones for diverse backhaul, which of course wouldn't be suitable for 4G. Those sites are paid for and sitting if not cannibalized by now and those should be made available for 4G upgrades to the communities that are prepared to implement those.

With regard to utility pole hygiene: The Department of Public Service has demonstrated no capacity to inspect nor has there been any effort to petition the Public Utilities Commission to order the pole owning utilities to complete transfers and remove double poles and for attachers to adhere to electrical and safety codes and best practice construction techniques especially for securing and protecting fiber optics where they transition from aerial overhead on the poles to underground, they become very vulnerable to accidents of snow plows, sabotage, car accidents, Etc.

Inspections and complaints of poor construction and poor maintenance should be delegated, with enforcement authority to municipalities empowered to inspect and enforce pole and cable maintenance and expedite double pole removal.

Along State Highways and right of ways, the state electrical inspectors employed by the Department of Public Safety, Fire Marshal division should be empowered by legislation, staffed up and trained to inspect and maintain proper installation and maintenance protocols along the poles and in the public right of way. Private easements across lands should be enforced by the municipal or state jurisdiction of surrounding lands.

As a funding source, the same pole attachment charge, maintenance, right-of-way surcharge that's being considered for remodeling the universal service fund and or public benefit fund for use of the right of way should also fund these maintenance inspectors as well as allowing municipal and state inspection agencies the option of retaining fine revenues.

PEG-Net With regard to the public access television Community, media network in light of the Court decisions and FCC changes that might allow cable companies to begin deducting from the five percent of revenues funding stream that currently supports important Public Access media functions in Vermont, the Statewide fiber Network, connecting the access media organizations should be separated from any Corporation Comcast,p especially, lest it be used as a high-cost deduction from the five percent share of the gross revenues.

The proposed 10Gbps fiber network is necessary for not only live broadcast of Live Events Statewide over both web streaming and broadcast via interconnection with the head ends but it's also important for centrally archiving public media of Select board meetings, Planning Commissions, design review, 911 board, Legislative events and for managing a restored Vermont Interactive Television network.

Enhanced 911 resiliency and planning With regard to the 911 system and 911 call completion assurance, resiliency very incremental progress has been made recently with a rulemaking on carriers reporting power outages but all these carriers should be required to identify all electricity dependent electronics, meaning field amplifiers, nodes, switches and hubs. The nodes are typically powered by the amplifier, powered amplifier locations requiring a metered grid connection and pushing voltage to the nodes themselves. But every one of these electronic devices electrically dependent devices needs to be mapped and consideration should be made of some equivalent of a PowerWall type powering source for extended runtime batteries, especially if these could be connected through an Ethernet Network and serve as a resiliency benefit Peak load leveling for the electric utilities, similar to the way the existing installed base of power walls supports Green Mountain Powers grid resiliency efforts.

Propagation Mapping Wireless coverage surveys and mapping must be on-going Mapping of all cell coverage, more precisely signal strength, data rate, location for all of the cell carriers must be mapped again as it hasn't been done since 2013 but the capacity needs to be built

within the state to continually go out and measure again when new towers are installed and to find the dead zones towards the supporting a plan for resolving or in filling those dead zones.

When a new tower is proposed, carrier should be required to share the most detailed information on projected propagation from those towers, that should be checked against as-built after the towers installed, both to hold the carrier accountable for the conditions of the permit, they were granted as well as to inform any infill necessary by Communications Union, Districts, or a neutral host operator.

The CoverageCo small cells have yet to be sold for scrap or donated and the 100+ remaining units installed on poles may still be accruing pole rental charges. This is necessary to resolve and will cost money to remove the electric meter sockets, which still have useful life in another location.

Resiliency and cyber security planning and prevention must be part of the plan. Critical databases such as cloud stored operations and repair manuals, gis mapping, restorable images of essential computers need all be geographically inventories and secured, on air gapped storage to assure availability in the event of a national scale cyber disruption or attack.

With regard the enhanced 911 system. The recently executed contract with in digital, spans the next four or five years thus its replacement falls within the ten year plan scope. E911 is now riding on fiber circuits leased from FirstLight, Consolidated Communications and possibly others. As the state's resilient Network to support CDs and broadband and Public Safety comes into maturity, through the design that will hopefully be completed by year-end 2021, an Unbundled 911 Plan and design for enhanced 911 beyond the inDigital contract should be incorporated into the Telecommunications plan.

Protected circuits between all public safety, locations and transmitter towers should be part of a comprehensive design from the landline or cell phone, through the cellular infrastructure and switching to the public safety answering point. To the Dispatch Center if not co-located with the PSAP and beyond that to the transmitting towers and receiving radios within the vehicles, or with the First Responders. I won't use the term cradle to grave because that portends an unfortunate outcome, but that Soup To Nuts, envisioning the reliability and resiliency of the enhanced 911 call process needs to be fleshed out in a plan complete with testing protocols.

It's very likely that Network design and maintenance would be one contract. Second contract can be selective routing and, or the state could look at acquiring selective routers. Third contract for PSAP equipment and dispatching equipment. Remodeling the universal service fund under the exceptions in the internet tax. Freedom Act for both Universal service funds used to fund the enhanced 911 as well as universal service funds created before 1996 both of which implicate Vermont's unique situation. So With regard to freezing deer in the road for fear of litigation risk. Vermont's strategy should be to cleanly separate the lifeline, the telecommunication services for the deaf, the TDD/TTY support and the connectivity. Remove all of those from the universal service fund. Include Dispatch within the 911 system because it is an essential piece of the 911 system. By so doing we would potentially be on safe ground to extend the 2% Universal service charge to all Broadband services and fully support enhanced 911 and dispatch from that fund.

Planning and governance changes required. The Ten-Year Telecommunications Plan should not be assembled by an agency responsible for grant disbursements. The chill on outspoken but necessary critique is detrimental to both the plan and the parties. The plan should be

assembled in a more comprehensive and integrated manner, consistent with the state five-year strategic IT plan, the Health IT Plan, the state economic strategy, the new E911 plan. A designated quasi-judicial body should review these plans for consistency among the plans as well as for strict adherence to statutory plan requirements. Plans should be approved only after an affirmative finding of both completeness and consistency among plans is made. This recurring review process should measure progress made since prior plans, changes necessary to finetune plans and new extended goals and milestones.

Recommendation for the Telecommunications Plan

The Telecommunications and Connectivity Advisory Board recommends that the 2021 Telecommunications Plan include a table in the Executive Summary that includes each of the recommendations included throughout the report.
That table should align each recommendation with:

- the statutory goal towards which it supports as well as a layman explanation of the
- impact/outcome of goal
- List of specific action items that are included in the current draft plans and any
- additional action items that the consultants feel are appropriate
- a timeline for completion
- the identification of the entity that is responsible for its implementation. These entities
- could include:
- Department of Public Service
- Other Agencies and Departments in state government
- Telecommunications and Connectivity Advisory Board
- Vermont Community Broadband Authority
- Communication Union Districts
- Other telecom providers
- Vermont Public Utilities Commission
- Vermont State Legislature
- Incumbent Local Exchange Carriers
- Competitive Local Exchange Carriers
- VELCO
- Regulated Electricity Utilities
- Others, as appropriate

The purpose of this recommendation is to establish a process for tracking progress in the implementation of strategies to accomplish the statutory telecommunications goals.

Please find my comments in reference to the the Draft version of the Vermont 10 Year Telecommunications Plan made public by the Vermont Department of Public Service on May 11, 2021. These support more detailed comments submitted on behalf of Vermont Access Network (VAN) on April 23, 2021.

Vermont Access Network (VAN) is particularly concerned about the long term viability of a public benefits structure that includes Public, Educational and Government (PEG) access.

1. **VAN members appreciate that the draft 10 Year Telecommunications Plan acknowledges the important role of public, educational and government (PEG)** access media services that Vermont Access Management Organizations (AMOs) deliver to cabled

and non-cabled communities alike. These have been recognized as “essential services” by the Legislature during the COVID-19 health emergency. (Act 137, Sections 18 and 19).

2. By definition, **it is necessary for the 10 Year Plan to take a longer term view** on the future of public access and community media. This plan focuses largely on the post-pandemic time frame, reflected in its limited recommendations about PEG access. The final plan must take a broader view of PEG related issues. Examples follow.

3. The **draft plan recommendations focus only on the recommendations of the “PEG Study”**, requested by the Vermont Legislature in 2020 (Act 137, Section 19) and commissioned by the the Vermont Agency of Commerce and Community Development.

In these recommendations, the draft Plan refers to the PEG Study recommendations for alternative PEG funding options for the Legislature to consider, while emphasizing the legal risks of the proposed options: “it should be reiterated that any option will carry litigation risk and a robust risk assessment” (page 139). This recommendation states the obvious and serves to de-emphasize the recommendations of the PEG Study.

At the same time, the draft Plan advances a streaming tax as perhaps the most viable of the options. In our opinion, this streaming tax (on content carriers) is the most vulnerable to legal challenge. The stronger recommendations lie with assessment of the public right of ways.

But the Plan is reluctant to lean in this direction while risking creating an unnecessary opposition between Vermont’s CUDs and Access Management Organizations (AMOs).2 The state can choose to support both policy goals by creating alliances rather than seeding competition for funds.

The draft Plan cautions the state against taking a lead role in modernizing PEG funding, without acknowledging the fact that Vermont is four decade, national leader in the development and diversification of PEG services and funding.

The larger goal, to modernize the state’s telecommunications tax structure, is a longstanding objective of key Legislative committees and is supported by the 2021 report of the Vermont Tax Structure Commission:
VAN agrees that there are legal implications for any tax modernization policies, but this should not dissuade the legislature from serious consideration of these questions

Further, VAN contends that discussion of the PEG Study recommendations should acknowledge the timeliness and importance of the Vermont Legislature using its authority to modernize the state’s telecommunications regulation and tax structure

4. VAN also recommends that the **plan include specific language to guide regulators and policy makers as they consider how to allocate public benefits of the communications and telecommunications network.** In particular, VAN recommends that Vermont legislators and regulators work to rationalize communications and telecommunications public benefits into a **Public Benefits Fund** to include Universal Service Fund, Broadband for All, E-911 Funds, and PEG Funds; elders/students/income sensitive; operating and capital funds for public access production centers (aka community media centers or AMOs); libraries, schools, etc. (The NTIA TIIAP Model); and, intermediaries like Tech Corps and/or AMOs that provide

production skills, management and broad distribution for communities to make highest use of these benefits.

5. The policy objectives of the 10 Year Telecommunications Plan has implications for future certificates of public good and negotiations with cable operators. It is necessary for the state to use its influence **to assure ongoing technical parity for PEG cable channels and applications.** Technical parity with commercial channels continues to be an issue for PEG channels. A longstanding example: Vermont's largest cable operators have resisted reasonable requests for HD channels, in spite of the fact that PEG channels are now recorded and prepared in HD formats.

Another important consideration is the "chipping away" of previously integrated cable features for PEG use. Namely, the high cost of including PEG metadata for cable viewers to know what is airing, and to manipulate the content. While PEG AMOs obtained access to the interactive program guide in the most recent Comcast Docket, the 2022 cost for using this service will be $6000 a month, per channel, according to most recent discussions with the IPG vendor. This is prohibitive for PEG channels small and large. Additional marketing support and technical assistance would be useful if better prices can't be negotiated.

In last week's 6th Circuit Court of Appeals ruling in City of Eugene v FCC 3, the court affirmed the idea that so-called "in-kind" benefits, such as free services that companies agree to as part of their contracts with local governments can be classified as "exactions" by the FCC – and then be counted against the 5% revenue cap of franchise fees that local governments derive from cable agreements. While these implications are not yet clear, the State must be willing to stand up for PEG in the face of the erosion of PEG funding.

6. **The draft Plan should not miss the opportunity to support public applications of the state's communications and telecommunications networks.** Examples to support and discuss in this Plan include:

- Interconnection of the new Vermont Community Television HD channel provided by Comcast, which increases in value as all cable operators adopt it. Connection of cable operators to (now) channel 1070 is encouraged in Rule 8.000 and bears repeating in the current version of the Plan.

- Design an Interactive Statewide fiber network. Now is an important and opportune time to immediately plan and build the next generation of low carbon, internet-based public participation: a statewide, interactive, high bandwidth, high definition teleconference and public hearing network that serves the civic, telehealth and educational purposes of the state of Vermont. At least two Legislative study committees,4 have identified the need for the next generation of VIT. *See VAN 4/23/21 Testimony, Appendix 3.*

- Capital Support - ADA Compliance, while the costs are coming down, the AMOs will need financial support to make meaningful adaptations for federal compliance with ADA laws.

- Archive Preservation - The Secretary of State's Archivist thinks that Vermont is an ideal model for a national funding to support the substantial statewide archives. CCTV alone has 41,000 programs in its database. VAN produces 18,000 hours a year. Continue to invest in

the archivist preservation position at the Secretary of State's office. Create a plan and obtain funding for a statewide video archive. Continue to support the Secretary of State's archival preservation position.

- Grant Program for Community Communications - As federal funds for broadband projects become available, VAN is looking for support for the statewide Vermont Community Television, Technical Assistance Corps, Summer/ Vacation Camp Delivery, and Municipal Meeting Coverage.

7. The 10 Year Plan should not flinch from discussing ways that Vermont can improve the decision making process on state level telecommunications matters. These are long term decisions made within the short term time frame of the Legislative session. There needs to be continuity of policy, administration and evaluation to make sure that the Legislature can make informed decisions with the help of knowledgeable legislative staff and accountable administration staff. Ideally, the new Vermont Community Broadband Authority, will add capacity to an overburdened Department of Public Service, whose primary job is to protect the public interest.

8. **Public Process in this Plan is Insufficient.** Given the widespread public interest in broadband deployment and telecommunications issues, the Department of Public Service (and State of Vermont) is missing an important opportunity to involve its citizens given the current design of the poorly thought through and not inclusive public process related to the review and approval of this version of the Plan.

To date, the public process has been relegated to press releases and the result has been sub-standard and must be acknowledged as unacceptable. The Department cannot simply include the PEG AMOs as partners in the process without sufficient time and meaningful collaboration. Nor can the Department staff design a process without professional advice on public engagement. **Resources must be spent to involve the public and strengthen the final version of the Plan.**

Thank you for the opportunity to participate in the public process. We hope our recommendations are of service to the work ahead. We are happy to provide additional information on any aspect discussed here.

Today, I am speaking in my capacity as a founder and long-standing member of Vermont Access Network (VAN), a professional society of Vermont's 24 community media centers.

VAN members manage and deliver public, educational and government (PEG) access media services to cabled and non-cabled communities alike, and have been recognized as essential services by the Legislature during the COVID-19 health emergency. (Act 137, Sections 18 and 19).

We pool our resources for joint projects, such as the Vermont Media Exchange (VMX) and the recently-launched Vermont Community Television Channel. VAN members also actively work to find new revenue alternatives to replace quickly declining cable funding.

This testimony contains:
- General Recommendations
- Exhibit 1: VERMONT PEG OVERVIEW
- Exhibit 2: EXHIBIT 2 - PEG STUDY RECOMMENDATIONS, SUMMARY
- Exhibit 3: VERMONT INTERACTIVE TV 2.0

1. OVERVIEW: In today's changing global telecommunications industry, Vermont's "Ten Year Plan" will guide Vermont's Legislature and Administration in decisions related to communications, telecommunications and information policy, initiatives and actions. Per Act 79:

The Department of Public Service shall constitute the responsible planning agency of the State for the purpose of obtaining for all consumers in the State stable and predictable rates and a technologically advanced telecommunications network serving all service areas in the State. The Department shall be responsible for the provision of plans for meeting emerging trends related to telecommunications technology, markets, financing, and competition.

In particular, Vermont Access Network is concerned with the following elements of the Ten Year Plan:1

(6) An assessment of opportunities for shared infrastructure, open access, and neutral host wireless facilities that is sufficiently specific to guide the Public Utility Commission, the Department, State and local governments, and telecommunications service companies in the deployment of new technology.

(7) An analysis of available options to support the State's access media organizations.

(8) With respect to emergency communications, an analysis of all federal initiatives and requirements, including the Department of Commerce FirstNet initiative and the Department of Homeland Security Statewide Communication Interoperability Plan, and how these activities can best be integrated with strategies to advance the State's interest in achieving ubiquitous deployment of mobile telecommunications and broadband services within Vermont.

(9) An analysis of alternative strategies to leverage the State's ownership and management of the public rights-of-way to create opportunities for accelerating the buildout of fiber-optic broadband and for increasing network resiliency capacity.

Vermont Access Network recommends that Vermont use its authority to modernize the state's telecommunications regulation and tax structure. VAN is particularly concerned about the long term viability of a public benefits structure that includes Public, Educational and Government (PEG) 2, although our comments address other aspects of open access to the state's communications network.

2. STORY BEHIND THE CURVE: Telecommunications (phone), Communications (TV, cable, satellite) and information (internet) services have converged into a digital stream running

through fiber networks and wireless distribution points, largely located on state and local "rights of way" (ROW).

In federal law, each of these communications methods resides in a regulatory silo with different public interest requirements. In Vermont, telecommunications companies are required to subsidize the High Cost Program (Universal Service Fund or USF), the, enhanced E-911 fund,3 and most recently, the Connectivity Fund. It is important to note that all of these are passed through to ratepayers. Cable companies are required to underwrite public, educational and government access (PEG). Internet companies are exempt from public interest requirements.

The historic drop in phone and cable usage in favor of broadband internet is creating deficits in these public benefit funds: Evident in E-911 Fund deficits4, the steady increases in the Universal Service Fund (phone), plus 5% annual projected decline in public, educational and government (PEG) access TV (cable). 5

Revenue projections do not favor a sustainable future for PEG and community media. Pay TV revenue, which includes cable in the US, is estimated to decline by 35% by 2025 as cable subscribers "cut the cord" in favor of a la carte internet based news and entertainment services. In Vermont, Comcast's annual PEG reports show a 8.5% decline in revenue between 2019 and 2020.6

3. RECOMMENDATIONS: The convergence of coaxial cable, land lines, wireless into the fiber backbone (with wireless outposts) makes the siloed policy approach to public access outdated.

The PEG Study discussed the State of Vermont's authority to modernize its policy approach and points to ways the State can rethink how commercial providers exchange public benefits for their use of the public ROWs.7

Vermont Legislature has the authority to restructure and modernize its telecommunications tax structure, including requirements for public benefits to promote access to the network and community production.

- Modernize Vermont's Telecommunication Tax structure to reflect the technology transition from discrete industry silos to converged fiber-driven networks. It's worth noting that the goal of these fees/ taxes is to increase access to the means of production and distribution. The providers pass the cost on to subscribers and gain new customers. (That is, regulation is good for business).

- Ensure **Open Access** Provisions for all the fiber that is built/ or activated, especially those projects that receive public money.9 All fiber built in the public rights of way should set aside capacity for competitors to lease and for public benefit at no or low cost. This also makes monopolies harder to achieve and add more customers to the network.10

- Rationalize **Public Benefits Funds** to Promote Network Use, such as Universal Service Fund, Broadband for All, E-91111 Fund, PEG Funds. All compensation from providers benefiting from access to the state and local ROW. In particular, be sure there is a reliable revenue stream for PEG funding and community media applications.

Taken together, **public benefits include:** "channels"; rate subsidies for elders/students/income sensitive; operating and capital funds for public access production centers (aka community media centers or AMOs); libraries, schools, etc. (The NTIA TIIAP Model); and, intermediaries like Tech Corps and/or AMOs that provide production skills, management and broad distribution for communities to make highest use of these benefits.

(7) An analysis of available options to support the State's access media organizations.

- Continued recognition by the State of Vermont as an "essential service" - provider of technical assistance and production resources on keeping the community connected. In light of federal funds for broadband intermediaries and tech corps, we recommend that the State include access management organizations (AMOs) in eligibility requirements for federal broadband funds Vermont's broadband bill + New National Initiatives + ARPA funds.

Vermont's community media centers are living color examples of public benefits of universal broadband service in our communities and need to be treated as such--another reason to look beyond cable to all video (telecom/ communications) users of the right way to support public benefits.

- Assure ongoing technical parity for PEG cable channels and applications.

Technical parity with commercial channels continues to be an issue for PEG channels. Vermont's largest cable operators have resisted reasonable requests for HD channels, in spite of the fact that PEG channels are now recorded and prepared in HD formats. Another important consideration is the "chipping away" of previously integrated cable features for PEG use. Namely, the high cost of including PEG metadata for cable viewers to know what is airing, and to manipulate the content. While PEG AMOs obtained access to the interactive program guide in the most recent Comcast Docket, the 2022 cost for using this service will be $6000 a month, per channel, according to most recent discussions with the IPG vendor. This is prohibitive for PEG channels small and large. Additional marketing support and technical assistance would be useful if better prices can't be negotiated.

- Interconnection of the new Vermont Community Television HD channel provided by Comcast, which increases in value as all cable operators adopt it. Connection of cable operators to (now) channel 1070 is encouraged in Rule 8.000 and bears repeating in the current version of the Plan.

- Design an Interactive Statewide fiber network. Now is an important and opportune time to immediately plan and build the next generation of low carbon, internet-based public participation: a statewide, interactive, high bandwidth, high definition teleconference and public hearing network that serves the civic, telehealth and educational purposes of the state of Vermont. At least two Legislative study committees,12 have identified the need for the next generation of VIT. *See Appendix 3*.

- Capital Support - ADA Compliance, while the costs are coming down, the AMOs will need financial support to make meaningful adaptations for federal compliance with ADA laws.

Worth noting from the previous Telecom Plan Draft: The state should explore the adoption of new equipment and services that improve communication for deaf, deaf-blind, and hard of hearing consumers. The State should explore the feasibility and value of

a communications facilitator program for deaf-blind consumers. The state should also consider adding relay conference captioning (RCC) to the menu of supported TRS services. While the State considers adjustments to existing VUSF programs, the state should be ever aware of the trends and financial wherewithal of the fund to handle changes and additions to the supported programs.

- Municipalities will require ongoing support for the next generation of public meeting and event coverage. The AMOs are developing cost effective hybrid meeting "kits" to support this transition. This type of capital expense should be eligible for federal relief and other funding.

- Archive Preservation - The Secretary of State's Archivist thinks that Vermont is an ideal model for a national funding to support the substantial statewide archives. CCTV alone has 41,000 programs in its database. VAN produces 18,000 hours a year. Continue to invest in the archivist preservation position at the Secretary of State's office. Create a plan and obtain funding for a statewide video archive. Continue to support the Secretary of State's archival preservation position.

- Grant Program for Community Communications - As federal funds for broadband projects become available, VAN is looking for support for the statewide Vermont Community Television, Technical Assistance Corps, Summer/ Vacation Camp Delivery, and Municipal Meeting Coverage.

And finally,

- Improve the decision making process on state level telecommunications matters. These are long term decisions made within the short term time frame of the Legislative session. There needs to be continuity of policy, administration and evaluation to make sure that the Legislature can make informed decisions with the help of knowledgeable legislative staff and accountable administration staff.

Ideally, the new Vermont Community Broadband Authority, will add capacity to an overburdened Department of Public Service, whose primary job is to protect the public interest.

- Use the Plan! The State of Vermont has a better chance of achieving its "access for all" goals with a realistic plan. The Ten Year Plan must be a living document that guides decision making with annual updates. As the framework for policy considerations, the plan should be easy to explain and realistic to implement.

Thank you for the opportunity to participate in the public process. We hope our recommendations are of service to the work ahead. We are happy to provide additional information on any aspect discussed here.

I wish to offer the following comments in areas I believe the Vermont Tlecommunications plan must address. I have written my comments which I feel are vital to the overall success of Vermont's efforts to build out Broadband, Fiber to the Home (FTTH) in the remaining areas of our state which have remained extremely economically challenging to construct. The first

area which has contributed significantly to our inability to affordably buildout the small, remaining areas of the 2 towns we serve is personal property taxation.

History
Duncan Cable TV like all other Cable companies licensed to sell service in Vermont, have always paid local and now state wide property taxes on it's personal property. This category includes cables, including fiber optic cables, distribution equipment and other numerous types of technology we have in service. Over the last 49 years, we have never enjoyed any tax break when it comes to annual personal property taxation. On the other hand, Telephone companies have been exempt by statute from having to pay any personal property taxes. This Telephone company exemption has been in place since the 1930's.

Currently
In today's world of "connectivity", the long standing boundaries defining what types of services a Cable Broadband company vs Telephone DSL company sells, have for the most part, melted away. Telephone companies now offer Video content like Cable and Cable companies now offer Telephony like phone companies.

Consequences of inconsistent property taxation policy
As noted for decades in the Vermont Telecommunications Plan, Vermont's requirement that Cable TV Broadband providers must pay local and state personal property taxes on their equipment while DSL Telco's are exempt, is unfair and an impediment to Broadband Cable companies fully building out their served areas.

For example, a 4 million dollar investment in DCTV's Broadband FTTH network results in approximately a $108,000/yr personal property tax bill. A 4 million dollar investment in a telco's DSL FTTH network results in a $ 00 property tax bill. It's worth mentioning that Telco's and other property tax exempt entities are not bogged down every spring filing Vt Property valuation forms and related, calculated information to state and local lister boards.
Nor are they bogged down each year when appealing grand list values is necessary.

Doubling down on inconsistent property taxation policy
Fast forward to today's CUD proposals, they, along with their potential partners, are seeking personal property tax exemption and plan to offer Telecommunications services in direct competition with existing Vt. Broadband Cable providers who do not receive the same exemption status. Extending property tax exemptions to CUD's and their partners such as Consolidated Communications and Washington Electric for example, will only serve to tilt the already unfair playing field in favor of some new providers over other legacy providers without real justification for doing so.

Solution
All telecommunications providers must be treated equitably when it comes to personal property taxation. It is my understanding that the Vermont Department of Public Service agrees with this position. This Vermont Telecommunications Plan should include a clear path to where any and all Vermont providers of telecommunications services, both wholesale and retail, must pay local and statewide personal property taxes in a fair and equitable manner, with no exceptions.

CUD's

CUD's must be required to compete for any funding opportunities with existing FTTH providers like Duncan Cable TV through an application process which is merit based. The Department best knows, from day to day experience, important considerations such as:
What areas of an existing Cable Broadband provider's town(s) remains un or underserved.
Existing experience in the town where the app is being made,
Experience and customer service record with the VDPS,
Financial worthiness and solvency as demonstrated over many years of service,
Other previous build commitments in the town as it may relate to a company's deserving nature.

Solution
The new revised plan should provide a clear, specific and merit based process which paves the way for the buildout of Vermont Broadband ubiquity. Long stand Vermont Broadband service providers deserve nothing short of process which acknowledges and supports providers with proven track records of quality of service and successful distribution coverage through self funded investments.

Thank you for this opportunity to comment on this important issue.

There are Vermont residents who still are dependent on landline telephone services.

Even if these residents are a small percentage of Vermont's population, any regulation or legislation of **voice-over-fiber** or voice-over-internet services must put these Vermont residents at its center. The stakes are life and death because these residents depend on landline telephone services to get emergency help.

I would like to see all customers of state-regulated telephone companies that deliver voice over fiber optic cables to be provided with a 24-hour battery with a switch. The switch will allow residents to turn off their battery to conserve power during extended power outages.

I also support the following practices:
-Telephone companies should provide a free replacement battery to consumers after the expected life-span of the battery. The battery is required for the service the telephone service provides, so it should be considered a part of that service.
-Telephone-company provided batteries that are defective or substandard should be replaced by the telephone company at no extra charge to the consumer.
-Replacement batteries should be available for purchase locally. A battery that is only available for order online is not acceptable.
-Existing voice over fiber installations should NOT be grandfathered under new regulations.

Andover residents should not be penalized because Vermont Telephone got a federal grant. Grandfathering will only encourage state-regulated utilities to implement new technologies before the state has the chance to assess the technologies' effect on consumers.

Many residents of Andover, Vermont do not have cell phone service at home. They frequently experience power outages of longer than eight hours. Andover residents depend on telephone service from our local telephone company to communicate with the outside world.

We particularly need to do this during and after severe storms when it's likely we won't have power.

I urge the Public Service Department to consider the residents of Andover, and other Vermont residents in a similar situation, in your 10 year plan.

The Vermont 10-Year Telecommunications Plan needs to include a strong statement on the value and necessity of full public disclosure of system information by all telecom entities. both private and public, including Communication Union Districts (CUD's). Such disclosure - to State executive and regulatory agencies and the Legislature and to the public - is essential for administration, regulation, coordination, oversight, and public funding of telecommunications activities in Vermont.

