2018

Vermont Telecommunications Plan

Vermont Department of Public Service
Telecommunications Plan DRAFT
issued pursuant to 30 V.S.A. § 202d(e) &(f)
November 14, 2018

Table of Contents

Overview and Acknowledgements

The Vermont *Telecommunications Plan* is the state's primary public policy document regarding the Vermont's telecommunications sector. The Department of Public Service is the primary planning agency for the State "for the purpose of obtaining for all consumers in the state stable and predictable rates and technologically advanced telecommunications networks serving all service areas of the state."[1] In 2014, the Department issued the *2014 Telecommunications Plan*. In 2017, pursuant to 30 V.S.A. § 202d (f), the Department initiated proceedings to begin revising the *2014 Plan*, which included a series of public hearings throughout the state. At the heart of the Plan are the guiding principles established in 30 V.S.A. § 202.

The 2018 Final Draft Plan was created in collaboration with the staff from the Department of Public Safety; the Enhanced 9-1-1 Board; Agency of Commerce and Community Development; Agency of Digital Services; Agency of Education; Agency of Agriculture, Food, and Markets; Agency of Transportation; the Department of Labor; and the Department of Health, all of whom contributed valuable expertise in crafting this Plan. The Department further received valuable input and comments from members of the Public, Access Management Organizations, and industry leaders. The Department thanks all of these stakeholders for their contributions to this important planning work.

[1] 30 V.S.A. § 202d(a)

Executive Summary

2018 Plan provides an overview, looking 10 years ahead, of future requirements for telecommunications services. It considers the services needed for economic development, technological advances, and other trends and factors which will significantly affect State telecommunications policy and programs. The 2018 Plan asks: at the end of 2027, what should telecommunications services look like and how will Vermonters use them? Without a doubt, advanced telecommunications service will play a vital role in the every-day life of every Vermonter.

Vermonters need and expect affordable telecommunications services of good quality. The internet is now widely used to deliver services in government, agriculture, healthcare, education, and private industry. Without a web presence many of Vermont's most successful companies would not be where they are today. Today, our younger residents are growing up without ever having experienced life before the internet, and Vermonters are increasingly adopting new forms of communication, from social media to videoconferencing. The Internet is making government more transparent and efficient, as records, permits, applications, and information about government services become accessible online. Healthcare is increasingly delivered online and first responders will soon rely on broadband-capable technologies to protect the public in emergencies. Internet access is important to grow and maintain our economy, as in the future work will seamlessly be performed between home and the jobsite. Robust and ubiquitous broadband networks will be vital to attracting new talent, and will be integral to preserving Vermont's culture and way of life.

Vermont is a rural state. At this time, not every Vermonter has access to the internet, and where available, access is not always equal. The telecommunications industry has long pointed

to the difficult business model for improving broadband internet access in rural economies. In fact, government programs have been geared toward sustaining traditional telephone service and broadband expansion in rural areas – both in terms of capital investment and ongoing operations. Furthermore, internet access remains unaffordable for low-income residents. Those Vermonters without access to the internet are not be able to access local and world markets, are not able to take advantage of educational opportunities and healthcare options and are not able to participate in community and political discourse. These Vermonters lack access to government services and do not share in the community benefits of services like Front Porch Forum and applications now used by public schools to communicate with parents and students.

There are state and federal initiatives directed at addressing Vermont's digital divide. Over the last three years, the State has seen the completion of several federal-and-state funded broadband projects. The Broadband Technologies Opportunity Program (BTOP) funded a $33.4 million-dollar middle-mile fiber project that was completed in 2014. This network connected 340 community anchor institutions with Sovernet's existing broadband network. In 2015, after the sunsetting of the Vermont Telecommunications Authority ("VTA"), and the Department of Public Service completed several middle-mile fiber construction projects. The State now owns or licenses over 300 miles of fiber optic cable. Vermont Telephone Company was the recipient of $116 million in grants and low-interest loans from the Rural Utility Service ("RUS") that it used to build two last-mile broadband projects – a fiber-to-the-premises ("FTTP") network within its traditional telephone Territory, and a state-wide wireless network. Both networks are now in operation. The Federal Connect America Fund available through the Federal Communications Commission ("FCC") is providing over $50 million for digital subscriber-line service in rural

Vermont. Lastly, community fiber projects have gained significant traction and one established organization now connects a few thousand Vermonters.

These projects expanded broadband to many previously unserved areas between 2014 and 2018. Today, basic broadband enabled through wireline access[2] is now available to 93% of the state. There remains a need to bring high quality broadband to the last mile. Serving the last mile will require multiple strategies. Unlike the top-down approach of the federal and state investments, reaching the last-mile will require a grass-roots approach that is founded on input and support of local communities, whose residents are best situated to decide what broadband solution fits their needs.

There are new federally funded projects on the horizon. FirstNet, a public safety broadband network, is a project that will deploy a nationwide first-responder broadband network. Every state and territory across the nation, including Vermont, has opted into the deployment of the nationwide network. Work must now be done to ensure that our public safety networks are secure, resilient, and provide the coverage that first responders need to do their job. The United States Department of Agriculture is also supporting projects in Vermont and is seeking to do more. Questions about the eligibility of many regions of the state will need to be resolved before Vermont can make the most of funding available through the USDA.

Federal regulatory changes have also had an impact on our telecommunications landscape. In 2015, the FCC issued an order declaring broadband internet service a “Title II” service and prohibited ISPs from throttling, blocking, or prioritizing traffic. In 2017, under new

[2] The service referred to here is broadband of 4/1 Mbps or better. Broadband availability approaches 100% if satellite service is included in the count. However, latency, diminished quality in weather, and the material cost disadvantage are factors that pose formidable barriers for the adoption of satellite.

leadership, the FCC revoked 2015 order, and again declared broadband as a "Title I" service, which means broadband internet access service ("BIAS") is largely unregulated. Likewise, Congress repealed FCC rules that prohibited internet service providers from collecting personal information on consumers. The recent decisions by the FCC on internet neutrality have spurred states to action. Fueling the controversy attendant to these federal decisions is the legal issue of federal preemption, which strictly limits the ability of states to pass laws affecting matters that are regulated by the federal government. The federal government's actions in both circumstances highlight the need for new, and comprehensive, federal legislation on telecom.

Within, Vermont there have been several several changes in the sphere of the regulated telecommunications industry. First, Vermont's largest telephone company (and only legacy Regional Bell Operating Company) merged with Consolidated Communications. Comcast Cable, Vermont's largest provider of cable TV and internet access service, sought renewal of its Certificate of Public Good ("CPG") in 2016. Although the Public Utility Commission renewed Comcast's cable television CPG, Comcast has sought federal judicial review its terms, which could mean major changes in construing the scope of the state's jurisdiction over the cable industry. Lastly, with the sunsetting of the VTA in 2015, state policy shifted the role of state government in telecommunications from an active market participant to supporter of new entrants in the form of grants and other inducements.

The 2018 Plan sets forth a clear strategy for continuing to improve broadband access and quality. Vermont cannot realistically promise every resident the best internet access available on the market absent substantial federal funding. However, Vermont can take steps toward closing the digital divide. First, the State should consider funding broadband expansion, either at the local level or through an existing state program such as the Connectivity Initiative. Any

broadband solution must call on the resources of local communities and the stakeholders who directly benefit from internet access, such as commercial-edge providers, education, healthcare, agriculture, and energy sectors. Second, the 2018 Plan makes recommendations for regulatory changes that will increase broadband expansion, such as modifications to the pole attachment rules and a new process for permitting small cell installations. Third, the State should lay out a clear path for leveraging assets owned by the State and public service utilities for broadband expansion, including maximizing use of existing under-utilized middle-mile fiber networks, public rights-of-way, and state lands.

Lastly, the 2018 Plan addresses concerns and opportunities pertaining to the State of Vermont's telecommunications networks. The State of Vermont is a large purchaser of telecommunications and data services. Recent changes to the state's Information Technology and telecommunications infrastructure, including the creation of the Agency of Digital Services, will bring new opportunities. Other developments, such as the transition to a voice-over-Internet protocol (VoIP) phone system have resulted in cost savings for the state. A remaining challenge will be connecting satellite state offices with high quality internet, such as Agency of Transportation ("AoT") garages and ensuring that state offices stay connected while the state ensures an open internet for its residents.

Broadband

Vermont has set a statutory goal of regarding broadband deployment, namely of "ensur[ing] 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."[3] The good news, is that we are nearly 75% of the way there with download speeds. That said, meeting this goal in full will require significant investment that likely is out of the reach by the State alone. Achieving this goal will require at the very least either cable coax service, fiber-to-the-premises (FTTP), or 5G LTE service that is available to all 305,000 locations. New technologies, such as utilization of TV white space spectrum and low-orbiting satellites may improve coverage and lower costs of deployment.

Accurate mapping of broadband availability is more important than ever. Should the State receive funding support through a sizeable federal infrastructure initiative, the 2018 Plan can and should be called upon as a resource for federal policy makers. Without granular data and local knowledge, it can be difficult for federal agencies, such as the Department of Commerce and Department of Agriculture, to understand the unique needs and challenges of Vermont. Broadband modeling on a census tract level does not give federal policy makers a clear picture of the deployment challenges in Vermont, because so many underserved locations in the last mile simply do not slot conveniently and accurately into a finite set of census blocks.

In the 2014 Plan, the Department of Public Service defined the minimum technical service characteristic objectives ("Objectives") for high speed internet access. The Department set the Objective at 4/1 Mbps and proposed moving the Objective to 10/1 in 2017. The Objectives have two purposes. First, locations lacking the Objective speed are eligible for state-funded broadband upgrades. Second, the Objectives are a requirement for grantees to match. Any change to the Objectives will increase the number of underserved locations and limit the type of technology and providers eligible to receive public support. The State's Objectives mirror the

[3] 30 V.S.A § 202c (b)(10).

federal objectives and can be helpful in complimenting national programs, such as Connect America Fund and projects funded by the Rural Utility Service.

More recently the Department put forward an action plan for expanding rural broadband. This plan should be implemented and every possible source of funding for rural broadband should be targeted to meet the state's statutory broadband goal. With the growing interest in creating Communications Union Districts, funding should be made accessible to these districts to complete feasibility studies and engineer systems. Without proper planning and initial funding, CUDs will struggle to compete against larger telecom companies and will likely fail.

Voice Service

With the introduction of Voice over Internet Protocol (VoIP) and wireless services, "plain old telephone service" subscription has declined and will continue to decline. However, many of these newer voice offerings are not available in rural areas or can be unreliable. Rural communities live with a variety of telephone issues. Rural call completion has been a significant problem nationwide, to the point of requiring intervention by Congress. Companies providing long distance, and specifically, least cost-routing services, have come under scrutiny for failing to properly hand-off calls to rural telephone companies. In addition, plant in the rural last-mile is old, and, in some cases, past its useful life. Moisture from heavy rain storms frequently penetrates old paper tubing causing interference and disruption.

Regulatory policy should remain focused on improving the quality of rural voice service. While much of Vermont has competitive choice from new VoIP offerings, consumers in rural, high-cost, exchanges have no alternative. The state should promote measures designed to encourage phone companies to continue to reinvest in their networks, especially in the last mile.

Vermont's independent telephone companies generally provide good service in some of the hardest to serve areas. Most of these companies emphasize serving their local communities. Several companies, most notably, Vermont Telephone Company, have upgraded their plant to fiber-to-the-premises. The State, working in partnership with the federal policy makers, should find ways to encourage other rural incumbent local exchange carriers ("ILECs") to do the same. These networks are crucial to preserving Vermont's rural way of life and should be given the support they need to continue offering service in their rural markets.

Over the years, the independent companies have been aided by federal high-cost support, which has allowed them to offer their rural customers service comparable urban exchanges. However, in 2016 the FCC made changes to the federal Universal Service Fund high-cost support mechanism. Now some ILECs are seeing an increase in funding while others are seeing a reduction. Yet the costs of serving these areas is not changing, and these reductions, if unaddressed, will put greater burdens on independent telephone companies and could detrimentally affect rural service quality.

Universal Service

The Vermont Universal Service Fund supports four important programs: Lifeline, Telecommunications Relay Service, E-911 and the Connectivity Fund. In 2015 the management of the Fund's contract was shifted from the Public Utility Commission to the Department of Public Service. The Department selected Solix Inc. to manage the fund. The VUSF brings in over $6 million in revenues annually. The fund has funded Vermont's broadband buildout activities for the last three years through the Connectivity Fund.

The Department continues to review the VUSF-funded programs and recommend changes that will improve the lives of Vermonters. Last year Vermont took steps joined the National Lifeline Accountability Database ("NLAD") and National Verifier, which will improve the ability of wireless companies to participate in Lifeline in Vermont. This move also freed up resources at the Vermont Department of Children and Families and should ensure greater efficiency in the duplication checking process. Nevertheless, the way the FCC and the Universal Service Administrator Company ("USAC") implements the National Verifier and NLAD could result in a reduction of low-income households receiving the lifeline benefit. Therefore, the State should closely monitor the implementation of these programs.

The Vermont Lifeline program also saw changes that will help maintain predictability in the fund. The law now caps lifeline credits at 4.25 or the amount of the credit consumers received on October 31, 2017. While stability on the state side will increase predictability, changes at the federal level for non-facilities based eligible telecommunications carriers (" ETCs") could put a greater burden onto the VUSF.

The Vermont Telecommunications Relay Service (TRS) is also changing. 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.

Wireless Infrastructure and Services

Wireless coverage has expanded in Vermont over the last three years. Vermont has a wireless siting law that provides a streamlined process for permitting wireless facilities.[4] Since 2014, over 800 certificates of public good (CPGs) have been issued under Section 248a for the construction and improvement of wireless facilities. The bulk of the improvements upgraded Vermont's wireless infrastructure from Second Generation ("2G") voice to 3G and 4G LTE data. However, wireless service is still not ubiquitous and in Vermont solutions for rural cell service have remained elusive. Small cell deployment has been attempted along rural routes with very limited success and the national efforts to expand small-cell, distributed-antenna systems, and 5G[5] upgrades have focused on urban areas. The common refrain on 5G is that "it's not coming to rural America." 5G should come to rural Vermont and the state should take efforts to improve its reach into rural areas. First, the State should adopt changes to Section 248a that distinguish between macro- and micro-cell sites and provide a streamlined permitting process for small cell and distributed antenna systems. Such changes will be needed to address the issue of unpermitted wireless facilities within the right-of-way.

Enhancing first responder communication is another important goal for the state government telecommunications planning. As FirstNet and competitor first-responder services are deployed, Vermont will rely increasingly on 4G and 5G networks during emergency situations. Recent storm events in Vermont and across the United States, especially hurricane ravaged jurisdictions like Texas, Florida and Puerto Rico, have only highlighted the importance of wireless communications. But these facilities remain vulnerable to extreme weather. As the

[4] 30 V.S.A. § 248a
[5] The International Telecommunications Union ("ITU") which determines the specifications for cellular technology has not defined 5G. Nevertheless, the industry has decided on a loose definition that includes bandwidth

effects of global climate change continue to be felt in Vermont, these facilities will become more vulnerable to damage and destruction. Vermont must take steps to protect wireless communications, so that these facilities are working properly when they are needed most. For instance, Vermont could develop protocols through the Emergency Operations Center for wireless and wired broadband companies to report service outages. Subject to its jurisdiction and authority, Vermont should also consider rules for ensuring that wireless infrastructure is appropriately hardened and remains resilient in emergency situations. As the Firstnet network is constructed, Vermont should, through the Public Safety Broadband Network Commission, ensure that the FirstNet vendor, AT&T, meets the needs of the State's first responder community.

Video

Since the late 1970s cable video systems have expanded to bring video service to thousands of Vermonters who lacked access to broadcast television. These video systems used existing utility pole facilities and were able to attach to the poles at lower rates than traditional telecom systems. In the early 2000s cable companies introduced to cable modem technologies and Data over Cable Systems Interface Specification (DOCSIS), which Facilitated significantly improved bandwidth over the prevailing dial-up technology of the day. Since the introduction of the cable internet service, cable providers have expanded and improved upon the technology have released new offerings such as VoIP. Meanwhile, video has migrated to the internet. Cord-cutters now enjoy a plethora of online video media. Cable companies hardly think of themselves as video resellers anymore. The largest cable companies also own content and provide a multitude of services including Quad-play packages (video, landline phone, internet, and wireless). Changes in video distribution will affect consumer decisions.

Although Vermont has not seen a marked reduction in cable video subscriptions the 2018 Plan still anticipates cord-cutting will continue as a trend in the cable video market. Cord-cutting will impact public access TV organizations that rely on revenues generated by fees paid by cable subscribers to sustain their operations. These organizations are evolving too, migrating services online and making content available on demand through online channels. Public access organizations are engrained in the community and provide a multitude of services, from local content to educational and training services. They are often the only video media source for their respective communities. Public access organizations are better thought of as community media centers. As video subscriptions wane, the state should explore new methods of supporting our community media centers.

State Telecommunications Services and Infrastructure

The State of Vermont is an enterprise-level purchaser of telecommunications services. The state also owns telecommunications facilities, which it uses for public administration and leases to private industry. Recently, the State switched its primary landline voice carrier from FairPoint Communications, the largest instate provider of traditional phone services, to a VoIP provider. This transition should save the state money over the long term and provide much needed modernization of the state's voice services.

The Department of Public Safety manages key systems and infrastructure as the owner of wireless towers and the manager of two-way radio systems. First responders will soon rely on first responder networks such as FirstNet and Verizon to communicate. Even as FirstNet is deployed, the State's two-way radio systems will remain an important resource. Coverage will also remain a key consideration as the FirstNet project is deployed, and the State will need to play a central role in encouraging expansion of the FirstNet network. The network should

provide service in areas with critical infrastructure such as substations, dams, transmission lines as well as popular wilderness and outdoor recreation areas. State and local first responders will need to leverage their power as the primary purchaser of these services to ensure that coverage, privacy, and resiliency remain key priorities for FirstNet and its vendors. In the meantime, Vermont should retain its two-way radio systems to ensure that First Responders have all the available communications tools to do their job.

Net neutrality now factors into state purchasing of telecommunications services. In 2015, the FCC, through its Order *Preserving the Open Internet* ("Open Internet Order"), classified retail broadband access service as a telecommunications service, thereby subjecting it to common carriage laws and rules, under Title II of the federal Communications Act. In particular, the Open Internet Order invoked rules that prohibit ISPs from blocking and throttling consumers' data traffic and prohibited paid prioritization of internet traffic. In 2018, the FCC issued the *Restoring Internet Freedom* Order, which officially revoked those rules and reclassified Internet access service as a Title I "information services," the effect of which was to exempt ISPs from rules prohibiting blocking, throttling, and paid prioritization. In the wake of the *Restoring Internet Freedom* order, Governor Philip Scott issued Executive Order 2-18, which requires all ISPs doing business with the State of Vermont to certify that it abides by Net Neutrality principles in Vermont. Following issuance of the Executive Order, the Vermont Legislature passed Act 169, which codifies the policy of EO 2-18. Several other states have taken a similar course of action, either through executive orders or legislation. Through their purchasing power, these states are seeking to ensure that major ISPs continue to carry lawful internet content fairly.