In both rulemaking proceedings and in court, corporate telecommunication companies have repeatedly and resolutely sought to be exempt from disclosure, usually invoking the "trade secrets" provision of the Vermont Public Records Act (1 V.S.A. Sec. 315-320). In a recent rulemaking on outage reporting by the Vermont Enhanced 911 Board, for example, utilities sought a blanket before-the-fact, no-further-explanation-required exemption, citing both business competitiveness and infrastructure security. CUD's may also claim confidentiality for information about their activities, despite the fact that those activities will be publicly funded.

The Telecom Plan should at a minimum set forth the justification for and thus provide a foundation for more forceful efforts by Vermont's executive agencies and legislative bodies to request detailed information from telecom service providers. To address the matter of transparency fully, the Plan really needs to recommend that the Legislature update the Public Records Act with specific requirements that would apply to the State's telecommunication (and other, e.g., electric) utilities and would state that relevant reports may be required by State agencies and that such reports shall be considered as public records. The Legislature may of course include whatever qualifications for disclosure it deems appropriate.

I am requesting that the Plan address the issue of public disclosure and include the recommendation noted above. Such public disclosure of telecommunication information is fundamentally necessary to ensure the reliability and resilience of Vermont's telecommunication systems, the cost-efficient and accountable expenditure of public funds, and the safety and welfare of Vermont citizens.

I appreciate the opportunity to provide comments on the draft Telecom Plan. There are major omissions and deficiencies in the Draft which other commenters have pointed out. I hope these will be adequately addressed, but my comments deal more narrowly with an issue the Department has refused to focus on despite repeated requests and opportunity to do so: the dependency of today's fiber optic technology on electricity and the vulnerability of our telecommunication system to loss of connectivity in event of a temporary or catastrophic electric power outage. The Plan needs a section that explicitly and fully recognizes this disadvantage, vulnerability, risk factor - whatever we choose to call it - of widely-supported and largely beneficial broadband technologies - - a separate section, not buried away where it goes unnoticed. The text should explain in layperson's terms the nature of the electricity dependency, the circumstances under which E-911 and regular connectivity could be lost, the consequences of such loss of telecom service, and

measures that can and should be taken to minimize risk or to deal with outages that occur. My similar request to RISI in late 2020 (excerpt below) was ignored.
A number of actions to address this problem were proposed in previous telecom-related proceedings, including Public Utility Commission Case No.19-0705-PET (see Attachments A and B). Most importantly, the Plan should emphatically state that plans submitted by Communication Union Districts to receive State funding "shall" describe what actions the CUD will take to inform subscribers of the loss-of-service vulnerability of their technology and the actions the CUD will take to assist subscribers with service options such as backup power or signal boosters, micro cells, wi-fi hotspots, or other services in areas without cell phone coverage.
Now a few other comments. The Plan must take cognizance of and address the equity issue, again in a separate and well-articulated section. This was described in a June 1 article in The New York Times by economics reporter Eduardo Porter:
A Rural-Urban Broadband Divide, but Not the One You Think Of
Many more people in cities lack broadband access than in rural areas, but lawmakers are primarily focused on extending high-speed access to remote areas.
https://www.nytimes.com/2021/06/01/business/rural-urban-broadband-biden.html?smid
Universal Fiber-to-the-Premises is a commendable goal, but doing this in a rural state through CUD's, rather than for-profit carriers, will not make it any more

affordable to residents of limited financial means. All the technology in the world is meaningless unless a person, rural resident or urban, can pay for it. We in Vermont are hearing a lot about the need for for "affordable housing". Our Vermont Telecom Plan needs to propose ways to assure affordable broadband.
To be useful as a "10-Year Plan", the document must bring the issue of resiliency to the forefront. In our interconnected world and technology-based economy, if and (more realistically) when a catastrophic event occurs, when a major segment of the electric grid and/or the telecommunications system goes down, everything - basically life as we know it - will go down. It could be a severe hurricane or other weather event, it could be a cyber or ransomware attack: consider climate change, recent events in Texas (massive winter storm power outages in February), the Southeast (Colonial Pipeline), the December 2020 Solar Winds and subsequent attacks: https://www.csis.org/programs/strategic-technologies-program/significant-cyber-incidents). Unless this document describes, recommends, and generates preparatory actions for what Vermont will do to maintain essential services in such an event, it will be a "plan" in name only.
Finally, I ask for responsiveness. While submitting these comments only as an individual, I participated in and am well aware of my town of Shrewsbury's 2-1/2 year effort to raise awareness and obtain solutions to this vulnerability of the fiber optic technology that is currently receiving so much attention and public funding. To document this point as forcefully on the record as I can, I am submitting the January 16, 2019 letter from the Shrewsbury Selectboard to Commissioner Tierney (Attachment C). Excerpted from a followup letter the Selectboard sent to Comm. Tierney on March 20, 2019 is the short paragraph below. To this day the requested commitment has not been made. I ask again that it be fulfilled.
"The opening line of our January 16 letter identified its purpose to offer comment on the 2018 Vermont Telecommunication Plan and a key request was to ask you to amend the Plan to recognize and address the problem we described of loss of

basic voice phone service during electric outages. Will you commit to doing so?"
Please review and consider the attached documents to be part of this comment.

Thank you for the opportunity to provide comments on the draft Plan which presents a great deal of information. I have nine suggestions for improving it.
1. In Sec. 8.2.2.3. on Pg. 87, the text should better describe cell signal boosters (with a photograph). It should also explain how these differ from micro-cells that are attached to telephone poles. The Plan should assess whether such micro-cells can play a role in extending connectivity in underserved areas, perhaps those where line extensions are less feasible. If they can, then micro-cells should be included in the Plan's recommendations for enhancing connectivity.
2. On pages 64-67, advantages and disadvantages of four types of internet broadband are listed. In the first, "high-speed wireline technology (fiber optic and cable)", there is no mention of the fact that non-line powered systems rely on electricity for their functioning such that, after their one-to-eight hour batteries expire, they lose all connectivity in an extended electric power outage caused by a weather event, a system-wide malfunction, or a cyber-terrorism attack.
This outage potential during what are by definition emergency circumstances is a very serious - and largely unrecognized - reality. The draft Plan should put this public safety vulnerability fully into view and propose solutions to address it.

Prefiled Document for October 21, 2019 Workshop
Vermont Public Utility Commission Case No.19-0705-PET

Cover Letter

This submission is made in response to the Order of September 24, 2019 regarding the fourth workshop scheduled for October 21, 2019 in the above-cited Case. It includes in one document this cover letter along with two attachments. Additional recommendations, commentary, or exhibits may be offered at the workshop. To avoid repetition, please refer to submissions for the three previous workshops by Jonathan Gibson and/or Chuck Finberg from Shrewsbury that contain background on the loss-of-911-continuity problem, observations on the varying degrees of utility compliance with FCC rules, and recommendations for actions which supplement those presented here.
In addition to recommendations in the two attachments, there are three topics previously considered or that can be considered on Oct. 21 that the Commission should address in preparation of its Act 79 Report to the General Assembly.
First, the Legislature's directive to the PUC has two parts: to report "its findings regarding provider compliance with backup-power obligations" and to "recommend best practices for minimizing disruptions to E-911 services during power outages" through four specific measures. The best practices could be those voluntarily undertaken by telecom utilities, those the Legislature could mandate by statute, those the PUC could order the utility to provide, those that one or more existing entities or a new entity could perform, or a combination of the options just noted. The PUC should clearly identify actions that it intends to take or that it can take on its own authority to require that best practices are required and implemented.
Second, a major issue that has surfaced in the workshops and that the Report must address is the ambiguity and adequacy of the "shall offer for sale" and "at the

point of sale for a Covered Service" requirements of FCC Rule Part 12, Sec. 12.5. How and to what extent were subscribers informed of the shift in responsibility for maintaining E-911 continuity, to what extent are they actually aware of this today, are annual disclosures or websites sufficient to ensure public safety measures, and can utilities outsource provision of 24-hour or replacement batteries to third parties? These questions should be examined more fully in the Oct. 21 workshop. Third, at the Sept. 19 workshop there was discussion of the Regulatory Recovery Fee that appears on some telephone bills (pgs. 46-50). The Hearing Officer suggested (pg. 49) that the question of what the fee is for and how it could be used be further examined. This will be a useful topic for further consideration on Oct. 21.

October 11, 2019

Attachment 1

The recommendations listed below should be included in the Report that the Public Utility Commission is directed by Act 79 to make by December 15, 2019 to the Vermont General Assembly of "best practices for minimizing disruptions to E-911 services during power outages."

1. Utilities should be required to replace the eight-hour battery in customers' homes with the now Federally-mandated 24-hour battery (or equivalent). This should be done at the utility company's expense.
2. All telecoms should be required to acquire and to keep in stock several high-quality batteries of varying capacity to replace customers' batteries when these expire. Corporate bulk purchases will reduce battery cost to consumers and will enable consumers to avoid mistakes in ordering incompatible batteries, as well as eliminate long-distance shipping and handling charges for individual orders. Utilities can use existing Regulatory Recovery Fees (RRF) collected in monthly bills from their customers to cover the cost, or these costs can be rate-based to ensure reliable service and public safety.
3. Phone companies should be required to install new 24-hour batteries or replacement batteries with their own personnel on request from their customers. This service should be available at no added cost to the subscriber.
4. Since the telecoms have the capability to monitor the condition of a customer's backup battery, the companies should be required to notify the customer if the battery is in a low-charge condition or otherwise non-functional. The customer can then request delivery and installation of a replacement battery per 1-3 above
5. The Commission should recommend the full-service backup power option – batteries provided and installed at utility expense – in its Report to the Legislature. The Commission may also want to outline the service-for-fee option requiring utilities to provide and install the batteries, but allowing them to cover their costs (i.e. not add a parts or labor markup). This is the approach some telecoms have adopted. All companies should be required to offer this approach at a minimum.
6. Recommendation #5 may be affordable for some customers, but certainly not for all. Customers who are on lifeline service or who may otherwise have difficulty in affording to purchase – or in installing – batteries must be provided with these services at no cost or for reduced cost. The PUC cannot fail to recommend provisioning of reliable backup power to the most vulnerable segments of our state's population.
7. From both common sense and from the presentations of a number of rural

towns, individuals, and organizations, the PUC must recognize that there is not a widespread awareness of the vulnerability to loss of regular and emergency calling service during extended power outages. This must be addressed through recommendations in the Report for greatly improved consumer education and community outreach by the telecoms. In some cases, such as for the elderly or handicapped, people with disabilities, and the like, individualized contact and assistance with battery monitoring and replacement will be necessary. The Report

must address this specific need.

8. Annual notices and website information are inadequate to inform or to impress upon consumers the shift in responsibility for maintaining telephone infrastructure or for maintaining, obtaining, and replacing batteries. To remedy this deficiency, the PUC Report should recommend an "enhanced notification" requirement that utilities do the following:

a) provide colored (or multi-colored) notices to each consumer containing all necessary backup power information;

b) provide, either electronically or otherwise, an instructional video about battery maintenance, upgrade, and replacement to all subscribers (customers to receive individually, not by visiting a website);

c) provide a toll-free telephone number and personnel for customer assistance and trouble-shooting on battery matters;

d) include in their mailings and on their website a reasonably complete listing of local, state, and national sources from which backup power can be obtained (not just a few hardware stores, battery suppliers, or solar installers in a limited area);

e) undertake coordination with local governments and community outreach on measures by which jurisdictions and individuals can reduce disruptions to E-911 continuity; and

f) produce an updated disclosure form to be signed and returned by each customer stating clearly that the subscriber acknowledges and accepts full responsibility for all aspects of "self-provisioning" for E-911 continuity during power outages.

9. In the three workshops held to date by the PUC, the telecoms have steadfastly maintained that they are in compliance with the FCC's 2015 requirements regarding backup power and do not wish to incur any additional costs to minimize disruptions to E-911 services during power outages. Given this now obvious fact, that the telecoms can't or don't want to do it, the PUC should recommend one or more alternative approaches – or as the statute says, entities – to get the job done. Discussion in the workshops has suggested a variety of actions and mechanisms that may be helpful: more educational efforts by state agencies (and the utilities), better coordination and action by emergency management agencies, greater involvement of local governments, and possibly an expanded role for the E-911 Board. All of these have their place, but two considerations are paramount.

First, the telecoms cannot "get off the hook" – they shifted from the POTS (plain old telephone service) system to an electricity-dependent communication system, and the primary responsibility to replace what was taken away rests with them.

Second, without a specific, primary, and focused mandate to provide technical and financial assistance to Vermonters on an individual house-by-house basis, it is unrealistic to think that the needed backup power support services will be made available.

This is why the PUC should, and in fact, must, include in its array of recommendations for possible action the creation of what we prefer to call a "telecom backup

power utility" (rather than strictly an "E-911 utility"). Such an entity would be established by Order of Appointment similar to Efficiency Vermont and funded by telecom consumers through an appropriate rate charge. The PUC staff, which is familiar with efficiency utilities, should examine and develop this concept more fully as an option to include in the Report for consideration by the Legislature.
10. The fourth topic in Sec. 26 (b) of Act 79's directive to the PUC has not been addressed in the first three workshops, i.e. minimizing E-911 disruptions through "ongoing monitoring of provider compliance with backup-power obligations." Rulemaking by the E-911 Board per the Act's Sec. 25 may address this issue, but utility capacity to monitor individual battery conditions is a very relevant factor in assessing outage scope and duration. Best practices to achieve this goal can be discussed at the Oct. 21 workshop and should be included in the Dec. 15 Report. Outage reporting requirements for utilities should be recommended in the Report.
11. Recommend that in its Ten-Year Telecommunications Plan, the Department of Public Service provide a full discussion, with specific actions to be undertaken, to address the issue of the dependency of telephone service, and 911 service especially, on electricity and the attendant vulnerability and public safety issues.
12. Recommend that no new broadband systems receive approval, obtain state financing, or be installed by any utility in Vermont until the utility has made a showing to the approving authority that adequate consumer notification and provision of technical and financial support with backup power will be provided to all potential subscribers in the proposed service area.
Concluding Memo in Vermont Public Utility Commission Case No.19-0705-PET
This Concluding Memo is submitted to assist the Hearing Officer and Commission in preparing the Act 79-mandated Report to the General Assembly to "recommend best practices for minimizing disruptions to E-911 services during power outages." The Memo has three parts: A) brief observations on the October 21, 2019 Workshop, B) summary of specific Best Practice recommendations, including reference to CSRIC practices, and C) filed separately, which requests that a "comprehensive telecommunications resiliency investigation" by the PUC be recommended in the December 15 Report. This submission includes seven exhibits, numbered 1 to 7.

A. Comments on Oct. 21 Workshop

We wish to thank the Commission for holding these four Workshops and Mr. Tousley for conducting them so as to encourage open and civil discussion. We reference and request review of our previous submissions in this Case, dated in ePUC as April 24; May 28; June 20; August 9, 20, and 22; Sept. 13; and especially Oct. 11 and 18.
* The Report should recognize that while the transition to fiber may work for people in urban areas with cell service, it does not work in rural towns without cell service that are in weather-susceptible locations and are served by certain companies (e.g. VTEL). This is a safety vulnerability for a segment of the population that must be addressed.
* Report recommendations can be grouped in three categories: 1) those that require Legislative authorization, 2) those that don't require new statutory basis, but on which the PUC seeks Legislative direction, and 3) those that the PUC can undertake on its own. Many of the actions we request, though not all, fall into the third category.
* Telecom technology is changing rapidly; see Oct. 21 transcript, Mr. Austin and Mr. Birnbaum, pgs 109-111. These changes are often for better, but not always. Hence any legislation or PUC rule pertaining to Best Practices must require that "Best Available

Technology" (BAT) be the standard of compliance for utilities with respect to the technology and equipment they use and offer and their procurement from vendors. A PUC standard for Best Available Technology is the kind of farsighted state-level action that will push forward the innovation needed for consumer service and safety. FCC Commissioner Rosenworcel's concurring statement four years ago in Docket 14-174 highlights the need for vigilance and technology improvement going forward (Exhibit 1).
* A "telecommunication resilience utility" (TRU) is a promising prospect for delivering technical and financial solutions to the electricity-dependency problem of today's telecommunication systems. Act 79, Sec. 26(b)(3) clearly suggests that an "alternative entity" could provide consumer information, technical and financial assistance. The Efficiency Vermont model shows how such a special purpose entity works closely with a regular utility, GMP (Exhibit 2 a-c). Creation of a TRU will require Legislative action. The PUC Report should recommend initiating the process for examining this option.

B. Best Practices

Several of the telecommunication providers at the workshops asserted the adequacy of their compliance with the FCC backup power rules and argued that nothing more should be required by the State of Vermont. One of the reasons these assertions invite skepticism is because the approaches the companies employ to "comply" vary so widely. At least one company relies on grandfathered eight-hour batteries which

customers are required to monitor, maintain, and replace by making purchases from third-parties. One stocks and installs a type of 24-hour backup batteries. Some companies remotely monitor backup battery status and can inform customers. One has this capacity now, but will discontinue it with new equipment. Informational materials vary widely; some are in minuscule fonts on websites, others consist of mailed back-of-bill notices or flyers of differing content and prominence.
It would not be wise, fair, or practicable to require companies whose capital, planning, and management assets differ as greatly as those between, say, Comcast and EC Fiber, to provide identical backup power services at identical expense. But it is entirely reasonable to require a uniform array of best practices that go beyond the de minimus FCC requirements. There are ways to accommodate size and resource distinctions.
The Vermont PUC should therefore require utilities to undertake "enhanced backup power obligations" to meet the E-911 continuity needs identified in the workshops. Shrewsbury and other Towns have proposed a number of such enhanced services - informational, technical, and financial. The Sept. 2014 CSRIC Report identifies others. We ask such enhanced backup power requirements be recommended in the Report.
Listed among CSRIC's Best Practices are the following ten that we think are most applicable and readily implemented (numbered as in the CSRIC Report). Additional comments (italicized) are offered on some of the CSRIC recommendations.
• Affordable backup batteries 01 – As of Feb 2019, 24-hour batteries are the FCC requirement. The current best practice is for utilities themselves to offer to supply and install, at cost or subsidized, 24-hour batteries to any subscriber who so requests.
• Work with vendors to develop of alternative powering technologies, 03
• Battery on/off switches to extend battery life during outages, 06
• Battery standardization, 08 - also encourage standardization among utilities
• Provider supplying of spare and replacement batteries at reasonable cost, 12
• Work with vendors to ensure remote battery status monitoring, 14 and 21 - and notification to consumers and replacement

• Emergency weather event notification, 19 - by automated phone/text/e-mail alerts
• Offer of whole home power protection, 27 – coordinated with electric or “telecom resilience” utility
• Detailed, step-by-step instructions regarding backup batteries, 29 – and in video
• Battery disposal/recycling information and recycle mailing kit 25 and 26

We may be mistaken, but we do not recall that any provider offered to adopt any of the Best Practices requested by towns or compiled in CSRIC’s Report. We appreciate the RLEC’s offer to perform certain practices (voluntarily). But we note that the RLEC list of ten practices they are willing to perform is worded such that none specifically cite or directly correlate with the 29 CSRIC Best Practices or are markedly different from what the RLEC’s are presently doing.

Likewise, the DPS that initiated these workshops has declined to express a position on any Best Practice requested by Towns or contained in the CSRIC Report. The Dept. is not fulfilling its duty to protect consumers, other than a narrow focus on low rates. It has instead generally echoed the utility contention of “fully in compliance” even to the strained argument (Oct. 21 transcript, pg. 90) that telecoms should not be required to procure, stock and provide (“sell” and “warehouse”) backup batteries even while companies like VTEL expect their many thousands of individual consumers to assume this responsibility themselves. The Report should call for DPS to issue a Ten-Year

Telecommunications Plan as soon as possible, to substantively address in that Plan the issue of telecom electricity dependency, and to propose specific measures and practices to deal with the backup power problem. The Department’s recent RFI related to the Telecom Plan (due Oct 25) must not be allowed to be a cause of yet further delay in Plan issuance.

Communications reliability and public safety are not static phenomena. Vermont needs an ongoing process to stay abreast, indeed be in the vanguard, of advances in telecom technology. One way to do so is for the PUC to conduct an annual review of utility compliance with emerging backup power Best Practices. CSRIC, for example, is updating its Best Practices recommendations in 2020 (see Exhibit 3). The fourth “best practice” topic that Act 79 (b)(4) directs the PUC to examine is “ongoing monitoring”. This topic received little time during the workshops, so we attach below a suggestion that describes how monitoring might be accomplished through a PUC requirement for annual utility backup power reporting.

Concluding Memo – Attachment

Best practice for monitoring providers’ compliance with backup power obligations

By stand alone rule or included in any more far-reaching rule it may issue regarding “enhanced backup power obligations”, the PUC should require companies to submit an annual report with supporting exhibits to describe and document how they are complying, if a covered provider, with FCC Rule 15-98 or any successor rule or with any supplemental “Best Practices” rule the PUC may promulgate. This report will include the following:

Service Disruption:

o Any telecom loss of service their system has experienced: where, when, for how long, and number of subscribers affected (perhaps above a threshold such as 1-2 hours, 20-25 subscribers). Utilities should submit this data to PUC, even if required by Act 79, Sec. 25 rule to submit it to the 911 Board
o Number of consumer inquiries, requests, or complaints about service

disruption or backup power received during preceding year and how the company responded

Back Up:
o Whether they provide, by fee or subsidized, installation or maintenance of backup power equipment, and the type, consumer cost, and volume of such installations in the past year
o Names/locations of backup power venders or sources to which subscribers are referred
o Copies of any backup power information materials provided to consumers, whether by mail (periodic or special mailings) or on a website, including written and video materials

Batteries:
o Whether they stock backup batteries or other equipment for direct purchase by subscribers, and the number of sales during preceding year
o Whether they provide any battery monitoring and notice service, and details thereof

o Whether they have a technical assistance or call-in service to help subscribers with batteries
Community Outreach and Education:
o Number, location, and description of any community education events
o Describe any local government, emergency management, fire department or other public safety organization to which they have provided assistance and nature of the assistance
Improvement Efforts:
o Any action company has taken to improve E-911 continuity, e.g. microcells, call stations, remote terminal capability upgrades, provision of equipment to consumers, or the like
o The company's achievements in finding venders who can provide technological solutions to address loss of continuity during power outages, such as an on-off switch to conserve battery power that is easily accessible from living space (not at the battery housing), etc.

November 3, 2019

Exhibit 2a: GMP bill insert describing services and financing in partnership with Efficiency Vermont
Exhibit 2b: Two GMP bill inserts: Partnership with Renewable Energy Vermont (top of pg.) and description of Efficiency Vermont services and financing (bottom)
Exhibit 2c: Efficiency Vermont mailer offering financial assistance for purchase of energy efficient equipment

Thank you for the opportunity to comment on the 2018 Vermont Telecommunications Plan. We want to focus our attention on one very serious deficiency in the Plan. The Plan does not deal with the need for adequate back-up power at the home to provide basic voice service during extended power outages. The fiber optic cable to the home service provided by

Vermont Telephone Company, Inc. (VTEL) for a significant portion of Shrewsbury is dependent on the availability of electricity and in cases of a power shortage of significant duration is non-existent.
VTEL is not meeting the basic tenet of Universal Service by failing to maintain voice service during power outages. As Selectmen we are charged with establishing and maintaining the conditions and infrastructure to promote the safety and welfare of the residents of Shrewsbury. We take this responsibility seriously, and our residents' welfare is threatened by the ever-present vulnerability of power outage-related loss of communication capacity and of access to emergency services. When VTEL installed fiber optic cable in Shrewsbury in 2015, our telecom service became dependent on electric service. VTEL installed a backup battery at each home to support telephone service, we were told, for up to eight hours during a power outage (these are CyberPower units containing a B.B. Battery lead acid VRLA rechargeable battery, PB 7.2-12).
They do not last for eight hours, and in any outage greater than the battery capacity (as we had November 27-29, 2018), our residents have NO TELEPHONE SERVICE AT ALL. Around-the-clock telephone access is essential for preservation of personal and public safety. If there is a power outage and the telephone battery is not working, people who are elderly, infirm, or living alone cannot request help. In fact, no one who has an emergency situation can get help for an accident, stroke, or heart attack; a child who is hurt or suddenly ill; a house or chimney fire; a school crisis; or any number of welfare- or life-threatening circumstances. Our concern for interruption of emergency phone service is heightened by the fact that Shrewsbury has very limited cell telephone coverage.

The consequences of not having telephone service in a natural disaster, often accompanied by a power outage, would be disastrous on a community-wide scale. And even when loss of telephone service due to lack of power occurs in non-emergency conditions, vital everyday functions like conducting personal or professional affairs, working from home, and running a business are interrupted, with attendant economic impacts.
We acknowledge the expanded use of generators for power outages, but we emphasize that

many residents do not choose, or cannot afford, to purchase this equipment – nor should an ill-advised telecom company investment or installation decision force them to.

Perhaps the utility should upgrade the existing telephone backup batteries with high efficiency long-lasting ones so that basic voice service is maintained during power outages. Lacking technical expertise ourselves, we look to our governmental and private entities to identify and propose solutions. We believe it is the responsibility of regulatory agencies to require solutions and of the telecom companies to implement and finance them.
The experience with VTEL we've had in Shrewsbury should be a cautionary warning for the Department in other requests for approval of fiber optic telecom installations: Do not permit electricity-dependent systems unless the telecom company provides for continued communication service for both emergency and customary use during power outage events.
We ask the Department of Public Service:
1. NOT to finalize the 2018 Telecom Plan until you have examined the issue of telecommunication electricity-dependency and amended the Plan and to acknowledge the problems that this dependency causes and to propose solutions for these problems.
2. To extend or reopen the public comment period specifically to obtain input on the amended Plan and on how adequately it defines and proposes measures to address and fix the problems
associated with the electricity-dependency issue.

We also ask our Legislators to open inquiries in their House and Senate committees of jurisdiction to address the telecommunication electricity-dependency issue. Finally, we ask the Department and VTEL to address our local telecom situation. The Plan states, “Vermonters need and expect affordable telecommunication services of good quality.” VTEL, with the Department's knowledge, took dependable service away by disconnecting the copper lines and installing fiber optic. We ask you to find provide a solution for Shrewsbury. Do not leave our residents and first responders in the current unacceptable situation. Please contact us if you have any questions. Thank you in advance for your attention.
re: the 10-Year Telecom Plan. She feels that there has been a "cavalier attitude" about getting info out to or feedback from the public on this very important issue. Information is inconsistent about when public hearings will be held or when comments are due. For instance, Wednesday June 5 (on the Announcement for the Additional Public Hearings on the Plan) is an incorrect date. She said there's no logic as to how to find the information about how/when/where to submit comments on the plan, or when they're due. This is a very important issue affecting many people's lives in many different ways.
I am hoping to have affordable broadband in the near future that will be reliable. I am worried that all of the funding for broadband will only be for the residents that can connect to fiber. I live one half mile from the closest telephone pole and am on solar power. Fiber will not work for us at our home since it would be unaffordable to reach us. I am hoping that there will be wireless options considered for residents to be connected.
All public money should be used to install fiber FTTP - to the premises. NO wireless installation at all. Fiber is better and more reliable in every way. It will prevent the wireless companies from their upgrades and price increases and will last much longer. Please protect and serve Vermonters with fiber optic. Thanks!
I am an information worker. I have telecommuted to my office in Raleigh, North Carolina since first moving to Stowe, VT in 2010. Although I had purchased VT property a decade earlier, my decision to spend more time in Vermont was facilitated by the availability of 3 MGB broadband available over DSL via POTS at my house. It was quite difficult to obtain service at that time. Verizon had sold the infrastructure to Fairpoint because it was not profitable. The money losing proposition of broadband service in my area of Lamoille County has continued to this day. Service is hampered by financial constraints of Consolidated that purchased Fairpoint. Although they have wonderful customer service and excellent employees who try hard, their financial resources to provide internet service upgrades are simply not adequate at the current allowable rates. When they can’t make money in a community like Stowe where customers are willing to pay for high-speed reliable internet service, there are many communities in Vermont that have no hope of ever getting internet. Although service in Stowe area has improved to almost 30 MGB over the past decade, internet still becomes unusable when tourists flock to the area on busy weekends. If private industry can’t provide the service at a profit, it’s clear that government must form public-private partnerships to ensure service is available everywhere.

While the proposals in the bills will raise money, they don't seem to elucidate a clear path to success. The problem is not just the money, but also how it is going to be spent. Perhaps many volunteer consultants, like me, formed as a Board of Advisors to assist the designated consultant would allow more ideas to be considered.

It's all about the money. Since every area is different, each with different challenges and opportunities, maybe a voucher system could level the playing field statewide. Here is how it would work: Communities would be designated by the State of Vermont for broadband service. Each year the Public Service Commission (PSC) would set a fee for customers to pay for a certain level of service, i.e. $44/month for 25 MGB. The PSC would canvas the community to determine how many customers would pay $44. The PSC would put the community up for bid. Telco monopolies would lease their lines if bidders desired. Entities would submit bids for providing service. Assume bids were $220/month for 25 MGB for every subscriber in a rural community. Community members would pay $44.00/month and the State of Vermont would pay the difference, $176/per customer per month. Every person in the state who wanted internet could obtain it. The success would be immediate – every citizen could have internet. The competition from new technologies would drive the prices down quickly as each community contract was rebid each year. The State of Vermont would not be spending money on technology that was outdated. Outdated ADSL would be replaced by VDSL, Satellite internet, and 5G pretty quickly.

- Reliable, broadband access to the internet is essential for the future of Vermont's economy. Our students have come to depend on it and our workforce needs it to enable working from home. As white collar work moves in this direction, expanding our broadband coverage will increase property values for these neighborhoods.
- Given our scattered population and rugged topography, we may have to settle for a 90% solution. It may be cost prohibitive to reach every home.
- While expanding access is a priority, ensuring that access is affordable is also essential.
- Commercial broadband providers should be regulated like any other essential utility

I am concerned that Comcast maintains a monopoly on high-speed internet access for those of us who have been forced to work or learn from home. I have tried Fairpoint, but I feel that their service was spotty at best and insufficient for work purposes. It's almost as if Fairpoint has a tacit agreement with Comcast to provide terrible service so as not to compete. Whether bundled or as a stand-alone internet service, costs for Comcast service are prohibitive for many Vermonters. I do not feel that the Department of Public Service has aggressively pursued or made room for viable alternatives to the Comcast monopoly. Check Front Porch Forum anywhere in the state, and you will find Vermonters asking whether alternatives exist to Comcast. Meanwhile, people who reside less than a mile from my home are able to access Burlington Telecom at a rate that is less than HALF of what I pay for Comcast. Stand up to the corporate monopolies!

I am writing to strongly urge the State to expand fiber to the door stop for all Vermonters that they feasibly can. I would also strongly urge the creation of a Burlington Telecom like service to treat high speed Internet as a municipal service. Comcast has a de facto monopoly on high-speed Internet in many areas, and this would give them competition.

As referenced in tonight's public comment.

https://www.yelp.com/biz/firstnet-by-at-and-t-reston-2?sort_by=date_desc

Please seriously consider prioritizing this problem.
I am writing to support Jonathan Gibson's comments on June 3. And today June 5.
This is a terrible predicament and needs to be on the top of your agenda.

To: Vermont Dept of Public Service
From: Laura Hill-Eubanks, Northfield, VT
Re: Comments on State of Vermont 10 Year Telecommunications Plan Date: June 1, 2021

I am writing to offer comments on the State of Vermont 10 Year Telecommunications Plan, and specifically Section 14.3.1, Easements.

My husband and I own property over which a power line easement runs. The easement is from 1947 and is for "an electric transmission or distribution line or system" to be used by an electric cooperative. As confirmed by the electric company that holds the easement, the easement in question does not allow for any type of use other than electric lines.[2] Nonetheless, in 2006, a [1]
cable company entered our property without permission or easement of its own and installed their cable line on the poles in the 1947 electric line easement.

Despite our complaints to both the electric and cable companies, and repeated requests that the cable be removed, the cable remains. We are now considering litigation over the issue, and we find it very disturbing that we now must protect our rights as property owners due to badly conceived and overreaching laws.

The electric company that holds the easement is under the impression that they were required by law to allow the cable company to attach their cable line to the poles on our property, without regard for whether the underlying easement allows for such attachment. If this were correct, it would mean that the intent of the laws they cite is to completely disregard the rights granted by the Constitutions of the United States and the State of Vermont—both of which prohibit the "taking" of private property without just compensation. But the State has in fact assured me that the laws in question were not intended to cause a taking of private property.

However, both the electric company and cable company involved assert in effect that the laws do just that. And the Public Service Department and Board claimed that it did not have jurisdiction over a landowner dispute (which seems ridiculous considering that they regulate the companies involved). Thus, we may be forced to protect our property rights through litigation, which of course will be expensive and time-consuming.

And now it seems that the State, through its 10 Year Telecommunications Plan, is considering doing that which it has previously denied – to allow a taking of private property without compensation and without due process.

Many landowners gave easements to their electric company years ago, in good faith, and in return for electricity. In some cases, landowners may not have even been compensated for their easements. However, the electric company is now compensated when a telecommunications company uses the easement, but we as landowners are not, despite the fact that each new line diminishes the aesthetics of our property, and likely the value of it as well. So, in effect, the State's Plan to potentially allow all telecommunications companies to access all easements would transfer private property rights (and any associated profit off those properties), to mostly for-profit companies -- at no charge!

The law as proposed would seem to affect all easements – historical, current, and future. This would mean that no landowner, at the time they purchased their property would have notice that any utility company wanting to use the easement would have access to their property. And likely any utility company could access that property and install new lines with no warning or advanced notice, as was the case in my situation.

I can certainly understand the State wanting to facilitate access to telecommunications for the residents of Vermont. But it should not do so to the detriment of landowners that have already accepted a certain burden on their property, by now requiring them to take on much more than they had bargained for and agreed to originally. Aside from the fact that it would be very unfair to ask these landowners to now take on the burden of *all* new utility lines (that other Vermonters may enjoy the benefit of, without the burden), we do have legal processes in place for acquiring the use of private property, and I believe the changes that the State is considering to the current law would bypass those processes, in violation of our rights as private landowners under the Constitution.

At the very least, any law under consideration must be worded to define and protect the legal rights that landowners have. And those rights should include a fair and just process that compensates a landowner for any new utility lines on their property that were not clearly agreed to previously by easement or otherwise – and one that does not require a landowner to litigate to protect the rights that are theirs and to get the compensation they are due. And if the State does not, then I certainly hope it intends to notify all landowners of their impending potential loss of the property rights that they have enjoyed for hundreds of years.

[1] The easement in question is unambiguous in its restriction to allow for only electric lines; the electric company could therefore not transfer a right (to place telecommunication lines on the easement) that it does not have. See *Miller V Morrisville***,** PSB# 6579, 6/27/2002 ("it is a well settled principle of Vermont law that a grantor's power to convey property is confined to what he owns at the time that the conveyance is made." *Cummings v. Dearborn*, 56 Vt. 441 (1884), citing *Brown v. Jackson*, 16 U.S. 449 (1818); *Vermont Shopping Center, Inc. v. Pettengill*, 125 Vt. 145, 148 (1965); *Sheldon Slate Products Co. v. Kurjiaka*, 124 Vt. 261, 267 (1964). ... "In construing a deed, courts initially look at the instrument itself, which is deemed to declare the understanding and intent of the parties. A deed creating an easement by express reservation is a contract, which is subject to construction and enforcement according to the principles of contract law. Therefore, consistent with fundamental principles of

contract law, where the language of a deed is clear and unambiguous, the intent of the parties can be shown only by the terms of the instrument itself. Furthermore, the law presumes that parties to a contract meant and intended to be bound by the plain and express language used in the document and, accordingly, parties to a contract are bound by the common meaning of the words chosen to reflect their agreement." *Merritt v. Merritt*, 146 Vt. 246, 250 (1985) citing *Fairbrother v. Adams*, 135 Vt. 428, 429, 378 A.2d 102, 104 (1977); *Christmas v. Virgin Islands Water and Power Authority*, 527 F.Supp. 843, 847 (1981) citing *Weyerhaeuser Co. v. Carolina Power & Light Co*., 257 N.C. 717, 127 S.E.2d 539 (1962) and *Merrill v. Manufaturers Light and Heat Co*., 409 Pa. 68, 185 A.2d 573 (1962); *U.S. v. Sea Gate, Inc.*, 397 F.Supp. 1351, 1360 (1975), citing *Weyerhaeuser Company v. Carolina Power and Light Company*, 257 N.C. 717, 127 S.E.2d 539 (1962); *Whittington v. Derrick*, 153 Vt. 598, 603 (1990) citing *Downer v. Gourlay*, 133 Vt. 544, 546, 349 A.2d 707, 708 (1975); *Goodrich v. United States Fidelity and Guaranty Company*, 152 Vt. 590, 594 (1989); *Roy's Orthopedic, Inc. v. Lavigne*, 145 Vt. 324, 326 (1985)).

[2] We have asked the cable company numerous times to remove its cable line from our property or produce an easement that allows them to use our property. They have not done neither.
[3] See Federal law 47 U.S.C. §§ 224, 541; Vermont Public Utility Commission Rule 3.700.
[4] Letter from John P. Bently, Esq., State of Vermont Public Service Board, in response to Laura Hill-Eubanks (Nov. 27, 2007). (Explaining in regards to Rule 3.700: "Your central point ... that the Board appears to allow use of property beyond what is set out in an easement, may reflect a misunderstanding of the Board's intent in creating the Rule, and of its legal effect. Thus, while the Board's Rule governs the right of one utility to attach to another utility's facilities, the Rule does not create any right in the nature of an easement between later-attaching utilities and the servient landowners. The above is not to say that some utilities may be treating the rule as though it does just that. Also, we are told that most utility easements in Vermont describe the use for "utility" poles, wires, and appurtenances; where that is true, it may well be that, for example, the phone and cable companies have the right to follow the electric plant into the right-of-way. However, where an easement specifically allows only "electric" lines, it is difficult to see how another, non-electric company can justifiably enter the right-of-way without an easement of its own. ... As you may know, the Legislature passed a bill in the 2007 session, Act 79, that promotes the extension of broadband and wireless access in Vermont. ... However, the Act does not purport to abrogate the rights of property owners.")

See also, for example: *Marcus Cable Associates, L.P. d/b/a/ Charter Communications Inc. v. Krohn*, 90 S.W.3d 697 (Tex. 2002) (Holding that an easement held by a company that was only for "an electric transmission or distribution line or system" did not grant its use by a telecommunications company); *Cable Holdings of Georgia, Inc. v. McNeil Real Estate Fund VI, Ltd.*, 953 F.2d 600, 610 (11th Cir. 1992) ("In order to avoid substantial constitutional problems and in order to be consistent with our prior decisions in this area of the law, we have concluded that Section 621(a)(2) provides a franchised cable company with the right to access only those easements which have been dedicated for general utility use, whether by plat recordation for a residential subdivision or otherwise. The alleged easements existing on McNeil's property have not been dedicated by McNeil for general utility use. Rather, these easements were privately granted by McNeil in order to allow limited rights of access to particular entities. Therefore, under Section 621(a)(2) of the Cable Act, Smyrna Cable has no right to forcibly access and occupy those easements."); *Gerstein v. Axtell,* 960 P.2d 599, 601 (Alaska 1998) ("Without deciding whether § 541(a)(2) authorizes access to private easements, we note that such a construction would violate the Fifth Amendment's prohibition against "taking" without just compensation unless the Cable Act were also construed to provide for just compensation for any taking." citing *Cable Holdings of Georgia, Inc. v. McNeil Real Estate Fund VI, Ltd.*, 953 F.2d 600, 604-06 (11th Cir.1992).)

I am hoping to have affordable broadband in the near future that will be reliable. I am worried that all of the funding for broadband will only be for the residents that can connect to fiber. I live one half mile from the closest telephone pole and am on solar power. Fiber will not work for us at our home since it would be unaffordable to reach us.

I am hoping that there will be wireless options considered for residents to be connected.
Concluding Memo – Attachment Best practice for monitoring providers' compliance with backup power obligations By stand alone rule or included in any more far-reaching rule it may issue regarding "enhanced backup power obligations", the PUC should require companies to submit an annual report with supporting exhibits to describe and document how they are complying, if a covered provider, with FCC Rule 15-98 or any successor rule or with any supplemental "Best Practices" rule the PUC may promulgate. This report will include the following: □ Service Disruption: o Any telecom loss of service their system has experienced: where, when, for how long, and number of subscribers affected (perhaps above a threshold such as 1-2 hours, 20-25 subscribers). Utilities should submit this data to PUC, even if required by Act 79, Sec. 25 rule to submit it to the 911 Board o Number of consumer inquiries, requests, or complaints about service disruption or backup power received during preceding year and how the company responded Back Up: o Whether they provide, by fee or subsidized, installation or maintenance of backup power equipment, and the type, consumer cost, and volume of such installations in the past year o Names/locations of backup power venders or sources to which subscribers are referred o Copies of any backup power information materials provided to consumers, whether by mail (periodic or special mailings) or on a website, including written and video materials Batteries: o Whether they stock backup batteries or other equipment for direct purchase by subscribers, and the number of sales during preceding year o Whether they provide any battery monitoring and notice service, and details thereof o Whether they have a technical assistance or call-in service to help subscribers with batteries

Community Outreach and Education: o Number, location, and description of any community education events o Describe any local government, emergency management, fire department or other public safety organization to which they have provided assistance and nature of the assistance Improvement Efforts: o Any action company has taken to improve E-911 continuity, e.g. microcells, call stations, remote terminal capability upgrades, provision of equipment to consumers, or the like o The company's achievements in finding venders who can provide technological solutions to address loss of continuity during power outages, such as an on-off switch to conserve battery power that is easily accessible from living space (not at the battery housing), etc.
Cons said that she attended the public hearing last night (which she barely found out about) re: the 10-Year Telecom Plan. She feels that there has been a "cavalier attitude" about getting info out to or feedback from the public on this very important issue. Information is inconsistent about when public hearings will be held or when comments are due. For instance, Wednesday June 5 (on the Announcement for the Additional Public Hearings on the Plan) is an incorrect date. She said there's no logic as to how to find the information about how/when/where to submit comments on the plan, or when they're due. This is a very important issue affecting many people's lives in many different ways. I suggested cons submit her comments to the psd.telecom@vermont.gov email address and said they would be reviewed. I also said that these comments would be forwarded to the appropriate staff. Cons said she wanted to provide her name and contact info.
Msg in at 11:30 am from Martha Sirjane. She wonders whether comments she made at the 3/31/21 web meeting re: the 10-Year Telecom Plan to Clay Purvis and Matt Dunne are being registered as public comments for the Plan. If not, she needs to know so she can resubmit them. But she's not sure what the deadline is to submit public comments; the website has conflicting dates: June 5 in one place, and June 30 in another. "It feels a little willy-nilly and contradictory." Please call back soon. 802-492-3377.
We would like to express a few opinions regarding the ten-year broadband plan proposed by the Vermont Department of Public Service. Jim Linville is a member of the Weston Select Board and I represent Weston for the Deerfield Valley CUD.

Our main concern is that as the process of trying to bring decent broadband coverage to Vermont has been going on for a very long time, there is a possibility that despite the momentum generated by the proposals of the Federal and State Governments, the efforts to work toward the "perfect" solution of delivering fiber to every household in Vermont could well stall the project in its tracks and cause another ten years to pass before Vermont residents obtain a meaningful connection. There are a few people on the CUD board I have spoken to who have been working, with great zeal and the best of intentions, to bring broadband to their neighborhood for a dozen years or more. So when we speak of a ten-year plan, if the project is not looked at more like a two year roll-out of some kind of good service the effort will sputter. Here are a few of the reasons for our sense of urgency in getting broadband into homes. Not perfect broadband maybe but something very good. And while wireless solutions may not be as fast as we would like today, to remain competitive they will be getting better all the time. Companies with enormous resources are working hard to make this improvement and in all likelihood they will make significant progress.

1. Vermont is one of the few states in the country that is losing population. This is a tremendous problem for the state. And while working from home has become a necessity due to the pandemic, it seems certain that the "new normal" will include a lot more working online. The recent surge of folks moving to Vermont can only be sustained if they can get sufficient broadband.
2. Those who have moved here despite the challenges of the state's electronic infrastructure are not waiting to get connected; they are pursuing the other options and though they may not be as fast as a fiber, they can at least get people online. Satellite and copper options are being tested by many residents, and if fiber goes in six or more years from now, or even two, there will be many folks who are quite content with the service they have. If too many residents decide not to switch to fiber, the system could well be unsustainable.
3. With the increase in the use of Telemedicine, broadband connections have become even more essential for Vermonters.
4. The pandemic has caused many more people to work from home. After COVID subsides, many will continue to work online either part-time or full-time.
5. The role of broadband in education has been emphasized during the pandemic and though teachers will all be glad to get back to in-person learning they have come to

realize the real value of supplementing what they do with online resources -- but only if their students have access to the internet.

We encourage you to look at this list and find any of these problems will not be made worse by a delay of even a couple of years. Call your doctor in five years and in the meantime make do? Wait for your sixth grader to be a senior in high school while waiting for a connection?

And how can we even get a handle on how many people decide not to settle in Vermont because of poor broadband and cell service.

While we understand that "in the long run" maybe fiber to all homes is a great solution, the money is here now, residents are hungry to move forward, and if that momentum is lost we could be talking in another ten years of minimal progress in a smaller state. We have a chance now to do something bold. If we delay, broadband could stagnate, and along with it, the State of Vermont could stall as well.

Here is what we are advocating: Instead of persuing fiber at all—for every last mile—Vermont should be pushing for the most cost effective and quickest way to implement fiber for the many. This undoubtedly would cost a fraction of what "fiber for all" would cost but could be done much sooner. Solving the problem for the "last mile" could then be tackled with a 6-10 year time horizon when there might be much cheaper but suitable options like satellite or 5G cell.

This effort would require "top down" leadership from the state but would result in:

- The most cost-effective solution to spending the money that is currently allocated to solving the broadband problem
- The fastest implementation
- More of the folks who have moved to Vermont to avoid COVID staying here permanently
- More folks (especially young folks with kids for our schools) looking to move to Vermont and helping to solve our population problem

Finally, speaking of losing population, we would like to point out that waiting 6 or 10 years while losing 2% of your population every year is a loss of 12% -- 20% of Vermont's population: sooneverytownroad1houseinevery5(or8) will be for sale in 6–10years. We are in a crisis and we need to act now.

To whom it may concern,

I would like you to know that I value locally produced media, youth media education, gavel-to-gavel coverage of local meetings, community video archives; and the way Public, Educational, and Government Access helps to knit our community together.

Many years ago, I hosted a show and learned from many people how much they valued that and so many shows.

It was a link to isolated and active residents. I urge you to continue this valuable service.

If I hear any more about this I'm going to throw up. The State has been promising Broadband access state wide for at least 10 years, yet many areas are still not served. Furthermore, the anti-business attitude fostered by State government is enough to drive away any business considering expansion or relocation here. The permit process alone is time consuming and *extremely costly.* Act 250 needs a complete overhaul, not in 10 years, *now*. Any jobs which pay enough to live on are in Chittenden county. The rest of the State has been forgotten. Have you heard the joke about Chittenden county? It's nice because it's so close to Vermont. I wouldn't live there again if I had the best paying job in the State.

Vermont is being bought up by wealthy people from other states who work from home, are retired, or don't need to work. People born here cannot afford to stay because the cost of living far outpaces what most jobs pay. At some point there will be no native people here and Vermont will have completely lost the culture which makes it unique. We will simply become another "New Jersey". "So I heard you are from Vermont, yes? . . . I sure am. . . What exit?"

I appreciate the opportunity to provide comments on the draft Telecom Plan. There are major omissions and deficiencies in the Draft which other commenters have pointed out. I hope these will be adequately addressed, but my comments deal more narrowly with an issue the Department has refused to focus on despite repeated requests and opportunity to do so: the dependency of today's fiber optic technology on electricity and the vulnerability of our telecommunication system to loss of connectivity in event of a temporary or catastrophic electric power outage.

The Plan needs a section that explicitly and fully recognizes this disadvantage, vulnerability, risk factor - whatever we choose to call it - of widely-supported and largely beneficial broadband technologies - - a separate section, not buried away where it goes unnoticed. The text should explain in layperson's terms the nature of the electricity dependency, the circumstances under which E-911 and regular connectivity could be lost, the consequences of such loss of telecom service, and measures that can and should be taken to minimize risk or to deal with outages that occur. My similar request to RISI in late 2020 (excerpt below) was ignored.

A number of actions to address this problem were proposed in previous telecom-related proceedings, including Public Utility Commission Case No.19-0705-PET (see Attachments A and B). Most importantly, the Plan should emphatically state that plans submitted by Communication Union Districts to receive State funding "shall" describe what actions the CUD will take to inform subscribers of the loss-of-service vulnerability of their technology and the actions the CUD will take to assist subscribers with service options such as backup power or signal boosters, micro cells, wi-fi hotspots, or other services in areas without cell phone coverage.

Now a few other comments. The Plan must take cognizance of and address the equity issue, again in a separate and well-articulated section. This was described in a June 1 article in The New York Times by economics reporter Eduardo Porter:

A Rural-Urban Broadband Divide, but Not the One You Think Of
Many more people in cities lack broadband access than in rural areas, but lawmakers are primarily focused on extending high-speed access to remote areas.
https://www.nytimes.com/2021/06/01/business/rural-urban-broadband-biden.html?smid

Universal Fiber-to-the-Premises is a commendable goal, but doing this in a rural state through CUD's, rather than for-profit carriers, will not make it any more affordable to residents of limited financial means. All the technology in the world is meaningless unless a person, rural resident or urban, can pay for it. We in Vermont are hearing a lot about the need for for "affordable housing". Our Vermont Telecom Plan needs to propose ways to assure affordable broadband.

To be useful as a "10-Year Plan", the document must bring the issue of resiliency to the forefront. In our interconnected world and technology-based economy, if and (more realistically) when a catastrophic event occurs, when a major segment of the electric grid and/or the telecommunications system goes down, everything - basically life as we know it - will go down. It could be a severe hurricane or other weather event, it could be a cyber or ransomware attack: consider climate change, recent events in Texas (massive winter storm power outages in February), the Southeast (Colonial Pipeline), the December 2020 Solar Winds and subsequent attacks: https://www.csis.org/programs/strategic-technologies-program/significant-cyber-incidents). Unless this document describes, recommends, and generates preparatory actions for what Vermont will do to maintain essential services in such an event, it will be a "plan" in name only.

Finally, I ask for responsiveness. While submitting these comments only as an individual, I participated in and am well aware of my town of Shrewsbury's 2-1/2 year effort to raise awareness and obtain solutions to this vulnerability of the fiber optic technology that is currently receiving so much attention and public funding.
To document this point as forcefully on the record as I can, I am submitting the January 16, 2019 letter from the Shrewsbury Selectboard to Commissioner Tierney (Attachment C). Excerpted from a followup letter the Selectboard sent to Comm. Tierney on March 20, 2019 is the short paragraph below. To this day the requested commitment has not been made. I ask again that it be fulfilled.

"The opening line of our January 16 letter identified its purpose to offer comment on the 2018 Vermont Telecommunication Plan and a key request was to ask you to amend the Plan to recognize and address the problem we described of loss of basic voice phone service during electric outages. Will you commit to doing so?"

Please review and consider the attached documents to be part of this comment.
Excerpt from a previous comment

Comments on Draft Covid Telecom Recovery Plan
December 10, 2020

Thank you for the opportunity to provide comments on the draft Plan which presents a great deal of information. I have nine suggestions for improving it.

1. In Sec. 8.2.2.3. on Pg. 87, the text should better describe cell signal boosters (with a photograph). It should also explain how these differ from micro-cells that are attached to telephone poles. The Plan should assess whether such micro-cells can play a role in extending connectivity in underserved areas, perhaps those where line extensions are less feasible. If they can, then micro-cells should be included in the Plan's recommendations for enhancing connectivity.

2. On pages 64-67, advantages and disadvantages of four types of internet broadband are listed. In the first, "high-speed wireline technology (fiber optic and cable)", there is no mention of the fact that non-line powered systems rely on electricity for their functioning such that, after their one-to-eight hour batteries expire, they lose all connectivity in an extended electric power outage caused by a weather event, a system-wide malfunction, or a cyber-terrorism attack.

This outage potential during what are by definition emergency circumstances is a very serious - and largely unrecognized - reality. The draft Plan should put this public safety vulnerability fully into view and propose solutions to address it.

Supplementary comment to PSD on Draft 10-Year Telecommunications Plan
Please add this to the more extensive comments, with attachments, that I submitted on June 3 at 4:23 pm.

The Vermont 10-Year Telecommunications Plan needs to include a strong statement on the value and necessity of full public disclosure of system information by all telecom entities. both private and public, including Communication Union Districts (CUD's). Such disclosure - to State executive and regulatory agencies and the Legislature and to the public - is essential for administration, regulation, coordination, oversight, and public funding of telecommunications activities in Vermont.

In both rulemaking proceedings and in court, corporate telecommunication companies have repeatedly and resolutely sought to be exempt from disclosure, usually invoking the "trade secrets" provision of the Vermont Public Records Act (1 V.S.A. Sec. 315-320). In a recent rulemaking on outage reporting by the

Vermont Enhanced 911 Board, for example, utilities sought a blanket before-the-fact, no-further-explanation-required exemption, citing both business competitiveness and infrastructure security. CUD's may also claim confidentiality for information about their activities, despite the fact that those activities will be publicly funded.

The Telecom Plan should at a minimum set forth the justification for and thus provide a foundation for more forceful efforts by Vermont's executive agencies and legislative bodies to request detailed information from telecom service providers. To address the matter of transparency fully, the Plan really needs to recommend that the Legislature update the Public Records Act with specific requirements that would apply to the State's telecommunication (and other, e.g., electric) utilities and would state that relevant reports may be required by State agencies and that such reports shall be considered as public records. The Legislature may of course include whatever qualifications for disclosure it deems appropriate.

I am requesting that the Plan address the issue of public disclosure and include the recommendation noted above. Such public disclosure of telecommunication information is fundamentally necessary to ensure the reliability and resilience of Vermont's telecommunication systems, the cost-efficient and accountable expenditure of public funds, and the safety and welfare of Vermont citizens.

Thank you for the opportunity to provide comments. I am the Executive Director of Greater Northshire Access Television, Inc. also known as (GNAT-TV). We operate three PEG channels on the comcast system and serve a regional community of 11 towns in Southwestern Vermont. These including Arlington, Dorset, Londonderry, Peru, Manchester, Rupert, Stratton, Sunderland, Weston, Winhall. GNAT-TV provides essential media services for individuals, and for our towns, schools and community organizations. In addition to traditional PEG services, we meet the cable related needs of our communities, by providing local news and information programming. Our news programming exposes local stories and provides essential local information that is not otherwise covered through traditional commercial media outlets located in Burlington, VT or Albany, NY.As we look to the future, it is apparent that traditional cable subscriber funding for PEG Access is going to decline by nearly 5% a year. One of our biggest challenges and opportunities is to find solutions for serving our communities in a rapidly changing media landscape. We must ensure the public has access to local information, both on cable and online platforms. As more people consume information digitally, the expectations are that PEG access be available everywhere and with high quality technical standards including HD. We must do this as we face funding declines.

We were disappointed that the Telecom plan did not take a deeper look into the recommendations included in the PEG Study that was commissioned by the legislature. The PEG study recommends a way for the Vermont Legislature to modernize its telecommunications tax structure and describes the authority of the State to create a public benefit structure. This benefit structure includes funding solutions for PEG, E-911 and Universal Service. We feel strongly that an analysis of these recommendations are essential for finding creative solutions for funding public communication services. Our interests should not have to be in conflict with ratepayers and the CUD's. We would like to encourage more opportunities for partnership among PEG access entities, CUD's and the Department of Public Service. Access stations reflect the needs and the pulse of our communities. We are embedded in the fabric of our towns. Individuals and organizations from all segments of Vermont's population engage with us on a daily basis. PEG Access centers can be a vital local partner in crafting new telecommunications solutions to serve Vermonters into the future. Thank you for the opportunity to comment.