Vermont is also seeking to transform transportation in order to move away from fossil fuels and toward electrification and intelligent transportation. With data applications

revolutionizing highway transportation, wireless and fiber connectivity along Vermont's highways will be vitally important. The Agency of Transportation also manages the state's intelligent transportation networks, which will become key to realizing our goal of creating an environmentally sustainable transportation system.

E-911 is working toward industry best practices for the provision of 9-1-1 services. In 2014 E-911 introduced text to 9-1-1, which allows users to send text messages to 9-1-1 public safety answering points in an emergency. In 2015 E-911 changed its vendor for the ESI Net system from Intrado to FairPoint. Recent state-wide service outages have called into question the value of the FairPoint system. When a new RFP for E-911 system is issued, the State should consider requirements that ensure reliability through all aspects of the E-911.

Conclusion

The 2018 Plan describes solutions for the state's current telecommunications challenges. Rural broadband, rural service quality and First Responder communications are central themes that have emerged over the past three years. The 2018 Plan puts the focus on achieving better service for all Vermonters.

1. The state should adopt pole attachment reform by unifying pole rental rates and enacting rules that reduce make-ready delays.
2. The State and municipalities should work together to plan for broadband expansion, either through existing networks or Communications Union Districts. The State should take steps to implement the Department of Public Service's Broadband Action Plan. The State should identify a secure revenue source for broadband expansion.

3. The State should look for opportunities to expand the use of existing state-owned middle-mile fiber optic facilities and increase availability of fiber optic cable along the State's highways.
4. 5G small cell and DAS networks should be encouraged through regulatory reforms of 30 V.S.A. § 248a. Such reforms should include an expedited process for permitting facilities on utility poles along travel corridors.
5. Telecommunications service quality standards should continue to apply to rural exchanges. Service quality protections should be strengthened for rural customers in areas where competition is lacking. The state should consider incentives for improving last-mile service quality.
6. The State should continue to support telephone companies through high-cost support mechanisms, especially in the face of receding federal support. Changes to Vermont's high cost support program should be considered to ensure that support is weighted toward companies who have lost funding through federal high-cost changes.
7. The State should consider policies for enhancing the resiliency of wireless communications facilities by ensuring that such facilities are soundly constructed and have the ability to maintain electricity and connectivity during sustained power outages.
8. The E-911 Board should continue its path toward greater security, reliability, and efficiency. As it hires a contractor for the E-911 system, the Board should ensure that the successful respondent will implement the recommendations made in the 911 Authority Report.

9. Subject to its jurisdiction and authority, the State should explore appropriate rules and policies for protecting internet service subscribers through the process established in Act 169.
10. The State should explore new methods of supporting community media centers, as cable subscription revenues decrease. There should be a nexus between the revenue source and the services provided by community media centers, with consideration for the inability of the state to tax internet access subscriptions.

I. Broadband Internet Access

Introduction

The 2018 Plan considers broadband internet access services ("BIAS") to be the most important telecommunications service needed by Vermonters in the next 10 years. Universal access to BIAS by 2024 is a statutory goal of Vermont.[6] Universal access to BIAS also remains very challenging to achieve. Over 20,000 service locations in Vermont lack access to basic broadband today. With other services, such as voice migrating to IP based platforms, BIAS has become a necessity for most Americans. Yet, federal law, which preempts states' regulatory authority over authority, does not treat or define BIAS as a necessity. Other essential utilities such as water and electricity distribution systems operate under extensive state regulation that help ensure universal access at just and reasonable rates. States, however, are preempted by the Telecommunications Act of 1996 and orders of the FCC from regulating retail BIAS services. Federal law favors a "light touch" regulatory atmosphere that relies on free-market principles and technological innovations to ensure access. As a result, Vermont cannot mandate that companies extend broadband capable facilities to unserved areas or regulate the price and quality of those services.

Notwithstanding this approach to the regulation of BIAS, carriers have opted to expand broadband capable networks throughout the state. Currently, 93% of the state has access to broadband of at least 4/1 Mbps. Cable and FTTP networks cover about 73% of E-911 business and residential locations.[7] FTTP alone covers 13%, while 7% of locations are unserved or

[6] *See* 30 V.S.A. § 202c(b)(10).
[7] The Department of Public Service maps broadband availability using the E-911 location database.

underserved. Most of these underserved locations are in rural areas, on dirt roads or rugged mountain terrain and are overwhelmingly residential.[8]

In the last three years, the state has seen significant growth of fiber-to-the-premises networks. Most of these networks actually do serve rural areas. Vermont's incumbent local exchange carriers, such as Waitsfield-Champlain Valley Telecom and Franklin Telephone, have expanded fiber resources within their footprint. Vermont Telephone Company deployed FTTP to every location within all of its exchanges, thanks in part to grants and low-interest loans from the USDA. Springfield for example, which is focusing its efforts on economic development, can now take advantage of the best broadband in the world. The question for state and local economic development organizations is how can these existing broadband resources be leveraged to promote growth and economic sustainability for Vermont's businesses?

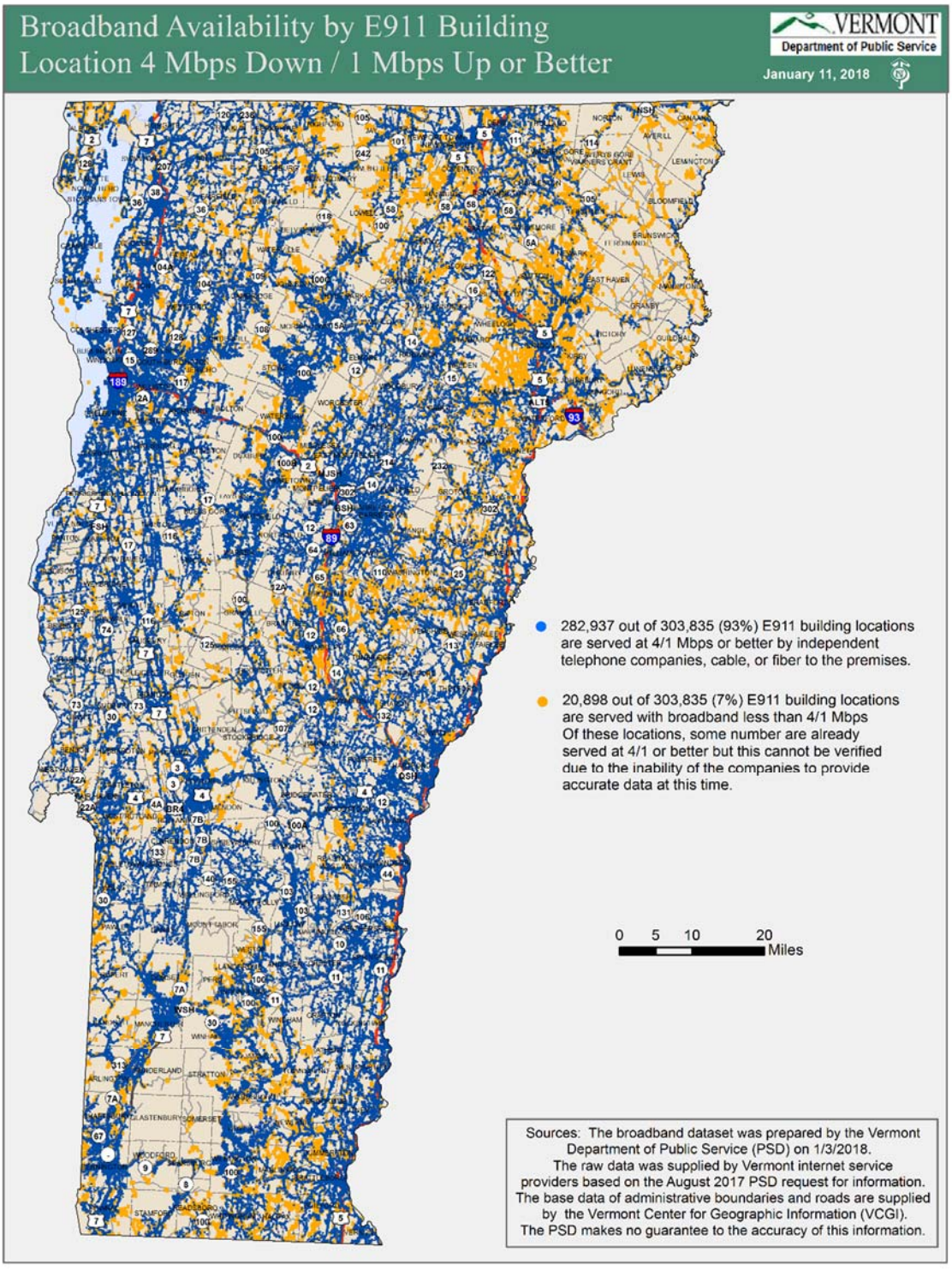
At least 66 Vermont towns are completely or nearly completely built out with cable-modem services. Cable modem service reaches 68% of the state's business and residential locations. Cable modem service can provide exceptional broadband connectivity for residential and small business users. These services are confined to urban and suburban areas where the density is such that cable companies can and want to be there.

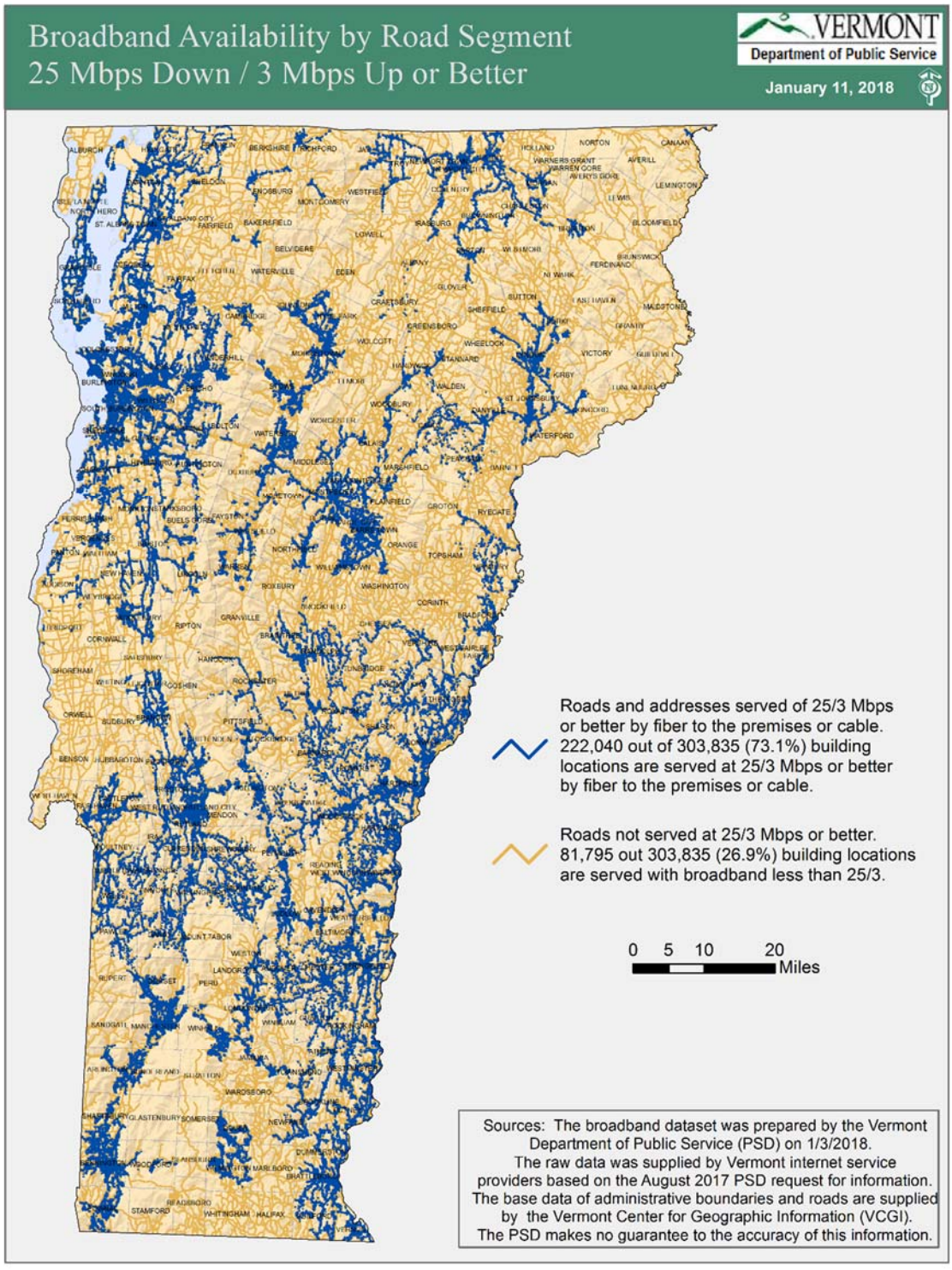
Despite these gains, Vermonters still demand more bandwidth, both in terms of mobile and fixed technology. Even in the most rural locations residents expect consistent and fast broadband service. Most concerning are the 7% residential locations that lack basic broadband.[9] There are serious consequences for Vermont families without access to the internet, including

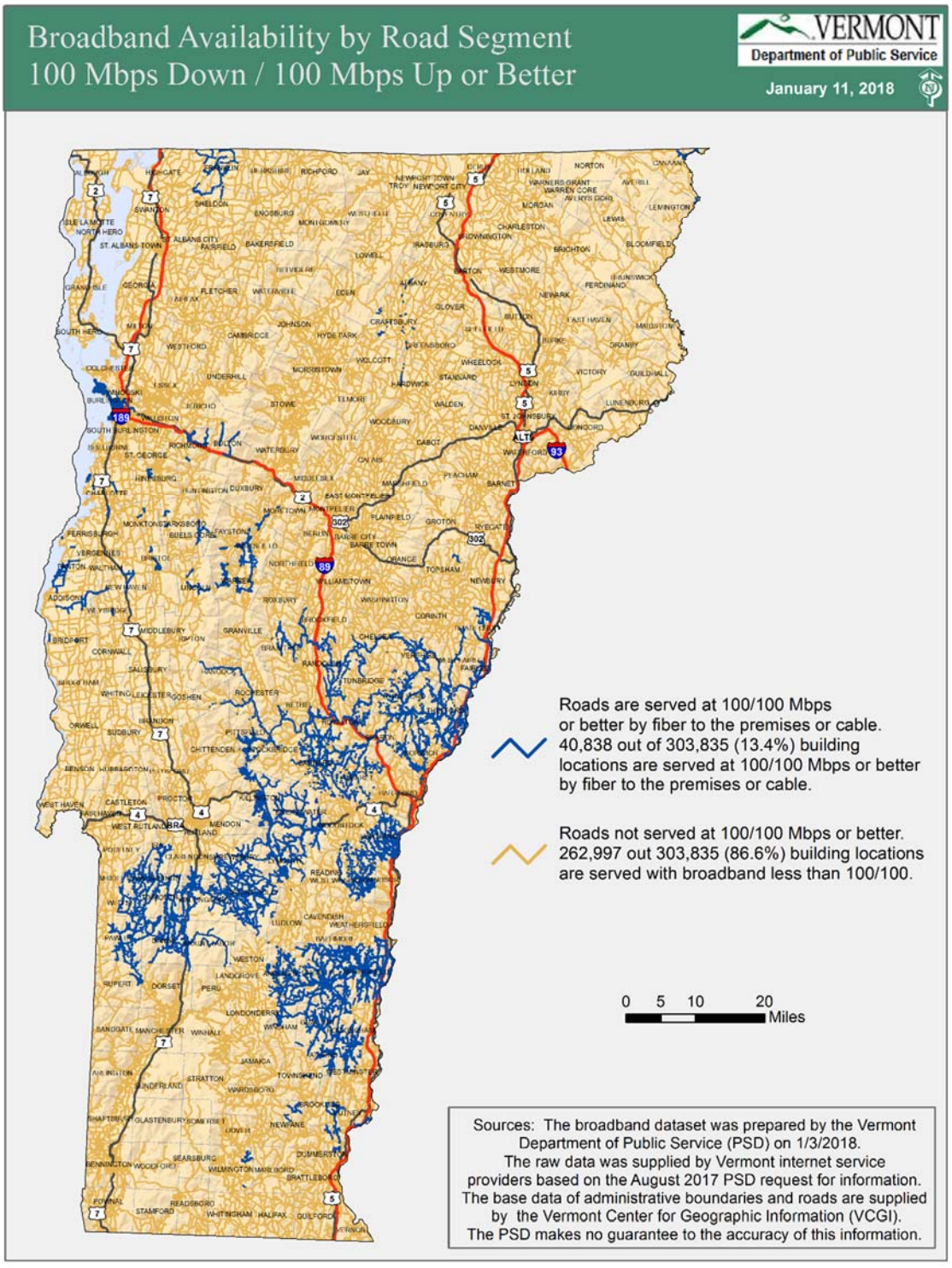
[8] it should be noted that many of Vermont's small businesses and independent contractors operate from residential locations.
[9] Broadband statistics by town is available in Appendix 2 of the 2018 Plan

potential limitations for economic prosperity and community connectedness. Our economy is moving online, as is the cultural and social life of many citizens. Government has also migrated online. Local, state and federal government all maintain websites with important information for constituents about government services. Healthcare is using remote technologies that allow residents to age in place with comfort and convenience and one would be hard-pressed to find a job without access to the career resources available on the internet.

Connectivity is more important than ever with the addition of new Think Vermont incentives to attract remote workers. High-tech workers will soon leave their high-stress, high-rent urban lifestyles for the Green Mountain State. This past year Vermont began offering tax credits of up to $10,000 to remote workers who relocate to Vermont and continue working for out of state employers. When these workers arrive, they will expect there to be housing with good quality broadband service and a nice view. To attract and keep remote working professionals the state must endeavor to improve broadband in its rural locations. This section discusses some of the programs in place that address the expansion of broadband.


Broadband Availability by E911 Building
Location 4 Mbps Down / 1 Mbps Up or Better
VERMONT
Department of Public Service
January 11, 2018
282,937 out of 303,835 (93%) E911 building locations are served at 4/1 Mbps or better by independent telephone companies, cable, or fiber to the premises.
20,898 out of 303,835 (7%) E911 building locations are served with broadband less than 4/1 Mbps Of these locations, some number are already served at 4/1 or better but this cannot be verified due to the inability of the companies to provide accurate data at this time.
0 5 10 20
Miles
Sources: The broadband dataset was prepared by the Vermont Department of Public Service (PSD) on 1/3/2018.
The raw data was supplied by Vermont internet service providers based on the August 2017 PSD request for information.
The base data of administrative boundaries and roads are supplied by the Vermont Center for Geographic Information (VCGI).
The PSD makes no guarantee to the accuracy of this information.