I am the Executive Director of CAT-TV in Bennington. CAT-TV serves as the PEG Access Center for the Vermont towns of Bennington, North Bennington, Woodford, Pownal and Shaftsbury. As the local Community Media Center for 30 years, we have provided community members access to governmental and school board meetings, church services, coverage of local events, technology training and equipment use and so much more. During the pandemic, our services were more essential than ever. In an area that is not served by local news outlets, CAT-TV's communication to the community on the growing crisis was critical. We partnered with Southwestern Vermont Medical Center to offer live updates from the medical community directly to our residents. We quickly shifted to help governing boards hold virtual meetings keeping the doors to democracy open even during a global pandemic. We worked with area churches to ensure that weekly worship services were available to their parishioners. We hosted live virtual concerts at the height of the pandemic to keep everyone connected and provide a moment of levity. We've been doing this work every year for 30 years, but this past year made our work even more valuable and important. We were proud to be recognized as one of The Bennington Banner's Unsung Hero Award for our work during this time.

We are fearful that the public benefit funding that supports us is declining to the point that we will no longer be able to provide these essential services. We've always known how valuable PEG Access and Community Media Centers are to our state, but with COVID a spotlight has been placed the importance of our work. With that spotlight clearly shining, we must now work to ensure that Vermont not lose all that our centers bring to our communities. It is critical that Vermont find ways to financially support PEG Access considering the changes in the cable industry and the failure of federal policy to keep up with those changes. The move to IP based

delivery should not be the end of PEG Access in Vermont. We need to be the example for the rest of the country and support the importance of hyperlocal content that connects and builds community. Isn't that the very essence of Vermont – placing importance on our communities, our people and our values? That's what PEG Access and our Community Media Centers do!

The PEG Study, released earlier this year, clearly outlines paths to support our work. We encourage the Legislature and Department of Public Service, to work in partnership with the PEG Community to find sustainable funding models and strengthen community-based communications. It is important to have the 10 Year Telecommunications Plan speak directly to the importance of PEG Access and the importance of identifying solutions to structure communication fees and taxes that support our work through the telecommunication networks in the state.

Thank for your time and I hope that CAT-TV can count on these issues being clearly reflected in the 10-year plan.

Appendix G: Responses to Public Input and Comments

The Department of Public Service received well over 100 written and live comments on the Draft 10 Year Plan via multiple live input sessions as well via email or through their dedicated feedback survey.[160] Recordings of input sessions one,[161] two,[162] and three[163] can be found in the corresponding footnotes below, as can the results of the dedicated feedback survey.[164] This feedback was crucial to informing the Final Draft of the telecom plan.

All comments can be found verbatim in the appendix. Comments along similar themes have been summarized by theme here, along with a note about how the Final Draft was or was not updated to reflect the input. This plan also presents a direct response to comments that had a particular specificity or a unique nature to them and could not be grouped by theme.

Comments by Theme

Below, themes common in public comments are provided in plain text, **project team responses are presented in bold.**

###

Access for All

Many respondents voiced concerns about ensuring quality broadband services be made available to all "last mile" customers, regardless of how remote a dwelling may be. Many also shared a desire to make sure these services are made available at affordable monthly rates and with an easy to navigate and access, progressive cost structure. An additional recommendation was to provide broadband for free public use at strategic places in every community. Thus, providing those who may be unable to afford access at home with some place to go where they know they will have free and quality broadband access at all times.

This plan affirms the importance of access to broadband internet. Not only should free broadband be available at libraries and in other public spaces, broadband should be affordable at home. This plan presents strategies for CUDs to incorporate affordability, digital equity, and digital skill building into their network deployment and connectivity work.

CUDs

[160] https://www.surveymonkey.com/r/VT10yearTelecomPlan
[161] https://www.youtube.com/watch?v=tNxc5pcHrZQ
[162] https://www.youtube.com/watch?v=-V5E6vsWEsU
[163] https://youtu.be/YsS1TiNNG5s
[164] https://www.surveymonkey.com/results/SM-F93PL9D89/

While some respondents voiced concern, the majority were grateful for CUDs and the opportunities they present in rolling out FTTP service to last mile customers. The most apprehension was focused on future funding of the districts and their endeavors with many residents advocating for continued funding in the form of grants rather than municipal bonds or other sources that must be repaid and subsequently raise costs of service for customers.
This plan affirms the role of CUDs in closing Vermont's connectivity gaps, and the through line between grant funding and overall cost to customers.

This plan endorses Governor Scott's proposed allocation of grant funding to CUDs to reduce the amount of debt they must use for deployments, and thereby lower the costs to end users. This plan also discusses the strategies and support CUDs will need to effectively negotiate with private providers. Effective negotiation is key to ensuring service quality and affordability for constituents.

Planning for the Future

Constituents have many ideas around the future of broadband in Vermont with many similar themes. A few key ones to highlight are:

- Make sure the networks are set up to allow for future increases in bandwidth speed
- Treat the networks as either utilities or publicly owned non-profits
- Provide ongoing consumer education
- Make sure any provider is able to provide prompt, skilled, local, and friendly customer service 24/7

This plan endorses the need for future-proof networks that can scale up to provide greater bandwidth as bandwidth needs increase. Fiber, and to some extent coaxial cable, are the only types of infrastructure that are truly scalable, and only fiber is scalable symmetrically. The issue of treating networks as utilities does not fall within the state's jurisdiction, but this plan endorses public ownership of assets as a viable mechanism for ensuring quality and affordable service in many cases. Ongoing customer education is key to increasing usage of the internet and ensuring everyone can take advantage of the benefits it brings; section 10 addresses digital skill building. Lastly, this plan recognizes local and prompt customer service as a value that advocates and customers want, and encourages CUDs to negotiate for local customer service if needed as they form partnerships with private providers.

Existing Internet Service Providers

Constituents shared many thoughts on the service quality, infrastructure quality, and customer service responsiveness of existing providers. Many also expressed a desire for more choice between competitive providers.

This report addresses constituents' desire for competitive choice between providers and documents the plans of CCI to bring fiber competition to areas with cable, as well as the network standards that must be used to ensure service and infrastructure quality for all new deployments.

Broadband Internet Definition and Future Needs

The current definition of broadband with upload speeds of 25 Mbps upload and download speeds of 3 Mbps was cited as a concern by some constituents. While those speeds are presently adequate for most everyday uses, they may not be fast enough for some intensive users and likely won't remain fast enough as technology continues to evolve. The main suggestion to remedy this was to plan for the future by installing fiber capable of being easily and efficiently upgraded to gigabit speeds.

This plan affirms the need to be future-focused so that resources spent today fixing broadband gaps are spent efficiently and support long-term solutions. Currently, the FCC definition of broadband is 25/3Mbps; though this may change (and has changed before), it is more important to note that the state of Vermont has set a goal of 100/100Mbps service. The plan focuses on deploying service that meets the state's goal rather than the federal definition.

Data Caps / Net Neutrality

Making sure providers, regardless of entity type, consistently act with the best interests of customers in mind was a key element cited by respondents. Preventing the implementation of data caps or limits and abiding by net neutrality were highlights called out by many.

The plan documents the values, like net neutrality and unlimited data, prioritized by advocates and policymakers, and outlines the likeliest path to achieving these network standards for new network deployments. In short, CUDs must be empowered to negotiation for these network standards by negotiating from a position of financial strength and expertise.

5G Wireless Service

While limited, there was some hesitancy raised about the ability to truly bring fiber to every premise due to restrictive costs and geography. The suggested remedy to this potential challenge was to run fiber to strategically placed 5G towers that would then deliver fast, quality internet service to more remote areas difficult to reach by traditional means. However, there were also concerns over 5G deployments and whether there were adverse health effects associated with 5G radio waves.

This report does not recommend 5G radio deployments be used as a stand-in for bringing fiber to the home, for many reasons. Primarily, 5G's effective range is relatively small, fiber would need to be deployed almost anywhere anyways for 5G to be effective, and 5G does not penetrate walls and trees sufficiently to provide reliable and fast indoor service, especially at any distance. In addition, this report included a paragraph mentioning health concerns related to 5G deployments expressed by constituents. While this report does not endorse these health concerns, it is imperative to monitor ongoing science and research on wireless internet and incorporate public health best practices from respected and trusted sources into network deployment strategies.

Fiber Deployment Mechanisms and Utility Involvement

Feedback varied greatly in regard to the installation of infrastructure. Some constituents were adamant that fiber laid underground was the best method, while others cited the use of existing utility poles as the most efficient and cost effective route. The longevity of the materials and their ability to withstand downed poles/lines as a result of storms was cited as a concern.

This report notes that while some places in Vermont will see underground deployment, most will see aerial on existing infrastructure. New underground deployment in areas with existing pole assets would increase the costs of deployment substantially and act counter to the goals of reaching all un- and underserved premises efficiently.

Some constituents specifically called out the ability of CUDs to partner with existing electric companies to run fiber along with existing electric wiring. It was suggested that CUDs be exempt from compensating electric companies for use of the utility poles, as they are both municipal organizations, and that the money saved from this could lower the overall cost to consumers.

This plan responds to this comment by saying that most utilities are not municipal entities. Deployments have to abide by existing pole attachment rules. GMP and VEC have also started programs to defray make-ready costs, which assist with this.

Still another constituent suggested that the state itself, perhaps even the Vermont Department of Public Service, be responsible for initiating, constructing, and maintaining necessary broadband infrastructure to every Vermonter. This infrastructure could then be leased by profit driven organizations who would agree to certain conditions and requirements to see that it is used in ways the benefit Vermonters.

The plan acknowledges the tension, costs, and benefits between fully private and fully public solution, and endorses a balanced approached.

Environmental Concerns

Constituents concerned about environmental impact were excited about the opportunity to utilize future proof technology like FTTP. Even if it costs more in the short term to build out, FTTP was more appealing compared to other options that have a greater immediate environmental impact or will need to be upgraded and replaced due to obsolescence in a decade or two.

The plan endorses the idea that FTTP may provide more environmental benefits than other technologies due to less replacement costs and the ability to facilitate remote working, telehealth, and more, saving thousands of road miles of commuting and travel.

Public Access TV Stations

There were many thoughts and concerns regarding Public Access Television. Foremost among them was the need to continue funding the service, perhaps through a tax or fee capture from all telecom companies rather than traditional cable companies. A secondary concern revolved around making Public Access TV more broadly available again as more and more people subscribe to streaming services rather than traditional cable. Once suggestion was to use new funding captured to begin streaming local content via the internet as well.

This report agrees that PEG TV is a critical community function. See the section on PEG TV for comments addressing these issues.

Cell Service

While broadband is most certainly a priority, there was an abundance of feedback, thoughts, and concern from constituents with regards to existing cell phone coverage. Most noted cell phone coverage is still lacking in many rural regions of the state and that making it more readily available in even the most remote areas should be a concurrent effort with the expansion of broadband internet services.

The plan endorses the need to address mobile voice and data, and illustrates how mobile voice and data expansion can be facilitated by FTTP deployments.

Individual Comments

Below are a range of comments that the project team felt important to respond to directly, because they were either not able to be grouped by theme above, or because they were more specific or substantive in response to portions of the draft plan. Public comments are in plain text, **responses are in bold.**

###

I see the need for details on priority of 911 call completion assurance in all Community Broadband designs, and similarly, resilience of cable infrastructure for VoIP voice over IP, where power outage vulnerabilities and limited battery supply at amplifiers result in substantial numbers of subscribers not being able to call 911 until that's fixed.

This calls for regulation of voice services provided by CUDs. Individual CUDs may, or may not, decide to offer voice service. The legislature, in its passage of H.360, did not include such requirements relating to CUDs. The extent of state jurisdiction over VoIP service generally is not settled. The VCUDA may decide to develop "best practices" for network design. The VCBB may also decide to develop "best practices" and could decide to require grantees to adhere to such practices. In any event, the CUDs will be entering a highly competitive market, and requiring CUDs to adhere to standards (which competitors do not need to comply with) will increase costs and reduce competitiveness.

Overall 911 system reliability, including Regional dispatch. When towers lose power radio, dispatch towers lose power. If fiber Cuts between radios and transmitter antennas lose power or Fiber cuts sever backhaul. Public Safety is put at risk and I see no real details of those types of resiliency designs.

This calls for regulation of power and connectivity for Public Safety communications networks. Public Safety communications networks are generally classified as private networks. These include systems like the VCOMM, the state-wide radio network operated by the State of Vermont Public Safety Department, or the radio networks employed by local fire, police, or emergency networks. These networks are generally not subject to oversight by the PUC.

Requirement for diverse routes on all cellular backhaul to assure 911 call completion. We do have jurisdiction over Tower permits and as most 911 calls are coming in via cellular, we have jurisdiction to make requirements for diverse routes and backup power on those radio, cellular radio towers.
This calls for regulation of deployment requirements for cell towers. The state's jurisdiction is generally limited to the land-use review of installations. However, it has been an important long-standing state priority to improve wireless coverage. If the state were able to require cell carriers provide diverse routes, requiring diverse routes for cell existing towers would divert limited capital funds from deployment in unserved areas to adding diverse routes to existing tower. And adding a requirement for diverse routes for new towers would increase costs and thus constrain deployment. In addition, while most towers are approved under 248a, companies could and likely would, revert to permitting under Act 250 instead if the PUC were to impose such requirements.

Appropriate, use of the VCOM Statewide radio channels, what can they be used for? How should that be shared?. How should those details be shared with emerging and existing regional dispatch authorities?
This calls for regulation of public safety radio channels. The State of Vermont Department of Public Safety operates the VCOMM public safety radio network. This is a private radio network and The Department of Public Safety alone determines how best to allocate these resources.

The universal service fund, earmarked dedication for the connectivity fund is unnecessary, especially when the fund is running short unable to support current, 911 expenditures.
This calls for a change in allocation of Vermont USF funds. The allocation of the revenue of the Vermont USF is specified by statute.

Effective public participation. Several requests for made for a paper copy of the plan on paper. This is the first time that paper versions of the plan were not made available. It's unrealistic to expect people to read a hundred 200 Page, document on a small screen, much less retain or integrate much of it. The background knowledge of the general public has atrophied in the time the department has failed to complete a plan so that onus and responsibilities on the department to re cultivate, that general, public awareness of different technologies, different choices policies in order to be able to make informed participation in these telecommunications planning hearings and process.
This calls for printed copies of the draft version of the plan. Due to COVID-related restrictions imposed by the State of Vermont, the PSD and all state offices are closed. It was not feasible to make printed documents available to the public, as there was no way to distribute them.

Integrated planning for cellular Broadband. Wireless microwave resilience and Community media. This is not discussed in the plan. In the draft plan. It is inefficient ineffective to plan each of those in a silo.

It is unclear what this statement means. Mobile wireless service is offered by many different companies. Most of these companies offer voice and internet access. It is essentially impossible to develop "integrated planning" to expand these networks. This is because each of these networks is independent, consisting of its own network of towers and associated coverage areas. Wireless microwave communications technology is employed for many services, from subscriber connectivity for cellular service, to WiFi consumer services, to point-to-point high-capacity backhaul service for cell towers.

Required production of information by carriers when it's requested under 30 VSA, 202d versus 202e Shoreham being an example, fiber upgrades using A-CAM funding limited number of addresses. Fiber route Statewide can and could should, and could have been requested under 202d not subject to Non-disclosure agreement.

Vermont is often lauded for having the best broadband deployment data in the country. The PSD conducts its annual broadband deployment analysis with data requested pursuant to 202e. Some of this data is provided voluntarily, some provided subject to NDA, as allowed by the statute. Significant time and expertise is required to review, process and analyze this information. This information, while certainly not completely accurate, is of sufficient accuracy and precision to determine where broadband service is available to ensure that limited public funds are targeted appropriately. The PSD sees no benefit from pursuing similar data through 202d, which would surely lead to costly and time consuming litigation, when it would provide negligible additional benefit.

CUDs use of Trade Secrets looks appears the case law indicates that you can have sovereign immunity or you can have Trade Secrets, but you can't have both some discussion of whether The claims of Trade Secrets potentially specious claims are Trade Secrets by CUDs. Even extending to the non-disclosure agreements themselves. Or discussions related to asking municipalities for a share of their ARPA Money, where no contract is being negotiated. That's going on as we speak, where CVFiber claims to be eligible for executive session.

This calls for evaluation of public information rules and laws relating to CUDs. Section 11, H.360 strengthened CUD protections for trade secrets and competitively sensitive information.

Host remote isolation, remediation. Strategies rules. Why do we not even inform the public of which telephone exchanges are subject to host remote isolation and therefore block 911 calls and how are we going to require Consolidated to participate? Disclose the routes that are vulnerable. Participate in community Broadband, fiber planning, and possibly Help fund or at

least lease fibers within a fiber route to create route diversity from those remotes back to that host and eliminate that Host Remote isolation Vulnerability.

This calls for discussion of the issue known as Host Remote Isolation. Host Remote Isolation is a phenomenon in the Public Switch Telephone Network, and is the result of the absence of complete network route diversity for all telephone central offices in the state. The Vermont PUC opened docket 19-0869 to investigate this issue.

The need for a unified poles database, utility poles, database Statewide for accurate, attachment billing, accurate, double pole, removal enforcement, and even accurate pricing for pole attachments. These are not supposed to be a revenue Source. Supposed to be revenue-neutral, just including the costs of Maintenance and as more attachees get on a pole. Everyone existing attaches rate should be going down. I suspect that's not the case.

This calls for a unified utility pole database, and investigation into pole attachment rates. The majority of utility poles in Vermont are owned by the distribution electric utilities. Each of these utilities employs different approaches to managing these assets. The majority are owned by Green Mountain Power, Vermont Electric Coop, and Washington Electric Coop. These three utilities maintain pole databases which catalog the location and attachments made on these poles. The Department sponsored the creation of a pole data standard, now adopted by the state GIS enterprise working group. These utilities provided these datasets that largely conform to this standard to the State and they are published on the Vermont Geodata Portal. The Department does not see any reason to create a unified dataset as the data is already publicly available.

All Vermont PUC rules specify a formula for calculating the pole attachment rates based on the costs associated with these assets. All Vermont pole owning utilities maintain pole attachment tariffs presumably calculated based on this formula. The Department has no reason to suspect that the rates in these tariffs deviate from the PUC rules. The costs for these assets, like all other costs, rise with inflation. New assets are constantly being acquired as old assets are retired, so there is no reason to expect that these rates would decline over time.

Pole attachment, hygiene, and obligation for enforcement of the national electrical Safety Code. This is something that's been grossly, neglected by the Department and the Public Utility Commission.

This calls for an investigation into violation of PUC rules. The Vermont PUC rules require adherence to the National Electric Safety Code. Department has seen no evidence of widespread violation of this requirement.

A Statewide, fiber inventory is necessary. All fiber available for lease and its protection status

This calls for the creation of an inventory of fiber networks. Generally this is a project where the level of effort required would not be commensurate with the benefits. Many companies make route maps of fiber to the home routes publicly available. These depict roads where service is available; these do not depict fiber network routes or information, and do not depict

backbone fiber networks. Many companies also make publicly available network maps of their fiber networks. These are generalized however and do not provide detailed information or allow viewing at a fine scale necessary to employ the routes for network designs. To obtain information sufficient for network design, engineering level data would need to be collected. This would take a significant level of work to collect, process, and assemble into a unified dataset. It would likely require significant litigation to collect as the companies would certainly claim that the information is confidential. Even if it were collected it likely could only be used under seal, which would defeat the purpose of collecting it. Moreover, even if such network information were collected and made publicly available, it would not be very useful because nothing compels the owners to sell or make available services on these identified routes.

There are many companies that own and operate fiber communications facilities in the State. Some companies believe that routes where fiber-to-the-home service is available should be publicly accessible. And other companies provide publicly accessible

This calls for the PSD to collect and disseminate routes where fiber to the home service is available. The PSD, through its annual broadband deployment survey, collects information about where broadband service is deployed. After collecting, processing, and analyzing this data, the PSD prepares a dataset that depicts, for each E-911 business and residential building address in the state, the maximum broadband speed available at that location, in three speed tiers, 4/1, 25/3, and 100/100. The PSD also works with all providers to prepare routes, comprised of Vermont road segments, where fiber to the home service is available. This is presented in a fiber to the home route map published on the state geodata portal. Not all providers participate in this process, but most do. To reiterate, the Vermont broadband data is generally lauded as the best in the country.

Rules are necessary for mission-critical, fiber splice can opening. I witnessed a splice can behind Montpelier City Hall being opened by a FirstLight technician, which had loose fibers hanging outside of the trays and vulnerable to breakage those very same fibers, could easily have been carrying the police and capital west dispatch fiber, ethernet to dispatch towers. But yet not every fiber Splice can technician should be allowed to go unsupervised in to splice Cannes where mission-critical fibers are present.

This calls for regulation of access to private facilities. Utility pole owners and attaching entities are subject to Vermont PUC jurisdiction. Attachments to utility poles are conducted under a license from the pole owner (subject to PUC review) which governs access. Facility owners afford access to customers and their designees subject to their tariffs and terms and conditions of service which would also govern this situation. The PSD is not aware of any issues that would warrant an investigation by the PUC on these issues.

The VELCO fiber model as a resilient Statewide managed mesh architecture. Should the CUDs choose compatible equipment and triangulate to two of the existing Roadm, multiplexers in the VELCO network. We can accomplish both The fiber and mess mesh resiliency simultaneously.

It appears that this calls for developing standards for CUD network designs. It appears that the legislature intended to allow significant freedom to CUDs to determine and adopt an approach that they deem appropriate for their specific environment, and declined to require that CUDs adopt a uniform approach. The VCBB may determine that there is value in uniformity and may develop and require adoption of specifications for grants. VELCO is one of many companies that maintains a significant fiber network throughout the state. Some CUDs may decide to interconnect with VELCO for various purposes. It is unclear whether this would be the best solution for any individual CUD, much less to mandate it for all CUDs, without extensive research.

The neutral host strategy to address 911 roaming, call back currently at AT&T user is allowed to use a Verizon tower to call 911 but the calling number does not transfer similar vice versa. Whereas in a neutral host arrangement those numbers would transfer to the 911 Enabling Call back. Often a battery dies, a cell, can get disconnected, a person can need to hang up and call a family member. The 911 dispatcher call taker cannot call back If that person came in through the non-primary hosting carrier tower,

This appears to call for rules for calls to 911. FCC rules require mobile wireless carriers to accept calls to 911 from other customers of other mobile wireless providers "if it is technologically feasible". For instance, AT&T can accept calls from T-Mobile customers because both networks employ GSM technology, whereas AT&T cannot accept calls from Sprint or Verizon customers that employ CDMA technology. All carriers are in the process of migrating from GSM and CDMA technologies to VoLTE technology. This transition is sure to involve some problems, as VoLTE is a very complicated protocol. Eventually however the carriers are sure to sort out this issue as it is a worldwide phenomenon. There is no indication that a "neutral host arrangement" (whatever this is) would do any better addressing this issue.

All public safety all cell tower, all tower, permits 248a, permits, and otherwise should offer a right of first refusal for Public Safety, antennas and equipment on all poles and Towers.

This appears to call for the reservation of space on various facilities for public safety. It appears that this contemplates that the Vermont Department of Public Safety (DPS) would seek to attach communications facilities to poles or towers. The DPS maintains a significant communications network, but generally has very limited quantity of attachments to utility poles or towers. When the DPS finds that it needs such facilities it follows the industry practice of seeking attachment to existing facilities, at times this involves modifying existing facilities or erecting new facilities, at its expense. Reserving space for DPS on all facilities would increase the size and expense and aesthetic impact of all facilities, the vast majority of which the DPS is not ever going to use. The DPS is fully capable of advocating for itself and has not sought these facilities.

I see nothing in the draft plan about contingency plans, to address, fiber, optic, cable, and material shortage. And still stay on track for our 2024 for statutory goal.

This calls for development of contingency plans in case of materials shortages. It is true that industry analysts have forecast that there will be constraints on supply of fiber materials and laborers due to significant fiber deployment plans in the coming years – it is expected to be a growth industry. However, it is also the case that the legislature has adopted a decentralized approach of relying on CUDs to address the lack of broadband deployment. Generally these CUDs have not yet even developed plans, much less committed to projects. It is inadvisable to acquire materials for projects that may never come to fruition. The worries about supply problems may also never materialize.

Disaster preparedness, which fiber routes are most frequently interrupted? What can be done to create Geographic diversity to protect those routes? Which sites need to be restored first after a major storm just breaks a lot of fiber and what of the protocols and rehearsing those protocols such as making sure that everyone who does need to get to these sites to restore these towers quickly has the right access permissions at equipment to get there, even in the winter.

This calls for analysis to determine which routes are most prone to disruption, and then develop plans to protect or restore these routes. Vermont is served by a robust telecommunications marketplace. This includes traditional telephone companies, but also includes cable operators, competitive service providers, and the mobile wireless service providers. Each of these companies works to evaluate the risks it's individual network faces. These networks cover similar areas but are essentially independent; some may have vulnerabilities in one place while others face challenges in other places. It is not reasonable to attempt a top-town analysis to determine points of vulnerabilities in these many different independent networks.

Small cells should be, prioritized for resilience where power goes out more frequently, interrupting voice, both VoIP voice over IP service and potentially fiber breaks themselves, small cells, especially with resilient backhaul diverse routed, or microwave can be the make the difference between life and death in such areas where presently no cell coverage exists.

This calls for support of small cells to improve resiliency. The Vermont experience with CoverageCo demonstrates that small cells pose significant challenges in rural areas. The most significant challenge is adoption: because mobile wireless service is provided by multiple, individual mobile wireless providers, "neutral host" small cells can only be used by mobile wireless service providers agree to allow their customers to roam onto these networks. Experience has demonstrated that this is a very complicated issue. Another significant challenge of small cells is that each cell requires its own source of backhaul and electrical power. It is hard to see how small cells can improve resiliency. This is because during a typical Vermont storm event, the problem that might have disrupted fiber or power serving an area that a small cell was supposed to support, that small cell itself would likely be subject to the same disruption. Then there is the other significant issue of cost. A business model that relies on the small cell to support its operating costs from traffic will have the converse effect of

making it less likely for mobile wireless carriers to adopt its use; as costs for the mobile wireless carriers increase, participation will decrease. Finally there is the problem of maintenance. It is hard enough to maintain a few mobile wireless towers. Keeping sites operational increases exponentially with the quantity of sites, an issue demonstrated by the fact that most CoverageCo sites were often inoperable even after deployment due to system failures that could not reasonably be kept up with.

We should be promoting and designing high performance Network demonstration projects showing off what an ultra-low latency fiber network can offer.

This calls for demonstration projects. There is little disagreement that fiber to the home service has many advantages, and demonstration projects are unnecessary; just look at the Vermont Telephone Company, Burlington Telecom, or ECFiber. What is necessary is to identify a solution to deploy these services with a sustainable business model with prices that consumers can afford.

Next Generation Vermont interactive television using open source software, high-definition signal high quality audio possible uses by the legislature, the courts, the state colleges prior to Plumbing apprenticeship. Program. And the nursing program were utilizing VIT.

This calls for the creation of a video conferencing network. The pandemic has shown the need for video conferencing systems. It also showed the viability of off-the-shelf, over-the-top video conferencing software, such as Zoom and Microsoft Teams. The PSD supports the creation of a video conference network, to the extent that funding for the project can be identified. There is no lack of facilities, both physical buildings in which to conduct meetings, or telecommunications networks serving these buildings, or technology necessary to enable video conference meetings. The only issue is financial: the experience with VIT demonstrated that while there is interest in video conference meetings, there is not a business model to pay for them, and state financial support would be necessary for such a network. The state should consider these costs and the other alternatives now available on the market. The state could begin with a focus on livestreaming the legislative hearings as was proposed in S.106.

Statewide local program, origination and Statewide channel, on both cable and web, is a project that should involve the access media organizations, All Points of origination on existing cable system should be identified cataloged. And any fiber connected site could potentially be a point of origination for Statewide broadcast this type of design, including high performance network between Public Access stations should be very high priority.

This calls for the creation of a network connecting PEG Access studios and points of origination. Cable operators are required by PUC rules to deploy drops for remote origination. Access Management Organizations receive funding to manage their systems, presumably including arranging for broadband internet access. The PSD is not aware of significant or widespread issues with broadband deployment at PEG studios that would necessitate the creation of an

expansive (and expensive) parallel network. It is also unclear how such a network would be funded.

Next pandemic. Preparedness strategies and plans. We've totally bungled this one with zoom and YouTube. And Citizen participation blocked in legislative process. It seems that now would be the time to put media and Telecommunications plans in place for the next pandemic Wi-Fi as a utility and all Town centers. Both as a immediate pandemic response and as a emergency resilience response with special attention paid to the speed of the backhaul, the resiliency of the backhaul And the availability of backup power.

This calls for the deployment of public broadband by WiFi at town halls, with consideration of backup power and redundant broadband providers. The PSD has facilitated the deployment of at least 239 WiFi hotspots at public facilities throughout the state. The PSD sought funding and offered to provide and install WiFi hotspot equipment at these locations, with the only condition being that the host institution needed to supply the physical location, electrical power, and broadband internet access. The PSD conducted extensive outreach to town halls, schools, libraries, and NGOs throughout the state, and we are confident that entities that sought public WiFi have had the opportunity to participate. Wi-Fi Hot Spot Project | Department of Public Service (vermont.gov)

Cyber assault preparedness. Strategies for malicious intrusions or hacks by the Russians, the Chinese or even domestic what are our strategies to protect key assets?. Computer mapping databases, what options do we have to potentially disconnect from a national attack and yet still maintain media assets such as GIS datasets need to remain available.

This calls for development of cyber security protocols for State facilities. The State of Vermont oversees Geographic Information Systems through the Enterprise GIS Consortium and specifically through the Vermont Center for Geographic Information, a part of the Agency of Digital Services. ADS maintains physical hardware servers where VCGI maintains state GIS data. VCGI employs ESRI's ArcGIS.com as a front-end web service to make these features easily accessible to the public. This practice is followed by many state agencies, including the PSD. But the underlying resources are still housed and maintained by ADS on local physical infrastructure. ADS provides robust cyber security protection for these resources.

Should the state fund and equip AMOs with low power FM stations as a backup option for community emergency information access should all cable and internet connections be down?

This calls for the State to fund radio stations for emergency resiliency. Vermont is served by an active marketplace with dozens of commercial radio stations.

And finally, how should Vermont be spending the $53 million accrued from spectrum sales, that Vermont educational television sold. What is arguably the public's spectrum originally held by the state colleges or the University of Vermont that $53 million in spectrum sales, should not be

left to just the board of Vermont, Educational Television but discussed and debated as a public engagement process and discussion.

This calls for funds of Vermont PBS to be distributed. Vermont PBS is an independent non-governmental organization that is not affiliated with the State of Vermont. It make prudent business decisions and as a result enjoyed a significant windfall. This windfall will hopefully allow PBS to continue to serve Vermont well into the future. The Vermont PSB Board is best suited to make this determination.

DVFiber and SoVTFiber, both represented by and violating public records laws by colluding for billable hours with Primmer and Piper attorney Elijah Emerson may be intending to pursue H.360 public broadband funds to help Consolidated build uneconomical areas within the CUDs by colluding with the Department's consultant CTC/RISI to recommend the Ten Year Telecommunications Plan include statements that CUDs be allowed to ignore or individually negotiate exceptions to Vermont statutes on net neutrality, open access, competitive choice and mobile wireless priority in telecom planning investments.

This calls for oversight of CUDs with respect to adherence with public meeting laws. The CUDs are municipalities of the state of Vermont and are subject to public meeting laws and the oversight that Vermont law allows.

It will be interesting to see if CCI lawyers will reject provisions of grant conditions of H.360 requiring reversion of ownership of publicly funded fiber asset in the event a CUD or other grantee is sold or bankrupt. I suspect the open access requirements would also be a problem and possibly a deal breaker for Consolidated as it is private equity fueling the CCI build they may need to keep their options open to flip it as did Oak Hill Capital Partners with Sovernet, subsequently aggregated with all other Oak Hill acquired competitive NY/New England fiber properties becoming FirstLight, sold to Paris based Antin Infrastructure Partners.

No specific recommendation.

What does Vermont's open access rights to built fiber $30M+ grant from the VTA to build Sovernet fiber even mean today? Why is that clear explanation of terms, conditions and prices not laid out in the Ten Year Telecommunications Plan?

This calls for expansion of Open Access in the Telecommunications Plan, including the VTA experience. The revision of the plan will expand on Open Access, including the essentially meaningless NTIA Interconnection Obligations specified in the Sovernet project.

The Department intends to apply this August on behalf of the state for NTIA funding in partnership with an ISP, either Consolidated or possibly ValleyNet proposing to serve the maximum number of addresses, again likely ignoring the state's net neutrality law, competitive choice and open access statutory policy and goals found in 30VSA 202c.

This calls for the State to adhere to legislative policy goals should it seek funds from the NTIA. The PSD has not yet determined if it will pursue funds from the NTIA. If it does, it will consider

the policy goals in 30 VSA 202c, and whether adherence to these goals would improve chances of receiving a grant, or importantly, scuttle chances of success of the program if a grant were received.

CVFiber executive committee met yesterday and entered executive session to discuss not contracts but non binding MOUs with member town in an effort to convince towns to commit a portion of their ARPA funds to CVFiber while making no firm commitments to build by date certain in those towns. This had been made clear in a prior governing board meeting and thus the executive session held was in violation of open meeting laws.

This calls for oversight of CUDs with respect to adherence with public meeting laws. The CUDs are municipalities of the state of Vermont and are subject to public meeting laws and the oversight that Vermont law allows.

With regard to Public Safety Communications systems, Mr. Dunne commented last evening that Public Safety Communication systems are in pretty good shape. And apparently, this must be referring to state level systems because Televate has recently completed a draft report for central Vermont communities indicating that the Land Mobile Radio Systems, which are over 30 years old, are at risk of failure. They are reportedly obsolete, and in need of replacement, So Chittenden County is similarly working on a consolidated dispatch plan. They, however, have not done a technology needs assessment, similar to what Central Vermont has undertaken. Windham County is similarly, pursuing a regional consolidated dispatch plan, This draft ten year telecommunications plan does not appear to have addressed these fundamental issues of how these regional plans shall be crafted, interoperability testing conducted and coordinated. What criteria they will need to meet in order to fit and interoperate with state systems and federal systems? P.25 only? So the elements of the Telecommunications for Public Safety, include everything from the caller in need of help, having either landline copper or voice over IP or cell coverage to actually reach out and make a call for help. Coverage. We now know how spotty cell coverage is, how unreliable poorly maintained copper services are and how vulnerable to outages cable VoIP and fiber phone service is to power outages. Also vulnerable are Host-Remote circuits lacking diverse route protection, cell tower backhaul absent diverse route or diverse media protection and CUD internet based phone service with switching happening who knows where and possibly lacking any redundancy whatsoever for Vermont subscribers. FirstNet proposed wireless coverage and made commitments in Washington yet Vermont has no enforcement powers to hold AT&T to those commitments. Televate has found no coverage where AT&T claimed to have built coverage. Even after five years of buildout, they still only planned to have achieved about 76% coverage and that is only one carrier. Ermonts tourists and residents utilize all major cell carriers and require similar coverage. Where is the chapter in the Telecommunications plan to achieve ubiquitous mobile wireless coverage with all or most national carriers? Further comments on the draft 10-year telecommunications plan regarding Public Safety communications. A Statewide plan for a planning framework is necessary to guide

local initiatives at Regional Dispatch Communications planning processes. Central Vermont. Chittenden County and Windham County are all proceeding to redesign and modernize their Regional Public Safety Communications. This is typically analog land mobile radio. Central Vermont has hired the same company that the Department of Public Safety used in the FirstNet evaluation and in the FirstNet validation. And that company, Televate has tentatively concluded that the regional radio system being used by Central Vermont communities for dispatch is at end of life and requires replacement. Alternatives having been discussed are trunked radio system or simulcast radio system or both. A key question, which has yet to be answered is when a regional system is established, where does that function failover to in the event of loss of a dispatch facility. The failover question drives the need for interoperability. And interoperability on this scale, requires a Statewide architecture, such that Franklin could fail over to Chittenden, or Essex, or to Orleans, or Central Vermont to st. Johnsbury or Windham to Bennington, for instance. Combining Systems is impossible without strict adherence to standards and interoperability requirements or rules. None of this seems to be addressed in the Telecommunications plan. Whereas, these are million dollar Investments that are being made today and require interoperability with State systems. So in the absence of a single unified State system, in the hundred, 200 million dollar range, these Regional systems need Guidance and standards established in the state 10-year telecommunications plan to guide their decisions and their Investments. One such scenario being considered is Central Vermont, which is currently CapWest or Capital West, being dispatched out of the Montpelier Police Department, could fail over to Saint Johnsbury when they're new Dispatch facility is built provided compatible consoles, CAD systems, radio transmitter equipment that can access the frequencies used by both or alternatively, a single unified simulcast system that spans from the Green Mountain Range, Lincoln Peak, etc., all the way over to the Connecticut River. And then in day-to-day operations is run as if it were two separate simulcast systems by the Saint Johnsbury and CapWest dispatch facilities. But were either one of those to fail, the full load of calls, possibly even including serving as a Public Safety Answering Point (PSAP) would need to be able to be accommodated at the single site and the radio transmitters for the area with the failed facility, have to be accessible through the network, from the failover facility. This type of guidance is fundamentally necessary in a telecommunications plan. Similarly, in a disaster situation, either or both of these systems have to be able to access State radio resources and the Statewide VCOM radio channels, potentially the state microwave network in a post hurricane scenario or ice storm scenario, much of the aerial fiber around the state will have been damaged and most communication circuits will be inaccessible including backhaul to cell towers. So these LMR systems have to be designed for rapid repair and ultimate resilience.

These comments call for the Telecommunications Plan to evaluate local and regional public safety communications systems. This proposed evaluation is beyond the scope of the state Telecommunications Plan. 30 VSA 202d(b)(4) requires that the plan provide an assessment of

"state-owned and managed telecommunications systems". Local and regional communications systems are neither state owned, state managed, or even strictly-speaking "telecommunications" systems. The Vermont Department of Public Safety supports efforts to enhance communications capabilities of local and regional communications systems and has published interoperability guidance documents. Statewide Interoperability Planning | Radio Technology Services (vermont.gov)

I believe that the draft plan falls far short of the statutory requirements. I think it's somewhat absurd to suggest that we're going to make it optional for CUD's to choose whether they want to do open access or net neutrality. These are statutory foundational documents… they're foundation principles in statute- competitive choice and open access is our state policy- is our state goal. It's the job of this plan to define a path to implement it as quickly and as ubiquitously as possible. And it's not one where you pick and choose which goals and policies you like and make them optional. That's not what the plan- that's not what the contract requires, not what the statute requires. I think the plan is vastly deficient in that regard.

This calls for the Telecommunications Plan to recommend requiring CUDs to adopt open access and net neutrality. 30 VSA 202c(b)(6) states that it is the purpose of the section to support competitive choice for consumers among telecommunications service providers and promote open access among competitive service providers on nondiscriminatory terms to networks over which broadband and telecommunications services are delivered.

Requiring CUDs to adopt open access may not ultimately support competitive choice because it may undermine the CUD business model; a failed network is not in anyone's interest. The Telecom Plan addresses this tension by encouraging CUDs to evaluate open access.

I'd also like to point out that the Magellan plan said that we have a competitive market for middle mile fiber, which discredited its findings. It was also based on the electric utilities becoming ISP's and so- to reference that document is an error. It's building on sand.

This questions the extent of a middle-mile fiber market. The PSD believes that there is a robust market for middle-mile fiber in Vermont. Consolidated has fiber serving almost all central offices in the state. CenturyLink, Firstlight, and VTel have fiber serving central offices in all regions of the state. VELCO has fiber serving almost all substations. The PSD has cataloged the locations of all telephone company substations and central offices for use by entities seeking backhaul strategies.

I concur with ---'s comments that the accuracy of our base data, which we like to brag about, is all suspect and it says so on every one of the Department's maps- that we don't stand behind this data, that we got it from the carriers themselves, and it's somewhat absurd to be spouting it as if it were accurate.

This questions the quality of the Vermont broadband deployment data. The Vermont broadband deployment data is often lauded as among the most accurate and precise broadband data in the country. It is not perfect, but it is address-based (as opposed to census

block based) and is produced based on voluntary submissions from service providers, including route maps depicting road segments served by fiber to the home and cable broadband service. To the extent that the data contains inaccuracies, it is likely that it understates coverage because it does not include universal participation of all providers.

The potential uses of the VELCO network, the dense wave division multiplexers that are scattered all over the state on resilient rings- is not covered in this plan, whereas that may be the most immediate and available capacity that the CUD's could build off. And we risk making a grave error of not answering that question up front because if we build on that same architecture with the same manageable equipment, we would have both resiliency, capacity, and central management, and rerouting capability in the event a fiber breaks- around another path. Even if it has to go many miles around another route, that network is designed for that kind of thing.

This calls for the plan to evaluate the potential that the CUDs could build off of the VELCO network. VELCO has expressed an interest in supporting CUD deployments but has not yet expressed in concrete terms what this participation may include. CUDs are independent agencies. Some may choose to interconnect with VELCO, and each may do so in different ways. Others may determine that this is not in their best interests and that alternative arrangements make more sense for their individual situation. It is premature to develop a statewide plan for CUDs based on the VELCO network.

Similarly, the microwave network and its role in public safety failover and hurricane response or ice storm response- whether or not we should upgrade the microwave network and rely on that or backhaul for 911 calls at least if not other stuff.

This calls for evaluation of the reliability of the microwave network. It is unclear what microwave network this comment refers to, but presumably it refers to the network maintained by the Vermont Department of Public Safety. The DPS maintains a communications network that meets the needs of the state and it alone is responsible for the operation of the network.

The neutral host and mobile wireless chapter is really a farce. The neutral host strategy is- you can't ask a- you can't put our an RFP and ask the one vendor who was granted a huge advantage of $25 million in NTIA funds for FirstNet and an additional $30 M worth of spectrum (if not greater than that), to then put a competing proposal in or ask their main roaming partner in Vermont, VTel, who might be a nice, or appropriate neutral host operator, to compete against AT&T in such an RFP- that's just a fundamentally flawed concept. This example, this draft plan is an example where a vendor compromises their engineering integrity to accommodate a political perspective of a dysfunctional agency. I think it's a fraud upon the public to have charged three quarters of a million dollars for the two plans combined from this team.

This calls for the plan to support neutral host to expand mobile wireless coverage. The expansion of mobile wireless coverage requires the active participation of the three

nationwide mobile wireless providers, AT&T, Verizon, and T-Mobile. This is because the vast majority of consumers subscribe to services operated by these providers. The neutral host business arrangement holds potential, but it entails a complicated business arrangement that is ultimately dependent on the participation of these carriers.

The investments referred to in the comment are insufficiently described to address.

The statewide fiber design is necessary, it's in the bill, it's not mentioned, it may have come too late to make it into this draft because it was part of Conference Committee negotiations- but a statewide resilient fiber design would accommodate all built fiber that's got public funds or ratepayer funds, which would include VELCO, would include Consolidated's CAF II funded middle mile fiber, would include FirstLight from our Sovernet investments. So a statewide design thereby minimizing or reducing the expectations of the CUD's to have to build middle mile and long-haul infrastructure- I think we're greatly exaggerating the capacity and the skill, even the available materials and management teams it would take to turn the CUD's into fiber-building contractors or management operators. So by utilizing existing experienced utilities, especially ones that already have infrastructure, or could quickly build infrastructure with existing crews and trucks- is the only way that we're going to get this done. And I think that should have been fleshed out in this plan.

This calls for the Plan to support the proposal that the VCBB should engage the creation of a statewide fiber design. Recent legislation passed by the legislature (but awaiting review by the administration) creates the Vermont Community Broadband Board (VCBB) and authorizes the VCBB to commission a statewide fiber design. It will be up to the VCBB board to determine whether to proceed with this endeavor. This comment suggests that the study should consider integration with existing fiber networks, potentially based on "trading" access to VCBB-funded projects in exchange for access to existing networks. It is premature to offer advice to the VCBB, as the legislation has not yet been adopted. It is unlikely that the VCBB would adopt the trading proposal suggested in the comment.

Other people have mentioned that open access, competitive choice, 100 symmetric- a gaping flaw in this plan that is not optional- the plan is required to address each of the 202c goals and lay out a strategy to achieve those goals. This plan addresses a strategy to assert, to serve fiber eventually to everyone who doesn't already have cable, but the cable there is where the fiber does not exist are also required to have a strategy to reach and serve those areas in this plan. That's been ignored. That's a fundamental deficiency. The CUD's universal service plan should include every address that's not served with fiber if we're going to reach the 100/100 goal by 2024. I hear talk or I see press releases that suggest that we'll do this in 10 years. I'm sorry, that wasn't an option- the statutory goal is 2024, the funding is available- you don't have the option of choosing to take 10 years when the statute says we will have fiber to every home by 2024. I just think the fundamental premise, the arrogance of the, of the political manipulation and compromise of this plan, is ghastly.

This calls for the Plan to recommend deploying fiber service to locations that have access to cable broadband. 30 VSA 202c(b)(10) states that it is the purpose of the statute to support measures designed to ensure that by the end of the year 2024 every E-911 business and residential location in Vermont has infrastructure capable of delivering Internet access with service that has a minimum download speed of 100 Mbps and is symmetrical. Prioritizing deployment to the neediest locations is not inconsistent with this statute.
The windfall from the ARPA funds will allow the state to make significant headway in achieving this goal. But as the Public Comments draft states, the funding proposed to be allocated to the VCBB is far short of the total required to deploy 100/100 service to all locations that lack 25/3. If the task were expanded to include overbuilding the locations that are already served at 25/3, the budget would become completely unrealistic. Therefore the PSD continues to recommend that the primary task should be ensuring that locations that lack 25/3 be the priority.

The EBS spectrum, the connectivity division has been required for 5 or 6 years to inventory all available spectrum in the state that's held by instrumentalities and analyze it's best and applicable use toward deployment of broadband. That's not done in this plan and it hasn't been done by the Department in the last 5 years.
This calls for the plan to inventory spectrum held by the state. The PSD is not aware of any spectrum assets held by the state or state instrumentality. Some private colleges held EBS spectrum, and the VTA entered arrangements to assist these colleges to keep these leases intact. It is the PSD understanding that the colleges nevertheless allowed these licenses to lapse.
The legal analysis is all suspect and flawed and compromised by hiring an attorney who is on the board and an operating board member of ValleyNet, who is an ISP and a fiber builder under contract to ECFiber and Lyme Fiber and others- but yet claims to be a non-profit not subject to public records act, and therefore not accountable. But you can't have a legal analysis that fits the agenda of a vendor operating in this space underpinning your legal analysis in a 10-yr Telecommunications Plan. I'm referring to attorney Montroll there.
The legal analysis provided by the team of attorneys, including Jim Baller, Casey Lide, and Andrew Montroll, was an impartial analysis that focused predominantly on issues of federal preemption across the telecommunications landscape. The volunteer board position of Andrew Montroll on a Vermont non-profit has no impact on the legal analysis and the legal analysis does not promote the agenda of any organization.
The statute requires effective public participation. I find it very disingenuous to announce that this is the second of three hearings when no-one knew about or showed up to the first hearing. You can't call it a hearing. This is not the second hearing, this if the first hearing that anyone was notified about- and many were notified by my actions not yours.

This calls for greater public process. The PSD arranged three public hearings on the public comments draft, and followed public meeting rules in seeking public participation for the process.

The estimates of cell phone coverage 91.9% on class 1 roads is farcical and inaccurate to a laughable degree.

This questions analysis of mobile wireless coverage. The estimates in the public comments draft were based on industry standard propagation modeling, and employed the cell tower data drawn from permits issued by the Vermont PUC. The PSD shares the concern that estimates based on propagation analysis should be viewed skeptically. In our view the drive tests done by PSD staff and the tests done by Televate analyzing FirstNet deployment provide a more reliable estimate of coverage. However, the contractor followed the contract and provided the analysis as requested.

There's no realistic analysis of finding of the role of deployment interim fixed wireless as a strategy to provide broadband service above 25/3 until fiber can reach these customers. And it's potential benefit of also deploying mobile broadband simultaneously. That is one of the most economical strategies we could pursue and that and a neutral host model having all carriers share the costs of that infrastructure and support the fixed wireless being deployed and even owned by the CUD's. And yet that is entirely missing. The earlier interim plan that cost $475k poo-poo's the idea of using fixed wireless by saying it takes too long to site towers. As if no one in the Department or the contractors had been aware that a waiver on tower building permits had been passed in the prior legislation. I find that a ghastly oversight that undermines the credibility of this whole product and process.

This calls for consideration of fixed wireless service as interim step in deployment. The PSD considered fixed wireless service in its 2020 Connectivity Initiative grant program, and in fact the majority of the approximately 10,000 locations covered by that program are to be served by fixed wireless providers at 25/3 Mbps or better. It is notable that the legislature declined to allow the VCBB to fund fixed wireless in the forthcoming legislation.

Anyway I believe this plan is so deficient it cannot be adopted. It's main role is to establish and guide decisions via CUD's and agencies and especially the PUC in evaluating the incentive reg plan next summer. This plan needs to be built upon, improved upon, and finished- which it is far from now. It cannot be adopted as is and 3 years lapse and another compromised incentive reg plan [cell service is cutting out here].

This calls for the plan to be revised and expanded. The Public Comments draft was released May 11, 2021. The PSD has solicited and received public comments from many sources. The PSD will employ these comments and plans to release the Final Draft of the plan in June.

I wish we could potentially gain access to Consolidated's middle mile fiber [poor reception]. Build in this amount of years with this amount of money. And to fund infrastructure with public money it's perfectly logical that we would seek to not only access that fiber, but allow Consolidated to

roam on other state-built fibers in the interest of supporting competitive choice. We can't just selectively throw inconvenient or fearful impacts of competitive choice away because the CUD's would rather have a monopoly. When the statute says the Department and the Plan is to support competitive choice- end of sentence.

This calls for the state to gain access to Consolidated middle mile fiber. Consolidated Communications (CCI) maintains the most extensive telecommunications network in the state. This network includes fiber connectivity to the majority of its central offices. It is also building a significant fiber to the home network. While CCI has a wholesale tariff, the company does not offer dark fiber through this tariff, the obligation to do so was eliminated by the FCC decades ago. While it is the PSD understanding that CCI does not routinely offer dark fiber, it does however offer a wide range of competitive telecommunications services including to other carriers that request it.

The Public Comments draft includes an extensive analysis on the ability of the state to compel access to existing facilities. The PSD is not inclined to support such measures.

I think that we've compromised this entire process and I had great hopes when I succeeded in getting the legislature to allow private contractor to do it- but the Department has compromised this contractor and further compromised their own integrity in this product. I'll leave it at that for right now.

This asserts that the Department compromised the contractor. It is unclear in what way the comment alleges that the PSD has compromised the contractor. The company offered a competitive bid for the project and has produced the public comments draft largely on its own; the PSD provided no editorial guidance.

I will try to not cover the same issues I covered last time except for one. Still calling this the third hearing while the first was not warned and no one showed up- it's a farce to call that one a hearing.

This calls for greater public participation. It is a repeated comment and is previously addressed.

With regard to FirstNet and cell coverage- relying on any one carrier for a publicly funded or supported cell infill strategy is misguided in that we are a tourism-dependent state and we do not want to say we're only open for business if you're a Verizon customer, or only if you're an AT&T customer. People need to speak to their friends and family on all networks. That's an argument why neutral host is the only cost-effective strategy that we should be pursuing.

This calls for support of neutral host to improve mobile wireless coverage. It is a repeated comment and is previously addressed. It should be underscored that the neutral host model is dependent on the active and continued participation of the three nationwide providers. The situation described in the comment would persist if one of the providers abstained from the arrangement. There has been to date no assurance from any, much less all three providers that they would entertain sustained participation in a state supported neutral host effort.

Similarly, I've learned recently that 911 calls- if you make a 911 call from a Verizon phone, you're picked up by an AT&T tower- your calling number is not relayed to the 911 call answer location- the PSAP. That means when the call is disconnected or the person having an emergency needs to make another call, the PSAP caller cannot call that person back because the number was not relayed with that type of missing roaming feature. Again an argument for the neutral host.

This calls for neutral host design to address current intercarrier call processing. It is a repeated comment and is previously addressed.

It should be underscored that while FCC rules require carriers to accept 911 calls from customers of other carriers if it is technologically possible, this will continue to be complicated by the transition to VoLTE. The same example referred to in the comment could happen with the neutral host model if the carrier has not authorized roaming on the neutral host network.

Priority of 911 call completion in the design of these community networks. These community fiber networks have become increasingly vulnerable to both fiber cuts and power outages and to not be designing with the public safety grade resilience to assure that 911 calls go through or conversely having small cell wireless coverage in the same areas such that there is a fallback strategy to reach help in the event of a fiber cut or power outage. These are issues that really should be addressed in the plan.

This calls for recommendation that CUDs adopt measures to ensure reliability; calls for improved wireless coverage as backup. The CUDs are attempting to serve areas that the traditional providers have shunned because those providers, based on significant market experience, have determined do not pose a viable business model. The adoption of specifications or measures to improve or ensure reliability, such as diverse routes or backup power at central locations, would increase the deployment costs for these companies, thus making the already challenging business model more so. Nevertheless, the VCBB may decide to adopt such requirements when making grants.

Requirements for diverse routes. Again, I believe we're over playing the pre-emption and the fear of litigation. The FCC has been explicitly clear in their 2014 statement of policy- that when it comes to 911 calling reliability, they share jurisdiction with states- they do not pre-empt. That means that every 248a application should be reviewed for diverse backhaul and backup power with extended run time to make sure a single fiber cut… we had one fiber cut in south Burlington on Halloween two years ago which disconnected 23 Verizon cell towers. That should not have been allowed to happen. We do have jurisdiction based on that 911 call completion to require diverse route backhaul off a cell tower.

This calls for cell tower permits to require diverse routes. It is a repeated comment and is previously addressed.

Similarly, public safety failover. We rely on ethernet to reach transmitting towers. I've got a challenge another statement- 'Public safety, we're in pretty good shape'. And contrast that with

Televate's analysis for central Vermont which said our system is at risk of failure. Our radio system is 30 years old and at risk of failure. How we're being told it's in pretty good shape and therefore no design or attention has been paid in this plan is a serious question.

This calls for the Plan to evaluate local and regional public safety communications. It is a repeated comment and is previously addressed.

Appropriate use of the VCom statewide radio channels that we invest many millions in 10 or 11 or $13M.

This calls for evaluation of the use of statewide public safety communications radio channels. It is a repeated comment and is previously addressed.

The earmark for Universal Service Fund is currently unnecessary for the connectivity division in light of all this federal broadband money, so while 911 is being short- has a shortfall and we're still insisting on taking that connectivity fund off the top. 911 used to have a higher priority than connectivity in the fund. That's again- these are the issues that really are supposed to be fleshed out in this plan.

This calls for a change in allocation of VT USF funds. It is a repeated comment and is previously addressed.

I'm going to quote one section from 202d. It said the State 'In developing the Plan, the Department shall address each of the State telecommunications policies and goals of section 202c of this title, and shall assess initiatives designed to advance and make measurable progress with respect to each of those policies and goals. The assessment shall include identification of the resources required and potential sources of funding for Plan implementation.' That is fundamentally not in this draft. I'm going to repeat that we need to continue to push for our money's worth on this.

This calls for the plan to identify funding sources. 30 VSA 202d(c) states In developing the Plan, the Department shall address each of the State telecommunications policies and goals of section 202c of this title, and shall assess initiatives designed to advance and make measurable progress with respect to each of those policies and goals. The assessment shall include identification of the resources required and potential sources of funding for Plan implementation.

Respectfully this is a separation of powers issue and a legislative branch issue. For years the PSD has provided estimates for the costs of universal deployment, and the legislature has declined to provide funding. If the legislature saw fit to provide funding for a program the PSD would develop it. It is not realistic for the PSD to identify funding sources or develop cost estimates for programs that the legislature has shown no interest in funding.

In short, the potential funding source is either taxes through the general fund, or fees assessed on telecommunications services through the Vermont USF. The PSD does not support either of these ideas and therefore declines to offer these as options.

I just want to point out that the last meeting- the first one, you're calling it the second- started late and ended early. So to have a meeting where you're using half of it with a slide deck and then compressing all the public comments into 20 or 25 minutes is pretty uh… it's never been done this way before. There were no paper copies made available despite multiple requests. It almost seems intentional to diminish the public participation. Most people can't or won't read a 150 page document on a computer screen. To not publish any paper copies even on request is quite absurd. It's self-defeating as far as mandatory public participation- effective public participation.