Broadband Availability by Road Segment
25 Mbps Down / 3 Mbps Up or Better
VERMONT
Department of Public Service
January 11, 2018
Roads and addresses served of 25/3 Mbps or better by fiber to the premises or cable. 222,040 out of 303,835 (73.1%) building locations are served at 25/3 Mbps or better by fiber to the premises or cable.
Roads not served at 25/3 Mbps or better. 81,795 out 303,835 (26.9%) building locations are served with broadband less than 25/3.
0 5 10 20
Miles
Sources: The broadband dataset was prepared by the Vermont Department of Public Service (PSD) on 1/3/2018. The raw data was supplied by Vermont internet service providers based on the August 2017 PSD request for information. The base data of administrative boundaries and roads are supplied by the Vermont Center for Geographic Information (VCGI). The PSD makes no guarantee to the accuracy of this information.


Broadband Availability by Road Segment
100 Mbps Down / 100 Mbps Up or Better
VERMONT
Department of Public Service
January 11, 2018
Roads are served at 100/100 Mbps or better by fiber to the premises or cable. 40,838 out of 303,835 (13.4%) building locations are served at 100/100 Mbps or better by fiber to the premises or cable.
Roads not served at 100/100 Mbps or better. 262,997 out 303,835 (86.6%) building locations are served with broadband less than 100/100.
0 5 10 20
Miles
Sources: The broadband dataset was prepared by the Vermont Department of Public Service (PSD) on 1/3/2018. The raw data was supplied by Vermont internet service providers based on the August 2017 PSD request for information. The base data of administrative boundaries and roads are supplied by the Vermont Center for Geographic Information (VCGI). The PSD makes no guarantee to the accuracy of this information.

Connectivity Initiative and High Cost Program

Since 2015, the Connectivity Initiative has been the State's sole broadband expansion program. The Connectivity Initiative is funded through the Vermont Universal Service Fund (VUSF) and is managed by the Department of Public Service. The VUSF typically provides several hundred thousand dollars every year to ISPs to buildout last-mile broadband. For instance, in 2017 the VUSF contributed $220,000 at the end of the fiscal year. The amount of money available to the fund pales in comparison to the amount of funding requests that the Department receives, which is generally in the millions of dollars. With approximately 20,000 unserved and underserved addresses in Vermont, the Connectivity Initiative cannot make a meaningful dent in the number of underserved locations.

Of more concern is that the Connectivity Initiative and High Cost Program draw down the cash reserves in the VUSF, leaving the VUSF with a very low balance to begin the year and putting the fund itself at risk. Efforts to resolve this problem have fallen short. In 2016 and 2017 legislation to increase funding for the Connectivity Initiative failed to progress past the Senate.

All told, the Connectivity Initiative has improved the lives of Vermonters who have received better broadband as a result of the service expansions it has funded. In the absence of a more aggressive effort to fund broadband expansion, the State should at minimum continue to maintain this program. The Department has put forward a Broadband Action Plan, which contemplates leveraging Connectivity Initiative funds with local and private support. The State should find alternative revenue sources to fund the program in the future, and especially consider sources that do not raise state taxes and fees on Vermonters.

The Connectivity Fund also supports the Vermont high cost program, which provides ongoing support to rural telephone companies offering broadband service. The State should

continue to support phone companies through high-cost support mechanisms, especially in the face of receding federal support. Changes to Vermont's high-cost suppoirt program should be considered to ensure that support is weighted toward companies who have lost funding through federal high cost changes.

ThinkVermont!

ThinkVermont Innovation Grant Program was created in 2018 to respond to the growth needs of Vermont small businesses with 20 or fewer employees by funding innovative strategies that accelerate small business growth. The initiative will enable the State to invest in projects with grants that can be accessed more quickly and with fewer restrictions than traditional federal initiatives.

The overarching goal of the program is to support innovative strategies that grow the economy and support vibrant communities while facilitating "testbed" approaches to create reproducible results throughout Vermont. One possible use of the funding can be to enable small businesses to access to high speed broadband. An important consideration of projects funded through the ThinkVermont Innovation Grant Program is the potential impact on the entrepreneurial ecosystem as it pertains to small business growth

Federal Broadband Programs

Several federal broadband programs could be drawn upon to improve broadband service in Vermont. The USDA has several programs, and most recently launched the e-Connectivity Pilot Program, which provides $600 million in low-interest loans and grants for rural broadband. USDA's broadband programs are underutilized in Vermont. One explanation for why they are underutilized is that the areas of the state is that those areas are subject to existing projects which have active grants and loans from the USDA. An analysis performed by the Department of

Public Service reviewed Vermont's eligibility for USDA programs using state broadband data. The analysis shows that most of the census blocks otherwise eligible for USDA funding are covered by the VTel WOW project, which renders them ineligible for funding. It will be important to ensure that previously funded projects adequately covered residents of these census blocks or that the census blocks become eligible again for future funding.

The FCC continues to fund rural digital subscriber lines (DSL) through the Connect America Fund Phase II (CAF II) and the Alternative Connect America Cost Model for rate-of-return carriers (A-CAM). The FCC is providing millions of dollars in funding to support the expansion of DSL. Consolidated Communications is receiving $50 million from the FCC to deploy broadband in Vermont between 2016 and 2021 and will likely match that investment to meet the requirements of the program. Consolidated is required to bring 10/1 Mbps service to over 28,000 locations in Vermont.

Private Middle-mile Fiber Networks

There is an abundance of middle-mile fiber in Vermont. The term "middle-mile" describes network infrastructure that connects last-mile (i.e., local) networks to other network service providers, major telecommunications carriers and the internet. Most large telecom carriers own and manage extensive fiber networks that run throughout the State. Consolidated is likely the largest fiber network operator in the State. Comcast, Firstlight, Centurylink/Level 3, and AT&T also own extensive statewide networks. These networks serve interstate and international transport, other telecoms, and large enterprise level organizations such as schools, hospitals and large industry.

Public investment has also added to the middle-mile fiber market.[10] With the completion of the $33-million-dollar Broadband Technology Opportunities Program (BTOP) project, Firstlight now has a nearly 800-mile, publicly funded, fiber network running down the both the eastern and western sides of the state. Vermont Electric Power Company (VELCO) has an extensive fiber network running along electric transmission routes, and which connects its substations. This network touches nearly 70% of Vermont's towns and has substantial, untapped, capacity. Both networks provide solid opportunities for long-haul and middle-mile transport. But middle-mile fiber is not engineered for last mile service. Furthermore, contrary to what experts believed 10 years ago, access to middle-mile fiber was not the greatest impediment to last mile broadband. The same cost barriers that prevented carriers from expanding in rural areas are still present today. The two major barriers preventing rural expansion are the high capital cost of rural broadband and the ongoing operational costs of maintaining that infrastructure. Rural geography, sparse population, and decentralized settlement patterns all contribute to the ongoing costs of broadband networks. Finding ways to leverage these middle-mile opportunities into last mile broadband has been, and still is, a serious challenge.

Electric Utility as Broadband Provider

Across the country there is now much discussion of electric utilities stepping into the broadband space, especially rural electric cooperatives. Rural utilities and cooperatives are well situated to meet the needs of rural residents because they already provide electricity in rural markets. They also own the distribution plant (i.e. poles, bucket trucks, easements, and other assets) necessary to deliver broadband, and have a labor force trained to install telecom facilities and provide customer support. That said, electric utilities are unaccustomed to operating in a

[10] The State of Vermont also owns middle-mile fiber, which is discussed in greater detail later in this document.

competitive market. Broadband is not only competitive, but largely unregulated by state government. Rates are set by the market and new market entrants (along with new technology) can pose a competitive risk to established firms. These market conditions would be new to any utility accustomed to operating under traditional rules of cost-of-service (plus) rate regulation and state-sanctioned monopoly conditions. While the State should convene discussion about how electric investor-owned utilities and cooperatives could provide broadband, care must be taken accurately and realistically weigh the risks and opportunities for any such move..

Other states are exploring this model of service delivery, notably Virginia, which has directed its public utilities to write a report, in consultation with the State Corporation Commission, discussing the feasibility of electric distribution utilities offering broadband. Vermont should follow Virginia's example by way of a PUC investigation or other type of suitable proceeding.

New Technology

Advancements in technology will also bring about new opportunities. Low-orbiting satellites will bring new broadband to rural and wilderness spaces. These satellites will not suffer from the low-bandwidth and high latency that plague current satellite offerings. Additionally, Microsoft is partnering with new entrants to implement technology that utilizes TV white space. These developments should be closely monitored as the state makes new investments in broadband.

Broadband Action Plan

The State of Vermont is committed to ensuring that all Vermonters have the best available high-speed Internet access. The intent of Vermont's telecommunications planning and policy law is 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."[11] To that end, the Department of Public Service is directed to promote "access to affordable broadband service to all residences and businesses in all regions of the State."[12] Legislation directs the Department to start with those locations that lack service of 4/1 Mbps or better, and provide each with access at 10/1 Mbps.[13] This action plan, prepared pursuant to state law,[14] offers a strategy to advance these goals.

Fiber to the premises (FTTP) is widely understood to be the best technology for reaching the 2024 goal, but other technologies, including hybrid fiber coax (HFC) cable service (CableLabs DOCSIS 3.1 standard), DSL (ITU VDSL2 standard), and even mobile wireless (3GPP 5G standard) are also capable of meeting these requirements. Because HFC cable service is widely available in the state, existing cable networks should be considered as an important element in the state's overall broadband strategy.

Broadband affordability remains a challenge. Communities that can afford to tackle broadband expansion will succeed in improving service. But many communities cannot afford the capital costs of infrastructure deployment. Furthermore, many potential consumers in low income towns cannot afford the retail rate for the service itself. The FCC has taken steps to address low-income accessibility, such as expanding the popular lifeline program to wireless carriers and broadband providers. Some carriers also offer low-income packages. Yet, where

[11] 30 V.S.A. § 202(c)(10)
[12] 30 V.S.A. § 202e(a)(1)
[13] 30 V.S.A. §7515(b)a)
[14] The Broadband Action Plan is a requirement of 30 V.S.A. §202e(b)(6) and was originally issued on January 15, 2018.

families have access to only one carrier, these programs may not be available. Affordability is a criterion for the Department to weigh when awarding grants.

BAP Point 1: New models for broadband development

Vermont has seen significant improvement in broadband availability, but much work remains. State and federal funding constraints on broadband investment are limiting the current approach and new models for broadband deployment are needed. State policy must strengthen the connection between the demand for rural broadband and the Vermont-based industries that are likely to benefit from broadband deployment. With the increase of Internet of Things (IoT) ready appliances and services, broadband access will be necessary to support the basic functions of most households, and these services will be delivered by edge providers over broadband capable networks. Electric companies will manage load with micro-load control systems. Health care will be delivered by the internet, allowing patients the opportunity to heal in their own homes. Intelligent Transportation Systems (ITS) will make our highways safer and reduce carbon emissions. Educational opportunities will also be extended with broadband, allowing children access to globally available learning platforms. Without adequate broadband service, many Vermonters will not be able to adopt innovative technology.

The State should continue to explore new ways to leverage public-private partnerships in healthcare, education, transportation, and energy sectors in support of broadband expansion. The Department must work with other state agencies, including Agency of Transportation, Agency Commerce & Community Development, Department of Health, Agency of Education, and other stakeholders to realize Vermont's Connectivity goals.

BAP Point 2: Service Characteristic Objectives

Vermont legislation refers to the minimum technical service characteristic objectives of broadband service ("Objectives") to serve two specific purposes: a.) locations lacking services at

these speeds will be eligible for State support[15], and b.) grantees accepting State support will be obligated to provide services at these speeds.[16] Vermont legislation directs the Department to define the Objectives in the Vermont Telecommunications Plan.[17] The 2014 Vermont Telecommunications Plan set the Objectives at 4 Mbps down and 1 Mbps up. After the goal of universal availability of at least 4/1 Mbps is met, the focus will be directed toward furtherance of the goal of ensuring universal availability at 100/100 Mbps.

This will be accomplished through the establishment of interim speed tier Objectives in the Telecommunications Plan listed below.[18]

- 2014 - 2017: 4/1 Mbps
- 2017 - 2020: 10/1 Mbps
- 2020 - 2024: 100/100 Mbps

BAP Point 3: Coordination with FCC

FCC policies dictate separate approaches for two types of areas: completely unserved areas and partially served areas.[19] The FCC Connect America Fund (CAF) Phase II program is focused exclusively on completely unserved areas. The program defined areas eligible for support as census blocks where no location had access to service at 4/1 Mbps from a provider other than the incumbent local telephone company. The program will, by 2021, bring broadband Internet access at 10/1 Mbps service to the majority of locations in these completely unserved

[15] 30 V.S.A. § 7515b(a)
[16] 30 V.S.A. § 202 (e)
[17] 30 V.S.A. 202d(g)
[18] *2014 Telecommunications Plan*, at 89
[19] The Department believes that many potentially underserved locations have access to 4/1 Mbps service from wireless providers. However, while most wireless service providers submit coverage maps depicting service availability, only one affirmatively asserts the availability of service at 4/1 Mbps.

areas.[20] The State of Vermont's Connectivity Fund,[21] (including the high-cost program and the Connectivity Initiative) supported by the Vermont Universal Service Fund, will be directed to bring service to locations not served by the CAF II program. These are areas with locations that lack access to services at 4/1 Mbps or better but that are excluded from the CAF II program because they are in partially served areas or areas in which CAF II providers have chosen not to serve. The Department will work with the Public Utilities Commission ("PUC") to ensure that support from the high cost Program is directed to these locations.

BAP Point 4: Town-based approach to the Connectivity Initiative

State funding alone will not suffice to achieve Vermont's 2024 broadband goal at this time. Therefore, the Department will develop, with advice from the Connectivity Advisory Board, a process for leveraging state investment with municipal and private investments in existing broadband networks. Vermont's Public Utility Commission's cable line extension rule is a proven process for rationally allocating costs between service providers and consumers. [22] To ensure that cable operators are able to recover the capital investment required for line extensions, the rule employs a formula to apportion capital costs between the cable provider and affected cable subscribers on a sliding scale based on subscriber density. This formula can also be used to apportion costs of broadband deployment between service providers and subscribers. In addition, to add further incentive to deployment, the subscriber portion of the capital cost can be shared by the State and regional stakeholders, and the individual subscribers. These stakeholders could

[20] On August 19, 2015, FairPoint Communications (now Consolidated Communications Inc.) accepted the CAF II award of $8,789,359 per year for six years from the FCC and is required to offer services supporting 10 Mbps download speed and 1 Mbps upload speed to 28,399 supported locations within 6 years of the award. Through GIS analysis the PSD identified approximately 45,833 business and residential locations in the CAF II service territory and in FairPoint exchanges.
[21] 30 V.S.A. § 7516
[22] PUC Rule 8.313

include municipalities, educational institutions, healthcare service providers, electric utilities, and other organizations

The Department will then solicit requests for broadband service from towns, neighborhoods and other private groups. The Department will work with the Vermont League of Cities and Towns, the Agency of Commerce and Community Development, and the Regional Planning Commissions to ensure notice of this opportunity is provided to towns and that towns have an effective means to participate. The Department will identify all underserved locations through its broadband mapping system and will publish this information in the Connectivity Division annual report. Upon a formal stakeholder request, Department staff will visit the stakeholders and present broadband availability information and explain the funding process. The Department will provide a rough estimate of the cost to deploy services throughout the requested areas with an assumed take rate, using the cable line extension rule as a guide. If the petitioning stakeholder group pledges to fund some of the customer portion of the estimated capital cost, the Department will conduct a request for proposals, subject to available Connectivity Initiative funding. After receipt of a qualifying proposal, the stakeholder will be required to canvas the residents of the proposed service area and obtain signed contracts from potential customers. The final customer portion of the capital cost, as calculated under the PUC rule, will be split between the Connectivity Initiative, the stakeholder, and the individual subscribers. The Department will explore whether a process could be developed for resolving future requests for service by residents who did not participate in the initial funding of the project.

The Department will also work to reform its Request for Proposals (RFP) process. As the Department revamps its RFP process, it should provide greater weight and consideration to

affordability, through the cost of equipment, price of the service and any other factor that may impact the final price of the service. Consideration should also be given to economic factors of the area receiving publicly funded resources. The Department will also ensure that clear expectations for towns and carriers is provided in the RFP.

Broadband Mapping

Vermont maintains a robust broadband mapping program. In the wake of the recession Vermont received stimulus grant funding from the National Telecommunications and Information Administration ("NTIA") to map broadband data including availability and speeds. Vermont put together a team of agencies that participated in the program, which included the Vermont Center for Geographic Information ("VCGI"), the Department of Public Service, and the VTA. At the conclusion of the federal program, the state continued mapping broadband data at the state level. Today, the Department continues to collect broadband data and use the data to produce and publish maps that show broadband availability and speeds. The Department maps broadband data on an address-by-address level, making Vermont's broadband mapping program among the most granular. Federal initiatives to date, including the FCC's Form 477, have collected data at the census block level and do not take into account unserved addresses located within "served" census blocks. Currently, broadband is mapped at bandwidths of less than 4/1 Mbps, 4/1 Mbps, 10/1 Mbps, 25/3 Mbps, and 100/100+ Mbps. The maps inform where local and State entities should focus their efforts.

In 2018, the federal budget provided $7.5 million to the National Telecommunications and Information Administration (NTIA) to update the National Broadband Map. It is reasonable to expect that the NTIA, once authorized by Congress to do so, will enlist the help of the states to update the National Broadband Map. Vermont is well placed to take advantage of NTIA grant

funding and provide meaningful data to the National Broadband Map. Producing maps about wireless cell signal continues to be challenging. The Department is required to map wireless service coverage if it is financially feasible to do so. Calls from the public and the Legislature for wireless service data have only grown in recent years. However, the State should first identify the specific need for such a study before committing to it because the value of a propagation study depends on how it is performed. Commissioning a propagation study costs money, and the Department has not received funding to commission such a study. The 2018 Plan recommends a study of wireless propagation for the purpose of informing the public about the extent of wireless coverage in Vermont, so long as it can be used as part of the greater national effort to map broadband or some other specific purpose.

Data resulting from a propagation study could be useful to ensure AT&T's compliance with the state's FirstNet Plan. The NTIA provides funding that can be used for mapping new FirstNet coverage. The Mobility Fund Phase II program (MFII) also provides a valuable incentive to map wireless service. The MFII program provides $4.53 billion nationwide in funding for wireless coverage to areas presently deemed unserved. The program relies on mobile wireless broadband deployment data submitted to the FCC. Under this program, carriers can assert coverage, leaving the states to contest those assertions during a contest period. Unfortunately, the FCC's data erroneously portrays Vermont as nearly 100% served with wireless coverage. The State of Vermont, through the Department of Public Service, is actively contesting this data.[23] The FCC's program does not rely on propagation mapping to challenge the data, and a challenge does not require a propagation study.

[23] Results of the Department's drive test will be published in the final adopted Plan.

II. State of Vermont Telecommunications Infrastructure

Introduction

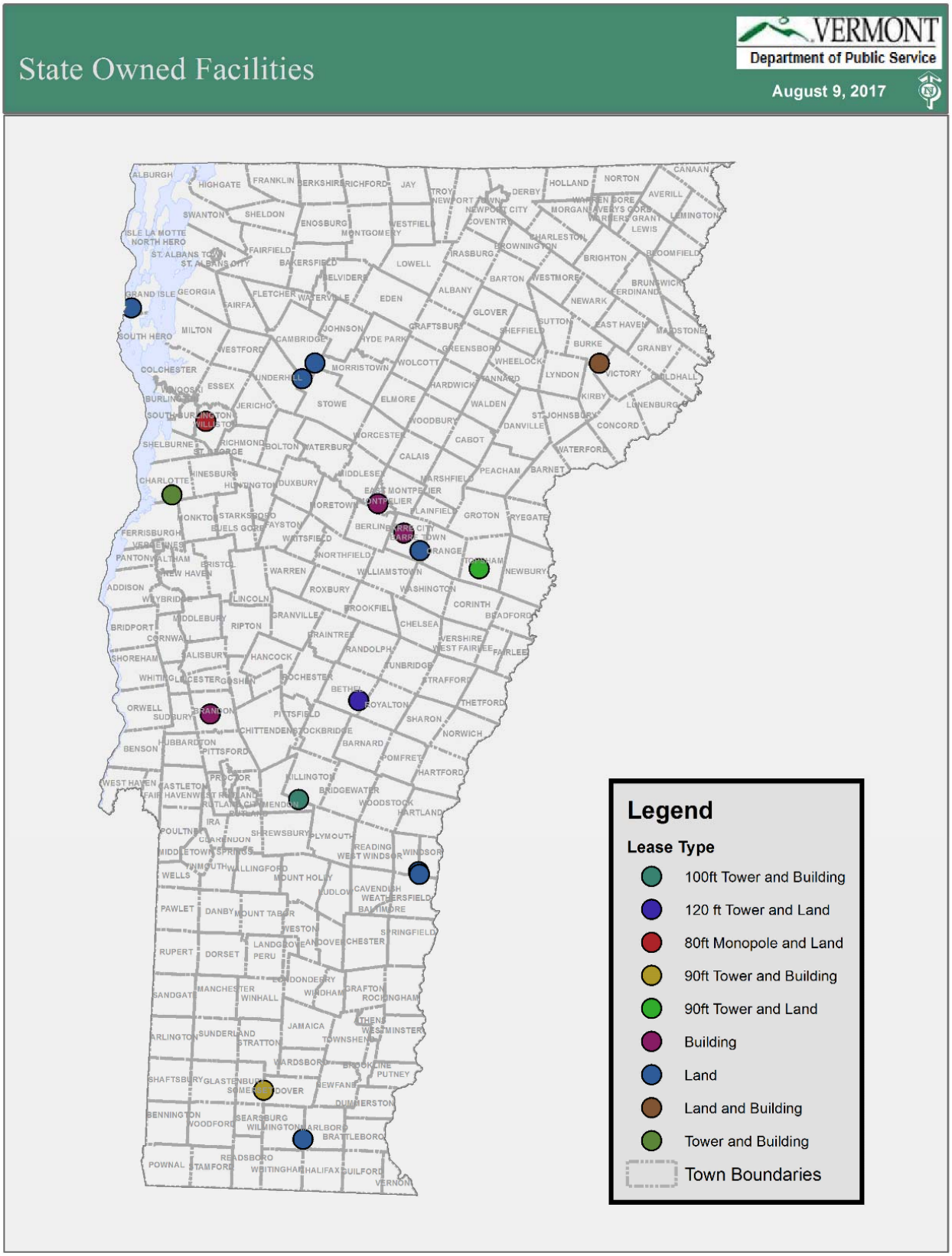
The State of Vermont owns telecommunications facilities, and these includes wireless towers, fiber-optic cable, radio network equipment, and IT networks and systems. The State hosts telecommunications facilities on public lands and buildings. The State of Vermont also manages critical public safety networks, such as Enhanced 911 (NG911) and two-way radio communications networks, which state and local first responders continue to use to fulfill their critical first responder missions. Section 202d(b)(4) of Title 30 calls upon the Department to conduct an assessment of state telecommunications systems and evaluation of proposals to upgrade those systems.

Acknowledgements

As directed by statute, the State of Vermont Telecommunications Infrastructure section of this report was produced with cooperation from the Agency of Transportation and the Department of Innovation and Information (now Agency of Digital Services). This section was also aided by the Agency of Natural Resources, Public Safety, Buildings and General Services, and the E-911 Board.

Commercial Use of State-Owned Wireless Communications Facilities

The state of Vermont owns of numerous buildings and thousands of acres of land. These properties present many opportunities to increase commercial wireless communications within the state. In fact, the state owns approximately 15 wireless telecommunications towers, or land used for telecommunications facilities, on which commercial mobile radio services (CMRS) carriers attach equipment. CMRS carriers also utilize several existing state buildings, including some iconic buildings in downtown Montpelier. Siting these facilities on state lands, however, can be challenging for carriers.


State Owned Facilities
VERMONT
Department of Public Service
August 9, 2017
Legend
Lease Type
100ft Tower and Building
120 ft Tower and Land
80ft Monopole and Land
90ft Tower and Building
90ft Tower and Land
Building
Land
Land and Building
Tower and Building
Town Boundaries

The Agency of Administration is designated as the exclusive agent of the state for purposes of executing wireless license agreements. This function is delegated to the Agency of Digital Services. However, the placement of telecommunications equipment usually involves at least two state agencies and can sometimes include as many as four. In many instances multiple agencies exercise concurrent jurisdiction over the same telecommunications facility. The Department of Forests, Parks and Recreation within the Agency of Natural Resources manages the state lands on which many telecommunications facilities are placed. The Department Buildings and General Services manages state buildings, and private-sector leases for those buildings, The Department of Public Safety—the State's only agency with expertise in radio frequency (RF) engineering—manages the public safety communications assets, which includes management of all public safety sites. The Attorney General's Office provides the legal support necessary to draft and negotiate wireless license agreements, and the Department of Public Service also plays a role, coordinating the telecommunications initiatives of executive branch agencies.

For the CMRS carriers, the process of executing a license to use state-owned telecommunications facilities can be fraught with uncertainty and delay. For instance, the rate charged for facilities varies between agencies. Also, each agency approaches licensing with a different set of policy considerations (e.g. preservation of state lands, broadband deployment or public safety benefits for e.g.). Lastly, there is no clear state-wide plan for processing requests to use state lands for wireless colocation. In the absence of clear direction and a lack of consensus between agencies, applications for co-location often languish. The 2018 Plan offers three recommendations that the State can implement to streamline the process.

First, the State should hire a full-time staff person or designate existing personnel with responsibility to process license agreements for state-owned facilities. Decisional authority over the sites would remain with the respective agencies, but the staff would be the "face" of state tower-licensing. The designated personnel for wireless leasing would manage all public information regarding state telecommunications licenses. The state wireless license designee would ensure that the State was in compliance with active license agreements. Lastly this designee would work with the respective state agencies to keep momentum going on proposed licenses. The Agency of Administration and AGO would maintain their respective roles as the official agent for the state and providing legal support.

Second, the State should adopt a uniform, state-wide fee structure. Currently, most state agencies use the VTA-created fee structure, which is adequate. However, a new fee structure could be developed based on an appraisal of state-owned communications facilities. An appraisal would likely show that sites in the Burlington and Mount Mansfield areas are more valuable to the wireless industry than sites in the Northeast Kingdom, and therefore, should garner different rates for co-location. When the State reviews fees, it should consider the revenues generated by a lessee's sublet of state facilities. Any new fee structure should be focused on fair market value and current market conditions and less on public policy goals of broadband expansion. Such a fee structure would not likely result in higher fees for carriers overall, but better reflect actual market conditions for specific sites. The State could also consider offering waivers of fees in high value zones as an incentive for buildout in areas lacking adequate cell coverage.

Third, a public portal should be created, which clearly outlines the State's process for executing telecommunications licenses. A simple webpage could include a data on available tower locations and all the forms necessary to begin petitioning for use of state property.

Public Safety Radio Technology Services

The Department of Public Safety has a Radio Technology Service division (RTS) that is responsible for engineering, operating, and maintaining communication networks that are vital for public safety organizations in Vermont. RTS serves the Vermont State Police, Vermont Emergency Management, the Division of Fire Safety, Vermont Crime Information Center and various state agencies and departments that have a public safety service function. The systems maintained by RTS also serve municipal police, fire and emergency medical services organizations. Each system within the RTS program provides specific technology to public safety practitioners who rely on communications to stay connected, maintain security, enhance safety and gain situational awareness.

The RTS programs meet or exceed operational requirements for public safety practitioners and are resilient. Resilience refers to the ability to continue operations or recover a stable state after a major mishap or event. These systems are engineered to avoid failures or losses of operation and to provide back-up options that ensure that public safety has communications 24 hours a day, 365 days of the year. As such, public safety voice networks and Land Mobile Radio systems must be built to higher resiliency standards than found in commercial provider installations. Key program areas are:

Land Mobile Radio Systems (LMR)

– LMR systems are terrestrially-based, wireless communications systems commonly used by federal, state, local, tribal, and territorial emergency responders, public works companies, and even the military to support voice and low-speed data communications. Nationwide and in Vermont, LMR systems are the foundational communication tool for public safety. LMR systems typically consist of handheld portable radios, mobile radios, base stations, a network, and repeaters. In Vermont, RTS supports and maintains two-way radio services for public safety that encompasses more than 4,000 base,

mobile, and portable radios located throughout the state. RTS services and maintains 129 communication sites statewide and hundreds of voice and data services.

Vermont Microwave Network – The microwave network provides broadband connectivity for public safety and is an important back-up system to ensure resiliency. The system has a self-healing ring configuration and network operation center computers continually monitor the health of the network, automatically notifying technicians when problems are detected. RTS manages the engineering, construction and maintenance of wireless towers, microwave backhaul systems and fiber optic connections.

Mission Critical Telephone System – RTS maintains and engineers highly stable, resilient telephone systems and voicemail for the Department of Public Safety, including the Vermont State Police, Emergency Operations Centers, and the two State 911 Public Safety Answering Points in Williston and Westminster.

FirstNet – In 2012, Congress passed the Middle-Class Tax Relief and Job Creation Act in 2012, which created FirstNet as an independent authority within the U.S. Department of Commerce's National Telecommunications and Information Administration (NTIA) and gave it the responsibility to build, operate, and maintain a nationwide wireless broadband network dedicated to first responders. The network is formally called the Nationwide Public Safety Broadband Network (NPSBN). The law also allocated portions of the nationwide 700 MHz spectrum (D-block) and $7 billion for construction of the network. FirstNet is tasked with leveraging existing telecommunications infrastructure and assets and to contain costs by exploring public/private partnerships. The creation of FirstNet and its mission were encompassed in the final recommendations of the 911 Commission. The law mandates FirstNet be self-sufficient and not require any additional government funding. FirstNet was to enter into an

agreement with a commercial partner. That partner may profit from the spectrum by leasing unused or underutilized portions to non-public safety subscribers. Public safety subscribers who elect to use the network also may be charged a subscriber fee, but it must be competitively priced to attract first responder users. While all states are required to have the NPSBN, individual first responders have the choice of subscribing to the network. However, the commercial partner will be financially penalized in some way if it does not sign up a legislatively mandated number of first responders.

In Vermont, the Public Safety Broadband Network Commission (PSBC) was formed by Executive Order in 2013 to be a liaison group in preparing for the Nationwide Public Safety Broadband Network (NPSBN). The PSBC is administratively supported by the Department of Public Safety and functions within RTS. The Vermont liaison group includes a Single Officer designee and program staff. On March 30, 2017, AT&T was announced as the winning bidderfor a 25-year contract to build the NPSBN. The NPSBN will provide a cellular type coverage to first responders, with priority and pre-emption features. FirstNet and AT&T are in the midst of a five-year nationwide network buildout plan that is required by federal law to be completed in 2022. As buildout proceeds, the broadband network will provide Vermont first responders with enhanced cellular coverage and represents another backup option for communication. Public safety practitioners are not required to use this network, but may subscribe as services, coverage and competitive pricing are developed.

Future Technology -- Technology developments in the future will include leveraging ways to use the enhanced broadband coverage provided through the FirstNet initiative to expand communication options for the public safety community. Among those considerations is how legacy LMR systems might interwork with a broadband network. A key tool to bridging these

technologies is found in Project 25 standards ("P25"). P25 is a joint effort of the Association of Public Safety Communications Officials and the National Association of State Telecommunications Director to ensure open standards-based digital radio systems. Standards developed and applied to digital radio systems under P25, provide common technical specifications for the interworking of LMR and Mission Critical Push-to-Talk (MCPTT) over LTE. MCPTT is an application designed to enable first responders to use their cell phones as they would a two-way radio. With the right interface, MCPTT applications can enable first responders to bridge into their legacy LMR systems. To take advantage of these opportunities, Vermont's public safety community must operationalize P25 digital in their LMR systems. The Department of Public Safety plans to operationalize P25 digital for the Vermont State Police, the largest enforcement entity in the state. In 2017, DPS conducted a survey of law enforcement entities regarding a switchover to P25 digital technology. The survey indicated that many of those entities were waiting for the VSP to begin transmitting via P25 digital radios before they made a technology change. Once the VSP makes the switchover, it is thought that a large number of other departments will also make the change. A challenge will be to find ways to assist departments who are unable to purchase new radios to accommodate this change.

The State should leverage the enhanced broadband coverage provided through the FirstNet initiative to expand communication options for the public safety community. The State should continue to maintain and operate the LMRS system for public safety use. The LMRS system will continue to provide vital public safety communications, especially where Firstnet broadband coverage is absent. Public safety entities should operationalize P25 digital technology

Enhanced 911

The State of Vermont is in its 20th year of providing a statewide 911 system. The system has kept pace with advances in technology since the first enhanced 911 call was processed on November 17, 1998. Vermont has taken a leadership role in implementing Next Generation 911 (NG911) services which utilizes Internet-Protocol (IP) to provide a more robust and resilient system.

NG911 technology, with its faster IP infrastructure, supports the transmission of both voice and data. This allows Vermont to take advantage of its robust GIS data. The GIS data is used for address validation pre-911 call, as well as for locating the caller at the time of the 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. As industry standards and best practices develop, Vermont 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.

The current fully-hosted NG911 system, implemented in July 2015, is provided by Consolidated Communications (formerly FairPoint Communications). In 2017, the system processed just under 200,000 calls for service. Over 66% of these calls were from cellular phones. There were 467 text messages to 911 in 2017. While this number may seem low in comparison to the number of voice calls, texting to 911 has proven to provide a life-saving service since becoming available six years ago. Text provides a critical service to the deaf and hard of hearing community and those who may be in a dangerous situation where making a voice call to 911 would only increase the danger. In areas where a cell signal is not strong enough to support a voice call but

strong enough to support SMS texting, texting may still be an option for accessing emergency assistance.

The 911 Board continues to find opportunities to leverage the NG911 environment and to improve all aspects of the service. Several projects focus on improving the accuracy of location information delivered to the PSAP with the 911 call – regardless of the type of device being used to make the call. The following initiatives are planned:

- Implementation of Location Validation Functionality (LVF) - this will improve location accuracy for wire line and VoIP callers by ensuring that addresses associated with these records are precisely matched with the authoritative 911 GIS data before the telephone service becomes active.
- Ensuring compliance with location requirements for users of Enterprise Communications Systems (ECS). These systems are common in schools, governmental agencies, large businesses, and hotels. Meeting the ECS location requirements ensures that a 911 call-taker can identify the precise location of the caller within these large facilities – thus reducing the risk for delays in emergency response.
- Careful monitoring of wireless carrier-provided location information to assess compliance with FCC established location accuracy metrics. In addition, the Board will seek to identify and evaluate additional tools for improving wireless location accuracy which are currently being developed by industry specialists.

As we look into the future, the E-911 Board will continue to work collaboratively with the system provider and other partners at the state, local and regional level to ensure Vermonters and our visitors are provided with a robust, reliable, and resilient statewide 911 system.