This calls for more public process. It is a repeated comment and is previously addressed.

Under 202d, the Department is empowered to require information from the carriers. I've made a recent request of the department- did RISI or the Department on RISI's behalf make requests to the carriers of whatever information on- for instance- shoreham's fiber buildout, OTelco's fiber buildout in Shoreham, or locations and available capacity for fiber for lease around the state. Those, unlike 202e under the Connectivity Division, those are not voluntarily disclosed- they're mandatory. They are not subject to nondisclosure agreements. If we did not do that, we fundamentally crippled this draft plan from the get-go. I want to point out that distinction because, in prior years, the same request was made and the Department made no request under 202d authority to ask for information from the carriers.

This calls for data requests under 202d. It is a repeated comment and is previously addressed.

Host remote isolation has been mentioned in Mr. Dunne's comments. If you allow the carriers to keep secret which remotes are subject to isolation by a non-diverse protected route from that host switch to that remote, you've basically made those public more vulnerable to being unable to call 911. And similarly, you've disempowered planning for a CUD who might want to build fiber sooner on a route that would allow or provide strands for Consolidated to close that host-remote vulnerability or provide a diverse route from that remote back to the host switch. This capitulation to over-broad secrecy and not warning the public and anyone in these exchanges is prone to having their calls isolated within the exchange and not being able to call 911. That is not public advocacy. I call that as an explicit area that should be fleshed out in the plan.

This calls for evaluation of the host-remote isolation issue. It is a repeated comment and is previously addressed.

Contingency plans to address the fiber and materials and manpower shortages, or skilled labor shortages. It's clear that we do have a 2024 goal to accomplish 100/100 to every address in the state and that strategy is not laid out in this draft plan. This plan addresses those without cable service, but it does not address customers up to fiber speeds.

Calls for the Plan to address potential shortages. It is a repeated comment and is previously addressed.

CoverageCo- there's about 10 sites that were built under the CoverageCo project with solar panels, generators, some of them have satellite phones for diverse backhaul, which of course

wouldn't be suitable for 4G. Those sites are paid for and sitting if not cannibalized by now and those should be made available for 4G upgrades to the communities that are prepared to implement those.

This calls for the plan to consider the use of the 10 Resiliency Sites. The Vermont Telecommunications Authority received a grant from the US EDA to deploy 10 backup power supply systems in villages it identified as potentially subject to isolation. The VTA deployed CoverageCo microcell systems at these sites. The VTA planned to employ satellite broadband systems at the sites. The VTA sized the electrical power systems for solar power and battery back at these sites to support the meager power requirements of these two communications systems. The microcell network has been disabled. The satellite backup systems were never deployed. The power systems can provide unlimited operation but only for a very tiny amount of power, and would be of little or no use for more robust communications systems. The PSD has asked the towns that host these facilities if they have any interest other than for net metering which they already supply them but has seen no response.

Count of Unserved / Underserved Premises The draft plan itemizes an estimate of 54,000 addresses that are unserved or underserved and not included in RDOF-subsidized areas. Not all cable providers offer 25/3 service to all customers. This is true in DVFiber's service area. The PSD should clarify which addresses are actually served at FCC minimum speeds by each cable provider.

The plan uses the PSD's 2019 Broadband Status dataset as the foundation for understanding served/underserved and at what level. Whether cable infrastructure actually offers 25/3 in some parts of the state is an important question; for the purposes of this report, the project team was beholden to the data.

The count of 54,000 is itemized. A count in the overview presentation is 7,000 lower -- 47,000 -- and not itemized. Getting the count right is critical. Please confirm your sources.

There are a few ways to calculate the universe of unserved, and the number this report believes is best indicative of the un and underserved premises has been updated in this document. This report asserts that the best way to calculate un- and underserved premises is to use the 2019 Broadband Status data, remove the premises funded by RDOF, remove the gigabit low latency premises funded by the Connectivity Initiative via either cable line extensions or fiber. This results in approximately 51,000 premises un- and underserved. This may be higher than the true number, however, because not all camps are on grid, and the 2019 data is not up to date in areas where there has been robust deployment (e.g., in the Waitsfield Champlain Valley Telecom service area).

Low Earth Orbit Satellite Obstructions

Section 4.1.5.2 -- Low Earth Orbit Satellites -- is generally accurate but makes the unsubstantiated claim that, "In general, LEO satellite service appears to be a good option for Vermont premises that currently only have access to DSL or traditional satellite. There are thousands of camps and

off-grid premises in the state that could benefit from Starlink's service for the long term, and some Vermonters are already enjoying improved service via Starlink."

This statement ignores Starlink's own guidance that a completely uninterrupted view of the sky at an angle of 50 degrees all around the satellite dish is necessary for the service to function as designed. Reports of knowledgeable reviewers emphasize this point. As a simple rule of thumb, the Starlink dish must be as far away from the nearest structure, tree, or other obstruction as that object is tall. The absolute worst places for Starlink systems will be in wooded areas. The rural locations that lack adequate broadband are much more likely to be wooded than the city or suburban areas that are more likely to have adequate options.

This comment is accepted, the section on LEO satellites has been updated to reflect this concern.

Camps The description of "Camps" at the top of page 98 is inaccurate and misleading: "We note that these totals include 9,126 addresses identified in the State's database as "camps," which range from unimproved properties without power, to larger buildings off the electrical grid powered by solar energy, that are improved buildings. We created a design that excluded the camps, which reduced the needed cable plant mileage by 795 miles, or seven percent of the total."

DVFiber will absolutely not exclude camps as passings and customer locations. In fact, "camps" can include substantially improved buildings that are on a par with any other residential structure. In Halifax, the average value of the structures on properties labeled "camps" was about two thirds of the average value of the structures on other residential properties when I last looked. This result was consistent across quartiles of valuation. My home, in which we invested substantially and is on the grid, and a nearby home that dates to colonial times and is owned by a family that have lived here for generations were both among those properties listed as "camps" at last inspection.

This comment is accepted - the plan meant to indicate that camps could be either on or off grid, and has been updated to reflect that reality.

Wacky Numbers - Possibly these mistakes have been corrected already. If not, please review and revise.

Figure 14 would have us believe that the cost per passing for a fiber network ranges between $10K and $20K and the cumulative cost per passing for a wireless network would be substantially higher. Either the data or the labels are wrong.

Table 22 suggests that DVFiber would have to construct 1,232.24 miles of network to reach 6,455 passings (about 5 passings per mile) when in fact we need about one third fewer miles to reach about 50% more uncabled passings. The proportion of passings to miles (about 5:1) that is attributed to DVFiber is about the same as the proportion that is attributed to all CUDs in total. I suspect the draft reported a mile count that would be needed to serve every location, served and unserved, and then included "unserved" addresses but excluded "underserved" addresses.

Figure 14 shows the cost per passing over time - it is not a range but an increasing cost as wireless equipment needs to be replaced.

For the address points used in this analysis we did the following filtering:

- **Download full 2019 Broadband Status Dataset**
- **Remove served (100/100 and 25/3)**
- **Remove addresses covered by Connectivity Initiative**
- **Remove RDOF areas at the gigabit low latency tier**
- **Assign town without a CUD into logical neighboring CUDs**
- **This resulted in 6,455 un- and underserved addresses for Deerfield Valley**

The number reflects the theoretical CUD that includes logically adjacent towns that had un and underserved addresses at the time of the analysis. The cost analysis is meant to be used to provide an order of magnitude for a statewide fiber solution - individual CUD builds will not likely adhere to the methodology we used for a statewide estimate.

For the network design, Section 6.2 adequately describes the route design methodology. Essentially, we created routing using an algorithm that connected all address and can pass through served areas to connect pockets of unserved.

The Telecommunications and Connectivity Advisory Board recommends that the 2021 Telecommunications Plan include a table in the Executive Summary that includes each of the recommendations included throughout the report, including:

- Goal (non-statutory, layman explanation of the impact/outcome of goal)
- List of specific action items/tasks to achieve the goal (more narrow than broad recommendations in the report)
- Proposed metrics to measure progress/success
- Timeline associated with completing that task(specifically task that have short windows before recommendation is no longer relevant)

That table should align each recommendation with the statutory goal towards which it supports as well as a timeline for completion and the identification of the entity that is responsible for its implementation. These entities could include:

- Department of Public Service
- Other Agencies and Departments in state government
- Telecommunications and Connectivity Advisory Board
- Vermont Community Broadband Board
- Communication Union Districts
- Other telecom providers
- Vermont Public Utilities Commission
- Vermont State Legislature
- Incumbent Local Exchange Carriers
- Competitive Local Exchange Carriers

- VELCO
- Regulated Electricity Utilities
- Others, as appropriate

The purpose of this recommendation is to establish a process for tracking progress in the implementation of strategies to accomplish the statutory telecommunications goals.

The project team has updated the executive summary extensively since the first draft plan was published to provide a more cohesive view of the recommendations in the plan, with a demonstration of how the recommendations point to the broad telecommunications goals of the state established in Section 202. We have not included timelines for the recommendations due to the plan's position as an educational and policy document rather than a discrete list of action steps; further, this report cannot assign timelines for executing, as these work must be set by the agencies and bodies responsible for that work in accordance with their internal planning, staffing, and the general vendor market.

With regard to utility pole hygiene: The Department of Public Service has demonstrated no capacity to inspect nor has there been any effort to petition the Public Utilities Commission to order the pole owning utilities to complete transfers and remove double poles and for attachers to adhere to electrical and safety codes and best practice construction techniques especially for securing and protecting fiber optics where they transition from aerial overhead on the poles to underground, they become very vulnerable to accidents of snow plows, sabotage, car accidents, Etc.

Repeated comment, calling for investigation into violation of NESC rules, calls for an investigation into removal of dual poles, and calls for creation and adoption of best practices related to underground fiber installation.

Adherence to NESC rules was addressed previously; the PSD has not reason to suspect that there is widespread violation of NESC rules. The Vermont PUC pole attachment rules require the removal of dual poles; the PSD does not believe an investigation into compliance with this newly-enacted rule is warranted. The PSD believes that the NESC adequately addresses construction standards and that additional best practices are not necessary. There are many industry associations and standards bodies that have already developed industry best practices, and service providers are well aware of these resources.

Inspections and complaints of poor construction and poor maintenance should be delegated, with enforcement authority to municipalities empowered to inspect and enforce pole and cable maintenance and expedite double pole removal.

This comment calls for delegation of authority to enforce PUC rules to municipalities. The PSD is not aware of any reason why the current PUC rules and practices are insufficient to address the concern. Delegation of authority is very complicated and would require PUC rule changes, and would likely require statute changes. Delegation of authority is not necessary; municipalities or frankly any entity, may file complaints with the PUC or PSD, or request the

PUC open an investigation. The PSD believes that service providers subject to PUC rules generally adhere to NESC rules, and will make required adjustments if deviations are brought to their attention, so additional process or authority is unnecessary.

Along State Highways and right of ways, the state electrical inspectors employed by the Department of Public Safety, Fire Marshal division should be empowered by legislation, staffed up and trained to inspect and maintain proper installation and maintenance protocols along the poles and in the public right of way. Private easements across lands should be enforced by the municipal or state jurisdiction of surrounding lands.

This comment calls for delegation of authority to Vermont Department Public Safety to enforce PUC rules. Companies subject to the jurisdiction of the Vermont PUC are required to adhere to the National Electric Safety Code. The PSD understands that most companies have highly qualified engineers that are well versed in the requirements of the code, and by in large expects compliance with its requirements. The proposal would require PUC rule changes and likely legislative change. The PSD is not aware of any large scale lack of compliance that would warrant the creation of a new bureaucracy to enforce compliance, and does not support the proposal.

As a funding source, the same pole attachment charge, maintenance, right-of-way surcharge that's being considered for remodeling the universal service fund and or public benefit fund for use of the right of way should also fund these maintenance inspectors as well as allowing municipal and state inspection agencies the option of retaining fine revenues.

Calls for funding source to fund proposed inspection bureaucracy.

The PEG-funding report prepared by Berkshire Consulting for the Vermont Agency of Commerce and Community Development includes a proposal to instate a right-of-way surcharge. It is not stated and it is unclear by whom a proposed right-of-way surcharge may be under consideration. Such a proposal would be difficult to implement, as it would transfer a require to collect the fee to the pole owning utilities. It would presents a seriously flawed policy consideration. The proposal would hold-harmless current contributions from the cable operators who already pay for right of way through their franchise fees. Thus this charge would apply primarily to two areas: a.) rural areas that lack cable broadband service, and b.) telephone companies that compete with cable operators and are already struggling financially. In addition, there are federal requirements relating to fees collected on rights of way that constrain their use. Therefore the PSD does not support the proposed right of way surcharge.

PEG-Net With regard to the public access television Community, media network in light of the Court decisions and FCC changes that might allow cable companies to begin deducting from the five percent of revenues funding stream that currently supports important Public Access media functions in Vermont, the Statewide fiber Network, connecting the access media organizations should be separated from any Corporation Comcast, especially, lest it be used as a high-cost deduction from the five percent share of the gross revenues.

Calls for access media organizations to be separated from funding corporation
Vermont PUC rules require individual cable operators to provide public access. The Vermont PUC allows the entire franchise fee (caped at 5% of cable customer bills under federal law) to be used for his purpose. Operators contract with access management organizations (AMOs) to fulfill these obligation. It is important to recognize that under the PUC construct this is a choice; the operators could choose alternative arrangements to meet the public access obligations. Since the funding is tied to meeting the specific cable operator obligation, it is impossible to separate the media organization providing the service from the operator that they are providing it for. It is unclear therefore what this comment proposes.
The proposed 10Gbps fiber network is necessary for not only live broadcast of Live Events Statewide over both web streaming and broadcast via interconnection with the head ends but it's also important for centrally archiving public media of Select board meetings, Planning Commissions, design review, 911 board, Legislative events and for managing a restored Vermont Interactive Television network.
This comment calls for support of a statewide fiber network to support public access and VIT. The PSD has not seen evidence that a statewide fiber network is necessary. The PSD understands that all PEG access studios have sufficient connectivity to support their business needs. The PSD supports the creation of a reformed statewide video conference network if a sustainable funding source can be identified. There is no information to indicate that a statewide fiber network would be necessary to support a reformed video conference network; to the contrary the experience of the pandemic has demonstrated that typical business or residential broadband service of sufficient capacity to support video conferencing services.

Enhanced 911 resiliency and planning With regard to the 911 system and 911 call completion assurance, resiliency very incremental progress has been made recently with a rulemaking on carriers reporting power outages but all these carriers should be required to identify all electricity dependent electronics, meaning field amplifiers, nodes, switches and hubs. The nodes are typically powered by the amplifier, powered amplifier locations requiring a metered grid connection and pushing voltage to the nodes themselves. But every one of these electronic devices electrically dependent devices needs to be mapped and consideration should be made of some equivalent of a PowerWall type powering source for extended runtime batteries, especially if these could be connected through an Ethernet Network and serve as a resiliency benefit Peak load leveling for the electric utilities, similar to the way the existing installed base of power walls supports Green Mountain Powers grid resiliency efforts
Calls for deployment of backup power for all electricity-dependent facilities.
No federal or state rules or laws require communications service providers to employ backup power at all facilities. The communications marketplace includes a patchwork of kinds of services each with associated regulatory requirements. If Vermont attempted to impose such

a requirement it would be in the context of this complicated regulatory environment. This would entail significant litigation risk and eventually uneven adoption by regulatory aspect, creating market advantage imbalances. It is unclear what the costs would be, but they are certain to be staggering. Therefore the PSD does not support the proposal.

Propagation Mapping Wireless coverage surveys and mapping must be on-going Mapping of all cell coverage, more precisely signal strength, data rate, location for all of the cell carriers must be mapped again as it hasn't been done since 2013 but the capacity needs to be built within the state to continually go out and measure again when new towers are installed and to find the dead zones towards the supporting a plan for resolving or in filling those dead zones.

Calls for propagation mapping of mobile wireless coverage

The PSD does not believe that wireless propagation maps are a reliable indicator of the availability of mobile wireless service. There is no standard understanding of even what a propagation map should depict. There many variables in the art of wireless propagation modeling, and slight changes in assumptions make significant changes. The PSD therefore does not support the proposal to adopt propagation modeling. To the extent that coverage estimates are helpful drive testing is a more appropriate tool. If funding were made available the PSD could arrange for drive testing, with the extent of the test depending on available funding. Several regional planning commissions have conducted extensive drive testing in 2020, the results are posted on the PSD website. The concept of "dead zones" is problematic as each mobile wireless provider operates an independent network with its own service characteristics. Therefore it is not clear what "dead zones" means, whether this means no service from one or all companies, or whether it includes voice, broadband, or if broadband what speeds.

When a new tower is proposed, carrier should be required to share the most detailed information on projected propagation from those towers, that should be checked against as-built after the towers installed, both to hold the carrier accountable for the conditions of the permit, they were granted as well as to inform any infill necessary by Communications Union, Districts, or a neutral host operator.

This comment calls for conditions in PUC tower permits. The proposal appears to call for a two step process; propagation estimates should be provided with a tower permit application, and these estimates should be corroborated after deployment. (Note Vermont PUC rules already call for petitioners to include propagation estimates with 248a tower site applications.) Requiring conditions on tower site permits would increase the deployment costs. Mobile wireless operators have consistently reported that costs and permitting process are an impediment to coverage expansion, as construction budgets are fixed, so adding new requirements would slow deployment, contrary to an important state policy goal. In addition, even if the service were corroborated, it is hard to see what use this would be, other than to the operator itself, and presumably the operator is in the best place to determine what

information is best for its network operation. It is also difficult to define how one would even go about designing a system to corroborate proposed coverage.

The CoverageCo small cells have yet to be sold for scrap or donated and the 100+ remaining units installed on poles may still be accruing pole rental charges. This is necessary to resolve and will cost money to remove the electric meter sockets, which still have useful life in another location.

This comment calls for CoverageCo microcell transceivers to be processed. The status of the CoverageCo microcell transceivers is complicated. Some of the devices were funded by state grants, but others were funded by a grant from the US EDA. Approximately half of the microcells in inventory are installed on the poles as they were by the VTA, the other half remain in storage. Neither the legislature nor the PSD have arrived at a proposal on the disposition of the microcells. The microcell equipment itself has very little value, but the sites are conditioned for small cell deployment and could, with minimal cost support a new installation, especially as fiber is built out along CoverageCo routes.

Resiliency and cyber security planning and prevention must be part of the plan. Critical databases such as cloud stored operations and repair manuals, gis mapping, restorable images of essential computers need all be geographically inventories and secured, on air gapped storage to assure availability in the event of a national scale cyber disruption or attack.

This comment calls for cyber security planning. The PSD shares the concern about the importance of cyber security planning, but believes that this is a problem that all companies must address individually and that there is no need for state oversight at this time. Vermont has not instituted state requirements for cyber security planning by communications service providers. The communications marketplace consists of many different kinds and sizes of companies, offering sets of services with widely differing regulatory requirements. Therefore the approach to cyber security of a large company will be different than small company. The ability to compel compliance to any rules or best practices would also very greatly by the regulatory setting of the company. To the extent that companies must comply with cyber security requirements, these are currently imposed at a federal level.

With regard the enhanced 911 system. The recently executed contract with in digital, spans the next four or five years thus its replacement falls within the ten year plan scope. E911 is now riding on fiber circuits leased from FirstLight, Consolidated Communications and possibly others. As the state's resilient Network to support CDs and broadband and Public Safety comes into maturity, through the design that will hopefully be completed by year-end 2021, an Unbundled 911 Plan and design for enhanced 911 beyond the inDigital contract should be incorporated into the Telecommunications plan.

This comment calls for the E-911 network to be evaluated in the Telecommunications Plan. The Vermont E-911 Board is responsible for developing and managing the state E-911 network. Evaluation of that network in the telecom plan is thus duplicative and not a reasonable use of limited public expertise. In preparing the plan the contractor developing the telecom plan

interviewed the E-911 Board and the VT Department of Public Safety as required by statute, and the comments of these interviews informed the development of the draft plan. While the E911 Board network itself is not subject to PSD or PUC oversight, the companies providing the component services, and these component services themselves are subject to PSD and PUC oversight.

Protected circuits between all public safety, locations and transmitter towers should be part of a comprehensive design from the landline or cell phone, through the cellular infrastructure and switching to the public safety answering point. To the Dispatch Center if not co-located with the PSAP and beyond that to the transmitting towers and receiving radios within the vehicles, or with the First Responders. I won't use the term cradle to grave because that portends an unfortunate outcome, but that Soup To Nuts, envisioning the reliability and resiliency of the enhanced 911 call process needs to be fleshed out in a plan complete with testing protocols.

This comment calls for evaluation of vulnerability in public and private E-911 networks. The comment does not appropriately understand the composition of modern networks, for the purposes of this comment these fall into three segments: a. the Public Switch Telephone network, b.) the private network of the E-911 Board, and c.) the dispatch radio networks.

The public switch telephone network, including wireless, wireline, and VoIP providers. This is the purview of the telecom plan. The E-911 private network extends from all voice providers to all PSAP facilities and is in the purview of the E-911 Board. The radio dispatch networks include the state, regional, and local LMR (land mobile radio) dispatch networks to connect to first responders, and is in the purview of the individual dispatch center, be it local, regional at state police. It's very likely that Network design and maintenance would be one contract. Second contract can be selective routing and, or the state could look at acquiring selective routers. Third contract for PSAP equipment and dispatching equipment. Remodeling the universal service fund under the exceptions in the internet tax. Freedom Act for both Universal service funds used to fund the enhanced 911 as well as universal service funds created before 1996 both of which implicate Vermont's unique situation. So With regard to freezing deer in the road for fear of litigation risk. Vermont's strategy should be to cleanly separate the lifeline, the telecommunication services for the deaf, the TDD/TTY support and the connectivity. Remove all of those from the universal service fund. Include Dispatch within the 911 system because it is an essential piece of the 911 system. By so doing we would potentially be on safe ground to extend the 2% Universal service charge to all Broadband services and fully support enhanced 911 and dispatch from that fund.

This comment calls for adoption of a new E-911 charge on broadband services. The PEG-funding report prepared by Berkshire Consulting for the Vermont Agency of Commerce and Community Development includes a proposal to place a fee on broadband services. The Department

believes that any initiative to implement proposals from the Berkshire Report should first carefully weigh the legal risks and administrative costs of any action. The Department believes that any new tax on broadband services would inhibit broadband adoption and expansion.
Planning and governance changes required. The Ten-Year Telecommunications Plan should not be assembled by an agency responsible for grant disbursements. The chill on outspoken but necessary critique is detrimental to both the plan and the parties. The plan should be assembled in a more comprehensive and integrated manner, consistent with the state five-year strategic IT plan, the Health IT Plan, the state economic strategy, the new E911 plan. A designated quasi-judicial body should review these plans for consistency among the plans as well as for strict adherence to statutory plan requirements. Plans should be approved only after an affirmative finding of both completeness and consistency among plans is made. This recurring review process should measure progress made since prior plans, changes necessary to finetune plans and new extended goals and milestones
This comment calls for a change in governance through new legislation. The statute authorizing the telecom plan was significantly revised in 2020, and this is the first edition under the new plan. The legislature declined to adopt the recommendations for governance change when revising the statute; that is the appropriate venue for these comments. To clarify, grant making authority is likely to transition from the PSD to the to be formed VCBB.
By definition, it is necessary for the 10 Year Plan to take a longer term view on the future of public access and community media. This plan focuses largely on the post-pandemic time frame, reflected in its limited recommendations about PEG access. The final plan must take a broader view of PEG related issues.

The project team has updated the executive summary and other portions of the plan to present a clearer throughline from the actions recommended in the near term to goals the state may achieve within 10 years.

The draft plan recommendations focus only on the recommendations of the "PEG Study", requested by the Vermont Legislature in 2020 (Act 137, Section 19) and commissioned by the Vermont Agency of Commerce and Community Development.

In these recommendations, the draft Plan refers to the PEG Study recommendations for alternative PEG funding options for the Legislature to consider, while emphasizing the legal risks of the proposed options: "it should be reiterated that any option will carry litigation risk and a robust risk assessment" (page 139). This recommendation states the obvious and serves to de-emphasize the recommendations of the PEG Study.

At the same time, the draft Plan advances a streaming tax as perhaps the most viable of the options. In our opinion, this streaming tax (on content carriers) is the most vulnerable to legal challenge. The stronger recommendations lie with assessment of the public right of ways.

But the Plan is reluctant to lean in this direction while risking creating an unnecessary opposition between Vermont's CUDs and Access Management Organizations (AMOs)[165]. The state can choose to support both policy goals by creating alliances rather than seeding competition for funds.

The plan is not meant to present the tax on streaming services as the most viable option; it is merely an example of a tax mechanism currently being attempted and litigated in court in other states.

The draft Plan cautions the state against taking a lead role in modernizing PEG funding, without acknowledging the fact that Vermont is four decade, national leader in the development and diversification of PEG services and funding.

The larger goal, to modernize the state's telecommunications tax structure, is a longstanding objective of key Legislative committees and is supported by the 2021 report of the Vermont Tax Structure Commission: https://ljfo.vermont.gov/assets/Meetings/Tax-Structure-Commission/2021-01-11/576baebcc8/DRAFT-TSC-Report-1-7-21.pdf

VAN agrees that there are legal implications for any tax modernization policies, but this should not dissuade the legislature from serious consideration of these questions.

Further, VAN contends that discussion of the PEG Study recommendations should acknowledge the timeliness and importance of the Vermont Legislature using its authority to modernize the state's telecommunications regulation and tax structure.

This report agrees that modernizing funding should be addressed by the legislature and that doing so in a timely manner is appropriate. The purview of this plan does not include a charge to make recommendations that are legally unclear; as such, the plan recommended that that modernization be done with a robust legal analysis.

[165] However, outside of any legal risk that strategy may carry, it also may counteract the state's efforts to support deployment of telecommunications. An additional $10 per pole per year fee, for example, could ultimately cost CUDs and their customers $250,000 to $500,000 per year. Draft 10 Year Telecom Plan, Page 139

VAN also recommends that the plan include specific language to guide regulators and policy makers as they consider how to allocate public benefits of the communications and telecommunications network. In particular, VAN recommends that Vermont legislators and regulators work to rationalize communications and telecommunications public benefits into a Public Benefits Fund to include Universal Service Fund, Broadband for All, E-911 Funds, and PEG Funds; elders/students/income sensitive; operating and capital funds for public access production centers (aka community media centers or AMOs); libraries, schools, etc. (The NTIA TIIAP Model); and, intermediaries like Tech Corps and/or AMOs that provide production skills, management and broad distribution for communities to make highest use of these benefits.

The plan agrees that AMOs, as well as libraries and schools and other organizations, have a large role to play in manifesting the public benefits of telecommunications. The plan also believes that CUDs and the ownership of assets by CUDs are a viable long term revenue source for demand side broadband challenges. This report refers readers to the COVID emergency plan for a discussion on the possibility of a broadband corps.

The policy objectives of the 10 Year Telecommunications Plan has implications for future certificates of public good and negotiations with cable operators. It is necessary for the state to use its influence to assure ongoing technical parity for PEG cable channels and applications. Technical parity with commercial channels continues to be an issue for PEG channels. A longstanding example: Vermont's largest cable operators have resisted reasonable requests for HD channels, in spite of the fact that PEG channels are now recorded and prepared in HD formats.

Another important consideration is the "chipping away" of previously integrated cable features for PEG use. Namely, the high cost of including PEG metadata for cable viewers to know what is airing, and to manipulate the content. While PEG AMOs obtained access to the interactive program guide in the most recent Comcast Docket, the 2022 cost for using this service will be $6000 a month, per channel, according to most recent discussions with the IPG vendor. This is prohibitive for PEG channels small and large. Additional marketing support and technical assistance would be useful if better prices can't be negotiated.

In last week's 6th Circuit Court of Appeals ruling in City of Eugene v FCC [3], the court affirmed the idea that so-called "in-kind" benefits, such as free services that companies agree to as part of their contracts with local governments can be classified as "exactions" by the FCC – and then be counted against the 5% revenue cap of franchise fees that local governments derive from cable agreements. While these implications are not yet clear, the State must be willing to stand up for PEG in the face of the erosion of PEG funding.

Technical parity is important, and has recently been helped via interconnection of the new Vermont Community Television HD channel provided by Comcast. Connection of cable operators to (now) channel 1070 is detailed in Rule 8.000. The report affirms the importance of PEG and the need for legislators and others to stand up for PEG, including using funding from the General Fund if necessary to ensure that PEG channels continue to deliver high quality services and public good.