State of Vermont Middle-Mile Fiber Networks

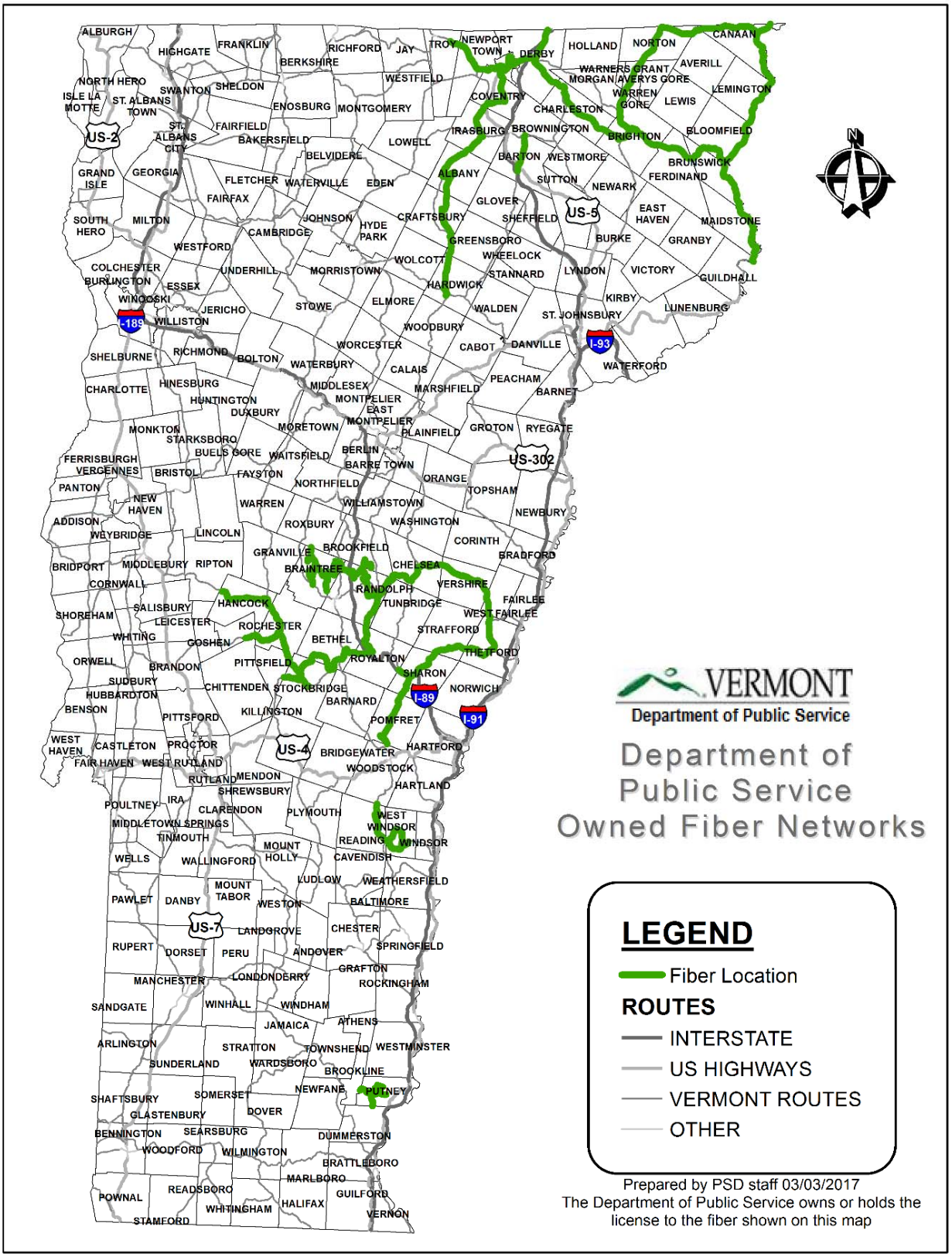
The State of Vermont, via the Vermont Telecommunications Authority built 100 miles of fiber-optic cable in two geographic regions of Vermont: The Northeast Kingdom and the Upper Valley. Through this construction, the VTA was able to leverage the use of an additional 200 of miles of fiber, thus facilitating for two complete regional networks. These networks are open access, meaning that anyone can lease and light strands of dark fiber at standard rates. Vermont Electric Cooperative uses the Northeast Kingdom Network to manage its electric utility operations. ECFiber uses the Upper Valley Network to bring broadband to Upper Valley residents. The Upper Valley Network was designed to meet the needs of last-mile residents, as the network winds through rural back roads and contains fiber splice enclosures at regular and predictable intervals. This network should be better understood as a last mile fiber project.

The Northeast Kingdom Network was designed as a middle-mile network. Use of these fiber assets by commercial internet service providers has not materialized as expected, although a few wireless towers are connected. Two related conclusions can be drawn about the lack of activity on the State's fiber network. First, access to middle-mile fiber resources was not the only barrier to last mile access or may not have been a barrier at all. Second, because Consolidated Communications and possibly other carriers have fiber along the same routes, wireless carriers are showing a preference for a full range of telecommunications services as opposed to the leasing specific unbundled network elements, such as dark fiber.

Nevertheless, the State should endeavor to make the most of these assets. In 2018 the Legislature approved a capital appropriation of $400,000 to the Department of Public Service to deploy fiber splice enclosures along the state's fiber routes. This will allow internet service

providers to easily access the network and allow them more opportunity to serve residential customers along routes such as 114.

The Department of Public Service assumed control of the State's fiber networks in 2015 after the dissolution of the VTA. The Department adopted the VTA's pricing schedule, in part to maintain continuity of operations and parity of pricing between current and future tenants. Nevertheless, given the lack of interest to-date in the state's fiber resources by the commercial users, the Department should consider reducing prices for dark fiber licenses. Any reduction should be carefully considered before implemented. Although construction of new middle-mile fiber should be discouraged, the state should do everything possible to encourage use of its existing fiber resources for rural broadband deployment.


VERMONT
Department of Public Service
Department of Public Service Owned Fiber Networks
LEGEND
Fiber Location
ROUTES
INTERSTATE
US HIGHWAYS
VERMONT ROUTES
OTHER
Prepared by PSD staff 03/03/2017
The Department of Public Service owns or holds the license to the fiber shown on this map
US-2
US-5
US-7
US-4
US-302
I-89
I-91
I-93
I-189

STRATEGIES

- The State should move forward with its initiative to increase the number of fiber splice enclosures in the Northeast Kingdom Network.
- The State should consider modifications to its fiber pricing schedule to encourage use by broadband providers.
- The state should discourage the construction of new state-owned fiber resources in favor of securing license to existing networks or providing grants to service providers to construct fiber resources.

State of Vermont Wireless Microcell Network

Since the publication of the *2014 Telecommunications Plan* the State, through VTA, deployed a network of wireless small cell antennas along select Vermont highways. The State's Vendor Vanu CoverageCo, Inc., experienced limited success with its early deployments. However, the business model proved too challenging to successfully implement. Accordingly, Vanu CoverageCo's contracts were terminated, and the network ceased operation. The State, which owns the small-cell infrastructure, remains committed to finding a new network operator. To that end, the State is seeking a new vendor to restart the network or try to find alternative models for deployment. It should be noted that the economics of serving rural Vermont with small cell technology are particularly challenging and service to these areas may ultimately need to come from a program that provides ongoing support facilities such as the FCC's Mobility Fund Phase II.

Agency of Digital Services Telecommunications Systems

As state government becomes more and more reliant on the use of information technology, the State of Vermont must establish internal telecommunications policies that ensure operations are not only enhanced, but also reliable, sustainable, and available for use anywhere. This telecommunications plan is designed to anticipate the needs of the state workforce for the next ten years. The State must procure and incorporate technologies that will optimize its

telecommunications infrastructure and create a platform that will enable the use of applications needed to support critical public services. In order for the State to remain innovative in its approach to telecommunications services, it must anticipate the needs of agencies and departments by designing and engineering a system that is flexible enough to handle any future technology. The 2018 Plan describes the ongoing optimization project that was started in fiscal year 2011. It also describes the current and future direction of the State's data and voice components, along with a strategic plan to move the State forward as new technologies become available.

Optimization

In 2003, the State of Vermont saw significant positive movement toward the effective management of telecommunications within state government. With the creation of the Department of Information and Innovation (DII), the State took initial steps toward an enterprise-wide approach of transitioning to a more centralized management concept. While the first stage of reorganization and integration took hold, it was appropriate to look at other ways to integrate state government telecommunications even further. In 2009, the Agency of Administration completed an Information Technology Optimization Project (I-TOP) assessment that led to a consolidation effort of information technology across state government. This consolidation led to cost savings, leveraging of existing and future vendor contracts, and centralized management of state government resources. In FY11, I-TOP was initiated and as of 2014, the telecommunication consolidation project was approximately 70% complete. I-TOP was completed in 2016, but continuous improvement of this initiative will continue over the next 10 years.

Strategies

- When examining its options for providing voice and data services to state government agencies, DII will examine both state-operated networks and facilities. DII is responsible for managing the

communications services provided and costs incurred across the entire state government enterprise.

- In budgeting for and funding state communications systems, facilities and services used for law enforcement, emergency response, emergency management, and public health threat response are considered high priorities.
- All state agencies and departments must consult with DII on planning and implementation of all major telecommunications projects, initiatives, and interagency service arrangements to ensure that these plans are consistent with state government enterprise-wide telecommunications policies and objectives.

Data Communications and Net Neutrality

Every three to five years, the State puts out to bid major telecommunications contracts for data services. Information technology changes rapidly during this intervening period. Services available have evolved, prevailing prices have changed, and a major upgrade to the network backbone of the State's telecommunications infrastructure was completed. The renewal of the state contracts for data communications services in the spring of 2014 represented an important opportunity to address these changes. The State maintains data contracts with multiple vendors to ensure the State avoids dependency for data services on a single vendor. It also gives the State an opportunity to leverage its power as a customer for the public interest, by bringing in high speed connectivity into rural locations and demanding higher quality service from those vendors that also support the private sector.

In 2018, Governor Scott signed Executive Order 02-18, which requires Internet service providers doing business with the state of Vermont to be net neutrality compliant. A company that provides data services to the State of Vermont must certify that it handles Vermont consumers' traffic in a neutral manner. Internet service providers may not block, throttle or

prioritize consumer traffic for their own commercial purposes. The Executive Order uses the State's purchasing power to achieve net neutrality for Vermonters and was enacted in response to the FCC's decision to rescind federal net-neutrality rules. Later in 2018, the Vermont Legislature enacted similar legislation into law. Under this law, the Attorney General's Office, in consultation with the Department of Public Service, will make further recommendations concerning net neutrality.

Strategies

- Except for those instances when there are overriding issues of public safety or security, state government should favor the use or creation of open networks above networks that only state government or elements of the public sector are allowed to use.
- The State must structure a request for proposals (RFP) for data communications connectivity to explicitly enable smaller vendors the opportunity to bid for a fraction of the state's data connectivity needs, or the state's needs in a particular region.
- The State should use its purchasing power and excess capacity on state-owned networks to promote improvements in telecommunications infrastructure, services, and prices, especially in unserved or underserved areas of the state.
- The State should seek to engage the purchasing managers at other telecommunications service providers on an ongoing basis. This should include entities such as colleges, schools, major businesses, and hospitals and health care networks. With these partners, State should seek to identify opportunities to coordinate purchases of telecommunications services for mutual benefit or to help improve telecommunications in the wider community.
- The State must make open space located in strategically placed state buildings available to telecommunications service providers, if doing so will enable telecommunications

vendors serving the State a better or less costly data telecommunications services to unserved or underserved communities.

- The State must issue a request for information (RFI) and an RFP (if warranted) for broadband service contracts to residences for state agencies and departments supporting telecommuting employees.

Voice Communications

In December 2015, the State initiated a transition to VoIP technology moving away from the traditional Centrex technology for voice communications throughout state government. As of December 31, 2017, the transition to VoIP was completed and the project closed out, with only a few small agencies electing not to join the new system. The State is poised to see significant costs savings and improved telecommunications service through operating a single voice and data network infrastructure, instead of providing separate voice and data services.

Strategies

- The State must continue to review emerging and maturing voice technologies and standards become firm.
- The State must continue to maintain a voice communications system that provides relatively low cost at high value to state government.
- The State should seek to balance lowest cost with features that enhance the productivity of state workers and improve service to the public, not allowing either one to eclipse the other as a consideration.
- The State must seek to establish a long-term technology migration path, while allowing enough flexibility to adjust to technology developments.
- The State must seek out telephone services that, when required, can be integrated with and complement other communications-related applications.

Strategic Plan

A strategic plan is necessary to help focus the State on future development and innovation of the State's telecommunication infrastructure. The design of the strategic plan was aided through reference to other state telecommunication plans, such as California's; however, the scope of this plan was designed to meet needs of State of Vermont.

The strategic plan emphasizes the need to continue with the move towards enterprise-wide management. It also addresses the need for a more robust and flexible telecommunications infrastructure. An emphasis is placed on public safety and emergency preparedness, along with the protection of all information assets. Finally, the strategic plan addresses the importance and need to integrate the State's telecommunications services.

Enterprise Approach

The State utilizes an enterprise approach towards management of telecommunications services. The State has accomplished this through acquisitions, management, and maintenance of enterprise-wide services that are necessary to support any current and all future State government operations. The State must continue to raise its level of telecommunications services to match its business needs. The state's needs must be identified during the planning, designing and implementation phases to ensure telecommunications systems are dynamic enough to support all State business requirements. To effectively implement an enterprise approach towards management, the State should:

- Periodically inventory existing telecommunications services.
- Identify telecommunications services required by State agencies and departments.
- Evaluate existing telecommunications services to determine if they meet the needs of the customer.

There are two critical components in the acquisitions process for telecommunications services: (1) procurement and (2) cost management. The State should only pursue additional enterprise-wide procurements that are timely and cost-effective. This can most effectively be achieved through leveraging of existing/future telecommunication contract vehicles. However, enterprise-wide procurement is only effective if contracts are centrally managed. Actual savings can occur through central management of state-wide contracts; as opposed to allowing individual agencies and departments the ability to manage telecommunication contracts within their organizations. To effectively transition to a centralized model of contract management, the State should develop an easy-to-use procurement vehicle for independent network service management and operational services, streaming video and audio services, and enhanced and extended data and/or voice services

In addition to centralizing the procurement process, the State should reduce complexity in its telecommunications cost-management. Previously, agencies and departments were responsible for managing their own bills for telecommunications services. This method incurred a substantial hidden cost of reconciling, reviewing, and approving invoices from telecommunication service providers. Efficiencies and cost-savings will be realized through the continuous efforts to centralize and simplify telecommunication services cost-management, where possible. To effectively realize cost savings, the State should continue implementing billing simplification options with telecommunication providers. It should also identify billing simplification options for other telecommunications costs and centralize invoices and ordering of data and telecommunication services that have been occurring for the past two years. Currently all voice and data orders must be handled through the Agency of Digital services. Most

telecommunication invoices are now handled through the Agency of Digital services and we continue to migrate other invoices as they are discovered.

Robust and Flexible Telecommunications Services

The State will procure robust and flexible telecommunications services in support of its business objectives. The State must remain innovative and forward thinking in its development and engineering of the telecommunications infrastructure.

To achieve this goal, the State should develop a more diverse network infrastructure. State networks must be engineered to support a wide variety of applications. Development of a more diverse network infrastructure gives the State flexibility in choosing locations where agencies and departments can conduct government business. This diversity also gives the State the unique ability to choose how business processes are conducted by being able to procure higher bandwidth options, along with network redundancy at critical locations.

To effectively implement this, the State should engineer appropriate wireless deployment models for use by state agencies and departments. The State must explore alternatives for shared high-speed communications services to support functions that include general backup, disaster recovery, and fault tolerance for multiple sites/organizations.

The State now has approximately 700 wireless access points throughout the State which allows users to conduct their business from practically any State office building.
The ability to enhance the State telecommunications infrastructure, as bandwidth requirements keep increasing, is a critical aspect of creating a robust and flexible network. The State agencies and departments administer many types of applications that rely on a considerable amount of network bandwidth. Modernizing an infrastructure that can quickly adapt to these unique requirements will enable greater types of usage, along with meeting business needs. To enable this to happen, the State should ensure advanced network features (e.g., Quality of Service

("QoS") and multi-casting) are built in to the network data flow. Vermont should implement and manage multimedia services to facilitate public access to government information and services, along with information exchange between government organizations. The State is now beginning to build in (QoS) on all State networks. This will allow the prioritization of data traffic ensuring that the most critical traffic gets higher priority. QoS was implemented early 2018.

Public Safety and Emergency Preparedness

The State has a responsibility to facilitate public safety and emergency preparedness. This will be accomplished through enhanced access to state-managed telecommunications networks and through improved survivability and sustainability of these networks. However, to ensure adequate protection of the public, the State will fulfill its obligations, related to public safety and emergency preparedness, by establishing an improved survivability and disaster recovery plan for the State's critical resources.

To achieve this goal, the State should assess the readiness, survivability, and flexibility the current telecommunications infrastructure and ensure the ability to recover from catastrophic outages is integrated into the operational plan.

The level of readiness, survivability, and flexibility of the State's telecommunications infrastructure will determine whether it has the capability to withstand any human made or natural disaster. An assessment of the level of readiness, survivability, and flexibility is critical in identifying single points of failure and unsustainable operations.

To enable this to happen, the State should direct a risk assessment of the readiness, survivability and flexibility of the State's telecommunications assets in the event of a major regional disaster and develop a proposed action plan for addressing identified deficiencies. Conduct a feasibility study of alternatives for survivable and rapidly recoverable

communications facilities for critical locations and initiate implementation to minimize and/or eliminate single points of failure. The ability of the State to recover from a catastrophic outage of telecommunications, power, IT resources, or other key infrastructure is totally dependent upon preparations and prioritization schemes developed prior to any major outage.

Strategies

- Ensure rapid recoverability and survivability features of new and existing telecommunication services are considered and used appropriately.
- Develop policies that facilitate prioritization of rapid restoration for the telecommunications infrastructure and any facilities affected by the disruption.
- Generate telecommunications fault tolerance guidelines and standards to be used for new State constructed buildings that address:
- Diversity of telecommunication pathways and installations.
- Minimum electrical power requirements needed to survive extended interruptions of utility services.
- Use current and emerging telecommunications technologies to provide information, directions, and status updates to the public during an emergency.
- Provide alternate region-wide emergency telecommunications capabilities for recovery from catastrophic or extended outages.

Protection of Information Assets and Networks

The State must protect its information assets and networks from loss, damage, misuse, and misappropriation. To ensure security of critical information assets, the State must take actions to secure its networks from unauthorized intrusion, malware, and other disruptions to the safe conduct of the state's business. State networks will be safeguarded from unnecessary or unauthorized use.

Strategies

- Establish policies and procedures for governing telecommunications security and
- Provide tools, services, and standards that enable organization to comply with these policies and procedures.

The establishment of policies and procedures that govern telecommunications security is necessary to create a safe and secure operational environment. It helps to educate users and produces a culture of smart business practices. It also sets an expectation of information security that is traditionally governed by state and federal statutes. Such policies should cover the following:

- Appropriate use
- Internet use
- Malware protection
- Expectation of privacy
- Mobile devices
- Remote access
- Identity management
- Authentication

Policies covering the management of remote connectivity to the network should cover:

- Virtual private networks
- Remote desktop and client applications
- Telecommuting
- Access from publicly accessible computers
- File sharing
- Network access control

The State should provide the security tools, services, and standards to all the agencies and departments. This will enable organizations to comply effectively with all security policies and requirements that are implemented.

Strategies

- Establish a repository for network security best practices, maintain an inventory of current installed technologies, and provide general information to the user of the State's telecommunications network.
- Assess the need of contracts for security products and service offerings (e.g., intrusion protection systems, firewall implementations, network access control, network vulnerability assessment, etc.).
- Implement a security strategy for wireless deployment.

Integration of Telecommunication Services

The State should promote the integration of voice, data, and video services. The State should move sensibly and deliberately toward unified communications. Unified communications services offer the promise of broader capabilities to better serve the public sector, while significantly reducing operational costs. Converged telecommunications technologies, when compared to traditional "silos" of voice, data, and video, offer efficiencies that must be investigated for possible cost savings and service improvements.

Strategies

- Develop a technology plan for state organizations that includes voice, data, and video services.
- Design networks with the capability of supporting integration of voice, data, and video services.
- Draft standards to ensure consideration of opportunities for integration in any new development or major redevelopment projects.

III. Regulatory and Policy Considerations

Introduction

Broadband expansion efforts have focused largely on regulatory reform. The federal Telecommunications Act encourages the removal of "barriers to deployment." Under this theory, cell and broadband providers will naturally expand their networks when regulatory red tape is removed. For instance, in recent years the FCC has sought to preempt state laws precluding the expansion of municipal broadband and local zoning laws of wireless infrastructure. Most recently the FCC implemented one-touch make ready for its pole attachment rules.

Vermont has adopted a similar approach, especially with regard to wireless deployment. Removal of barriers to deployment has encouraged growth and innovation in the state's telecommunications market. But there is still more to do in this area. It should also be noted that removal of barriers to deployment alone will not guarantee universal service. Nevertheless, movement toward this goal will require reconsideration of the many rules, regulations, and laws that affect the provision of telecommunications services. The 2018 Plan calls for several such reforms.

Section 248a Wireless Site Permitting

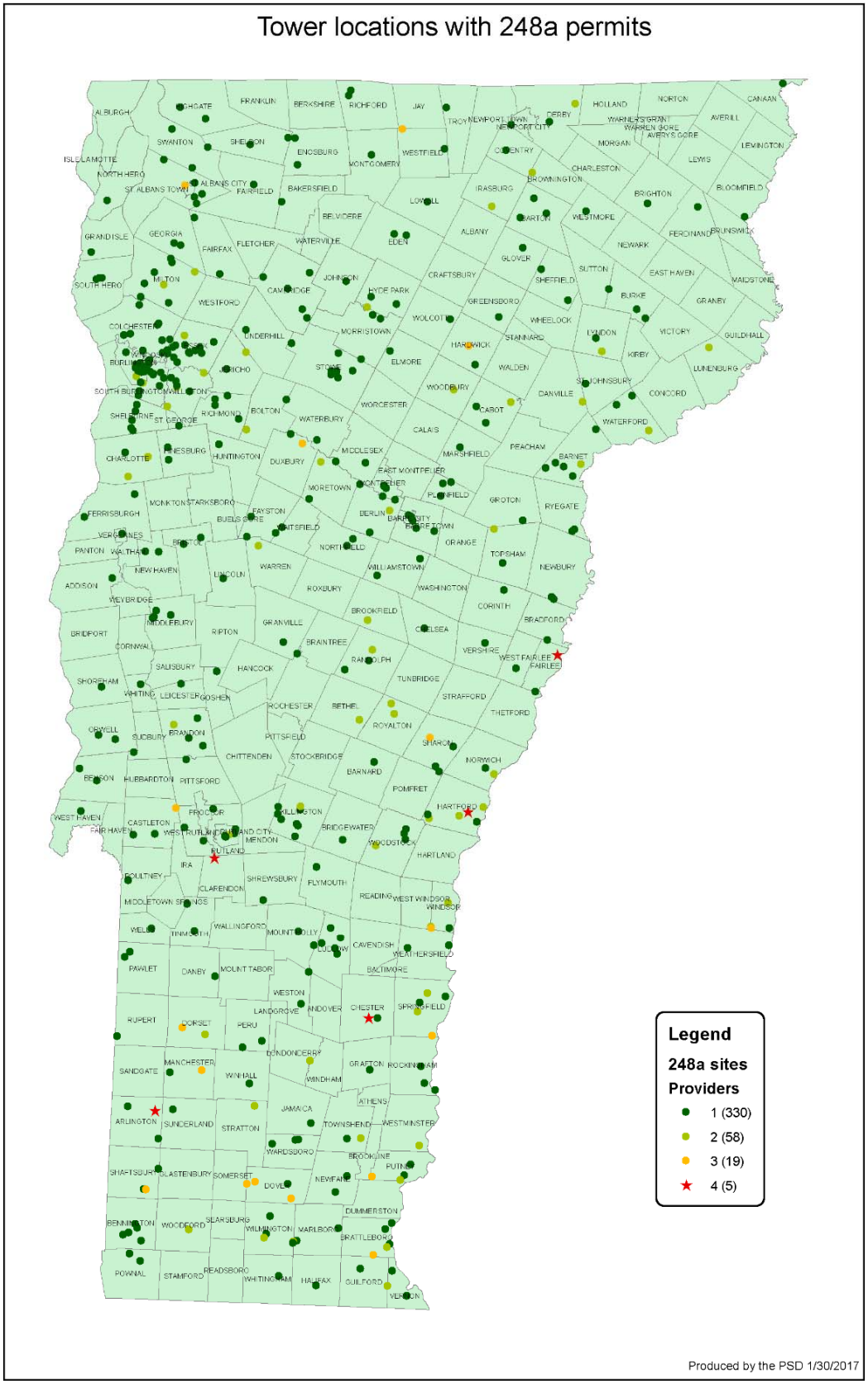
In 2009 the State adopted a wireless telecommunications siting law that establishes for a state-wide permit process.[24] This law gives wireless providers the option of seeking a permit from the Public Utility Commission to construct wireless facilities rather than seeking permission through the local zoning authorities and Act 250 review. 248a jumpstarted wireless development in Vermont. However, it also raised concerns about land use, aesthetics, and environmental impacts. The law has been modified over the years to increase public participation in the 248a

[24] 30 V.S.A. § 248a

process. The law is temporary and is slated to sunset in 2021. The sunset provision is an important opportunity for the Legislative and Executive branches to reassess the value of Section 248a to Vermont and consider changes. Nevertheless, with nearly ten years of success behind the law, it may be time to reconsider whether this successful statutory process should be made permanent.

There is, at least one piece of the 248a law that should be made permanent. Applications for *de minimis* modification, pursuant to section 248a (k), allow for minor changes to be made to existing facilities. Under this application process, providers are not allowed to extend the height or width of a facility structure. Most companies use the *de minimis* application process to make minor upgrades, to existing facilities, such as swapping old antennas for new ones. This section of the law has not been controversial and has allowed for quick upgrades especially when carriers advanced to 4G/LTE, thus the Section 248a *de minimis* provision should be made permanent so that facilities can always be upgraded quickly as new technology comes on the market.

Over the years an issue with timely construction has arisen. Carriers have sought and received certificates of public good to construct new facilities but have not necessarily followed through with construction of those facilities. The PUC should adopt a procedure that requires construction to commence within one year of receiving the CPG and completion within two years, and this requirement should be added to new certificates of public good issued under 248a. This change would help guarantee that permitted facilities get built. Carriers may argue that they would be disinclined to seek permits if such restrictions were put in place, but that is not necessarily a bad outcome. Resources at the PUC and Public Service Department might be saved if carriers only applied for CPGs for facilities they new they were going to build.


Tower locations with 248a permits
Legend
248a sites
Providers
1 (330)
2 (58)
3 (19)
4 (5)
Produced by the PSD 1/30/2017

Mobile Wireless Resiliency

Since Hurricane Irene in 2011, concern over the integrity of mobile voice infrastructure has risen. Similarly, with the hurricanes that have hit Houston, Puerto Rico, and Hawaii in the last two years, national attention has been brought to the need for resiliency in our nation's wireless infrastructure. It is clear that wireless facilities remain vulnerable to extreme weather. As the effects of global climate change continue to affect Vermont, these facilities will become even more vulnerable to damage and destruction. Vermont must take steps to protect wireless communications, so that these facilities are working properly when they are needed most. The State should consider policies and incentives for enhancing the resiliency of wireless communications facilities by ensuring that such facilities are soundly constructed and have the ability to maintain electricity and connectivity during sustained power outages. State policies will need to consider the limits of federal law in this realm.

Small Cell Deployment

The Section 248a law should be expanded to encompass small-cell deployments in the public right-of-way. Currently there is no regulatory process for reviewing small-cell installations placed in the public rights of way. Act 250 is triggered only when an installation exceeds 49 feet or for utility pole sets of a certain length, for instance a mile. Section 248a is optional. Most small cell deployments on utility poles do not trigger Act 250. Without the Act 250 backdrop, nothing limits a wireless carrier from deploying equipment in the public rights-of-way. But safety and reliability remain a key concern. Therefore, to ensure that small-cell deployments undergo public and government scrutiny, a process for permitting of small cell deployments should be considered.

Pole Attachment Reform

Vermont has always cut its own path when it comes to the regulation of utility poles. Vermont is one of 21 states that have exercised its right to "reverse preemption" of the FCC's

model pole-attachment rule. Vermont has its own rule, which closely follows the FCC's rule. However, Vermont differs from the model rule in two ways. First, Vermont currently maintains separate fee calculations for telecommunications and cable-video attaching entities. Second, Vermont has yet to adopt the "one-touch" make-ready rule. This plan puts forward two recommendations for reforming the pole-attachment rule that address these differences.

Pole Attachment Rates

Telecommunications carriers must purchase space at a "two foot" rate whereas cable providers enjoy a "one foot" rate. This rate differential was predicated on the notion that the state should encourage the development and expansion of cable facilities. At the time the rule was implemented cable-video providers were not direct competitors of the incumbent pole owner.

Today, cable companies directly compete with telephone providers in the voice, broadband and video markets. With the convergence of separate services onto one platform, it is no longer appropriate to think of cable companies as simply video providers. Competitive local exchange carriers have called upon the Public Utility Commission to set a unified rate with a presumption of use at one foot. They argue that attaching entities use only one foot when setting cables and should be charged for what they actually use. They also argue that establishing a one-foot rate would encourage broadband deployment. Pole owners have argued for the two-foot rate as a more accurate representation of the true cost of maintaining the infrastructure. Cable companies they argue should pay the two-foot rate given that they are providers of telecommunications services and are no different from any other facilities-based telecom provider.

There is little evidence that companies would use savings from reduced pole attachment fees to deploy more broadband. Given that pole-attachment fees make up a small fraction of most providers' overall operating costs, it does not seem likely that enterprise-level CLECs would use

the opportunity to enter the residential or small business market. The argument in favor of the two-foot rate is predicated on the assumption that pole owners, especially incumbent telephone companies would use earnings derived from poles to maintain the poles. While it is true that pole-attachment fees do not cover the full cost of maintaining the pole plant, one only has to drive a short distance down any road in Vermont to see an example of deferred maintenance, such as dual poles, rotted poles, lines on the ground or splice boxes dangling from a telecommunications attachment. Amending the rule to a one-foot or two-foot rate would create arbitrary winners and losers, and there are few public policy rationales to support either decision.

The Department of Public Service has advocated for a unified rate that is "revenue neutral." Under this plan, the rate would be calculated based on current pole attachment fee revenues. The rates would fall somewhere between the one-foot and two-foot rate currently in place. CLECs would receive a slight decrease in fees paid to pole owners, while cable companies would likely pay slightly more. Pole owners would receive the same revenue that they currently receive and attaching entities would be treated fairly. The State should implement a unified rate for pole attachments.

Make-Ready Reform

For any competitive local exchange carriers seeking to expand its network, make-ready delays have become a notorious impediment. Make-ready is the work that must be done on a pole before a new entity can attach its cables. Such work often includes moving existing lines up or down on the pole, replacing a pole, or reinforcing a pole. Trained engineers are sent to do make ready surveys and attaching entities bear the cost of any work.

Although the pole attachment rules clearly delineate the responsibilities of pole owners and attaching entities, no mechanism is in place to quickly remedy make-ready delays or disputes. Pole

owners have been accused of purposefully delaying the issuance of pole licenses. Alternatively, it may simply be that owners cannot keep up with the volume of pole attachment requests. Such disputes rarely come before the PUC, in part because staff at the affected companies seek to maintain positive working relationships with their counterparts at the pole owning entity.

Pole owner delays impede the progress of those providers that have set aggressive construction schedules. Therefore, the 2018 Plan recommends that the PUC Pole Attachment Rule be amended to include self-help remedy for attaching entities. In instances where the pole owner has passed the deadline for performing make ready and issuing the licenses, the applicant may dispatch a contractor from a pre-approved list of contractors to perform the work. A similar concept has been put in place in Maine and New Hampshire. While not quite one-touch, it allows for quick resolution to pole make-ready delay. And obviates the need for litigation. Under the current rules the pole owners are required to maintain a list of preapproved contractors, but the attaching entity does not have the right to dispatch a contractor.

Such a rule change could also help pole-owners remove dual poles. Dual poles are unsightly, and many are not functional. Dual poles can also be an unnecessary safety hazard for motorists, and utility line workers. In instances where the incumbent telephone company has not moved its lines in electric pole set territory, the electric company could use the same rule to hire a contractor to relocate the telephone line so that it can remove the old pole.

Communications Union Districts

In 2015, Vermont enacted a law allowing municipalities to create Communications Union Districts (“CUDs”). Municipalities use similar structures to provide water, and trash collection services. CUDs can be formed to deliver telecommunications services. Forming a CUD can give municipalities access to private financial resources and allows a growing municipal operation to

enjoy increasing economies of scale. Today Vermont has two CUDs: the East Central Vermont Telecommunications Union District and Central Vermont Internet. This Plan makes several recommendations to improve the ability of CUDs to flourish. This section focuses on two regulatory reforms.

First, public records laws[25] should be strengthened to protect CUDs from the forced disclosure of competitively sensitive information. CUDs operate in a fiercely competitive market, yet they are still municipalities subject to Vermont's Public Records Act. The Public records law could exempt CUDs from disclosure of competitively sensitive material such at subscriber specific information, subscriber counts, traffic data, and infrastructure maps. This information can be used by competitors to gain an advantage in the market place, and it is not information that private companies are obligated to disclose to the public. If CUDs are to meaningfully compete in the telecommunications space, they should enjoy the same protections as private companies. Although competitively sensitive materials are exempt from disclosure, a clear statement in the public records act specifically exempting CUDs from these types of disclosures would provide clear guidance to municipalities about what can and cannot be disclosed.

Second, the 2018 Plan recommends amending the current prohibition on municipalities pledging tax dollars to fund telecommunications plant. Vermont law currently prohibits towns from using taxpayer money to fund the capital expenditures and operations of a municipal telecommunications facility.[26] The intent of this law is to protect towns from investing in unprofitable broadband networks. The law could be changed to allow towns to bond for some capital expenditures of existing or starting networks. This new program would mirror New

[25] 1 V.S.A. §§ 315-320
[26] 24 V.S.A. § 1913

Hampshire's SB 170, which provides a process for towns to bond to expand networks to unserved locations within a municipality. Vermont could use a similar program to help start Communications Union Districts as well as allow towns to invest in existing networks of incumbent providers. Limitations on the authority to bond would need to be put in place. Such limitations should include focusing capital to underserved locations only, limiting the amount (or percentage) of tax payer dollars allowed to be collateralized, and setting technical requirements for the service. Lastly, the State should consider ways to help towns explore the feasibility of CUDs through resources geared toward planning.

Basic Telephone Service

Universal service is the cornerstone of telecommunications policy both in Vermont and nationwide. For many rural Vermonters, basic landline telephone service is a lifeline to the outside world. Many of the state's rural communities lack meaningful competition from cable and wireless providers. Even where there is competition, there is no obligation that competitors maintain service. Therefore, in some cases, basic local exchange service provided by the telephone company is the only communications service available to the rural customer.

The state has 10 independent telephone companies and legacy RBOC committed to universal service. These companies are eligible telecommunications providers (ETCs) and as a result of their ETC status, must provide service throughout their territory. These companies also provide much needed lifeline service.

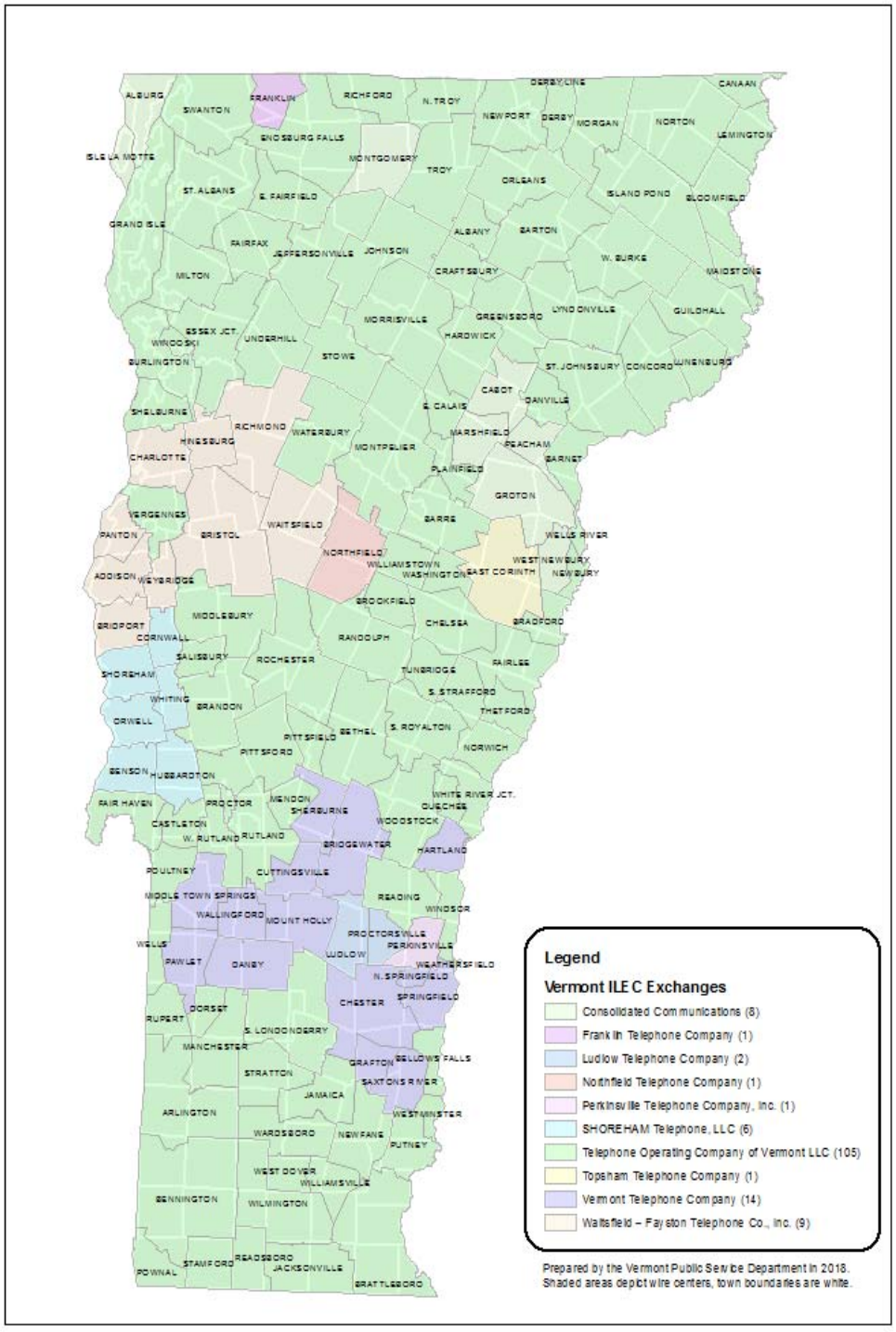
Yet Vermont is witnessing a decline in service quality in rural Vermont. An aging copper plant coupled with cuts in staffing have resulted in an inability of Consolidated Communications to maintain adequate service quality. As the largest rural provider, such degradation in service quality is unacceptable. At the same time the state needs to recognize that competition in the

market has shifted the focus for providers long-term planning to quarterly earnings. Competing in urban markets takes resources that could otherwise be devoted to rural service quality. Churn and line losses are a reality for incumbent telephone providers.