The draft Plan should not miss the opportunity to support public applications of the state's communications and telecommunications networks. Examples to support and discuss in this Plan include:

1. Interconnection of the new Vermont Community Television HD channel provided by Comcast, which increases in value as all cable operators adopt it. Connection of cable operators to (now) channel 1070 is encouraged in Rule 8.000 and bears repeating in the current version of the Plan.

2. Design an Interactive Statewide fiber network. Now is an important and opportune time to immediately plan and build the next generation of low carbon, internet-based public participation: a statewide, interactive, high bandwidth, high definition teleconference and public hearing network that serves the civic, telehealth and educational purposes of the state of Vermont. At least two Legislative study committees, have identified the need for the next generation of VIT. *See VAN 4/23/21 Testimony, Appendix 3.* **H.360 authorizes the VCBB to design such a network. The costs of VIT should be weighed against other commercial options. The department has also addressed this issue in reports, which should be considered.**

3. Capital Support - ADA Compliance, while the costs are coming down, the AMOs will need financial support to make meaningful adaptations for federal compliance with ADA laws. **More funding for AMOs for complying with applicable laws should be considered; the source of this funding is a decision that may be contingent on establishing new funding sources or an allocation from the General Fund.**

4. Archive Preservation - The Secretary of State's Archivist thinks that Vermont is an ideal model for a national funding to support the substantial statewide archives. CCTV alone has 41,000 programs in its database. VAN produces 18,000 hours a year. Continue to invest in the archivist preservation position at the Secretary of State's office. Create a plan and obtain funding for a statewide video archive. Continue to support the Secretary of State's archival preservation position. **Making recommendations for the secretary of state's office is not in the purview of this plan, and this is more about PEG content**

preservation than networking or telecommunications; however, this comment is being reproduced here for consideration and availability to the appropriate state officials.

5. Grant Program for Community Communications - As federal funds for broadband projects become available, VAN is looking for support for the statewide Vermont Community Television, Technical Assistance Corps, Summer/ Vacation Camp Delivery, and Municipal Meeting Coverage. **These issues are important, but outside the purview of the telecommunications plan.**

The 10 Year Plan should not flinch from discussing ways that Vermont can improve the decision making process on state level telecommunications matters. These are long term decisions made within the short term time frame of the Legislative session. There needs to be continuity of policy, administration and evaluation to make sure that the Legislature can make informed decisions with the help of knowledgeable legislative staff and accountable administration staff.
Ideally, the new Vermont Community Broadband Authority, will add capacity to an overburdened Department of Public Service, whose primary job is to protect the public interest.

Public Process in this Plan is Insufficient. Given the widespread public interest in broadband deployment and telecommunications issues, the Department of Public Service (and State of Vermont) is missing an important opportunity to involve its citizens given the current design of the poorly thought through and not inclusive public process related to the review and approval of this version of the Plan.

To date, the public process has been relegated to press releases and the result has been sub-standard and must be acknowledged as unacceptable. The Department cannot simply include the PEG AMOs as partners in the process without sufficient time and meaningful collaboration. Nor can the Department staff design a process without professional advice on public engagement. Resources must be spent to involve the public and strengthen the final version of the Plan.

The Department endeavored to include robust public input on the plan, which has resulted in well over 200 comments from over 100 individuals representing the full range of interests. In addition comments will continue to be open through June 30th and can be submitted based on the Draft Plan or Final Draft. That said, public engagement can always be improved and this feedback on how to improve the process for next time if appreciated.

In particular, Vermont Access Network is concerned with the following elements of the Ten Year Plan:

> *(6) An assessment of opportunities for shared infrastructure, open access, and neutral host wireless facilities that is sufficiently specific to guide the Public Utility Commission, the Department, State and local governments, and telecommunications service companies in the deployment of new technology.*
>
> *(7) An analysis of available options to support the State's access media organizations.*
>
> *(8) With respect to emergency communications, an analysis of all federal initiatives and requirements, including the Department of Commerce FirstNet initiative and the Department of Homeland Security Statewide Communication Interoperability Plan, and how these activities can best be integrated with strategies to advance the State's interest in achieving ubiquitous deployment of mobile telecommunications and broadband services within Vermont.*
>
> *(9) An analysis of alternative strategies to leverage the State's ownership and management of the public rights-of-way to create opportunities for accelerating the buildout of fiber-optic broadband and for increasing network resiliency capacity.*

Vermont Access Network recommends that Vermont use its authority to modernize the state's telecommunications regulation and tax structure. VAN is particularly concerned about the long term viability of a public benefits structure that includes Public, Educational and Government (PEG) [2], although our comments address other aspects of open access to the state's communications network.

STORY BEHIND THE CURVE: Telecommunications (phone), Communications (TV, cable, satellite) and information (internet) services have converged into a digital stream running through fiber networks and wireless distribution points, largely located on state and local "rights of way" (ROW).

In federal law, each of these communications methods resides in a regulatory silo with different public interest requirements. In Vermont, telecommunications companies are required to subsidize the High Cost Program (Universal Service Fund or USF), the, enhanced E-911 fund,[3] and most recently, the Connectivity Fund. It is important to note that all of these are passed through to ratepayers. Cable companies are required to underwrite public, educational and government access (PEG). Internet companies are exempt from public interest requirements.

The historic drop in phone and cable usage in favor of broadband internet is creating deficits in these public benefit funds: Evident in E-911 Fund deficits[4], the steady increases in the Universal Service Fund (phone), plus 5% annual projected decline in public, educational and government (PEG) access TV (cable). [5]

Revenue projections do not favor a sustainable future for PEG and community media. Pay TV revenue, which includes cable in the US, is estimated to decline by 35% by 2025 as cable subscribers "cut the cord" in favor of a la carte internet based news and entertainment services. In Vermont, Comcast's annual PEG reports show a 8.5% decline in revenue between 2019 and 2020.[6]

RECOMMENDATIONS: The convergence of coaxial cable, land lines, wireless into the fiber backbone (with wireless outposts) makes the siloed policy approach to public access outdated.

The PEG Study discussed the State of Vermont's authority to modernize its policy approach and points to ways the State can rethink how commercial providers exchange public benefits for their use of the public ROWs.[7]

Vermont Legislature has the authority to restructure and modernize its telecommunications tax structure, including requirements for public benefits to promote access to the network and community production. [8]

1. Modernize Vermont's Telecommunication Tax structure to reflect the technology transition from discrete industry silos to converged fiber-driven networks. It's worth noting that the goal of these fees/ taxes is to increase access to the means of production and distribution. The providers pass the cost on to subscribers and gain new customers. (That is, regulation is good for business).
2. Ensure Open Access Provisions for all the fiber that is built/ or activated, especially those projects that receive public money.[9] All fiber built in the public rights of way should set aside capacity for competitors to lease and for public benefit at no or low cost. This also makes monopolies harder to achieve and add more customers to the network.[10]
3. Rationalize Public Benefits Funds to Promote Network Use, such as Universal Service Fund, Broadband for All, E-911[11] Fund, PEG Funds. All compensation from providers benefiting from access to the state and local ROW. In particular, be sure there is a reliable revenue stream for PEG funding and community media applications.

Taken together, public benefits include: “channels”; rate subsidies for elders/students/income sensitive; operating and capital funds for public access production centers (aka community media centers or AMOs); libraries, schools, etc. (The NTIA TIIAP Model); and, intermediaries like Tech Corps and/or AMOs that provide production skills, management and broad distribution for communities to make highest use of these benefits.

1. Continued recognition by the State of Vermont as an “essential service” - provider of technical assistance and production resources on keeping the community connected. In light of federal funds for broadband intermediaries and tech corps, we recommend that the State include access management organizations (AMOs) in eligibility requirements for federal broadband funds Vermont’s broadband bill + New National Initiatives + ARPA funds.

   Vermont’s community media centers are living color examples of public benefits of universal broadband service in our communities and need to be treated as such--another reason to look beyond cable to all video (telecom/ communications) users of the right way to support public benefits.

2. Assure ongoing technical parity for PEG cable channels and applications. Technical parity with commercial channels continues to be an issue for PEG channels. Vermont’s largest cable operators have resisted reasonable requests for HD channels, in spite of the fact that PEG channels are now recorded and prepared in HD formats. Another important consideration is the “chipping away” of previously integrated cable features for PEG use. Namely, the high cost of including PEG metadata for cable viewers to know what is airing, and to manipulate the content. While PEG AMOs obtained access to the interactive program guide in the most recent Comcast Docket, the 2022 cost for using this service will be $6000 a month, per channel, according to most recent discussions with the IPG vendor. This is prohibitive for PEG channels small and large. Additional marketing support and technical assistance would be useful if better prices can’t be negotiated.

3. Interconnection of the new Vermont Community Television HD channel provided by Comcast, which increases in value as all cable operators adopt it. Connection of cable operators to (now) channel 1070 is encouraged in Rule 8.000 and bears repeating in the current version of the Plan.

4. Design an Interactive Statewide fiber network. Now is an important and opportune time to immediately plan and build the next generation of low carbon, internet-based public

participation: a statewide, interactive, high bandwidth, high definition teleconference and public hearing network that serves the civic, telehealth and educational purposes of the state of Vermont. At least two Legislative study committees,[12] have identified the need for the next generation of VIT. *See Appendix 3.*

5. Capital Support - ADA Compliance, while the costs are coming down, the AMOs will need financial support to make meaningful adaptations for federal compliance with ADA laws.

Worth noting from the previous Telecom Plan Draft: The state should explore the adoption of new equipment and services that improve communication for deaf, deaf-blind, and hard of hearing consumers. The State should explore the feasibility and value of a communications facilitator program for deaf-blind consumers. The state should also consider adding relay conference captioning (RCC) to the menu of supported TRS services. While the State considers adjustments to existing VUSF programs, the state should be ever aware of the trends and financial wherewithal of the fund to handle changes and additions to the supported programs.

- Municipalities will require ongoing support for the next generation of public meeting and event coverage. The AMOs are developing cost effective hybrid meeting "kits" to support this transition. This type of capital expense should be eligible for federal relief and other funding.

- Archive Preservation - The Secretary of State's Archivist thinks that Vermont is an ideal model for a national funding to support the substantial statewide archives. CCTV alone has 41,000 programs in its database. VAN produces 18,000 hours a year. Continue to invest in the archivist preservation position at the Secretary of State's office. Create a plan and obtain funding for a statewide video archive. Continue to support the Secretary of State's archival preservation position.

- Grant Program for Community Communications - As federal funds for broadband projects become available, VAN is looking for support for the statewide Vermont Community Television, Technical Assistance Corps, Summer/ Vacation Camp Delivery, and Municipal Meeting Coverage.

And finally,

- Improve the decision making process on state level telecommunications matters. These are long term decisions made within the short term time frame of the Legislative session. There needs to be continuity of policy, administration and evaluation to make sure that the Legislature can make informed decisions with the help of knowledgeable legislative staff and accountable

administration staff. Ideally, the new Vermont Community Broadband Authority, will add capacity to an overburdened Department of Public Service, whose primary job is to protect the public interest.

- Use the Plan! The State of Vermont has a better chance of achieving its "access for all" goals with a realistic plan. The Ten Year Plan must be a living document that guides decision making with annual updates. As the framework for policy considerations, the plan should be easy to explain and realistic to implement.

Many elements of this comment, such as about modernizing the tax structure, have been addressed in previous lines - please see responses above.

In direct response to this comment, the project team has included in the Final Draft additional information and considerations about alternate open access models. Further, PEG channels are ideal entities to provide ongoing support for public meetings and municipal functions, as well as to play a role as archivists of video and other resources.

The project team also endorses the notion that ADA compliance is essential and should be supported, as is the adoption of new services to improve communication for deaf, deaf-blind, and hard of hearing consumers. Potential advancements and greater involvement in PEG in services for these communities would serve the state well and fit within PEG channels' public good mission.

The Telecom Plan by statute must be updated every 3 years; this frequency of update is a compromise between cost and benefit to updates that occur more regularly than needed. The implementation of recommendations in this plan should be re-evaluated on an ongoing basis.

Consequences of inconsistent property taxation policy:

As noted for decades in the Vermont Telecommunications Plan, Vermont's requirement that Cable TV Broadband providers must pay local and state personal property taxes on their equipment while DSL Telco's are exempt, is unfair and an impediment to Broadband Cable companies fully building out their served areas.

For example, a 4 million dollar investment in DCTV's Broadband FTTH network results in approximately a $108,000/yr personal property tax bill. A 4 million dollar investment in a telco's DSL FTTH network results in a $ 00 property tax bill. It's worth mentioning that Telco's and other

property tax exempt entities are not bogged down every spring filing Vt Property valuation forms and related, calculated information to state and local lister boards.
Nor are they bogged down each year when appealing grand list values is necessary.

Doubling down on inconsistent property taxation policy

Fast forward to today's CUD proposals, they, along with their potential partners, are seeking personal property tax exemption and plan to offer Telecommunications services in direct competition with existing Vt. Broadband Cable providers who do not receive the same exemption status. Extending property tax exemptions to CUD's and their partners such as Consolidated Communications and Washington Electric for example, will only serve to tilt the already unfair playing field in favor of some new providers over other legacy providers without real justification for doing so.

Solution

All telecommunications providers must be treated equitably when it comes to personal property taxation. It is my understanding that the Vermont Department of Public Service agrees with this position. This Vermont Telecommunications Plan should include a clear path to where any and all Vermont providers of telecommunications services, both wholesale and retail, must pay local and statewide personal property taxes in a fair and equitable manner, with no exceptions.

CUD's must be required to compete for any funding opportunities with existing FTTH providers like Duncan Cable TV through an application process which is merit based. The Department best knows, from day to day experience, important considerations such as:
What areas of an existing Cable Broadband provider's town(s) remains un or underserved.

1. Existing experience in the town where the app is being made,
2. Experience and customer service record with the VDPS,
3. Financial worthiness and solvency as demonstrated over many years of service,
4. Other previous build commitments in the town as it may relate to a company's deserving nature.

The new revised plan should provide a clear, specific and merit based process which paves the way for the buildout of Vermont Broadband ubiquity. Long stand Vermont Broadband service providers deserve nothing short of process which acknowledges and supports providers with proven track records of quality of service and successful distribution coverage through self funded investments.

The tax policy set by H.360 is not in the purview of this telecommunications plan. This plan advises the PSD and other stakeholders on how to close telecommunications market gaps inherent in the most rural parts of the state. The plan agrees with the notion that private providers have crucial experience in network operation and endorses the notion that they should be encouraged to be part of the solution in rural areas, in many cases as partners to CUDs, to ensure that the goals established in 202c are met, namely, that every premise is served by robust infrastructure capable of 100/100Mbps.

The Department of Public Service has concluded that Land Mobile Radio (LMR)is not included in the term "telecommunications" and therefore planning for public safety LMR need not be included in the 10 year Telecommunications plan mandated by 30 VSA §202d. I find no explicit statutory definition to support this position. Indeed the contrary is easily demonstrated. LMR is the primary means of communication among public safety professional first responders and 911 responders. It is indisputably a telecommunications technology. The Department's position is plainly wrong.

LMR has been recognized a vital part of telecommunications by the Dept of Homeland Security in this presentation regarding Project 25.:

Project 25 (P25) is a standards development process for the design, manufacture, and evaluation of interoperable digital two-way land mobile radio systems communications products created by and for public safety professionals. The P25 standard is a critical component to achieve interoperability among different suppliers' products. The P25 CAP provides responders with the confidence that the communications equipment they use has been tested against the standards and successfully tested for interoperability, no matter the manufacturer. The P25 CAP is a congressionally mandated program that has enjoyed continued congressional support through DHS appropriation Conference Reports. As a voluntary program, P25 CAP allows suppliers to publicly attest to their products' compliance through P25 CAP testing at DHS-recognized laboratories. As proof, suppliers are required to submit Summary Test Report (STR) and Supplier's Declaration of Compliance (SDOC) documents. In turn, P25 CAP makes these documents available to the first response community to inform their purchasing decisions via the S&T's P25 CAP website.

Indeed an entire week has been set aside to support this process as the Chief of the Bureau of Public Safety states:

It's National Public Safety Telecommunicators Week, when we honor the dedicated professionals who answer the public's calls for help and dispatch life-saving assistance.

This past year was especially challenging for the public safety community. As the pandemic raged, the volume of 911 calls reached record levels in some locations. Telecommunicators, most of whom continued to work on-site, developed protocols to screen 911 callers for COVID-19 symptoms in order to better prepare first responders. Some areas were also hit with natural

disasters, from tropical storms and wildfires to hurricanes and severe winter weather. Throughout these difficult times, telecommunicators were there to assist us – often while coping with these same challenges in their personal lives. To these invaluable 911 professionals: we are grateful for your service.

The FCC continues to work on ways to support telecommunicators and other 911 professionals as you carry out your important missions. Later this month, for example, the Commission is tentatively scheduled to vote on a proposal to promote public safety by ensuring that 911 call centers and consumers receive timely and useful information about network disruptions that affect 911 service. If the Commission votes to move forward, we will seek public comment on these potential new rules.

I also want to highlight the FCC's Public Safety Support Center, a web portal where Public Safety Answering Points can report problems related to 911 service, including outages, fraudulent or spoofed 911 calls, missing or inaccurate location information with a 911 call, text-to-911 service problems, and carrier lines of demarcation issues. You can also provide updates to the FCC's Master PSAP Registry and submit questions about the FCC's rules and other 911 topics. Here's a tip sheet about the Public Safety Support Center that may be useful to you. Our team will respond promptly to any inquiries.

Of course as always, our FCC Operations Center is available 24 hour a day, every day, to assist you with urgent matters. Just call us at (202) 418-1122. Thank you again for helping to keep the public safe.

30 VSA §202 c (7) regarding State Telecommunications policy and planning supports this interpretation of the statutes. That law provides planning must:

Support the application of telecommunications technology to maintain and improve governmental and public services, public safety, and the economic development of the State.

LMR is likewise clearly included in 30 VSA 202d (8) which provides:

(8) With respect to emergency communications, an analysis of all federal initiatives and requirements, including the Department of Commerce FirstNet initiative and the Department of Homeland Security Statewide Communication Interoperability Plan, and how these activities can best be integrated with strategies to advance the State's interest in achieving ubiquitous deployment of mobile telecommunications and broadband services within Vermont.

This provision mandates consideration of HomeLand Security interoperability planning to achieve UBIQUITOUS (emphasis added) deployment of mobile telecommunications. Only consideration of LMR could lead to a ubiquitous planning process for telecommunications

The department's reading of its responsibility under these statutes is too narrow, and reflects a choice by the Public Service Dept to defer to Public Safety prominence in LMR rather than explicit statutory language. This appears to be an administrative decision convenient for governmental comity but contrary to statutory mandate.

I request that statewide LMR planning be included in the 10 year plan.

This comment calls for the telecom plan to evaluate local and regional Land Mobile Radio (LMR) systems

It appears that neither of the statutes call for detailed evaluation of LMR systems employed by regional or local public safety authorities in the telecom plan. Instead they refer to mobile telecommunications generally, which we interpret to mean Commercial Mobile Radio Service (CMRS), commonly referred to as cellular service, and the extent to which federal initiatives and requirements can advance the state's interests related to CMRS. The public comments draft states that LMR systems will continue to be an important part of the public safety communications network until public CMRS is more broadly available. That section of the plan will be updated to reflect comments from the public safety community.

The telecom plan generally deals with publicly accessible networks, whereas LMR systems are essentially private networks. The PSD believes that it was not the legislature's intent that the PSD and the Telecom Plan should be the vehicle to evaluate local and regional LMR systems.

RLECs are concerned that the Public Comments Draft includes some misstatements and misunderstandings of fact regarding the RLECs' history and current role in the Vermont regulatory landscape. Since the present debate appears to come down to whether the CUDs or the ILECs are best situated to provide affordable, universal broadband in Vermont, it's important that the 10-Year Plan present an accurate view of the regulatory landscape. To that end, I offer the following corrections to the Public Comments Draft:

1. Conflation of RLECs and RBOCs. In Section 3.1 (History of Broadband in Vermont), at Page 30, the Draft Plan erroneously states that companies like the RLECs "have provided landline telephone service across the country *since the breakup of the Bell Telephone Company*." This statement mistakenly confuses the RLECs with the RBOCs. As you know, companies like the RLECs began providing local exchange service *entirely independently* of the Bell Telephone Company, in rural communities that the Bell Telephone Company considered too remote and too sparsely populated to serve. The RLECs have served their rural communities in Vermont for well over a century, since long before the breakup of the Bell Telephone Company in 1984. Shoreham Telephone was incorporated by a Special Act of the Vermont General Assembly in 1894 (1894 Act No. 249). Franklin Telephone was incorporated by the Vermont General Assembly in 1906 (1906 Act No. 403). These companies' corporate existences even predated the modern incorporation process. Waitsfield-Fayston Telephone Company, Inc., has been owned and operated by the same family continuously since 1908.

   Recognizing this history is not an academic exercise. By lumping the RLECs in with the Bell Company (and with its successors, the RBOCs), the Draft Plan ignores the historic, home-grown ties that the RLECs have with the rural communities they serve. The RLECs have provided universal service to these communities since long before the FCC established a Universal Service Program. The RLECs have decades of experience building state-of-the-art

communications networks and making (and executing) a business case to serve rural Vermont communities that national carriers have ***always*** deemed to be uneconomical. There are no carriers in the Vermont marketplace that have a better understanding of how to meet (and beat) the challenges of building broadband networks in rural Vermont communities than the RLECs have.

The Draft Plan's casual conflation of the RLECs and the RBOCs speaks to a larger problem that the RLECs have long faced in discussions with Vermont regulators and Vermont legislators: the tendency to view Vermont's broadband challenges as having a one-size-fits-all solution. But even a cursory look at the Draft Plan's map of Broadband Coverage Gaps in Vermont (Figure 3, Page 29) shows that the areas with the most broadband coverage in Vermont are the areas served by the RLECs. The Draft Plan needs to acknowledge the long history and deep connections that the RLECs have in the rural communities they serve, and to take proper account of the RLECs in its recommendations for the best paths forward toward universal broadband connectivity in Vermont.

This comment is accepted and errors have been fixed in the Final Draft Plan.

2. Factual errors regarding Universal Service Funding. Similarly, the Draft Plan contains factual misstatements regarding the RLECs' involvement in the federal Universal Service Program:

- In Section 9.1.3.1 (Partnership with an Incumbent Local Exchange Carrier), at Page 120, the Draft Plan says: "Incumbent Local Exchange Carriers (ILEC) are private phone companies that ***at one point*** received government subsidy *[sic]* to provide phone service to every premises in a region." This is wrong, as ILECs have never stopped receiving, and continue to receive, federal universal service support
- In Section 14.4.2 (Vermont), at Page 160, the Draft Plan says: "Likewise, the incumbent carriers in Vermont have all, ***by and large***, been designated as ETCs and receive federal universal service support funds." The statement contains unnecessary equivocation, because Vermont ILECs have, without exception, all been continuously designated as ETCs in Vermont since 1997.
- In Section 14.4.1 (Overview), at Page 159, the Draft Plan erroneously states that "[d]esignated ETCs are then eligible to receive federal universal funding ***to support low income consumers***." This is inaccurate because it entirely ignores federal High Cost Support while focusing on federal Lifeline support. As ETCs in Vermont, the RLECs receive ***both*** types of support, while a handful of CLECs in Vermont have been designated as "Lifeline-Only" ETCs to subsidize low-income customers.

The foregoing statements also create confusion by implying, on the one hand, that ILECs no longer receive federal subsidies, while saying, on the other hand, that they do. The RLECs

want the Draft Plan to state clearly: (1) the RLECs have, without exception, ***all*** been ***continuously*** designated as federal ETCs in Vermont since 1997, (2) the RLECs ***all*** continue to receive federal universal service support to build ubiquitous networks and provide ubiquitous service throughout their rural service areas in Vermont, and (3) the RLECs receive both federal High Cost and federal Lifeline support as part of federal universal service funding.

Again, these errors are not just academic mistakes. The RLECs' networks in Vermont represent a substantial prior, ongoing, and future investment of public funds that are directed specifically to achieve universal service throughout the rural communities that the RLECs serve. In misconstruing or minimizing these substantial, decades-long public investments, the Draft Plan instead favors an entirely new type of public investment to build new network infrastructure to be owned by CUDs. The Draft Plan needs to acknowledge, first, that the RLECs' networks are not simply "private" but reflect a substantial investment of public funds, and, second, that a recommendation to build replacement CUD networks will have the effect of duplicating public investment to reach many of the same communities served by the RLECs. A full evaluation of the business model of the CUDs should take proper account of using public funds to overbuild and duplicate existing facilities that have also been built and maintained with public funds.

This comment is accepted and errors have been fixed in the Final Draft Plan.

3. Misunderstanding of COLRs. Section 14.4 (Carrier of Last Resort (COLR)/Eligible Telecommunications Carrier (ETC), at Pages 157-162, presents an incomplete and confusing discussion of the obligations of a carrier-of-last-resort (COLR) in Vermont and the potential ways that COLR obligations might be legally shifted from the ILECs to the CUDs. First, the Draft Plan erroneously conflates COLR obligations with the statutory classifications of "dominant" and "nondominant" carriers, which are established in 30 V.S.A. § 227c and codified in the Commission's regulations at Rule 7.500. The regulatory relief authorized by 30 V.S.A. § 227c is intended to reflect the increasingly competitive market for telecommunications services in Vermont, such that "nondominant carriers" (i.e., those with insufficient market power to control prices in their territory) may be relieved from complying with certain utility regulations. This statutory mechanism does not affect the obligations of a COLR, other than the fact that incumbent carriers (such as the RLECs) are classified as both COLRs and "dominant carriers" under Vermont law.

Rather than focusing on "dominant" and "nondominant" carriers, the Draft Plan should more fully describe the obligations of a COLR. The Draft Plan observes (at Page 160) that "Vermont does not appear to have any applicable state statutes or rules that would impose COLR obligations on carriers." This is an oversimplification. Many of the COLR obligations are set forth in Chapter 5 of Title 30. First and foremost, a COLR must be authorized by the PUC to offer local exchange telecommunications services by means of a certificate of public good ("CPG"). A COLR must offer services throughout its designated service territory using

approved rate schedules that set rates, terms, and conditions for service that are just, reasonable, and non-discriminatory. The Title 30 framework also establishes other requirements for telecommunications service, such as requiring PUC approval before abandoning any services or territories. The PUC's Orders over time have imposed additional requirements on COLRs, such as the requirement to adhere to local calling areas, to provide equal access to long-distance carriers, and to comply with Service Quality and Consumer Protection standards.

As the Draft Plan notes, federal law imposes additional service obligations on Eligible Telecommunications Carriers (ETC), which is a federal analog to COLR status. However, the Draft Plan's discussion of ETCs obligations is similarly incomplete and omits, for example, significant broadband buildout obligations, including strict construction deadlines and regular testing of speed and latency through the FCC's testing program, as well as substantial status reporting obligations, on top of regular federal reporting obligations on Forms 477 and 481 to meet an ETC's federal Universal Service requirements.

Finally, there are other duties that arise when a provider seeks to assume the status of an ILEC (such as FairPoint Communications did when it acquired the assets of Verizon New England, and as Consolidated Communications did when it acquired the assets of FairPoint). Under federal law, ILECs have additional duties generally considered as COLR obligations, such as the duties listed in 47 U.S.C. §§ 251 (interconnection, resale, dialing parity, collocation, etc.) and 252 (negotiation, arbitration, etc.), as well as significant new wholesale service obligations.

The RLECs are concerned that the Draft Plan might mislead CUDs into believing that their ability to take over the Vermont ILECs' existing COLR obligations involves only minor additions to their existing service requirements. In fact, the aggregate regulatory burdens that COLRs, ETCs and ILECs bear in Vermont greatly exceeds the cursory treatment presented in the Draft Plan. The Draft Plan should more describe these obligations more completely to provide an accurate context for evaluating CUDs or RLECs are best suited to carry out the duties of a COLR.

This comment provides additional context and interpretation on COLR and dominant/non-dominant status, and voices concerns about the ability of new entrants to become ETCs. This comment suggests a major change to the plan and was provided after the comment deadline closed and therefore too late to address in the plan; however, it is reproduced here because the content is important and should be considered by state officials, legal counsel, CUDs, and the department.