Regulations pertaining to POTS differs from that of other voice products. The state cannot regulate wireless service. The state's regulatory authority over VoIP is also in question and the subject of pending litigation. But the Telecom plan calls upon Vermont and the nation to regulate like services in the same way. Whether consumers use VoIP, POTS, or mobile wireless, consumers expect and deserve a basic level of service quality.

The state's primary focus should be placed on those consumers that have limited access to landline alternatives to incumbent telephone service. Vermont, through the PUC, should revisit how basic voice service is regulated with an eye toward preserving high quality phone service in the rural areas and bringing parity to the regulations that pertain to VoIP and POTS. The State should continue to support the use incentive regulation plans under 30 V.S.A. § 226b so long as it continues to promote the general good of the state. Service quality, however, should continue to be a consideration when approving such plans.

Territories of Vermont Incumbent Telephone Companies



Landline FTTP Resiliency

Resiliency and public safety are important considerations in telecommunications planning. With the aging out of plain old telephone service and the proliferation of fiber-to-the-premises, DSL remote terminals, and VoIP products, many Vermonters cannot rely on copper wires to maintain power to the communications lines in the event of a power outage. FTTP and VoIP products generally need power inside the home to work. Even traditional copper lines, which have been rewired to a remote terminal require a battery or generator source at the terminal in order to work during an outage. Lastly, consumers tend to favor cordless powered telephones which must have power to operate as well.

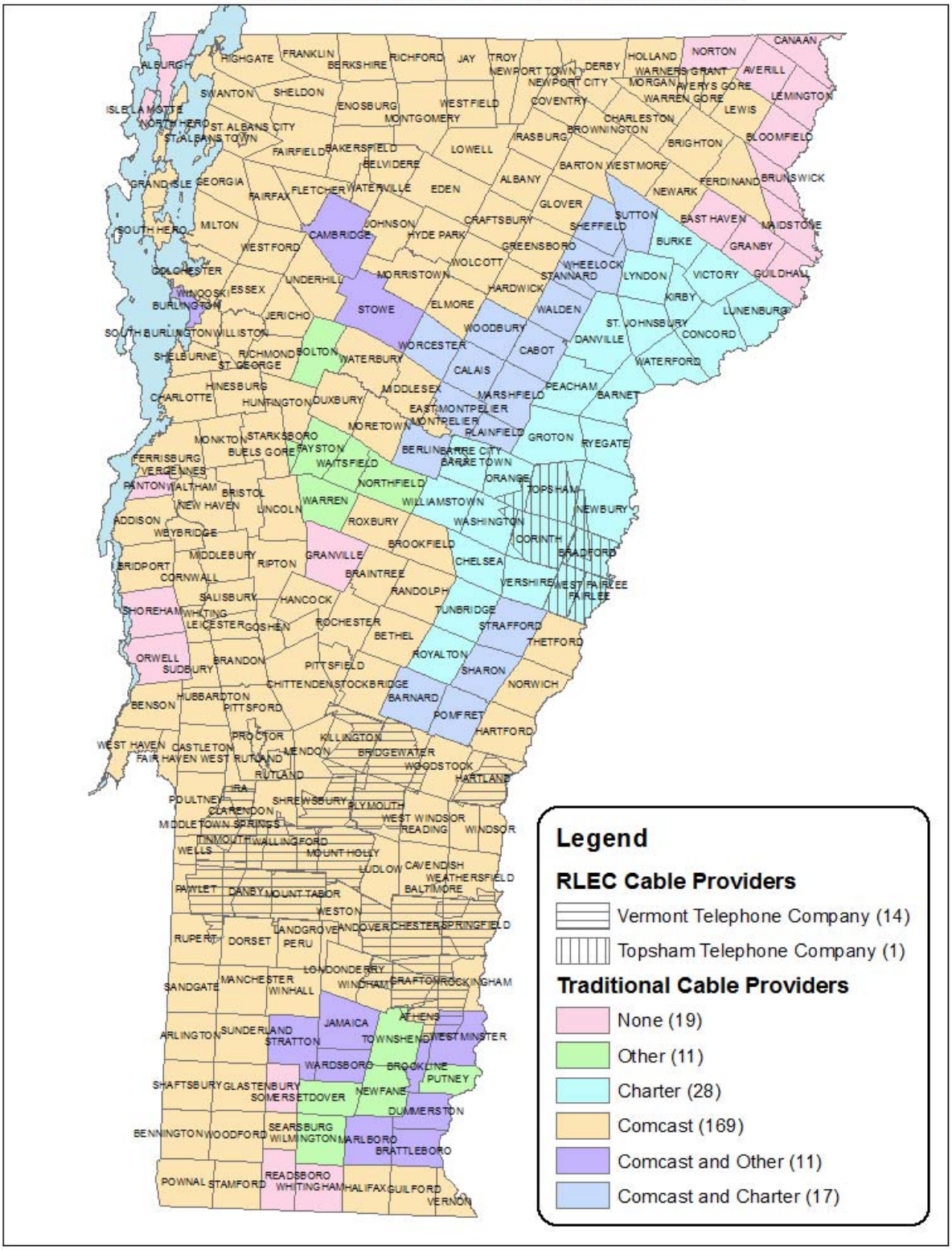
Therefore, communications should be a top consideration for energy planners as they think about distributed power, grid resiliency and integrated resource planning. The best way to ensure the resiliency of voice service during a storm event is to ensure that the power stays on. Vermont must find ways to reduce the occurrences of power outages, whether by focusing on in-home batteries, redundancy, or on better vegetative maintenance of the utility right of way. Our communications systems must have electricity and our electrical systems must have communications. It is in the best interest of both industries and the public to work together to improve resiliency in the energy supply, with everything from improving efficiency in the right-of-way clearing to transforming our distributing grid.

Cable Video Line Extensions

Cable television remains an important mode of communication for Vermont. Vermont has nine cable companies doing business in the State: Comcast, Charter, Stowe Cable, Burlington Telecom, Southern Vermont Cable, Duncan Cable, Topsham Communications, Waitsfield Champlain Valley Telecom, and VTel. Although the state is preempted from regulating rates, the State has maintained franchising authority for cable video systems at the PUC. The State has a

long-standing rule that governs the expansion of cable video systems. PUC Rule 8.232 governs the extension of cable services. The cable line extension rule can be a valuable tool for extending broadband and voice services as well, since cable companies now offer them with their cable-modem service. The rule provides a cost-sharing model which gives residential consumers a predictable formula for calculating cable-line extensions. This rule should be preserved, and policy makers should pay close attention to it as they craft broadband expansion programs. For instance, public funding could be used to pay some amount of the customer portion of cable line extensions.

Vermont Cable Franchise Areas



Prepared by the PSD 3/1/2018

Public, Educational, and Government Television

Public Educational and Government Television ("PEG TV"), better known as public access television is an important service provided to cable-video subscribers. PEG TV stations are run by Access Management Organizations (AMOs), typically 501(c)(3) non-profits dedicated to running these stations. The *2014 Plan* focused on AMO's as producers and facilitators of video content view on cable channels. While this statement is true, AMOs think of themselves as "Community Media Centers." AMOs facilitate civic and cultural engagement and free speech. They offer resources, support, and training to support community involvement in local programming. They also provide much needed education for those that want to learn about video production. Public access organizations are engrained in the community They are often the only video media source for their respective communities.

With changes in technology, AMOs are migrating to online platforms, just like private media. For instance, one has only to search for "Burlington City Council" on YouTube to find the latest city council meetings available thanks to content uploaded by Channel 17 Town Meeting TV. [27] For the many consumers who choose to cut the Cord, PEG TV is still an important conduit for local information.

The way AMOs are funded is not keeping pace with changes in technology and is increasingly outdated. PEG TV is funded through a 5% franchise fee on cable video revenues, which cable companies pay for use of the state's rights-of-way. With consumer demand for broadband increasing and plenty of over-the-top video options on the market today, cable television consumption is expected to decrease. These trends could negatively affect AMO

[27] This task is even easier for Xfinity customers who have adopted voice activated TV remotes. One has only to speak" Burlington City Council" into the TV remote, and, using the consumers cable box, the remote will search Youtube for the content.

revenues in the long-term. As much of the AMOs fee structure is driven by federal law policies, it will be incumbent on Congress and the FCC to give the states more leeway on PEG Funding. Congress prohibits the taxation of broadband internet access services and the Cable Act of 1984 is explicit on what can be levied as a franchise fee. If the law does not change and cable video trends remain on their current trajectory, AMOs may be faced with having to find alternative sources of revenue.

New methods of supporting community media centers should be explored, as cable subscription revenues decrease. There should be a nexus between the revenue source and the services provided by community media centers, with consideration for the inability of the State to tax internet-access subscriptions. AMOs may consider supporting a state-wide public access station that could provide a host of community resources in addition to local content, such as video conferencing.

Cable Video Plant Taxation

During the public hearings attendant to the preparation of the 2018 Plan, testimony was taken on the inequities of cable plant taxation. Cable companies pay real estate taxes on plant in service whereas telephone companies do not. Such inequities give telephone companies a competitive edge over cable companies. Taxation of cable and telephone systems should be reviewed to ensure equal treatment by local and state taxing authorities.

Vermont Universal Service Fund

The Vermont Universal Service Fund was created in 1994 to create a financial structure that would allow every Vermont household to obtain basic telecommunications service at an affordable price. This structure is supported with a proportional charge on all telecommunications transactions that interact with the public switched telephone network, except that "information" services are exempt from the fee by federal law. These services include Internet access services such as DSL, cable-modem, fiber, and wireless data. Today the fee of charge is 2% of a retail customers' telephone charges. The VUSF is managed by an independent fiscal agent.

The Vermont Universal Service Fund supports five programs: telecommunications relay service, the state's Lifeline Program, Enhanced 911, the High-Cost Program and the Connectivity Initiative. The 2019 Budget is depicted in the pie chart below. Except for the program administration and the E911 budget, the actual expenditures for the fund depend on usage of the funded programs. Lifeline and TRS are not capped and fluctuate with use.

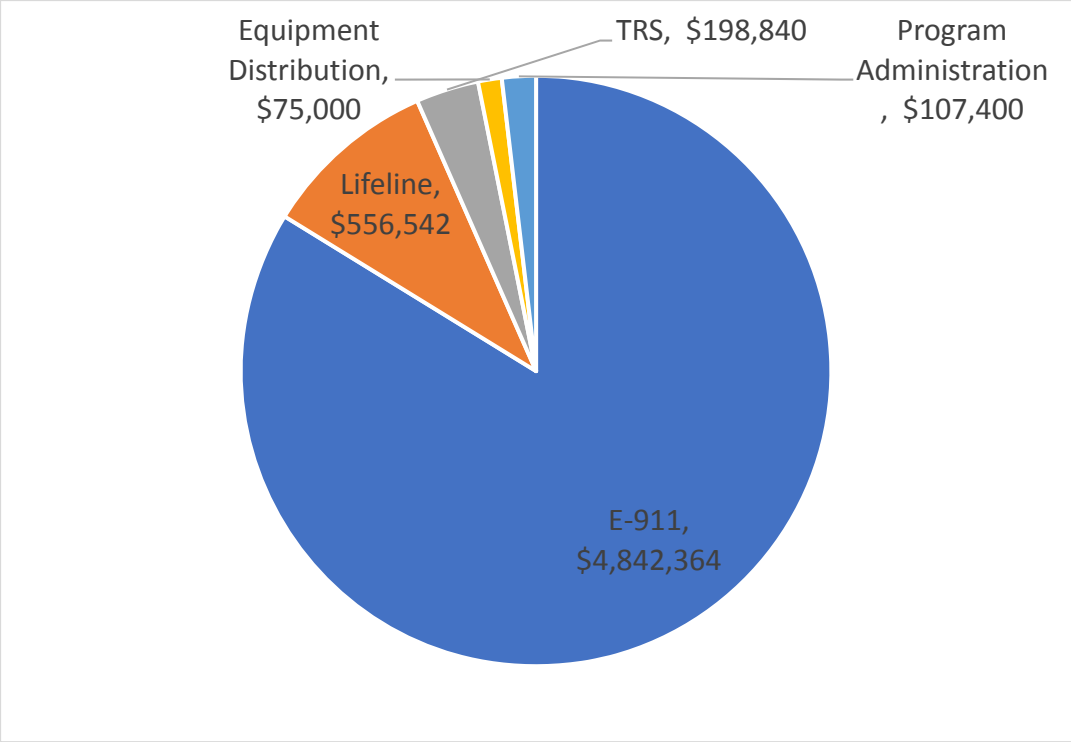


Figure 1: VUSF budgeted expenses for FY18. Note: expenses exclude funding made available to the Connectivity Initiative which is not a budgeted expense.

Revenues

The VUSF fee is set by statute at 2% of retail telecommunications transactions. VUSF revenues fluctuate from year-to-year based on market trends. The industry is becoming more competitive, resulting lower prices for services. Additionally, consumers who once had landline and cell phones have "cut the cord" in favor of mobile only service. VoIP and VoLTE services have transformed the delivery for voice and questions over the ability of the State to regulate these services have been mired in litigation. Recent federal precedent suggests that states may be precluded by the Telecommunications Act from regulating these new voice services in the same way as plain old telephone service.[28] Decisions like this, if upheld in the Second Circuit, could

[28] *Charter Advanced Services, LLC v. Minnesota Public Utilities Commission*, ___ F.3d___ (8th Cir. 2018)

have serious negative implications for the VUSF as it is possible that such a decision could bar the State from assessing a fee on a large and growing segment of the voice market.

As broadband and voice services become an integral part of our healthcare, energy, labor, and agriculture markets the State should consider broadening the funding sources for the VUSF supported programs so that universal availability of voice and internet access services can be achieved and maintained without putting the VUSF at the risk of insolvency.

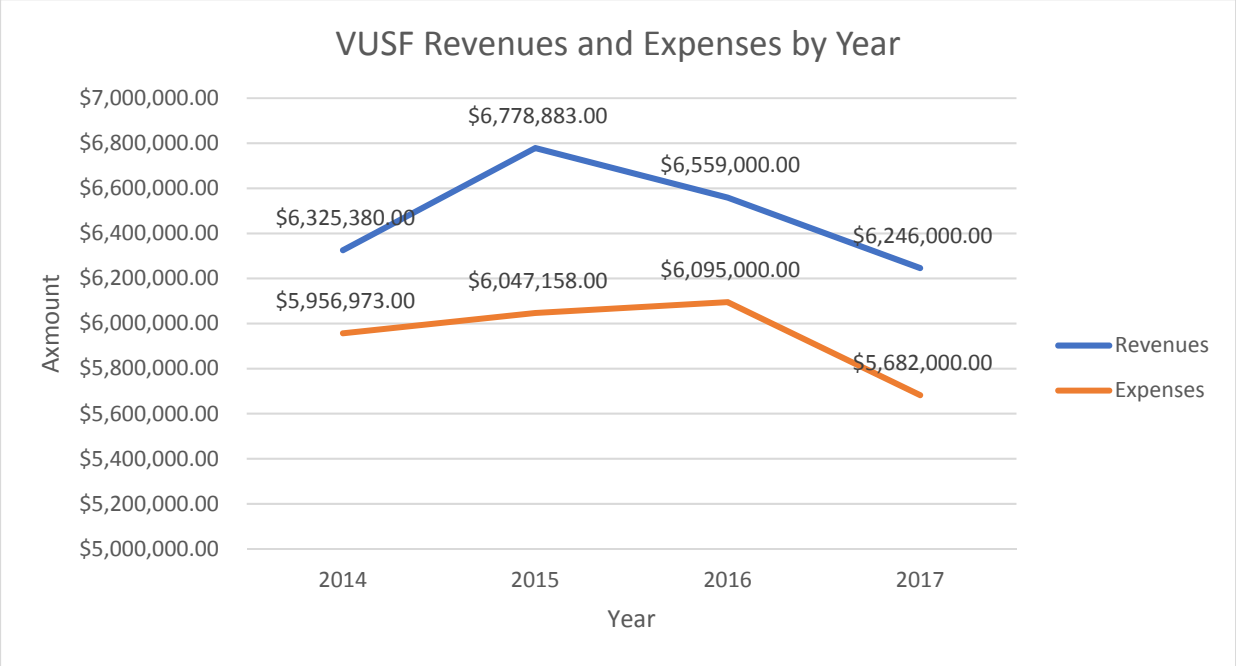


Figure 2: VUSF Revenues and Expenses by Year

The Lifeline Program

Lifeline is a valuable program that helps make telecommunications services more affordable for consumers with low incomes. The Universal Service Administrative Company (USAC) oversees the national Lifeline program across the country.

First established in 1985, Lifeline is a federal program that provides a $9.25 monthly discount on mobile or landline phone or internet service to eligible households receiving their

telecommunications service(s) from participating Eligible Telecommunications Carriers (ETCs). At the end of 2017, nearly 15,000 Vermont households received this important benefit. Changes in the national program may be attributable to declines in enrollment here in Vermont. The FCC compelled Vermont to join the National Lifeline Accountability Database and the State will soon be compelled to join the National Verifier. While the goal of these programs is to reduce waste, fraud, and abuse within the program, many are concerned that legitimate beneficiaries of the program are being eliminated through new programmatic requirements.

The FCC is also taking steps to dramatically scale back the wireless lifeline program. Currently, wireless eligible telecommunications carriers, such as Q-Link, provide mobile phones through the program. Most wireless ETCs are non-facilities mobile virtual network operators ("MVNOs"), meaning that they do not own towers and networks. MVNOs resell services of other facilities-based providers. The FCC issued a Notice of Inquiry seeking comments on rules that would limit the wireless Lifeline credit to facilities based ETCs.[29] There are no facilities based ETCs currently offering the lifeline service in Vermont.

Vermont's Universal Service Fund provides an additional state lifeline discount on telephone service only, and the amount varies between companies depending upon the provider and the cost of service but may not exceed $4.25 per month or the amount of the VUSF-funded credit a Vermont household received as of November 1, 2017. Other carriers may offer a discount for low-income consumers, but they are not required to do so, and they do not get reimbursed for their costs from the VUSF.

[29] *See* WC Docket No. 17-287; WC Docket No. 11-42; WC Docket No. 09-197. Vermont's lifeline credit does not support mobile wireless services because wireless ETCs by-and-large price their offerings to be the exact amount of the federal credit – $9.25 – making the service free to lifeline recipients.

The Vermont Telecommunications Relay Service (TRS) is also changing. 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.