These are the top-level errors that the RLECs see in the Draft Plan. In addition, they have a general concern about the Draft Plan's various recommendations concerning the role of CUDs in Vermont's deployment of universal broadband. Primarily, these concerns relate to the likely market distortion that will result from placing CUDs in a gatekeeper role for public broadband

funding. As the Draft Plan notes, CUDs at present lack financial, technical, and managerial experience in the design, development, ownership and operation of broadband networks. As a result, the Draft Plan places a good deal of emphasis on reviewing ways that CUDs can "partner" with private companies (i.e., experienced broadband providers in Vermont) to carry out the CUDs' mission. Under various scenarios discussed in the Draft Plan, each CUD would select one (1) broadband "partner" to work with, in a range of possible relationships from fee-for-service contracts to joint ownership and operation of facilities and services.

The RLECs observe that all of these scenarios represent a dramatic turnaround in regulatory policy for Vermont, which for 25 years has emphasized the need for greater ***competition*** in all aspects of telecommunications service. A good deal of Vermont's utility statutes and PUC regulations rely on the emergence of robust competition in the telecommunications market, which would result in expanded services, increased service quality, lower prices, and greater consumer choice. The impending enactment of H.360, and the recommendations of the Draft Plan that are based on the new enactment, take an opposite view. Rather than creating a level playing field that fosters ***more*** competition, the Draft Plan (following the policy set in H.360) openly expresses a preference for CUDs, which the Draft Plan envisions as the primary providers of broadband services in newly formed CUD districts across the State. A private entity that wishes to gain access to public broadband funding would need to "partner" with a CUD so as to advance the CUD's mission of universal broadband coverage in its district. The Draft Plan goes even further than H.360 in this regard, by discussing several options by which a CUD would select a single private "partner" (through an RFP or other public process) to assist or guide the CUD in its mission.

The RLECs see the potential for unintended consequences from such an abrupt reversal of Vermont's telecommunications policy away from a neutral promotion of competition and toward the preferential treatment of CUDs. Vermont regulatory policy for many years has favored relaxed regulation and even deregulation as a response to increasing market competition. The RLECs are concerned that a continued rollback of utility regulations may not be compatible with policies that favor a single broadband provider as the primary service provider in a designated district. The RLECs' concern is heightened by a seemingly offhand reference (at Page 107 of the Draft Plan) to the potential for state control over broadband services ("where a CUD does not exist, the state authority in charge of this [CUD] program may assume control of that town's funding and direct procurement on that town's behalf…") Given the experience of Burlington Telecom, it is not difficult to envision a scenario where a CUD is unable to generate sufficient revenue to meet its debt obligations and so must turn over control of its operations to the State. If that scenario repeats itself, Vermont could wind up with a monopoly broadband provider and all the attendant problems that a monopoly presents.

In sum, the RLECs request correction of the factual errors discussed above, a more complete assessment of the existing regulatory burdens that COLRs, ETCs and ILECs now bear, and a greater

transparency and analysis regarding the Draft Plan's shift in regulatory policy away from a competitive marketplace and toward the preferential treatment of CUDs.

This comment refers to H.360 as passed by the legislature and raises concerns about the legislative priorities contained in the bill, the potential for unintended consequences, and uncertainty around how the legislation will be implemented with regards to public and private entities. The plan endorses the CUD mechanism as appropriate and necessary to reach all un- and underserved premises; however, the Final Draft includes a new section commenting on H.360 as passed and notes the ways in which the VCBB will need to be more specific than what is included in the legislative mandate in setting up processes for distributing funding to ensure that all parties, from RLECs to CUDs, understand the processes and protocols, ideally in a manner that does not pit CUD and private companies against each other but instead encourages collaboration.

I appreciate the opportunity to provide comments on the draft Telecom Plan. There are major omissions and deficiencies in the Draft which other commenters have pointed out. I hope these will be adequately addressed, but my comments deal more narrowly with an issue the Department has refused to focus on despite repeated requests and opportunity to do so: the dependency of today's fiber optic technology on electricity and the vulnerability of our telecommunication system to loss of connectivity in event of a temporary or catastrophic electric power outage.

The Plan needs a section that explicitly and fully recognizes this disadvantage, vulnerability, risk factor - whatever we choose to call it - of widely-supported and largely beneficial broadband technologies - - a separate section, not buried away where it goes unnoticed. The text should explain in layperson's terms the nature of the electricity dependency, the circumstances under which E-911 and regular connectivity could be lost, the consequences of such loss of telecom service, and measures that can and should be taken to minimize risk or to deal with outages that occur. My similar request to RISI in late 2020 (excerpt below) was ignored.

A number of actions to address this problem were proposed in previous telecom-related proceedings, including Public Utility Commission Case No.19-0705-PET (see Attachments A and B). Most importantly, the Plan should emphatically state that plans submitted by Communication Union Districts to receive State funding "shall" describe what actions the

CUD will take to inform subscribers of the loss-of-service vulnerability of their technology and the actions the CUD will take to assist subscribers with service options such as backup power or signal boosters, micro cells, wi-fi hotspots, or other services in areas without cell phone coverage.

Now a few other comments. The Plan must take cognizance of and address the equity issue, again in a separate and well-articulated section. This was described in a June 1 article in The New York Times by economics reporter Eduardo Porter:

A Rural-Urban Broadband Divide, but Not the One You Think Of

Many more people in cities lack broadband access than in rural areas, but lawmakers are primarily focused on extending high-speed access to remote areas.

https://www.nytimes.com/2021/06/01/business/rural-urban-broadband-biden.html?smid

Universal Fiber-to-the-Premises is a commendable goal, but doing this in a rural state through CUD's, rather than for-profit carriers, will not make it any more affordable to residents of limited financial means. All the technology in the world is meaningless unless a person, rural resident or urban, can pay for it. We in Vermont are hearing a lot about the need for for "affordable housing". Our Vermont Telecom Plan needs to propose ways to assure affordable broadband.

To be useful as a "10-Year Plan", the document must bring the issue of resiliency to the forefront. In our interconnected world and technology-based economy, if and (more realistically) when a catastrophic event occurs, when a major segment of the electric grid and/or the telecommunications system goes down, everything - basically life as we know it - will go down. It could be a severe hurricane or other weather event, it could be a cyber or ransomware attack: consider climate change, recent events in Texas (massive winter storm power outages in February), the Southeast (Colonial Pipeline), the December 2020 Solar Winds and subsequent attacks: *https://www.csis.org/programs/strategic-*

technologies-program/significant-cyber-incidents). Unless this document describes, recommends, and generates preparatory actions for what Vermont will do to maintain essential services in such an event, it will be a "plan" in name only.

Finally, I ask for responsiveness. While submitting these comments only as an individual, I participated in and am well aware of my town of Shrewsbury's 2-1/2 year effort to raise awareness and obtain solutions to this vulnerability of the fiber optic technology that is currently receiving so much attention and public funding.

To document this point as forcefully on the record as I can, I am submitting the January 16, 2019 letter from the Shrewsbury Selectboard to Commissioner Tierney (Attachment C). Excerpted from a followup letter the Selectboard sent to Comm. Tierney on March 20, 2019 is the short paragraph below. To this day the requested commitment has not been made. I ask again that it be fulfilled.

"The opening line of our January 16 letter identified its purpose to offer comment on the 2018 Vermont Telecommunication Plan and a key request was to ask you to amend the Plan to recognize and address the problem we described of loss of basic voice phone service during electric outages. Will you commit to doing so?"

This comment calls for the plan to better address the vulnerabilities of telecommunications equipment that relies on grid-based power. In response to this comment and similar ones provided by other constituents, Section 12.6 has been added with mitigation strategies regarding this vulnerability. The plan also affirms the importance of equity expressed in this comment. Please see Section 10 for information on this topic.

I am writing to offer comments on the State of Vermont 10 Year Telecommunications Plan, and specifically Section 14.3.1, Easements.

My husband and I own property over which a power line easement runs. The easement is from 1947 and is for "an electric transmission or distribution line or system" to be used by an electric cooperative. As confirmed by the electric company that holds the easement, the easement in question does not allow for any type of use other than electric lines.[2] Nonetheless, in 2006, a [1] cable company entered our property without permission or easement of its own and installed their cable line on the poles in the 1947 electric line easement.

Despite our complaints to both the electric and cable companies, and repeated requests that the cable be removed, the cable remains. We are now considering litigation over the issue, and we find it very disturbing that we now must protect our rights as property owners due to badly conceived and overreaching laws.

The electric company that holds the easement is under the impression that they were required by law to allow the cable company to attach their cable line to the poles on our property, without regard for whether the underlying easement allows for such attachment. If this were correct, it would mean that the intent of the laws they cite is to completely disregard the rights granted by the Constitutions of the United States and the State of Vermont—both of which prohibit the "taking" of private property without just compensation. But the State has in fact assured me that the laws in question were not intended to cause a taking of private property.

However, both the electric company and cable company involved assert in effect that the laws do just that. And the Public Service Department and Board claimed that it did not have jurisdiction over a landowner dispute (which seems ridiculous considering that they regulate the companies involved). Thus, we may be forced to protect our property rights through litigation, which of course will be expensive and time-consuming.

And now it seems that the State, through its 10 Year Telecommunications Plan, is considering doing that which it has previously denied – to allow a taking of private property without compensation and without due process.

Many landowners gave easements to their electric company years ago, in good faith, and in return for electricity. In some cases, landowners may not have even been compensated for their easements. However, the electric company is now compensated when a telecommunications company uses the easement, but we as landowners are not, despite the fact that each new line diminishes the aesthetics of our property, and likely the value of it as well. So, in effect, the State's Plan to potentially allow all telecommunications companies to access all easements would transfer private property rights (and any associated profit off those properties), to mostly for-profit companies -- at no charge!

The law as proposed would seem to affect all easements – historical, current, and future. This would mean that no landowner, at the time they purchased their property would have notice that any utility company wanting to use the easement would have access to their property. And likely any utility company could access that property and install new lines with no warning or advanced notice, as was the case in my situation.

I can certainly understand the State wanting to facilitate access to telecommunications for the residents of Vermont. But it should not do so to the detriment of landowners that have already accepted a certain burden on their property, by now requiring them to take on much more than they had bargained for and agreed to originally. Aside from the fact that it would be very unfair to ask these landowners to now take on the burden of *all* new utility lines (that other Vermonters may enjoy the benefit of, without the burden), we do have legal processes in place for acquiring the use of private property, and I believe the changes that the State is considering to the current law would bypass those processes, in violation of our rights as private landowners under the Constitution.

At the very least, any law under consideration must be worded to define and protect the legal rights that landowners have. And those rights should include a fair and just process that compensates a landowner for any new utility lines on their property that were not clearly agreed to previously by easement or otherwise – and one that does not require a landowner to litigate to protect the rights that are theirs and to get the compensation they are due. And if the State does not, then I certainly hope it intends to notify all landowners of their impending potential loss of the property rights that they have enjoyed for hundreds of years.

[1] The easement in question is unambiguous in its restriction to allow for only electric lines; the electric company could therefore not transfer a right (to place telecommunication lines on the easement) that it does not have. See *Miller V Morrisville***,** PSB# 6579, 6/27/2002 ("it is a well settled principle of Vermont law that a grantor's power to convey property is confined to what he owns at the time that the conveyance is made." *Cummings v. Dearborn*, 56 Vt. 441 (1884), citing *Brown v. Jackson*, 16 U.S. 449 (1818); *Vermont Shopping Center, Inc. v. Pettengill*, 125 Vt. 145, 148 (1965); *Sheldon Slate Products Co. v. Kurjiaka*, 124 Vt. 261, 267 (1964). ... "In construing a deed, courts initially look at the instrument itself, which is deemed to declare the understanding and intent of the parties. A deed creating an easement by express reservation is a contract, which is subject to construction and enforcement according to the principles of contract law. Therefore, consistent with fundamental principles of contract law, where the language of a deed is clear and unambiguous, the intent of the parties can be shown only by the terms of the instrument itself. Furthermore, the law presumes that parties to a contract meant and intended to be bound by the plain and express language used in the document and, accordingly, parties to a contract are bound by the common meaning of the words chosen to reflect their agreement." *Merritt v. Merritt*, 146 Vt. 246, 250 (1985) citing *Fairbrother v. Adams*, 135 Vt. 428, 429, 378 A.2d 102, 104 (1977); *Christmas v. Virgin Islands Water and Power Authority*, 527 F.Supp. 843, 847 (1981) citing *Weyerhaeuser Co. v. Carolina Power & Light Co*., 257 N.C. 717, 127 S.E.2d 539 (1962) and *Merrill v. Manufaturers Light and Heat Co*., 409 Pa. 68, 185 A.2d 573 (1962); *U.S. v. Sea Gate, Inc.*, 397 F.Supp. 1351, 1360 (1975), citing *Weyerhaeuser Company v. Carolina Power and Light Company*, 257 N.C. 717, 127 S.E.2d 539 (1962); *Whittington v. Derrick*, 153 Vt. 598, 603 (1990) citing *Downer v. Gourlay*, 133 Vt. 544, 546, 349 A.2d 707, 708 (1975); *Goodrich v. United States Fidelity and Guaranty Company*, 152 Vt. 590, 594 (1989); *Roy's Orthopedic, Inc. v. Lavigne*, 145 Vt. 324, 326 (1985)).

[2] We have asked the cable company numerous times to remove its cable line from our property or produce an easement that allows them to use our property. They have not done neither.

[3] See Federal law 47 U.S.C. §§ 224, 541; Vermont Public Utility Commission Rule 3.700.

[4] Letter from John P. Bently, Esq., State of Vermont Public Service Board, in response to Laura Hill-Eubanks (Nov. 27, 2007). (Explaining in regards to Rule 3.700: "Your central point ... that the Board appears to allow use of property beyond what is set out in an easement, may reflect a misunderstanding of the Board's intent in creating the Rule, and of its legal effect. Thus, while the Board's Rule governs the right of one utility to attach to another utility's facilities, the Rule does not create any right in the nature of an easement between later-attaching utilities and the servient landowners. The above is not to say that some utilities may be treating the rule as though it does just that. Also, we are told that most utility easements in Vermont describe the use for "utility" poles, wires, and appurtenances; where that is true, it may well be that, for example, the phone and cable companies have the right to follow the electric plant into the right-of-way. However, where an easement specifically allows only "electric" lines, it is difficult to see how another, non-electric company can justifiably enter the right-of-way without an easement of its own. ... As you may know, the Legislature passed a bill in the 2007 session, Act 79, that promotes the extension of broadband and wireless access in Vermont. ... However, the Act does not purport to abrogate the rights of property owners.")

See also, for example: *Marcus Cable Associates, L.P. d/b/a/ Charter Communications Inc. v. Krohn*, 90 S.W.3d 697 (Tex. 2002) (Holding that an easement held by a company that was only for "an electric

transmission or distribution line or system" did not grant its use by a telecommunications company); *Cable Holdings of Georgia, Inc. v. McNeil Real Estate Fund VI, Ltd.*, 953 F.2d 600, 610 (11th Cir. 1992) ("In order to avoid substantial constitutional problems and in order to be consistent with our prior decisions in this area of the law, we have concluded that Section 621(a)(2) provides a franchised cable company with the right to access only those easements which have been dedicated for general utility use, whether by plat recordation for a residential subdivision or otherwise. The alleged easements existing on McNeil's property have not been dedicated by McNeil for general utility use. Rather, these easements were privately granted by McNeil in order to allow limited rights of access to particular entities. Therefore, under Section 621(a)(2) of the Cable Act, Smyrna Cable has no right to forcibly access and occupy those easements."); *Gerstein v. Axtell,* 960 P.2d 599, 601 (Alaska 1998) ("Without deciding whether § 541(a)(2) authorizes access to private easements, we note that such a construction would violate the Fifth Amendment's prohibition against "taking" without just compensation unless the Cable Act were also construed to provide for just compensation for any taking." citing *Cable Holdings of Georgia, Inc. v. McNeil Real Estate Fund VI, Ltd.*, 953 F.2d 600, 604-06 (11th Cir.1992).)

This comment presents an alternate interpretation of whether electric easements extend to telecommunications equipment in Vermont law. This issue was litigated in the Grice vs VELCO case and has also been addressed in H.360 as passed. Please refer to the legal analysis on this topic in Section 14 for this plan's analysis of case law.

New State-funded FTTH deployments should be designed to be Active Optical Network (AON) GigE networks, not Passive Optical Network (PON), to allow for the greatest speeds available to end users, greatest overall network capability, and CUD flexibility over time to change ISPs if needed. Limiting the State's goals to 100/100 Mbps would leave Vermont Telephone Company as the sole GigE FTTH network in Vermont. AON GigE is the "future-proof" design standard. It would be unfortunate for the State to invest hundreds of millions in fiber with the goal of a "future-proof" broadband solution, but have it deployed based on less than optimal design.

Regarding AON v PON reliability, all fiber systems require electricity at both ends. Any interruption in that will necessitate the use of batteries, generators, or other alternate energy source, in order to continue operating. This is true of both passive and active systems. In this there is no difference. As for a gain in reliability against a fiber cut: a fiber cut will affect both types of systems in nearly the same way, which is to say that if the path of the fiber is broken anywhere between the serving office and the customer, then service will be interrupted. Active systems are often actually more resilient here in that if the fiber cable is partially-damaged in an active system it will only affect the customer attached to the damaged strands, versus potentially impacting 32, 64, or more that could be impacted by a damage to a fiber in a passive system.

Another other area of reliability-gain in an active system is that each fiber strand connects to an individual transceiver. A single transceiver failure in an active system will affect a single customer versus 32, 64, or more in a passive system. These transceivers in the serving office are also where the referenced increase in power consumption occurs in an active system. Each active transceiver typically consumes up to 1 watt of energy (each serving a customer), and the calculated per-customer power consumption in PON is in the 0.8 watt range.

Even if you want to deploy passive systems today you should still construct the fiber plant as if you were planning to deploy active… and then use the passive if/when you need to in the central office or at the end of low-count fiber cables. Active is the simple, off-the-shelf, solution whereas passive requires specialized equipment. Cost savings for electronics and the future technology development will be greater with active because it's technology that is being used in virtually every home, campus, office, and data center today. If there's money to build fiber in the first place, do not limit yourself in the way you build it (regardless of what electronics are chosen today or down the road).

A network of fiber laid out to support passive won't, in most cases, easily be able to migrate to an active model without a lot of additional costly fiber construction. A network of fiber laid out to support active can easily support a passive model if preferred. There are really no drawbacks to an active design other than the incremental cost increase for materials. The labor (other than the splicing itself) is the same, and you've built an infrastructure that has a much lower chance having to be re-designed/rebuilt down the road. In the interim ~5 years expected for FTTH to be built out universally, nearer term solutions for improved broadband access are needed. Fixed wireless offers the benefit of improved broadband speeds via technology that can be deployed quickly, allowing CUDs an immediate solution to offer to their member residents while CUDs are deploying FTTH. Fixed wireless technology is currently capable of delivering several hundred Mbps to end users, and will soon be capable of 100/100 Mbps.

This comment addresses network design considerations between an Active Ethernet and PON network. The Plan's stance on this point can be found in Section 4.1. This comment also raises the question of the role of fixed wireless deployments in Vermont. The plan addresses this point extensively in Section 5.4

VCUDA Comments on Draft Final 10-Year Telecommunications Plan (June 10, 2021)

VCUDA approves of the direction of this plan and urges its adoption. Specifically, we strongly support the focus on community-driven, resilient, fiber-based solutions to the state's broadband gaps. Our members are generally in agreement with the plans' top-level findings and recommendations, though we have some specific comments and criticisms to relay. Thank you for the opportunity to provide this input.

Points of Agreement

We agree that Communication Union Districts are the best vehicle for deploying fiber infrastructure in Vermont's most rural communities. The hundreds of volunteers running the state's CUDs -- all nine members of VCUDA -- are ready and able to do the work envisioned for us in this 10-Year Plan and in Vermont law. Particularly, we agree with the following recognition in the plan: "CUDs, being municipal entities that are mid-stream in their planning work, are the best vehicle for bringing broadband to the last mile...Without a profit motive, and with access

to tax-exempt revenue bonds, CUDs will be integral to making stimulus money stretch as far as it can." (pg. 112)

We agree that "CUDs still need considerable pre-development and pre- construction support..." and believe that the deployment of ARPA stimulus funds for this purpose as prescribed in this plan and in Vermont law is appropriate. We also agree that providing access to service to unserved and underserved addresses are the right focus for this support, and that the number of those addresses in each CUD is a fair way of distributing these funds. However, we ask that there be a process outlined for challenging specific addresses designated as served, whether via pictures of pole attachments or community surveys. We also ask that DPS and VCBB remain aware that it is possible RDOF winners will not be able to fulfill their commitments and have a process for re-assessing unserved addresses should that occur.

We agree generally with the requirements for accessing this funding (pg. 116): (1) Obligation to offer service to all on-grid unserved and underserved addresses in member towns; (2) Offer service capable of speeds of at least 100 Mbps symmetrical (3) Meet best practices for technical standards to ensure broadband infrastructure is resilient and secure (4) Build networks capable of supporting future public good services such as mobile wireless and public safety. However, we caution against requiring too much specificity in network design, as there are different techniques and technologies that are capable of meeting statutory goals. We ask that these requirements include the clarification in the plan that this requirement does not preclude CUDs or other eligible providers from charging for long drops. We also ask that any deadlines keep in mind current labor and materials shortages that may affect our timeline.

We also support the priorities described here as well but have concerns about how some of these might be used in practice to distribute funding. These concerns will be discussed below. We support making pro-consumer values a priority rather than a requirement, particularly because "for CUDs, the question may come down to whether net neutrality meaningfully limits the CUDs options...of a service provider." Also, "open access" may be interpreted in multiple ways, only some of which are realistic for broadband networks in low-density rural areas.

We agree that the Vermont Community Broadband Board has work to do to establish specific procedures for determining what constitutes a conflict with a CUD universal service plan. We strongly believe that CUDs should have input on this point. Our universal service plans are described by our business plans and network designs. We do not believe that any proposal that overlaps with the network as designed should be awarded funding.

We agree that Vermont also needs a strategy for expanding cellular coverage and strengthening public safety networks, and that the deployment of fiber networks will be an important part of both of those strategies. CUDs ask that we be engaged in the development of these strategies to ensure collaboration.

We also agree that additional legislative action is needed to support the right of communication providers to utilize electrical easements on private property when attaching to existing

electrical poles. H.360's language allows fiber attachments in easements except where fiber has been specifically excluded in the easement. Because most easements date from times long before fiber became available, this language is likely to suffice for now.

General Points of Critique & Concern

We strongly agree on the need for reporting and oversight of federal grant dollars. However, the phased application process recommended on pg. 117 of the plan is extremely rigid and, if implemented, would slow the momentum of several, if not all, of our members. Phase 1, High-Level Planning - as described, the adjustment of business plans to reflect changes in recent months - is happening now or has already happened across the board. Phase 2, Detailed Planning, which involves the pursuit of partnership agreements and the development of high-level network designs, is already underway among most of our membership. We strongly urge the Department and the future Vermont Community Broadband Board to move directly into providing larger grants for detailed designs.

We also strongly agree that demand-side issues of affordability and awareness are areas where CUDs can play a role, particularly through the non-profit Equal Access to Broadband. However, we do not believe that the development of a low-income plan should be factored into funding awards. Our members' goal is to provide all customers with the most affordable broadband plan possible. Low-income subsidies should be addressed on a statewide level and funded through the state or federal government so that they enhance the viability of our networks, not impede our business case.

Public, Educational and Governmental Access organizations are an important source of information and civic engagement. We urge DPS and the legislature not to seek to impose additional pole attachment fees to solve the PEG funding challenge. Any additional fees would undermine our ability to make our networks sustainable. One option to consider is whether a percentage of attachment fees already paid could be utilized without increasing the total.

We agree in general with the high-level design objectives described in this plan. We are concerned with the specificity included in the plan related to network architecture (pg. 98-99). We would prefer to see a technology committee of the VCBB with CUD representation develop a range of technical options that meet the objectives.

Issues of Accuracy and Clarity

While reviewing the plan, we found inaccuracies and places where clarification is needed. We hope these can be updated prior to approval of the final plan.

NEK Broadband was formed through Town Meeting votes in March 2020, along with Deerfield Valley Fiber and Southern Vermont Fiber (pg. 45).

The purpose of this table is extremely unclear (pg. 46). If you are trying to show the percentage of unserved and underserved addresses by CUD, you should have a summation after the subtraction of subsidies. Also, the VEC and GMP subsidies should not have an impact on this evaluation because it is not clear where these will come into play.

The latest map of CUD towns is from June 1, 2021. The map in this plan is from December 2020 (pg. 47).

Although we understand that this analysis is meant to prove a point about the cost of wireless vs fiber, the cost assessment on pg. 88 of $16,000 per passing for fiber seems very high, particularly in an area with a density of 19 houses per mile. Even $60,000/mile (which is very expensive for aerial installation) would be less than $3,000 per passing.

The number used for unserved in the state on pg. 93 is 54,406, while an earlier number used was 51,000. Please explain or revise the discrepancy here.

This comment makes several important points about the need to balance efficiency and accountability in deploying resources and building networks. The VCBB will need to strike this balance as they develop their rules for deploying resources; as such, this comment is reprinted here for visibility and consideration by future readers. This comment also suggests that individual CUDs not be the responsible party for providing dedicated low-income service to members. This Plan asserts that, due to the likelihood that CUDs will own assets that generate some revenue, CUDs could be the entity that provides the subsidy for low-income service in the event that the federal EBB benefit or statewide benefits do not materialize, and that providing this service aligns with many if not all of the individual CUDs' mission. Regarding the specificity of the guidelines for network architecture, this comment does not provide any direct criticism except for a concern that the architecture is too specific. The architecture here is recommended based on its ability to meet the bandwidth needs and safety/security needs of Vermonters now and for decades; however, the architecture is not so specific as to recommend brands of equipment, preclude CUDs from enacting a range of alternate arrangements such as open access, or building in interoperability. Lastly, the authors of the plan thank you for bringing forward those questions about clarity and accuracy; relevant updates have been made where appropriate.

Appendix H: 30 V.S.A. § 202c

Title 30: Public Service

Chapter 005: State Policy; Plans; Jurisdiction And Regulatory Authority Of Commission And Department

Subchapter 001: General Powers

§ 202c. State telecommunications; policy and planning

(a) The General Assembly finds that advances in telecommunications technology and changes in federal regulatory policy are rapidly reshaping telecommunications services, thereby promising the people and businesses of the State communication and access to information, while creating new challenges for maintaining a robust, modern telecommunications network in Vermont.

(b) Therefore, to direct the benefits of improved telecommunications technology to all Vermonters, it is the purpose of this section and section 202d of this title to:

(1) strengthen the State's role in telecommunications planning;

(2) support the universal availability of appropriate infrastructure and affordable services for transmitting voice and high-speed data;

(3) support the availability of modern mobile wireless telecommunications services along the State's travel corridors and in the State's communities;

(4) provide for high-quality, reliable telecommunications services for Vermont businesses and residents;

(5) provide the benefits of future advances in telecommunications technologies to Vermont residents and businesses;

(6) support competitive choice for consumers among telecommunications service providers and promote open access among competitive service providers on nondiscriminatory terms to networks over which broadband and telecommunications services are delivered;

(7) support the application of telecommunications technology to maintain and improve governmental and public services, public safety, and the economic development of the State;

(8) support deployment of broadband infrastructure that:

(A) uses the best commercially available technology;

(B) does not negatively affect the ability of Vermont to take advantage of future improvements in broadband technology or result in widespread installation of technology that becomes outmoded within a short period after installation;

(9) in the deployment of broadband infrastructure, encourage the use of existing facilities, such as existing utility poles and corridors and other structures, in preference to the construction of new facilities or the replacement of existing structures with taller structures; and

(10) support measures designed to ensure that by the end of the year 2024 every E-911 business and residential location in Vermont has infrastructure capable of delivering Internet access with service that has a minimum download speed of 100 Mbps and is symmetrical. (Added 1987, No. 87, § 1; amended 2003, No. 164 (Adj. Sess.), § 15, eff. June 12, 2004; 2009, No. 54, § 49, eff. June 1, 2009; 2011, No. 53, § 24b, eff. May 27, 2011; 2013, No. 190 (Adj. Sess.), § 8, eff. June 16, 2014.)