IV. Telecommunications Almanac

Title 30, Section 202d(b)(3) provides that *Telecommunications Plan* should provide an assessment of the current state of telecommunications infrastructure. The statute also requires the *Plan* to provide an assessment of the state of telecommunications networks and services in Vermont relative to other states. This section provides information about Vermont based networks and services and compares Vermont to other states.

Nationwide telecommunications service revenue has declined from about $290B in 2005 to about $190B in 2016. Over the same time period, revenue from information services has increased from $85B to $311B.

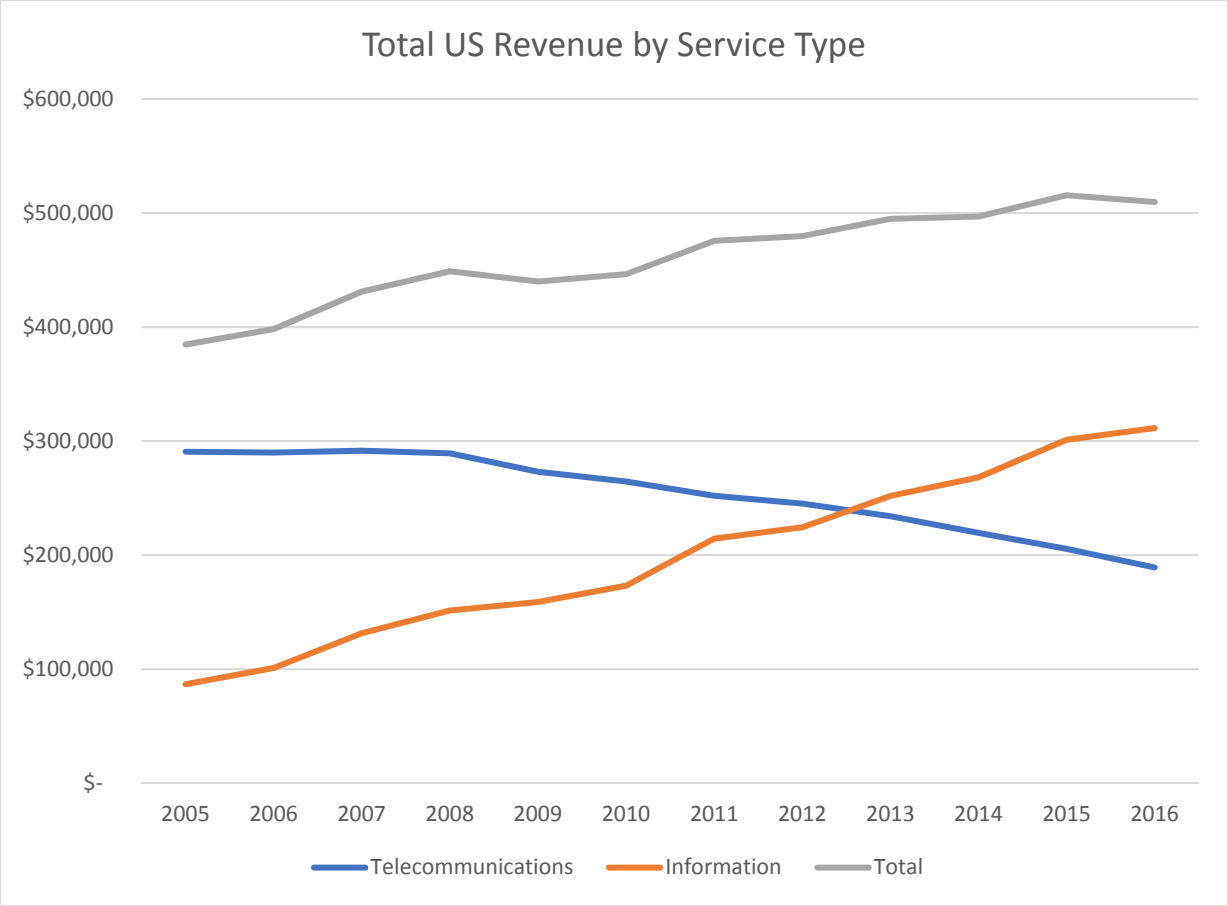


Figure 3:Total US Telecom Revenue by Service Type; Source: USMR Table 1.1 Filer Revenues by Service Type: 2005 -2016 (in Millions of Dollars)[30]

Vermont makes up only a small portion of national telecommunications revenues. The chart below depicts 2015 revenues for New England states.

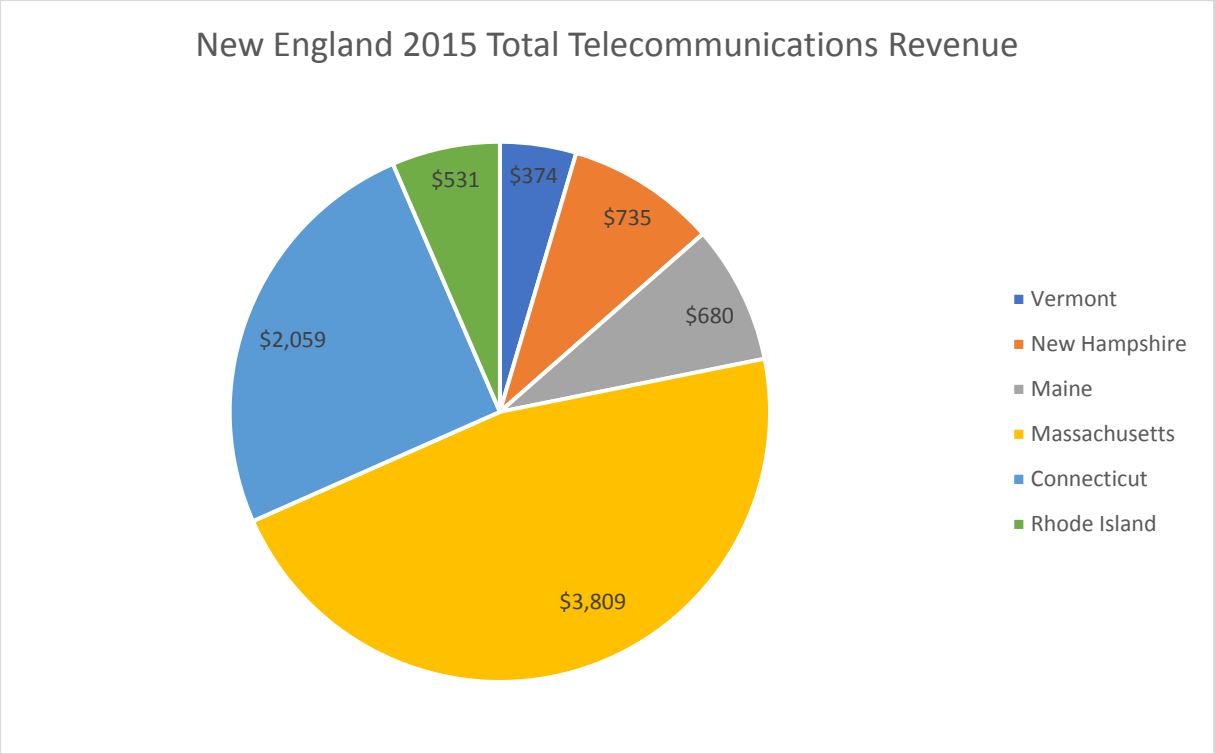


Figure 4: New England 2015 Total Telecommunications Revenue; UMSR Table 1.8 End User Telecommunications Revenue by State 2015 (in Millions of Dollars)

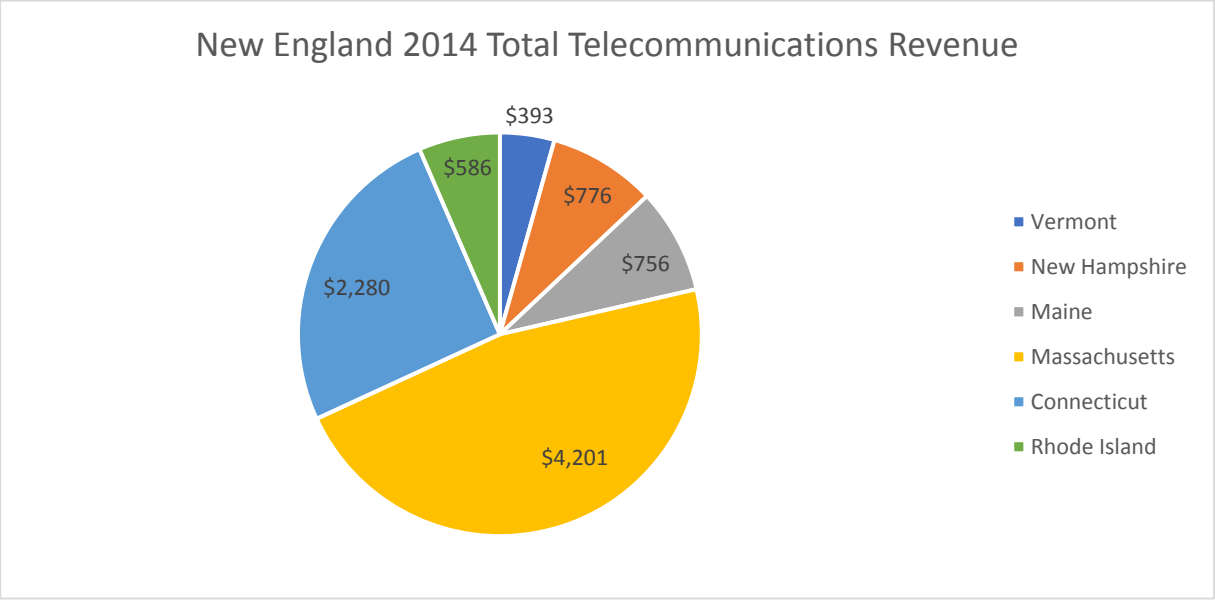


Figure 5: New England 2014 Total Telecommunications Revenue; UMSR 2015 Table 1.8 End User Telecommunications Revenue by State 2014 (in Millions of Dollars)

Intrastate telecommunications, that is, services that occur within a single state, are regulated by the states. Interstate and international telecommunications are regulated by the Federal Communications Commission. The portion of telecom revenue that is intrastate varies, as show in the table below:

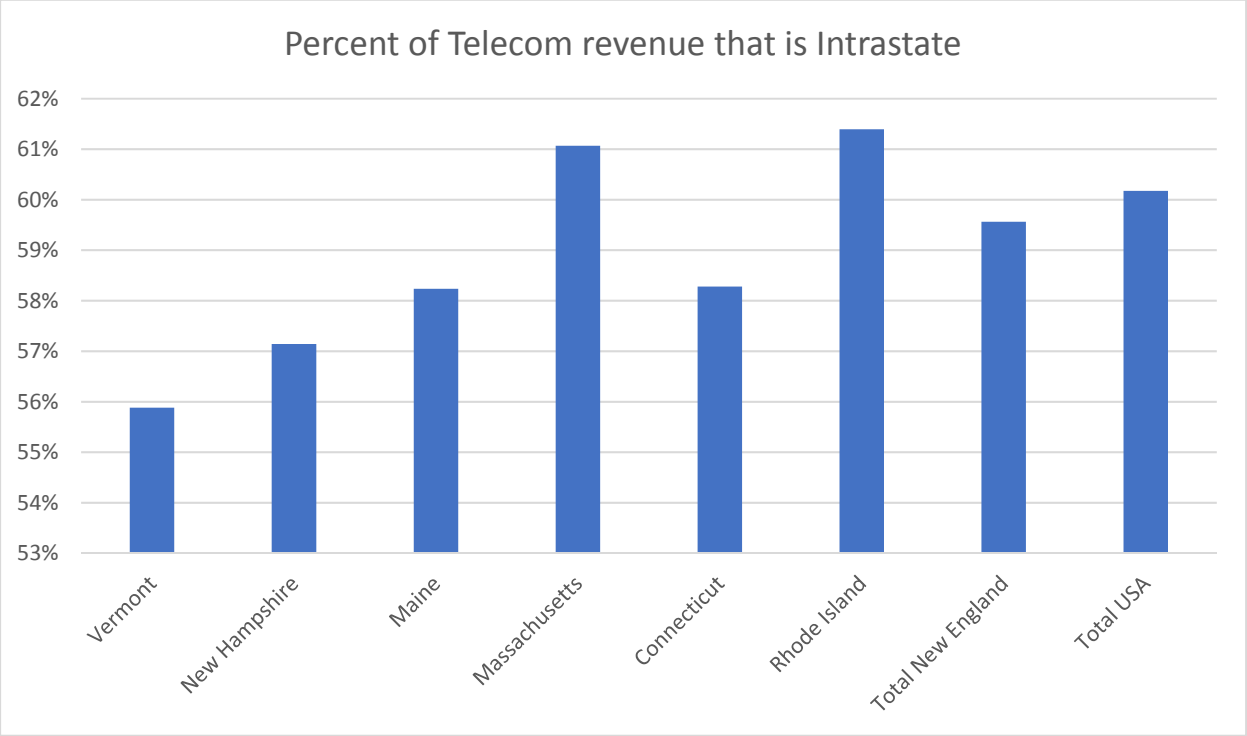


Figure 6: Percent of Intrastate Telecom Revenue; USMR Table 1.8 End User Telecommunications Revenue by State: 2015 (in Millions of Dollars)

The Federal Universal Service charge is applied to retail interstate telecommunications services. The proportion of telecommunications services that are subject to the Federal USF has risen from about 26% in 2005 to 30% in 2016.

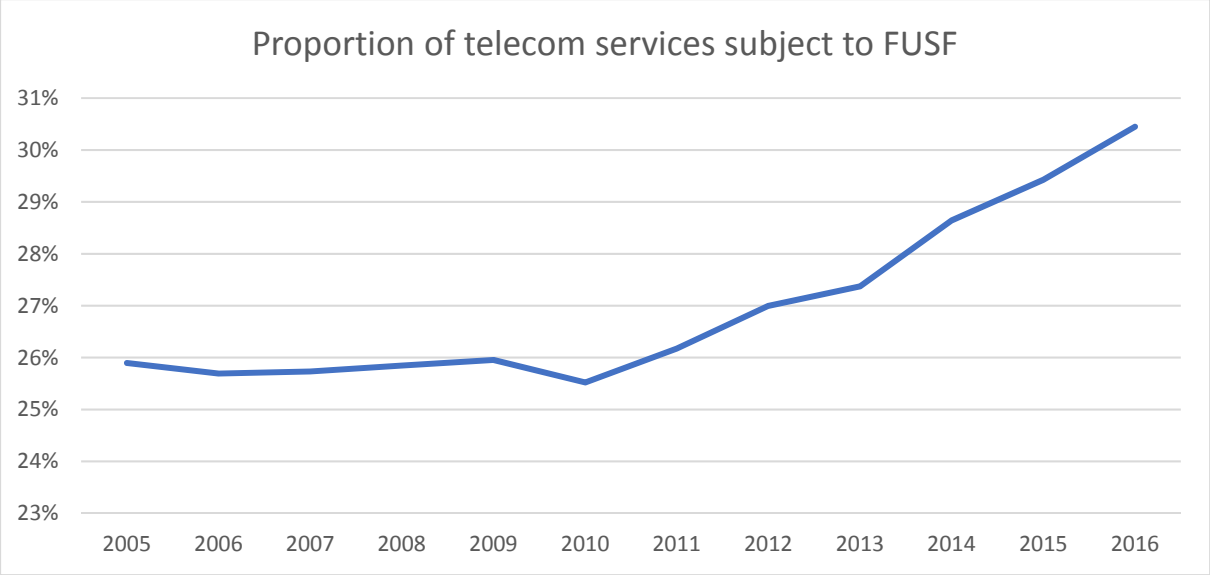


Figure 7: Proportion of Telecom Services Subject to Federal Universal Service Fund Charge; USMR Table 1.5 USF Contribution Base by Year1: 2005-2016 (in Millions of Dollars)

Intrastate telecommunications revenues, subect to Federal USF, have declined from $75M in 2005 to $57M in 2016. The budget for the federal programs funded by the federal USF has remained relatively constant, so the rate of the Federal USF fee has increased from 10.7% in 2005 to 18.4% in 2016.

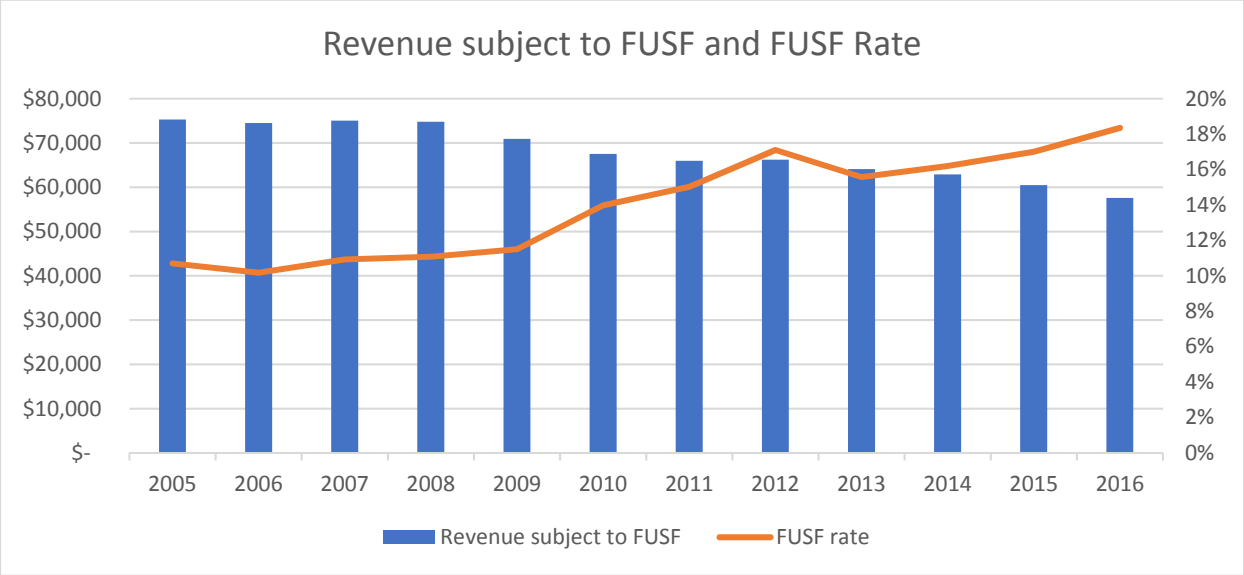


Figure 8: Revenue Subject to Federal Universal Service Fund Rate and the USF Rate; UMSR Table 1.5 USF Contribution Base by Year1: 2005-2016 (in Millions of Dollars) and USMR Table 1.6 Universal Service Fund Contribution Factor

Federal USF supports four programs. The total budget has grown from $6.5B in 2005 to $8.7B in 2016.

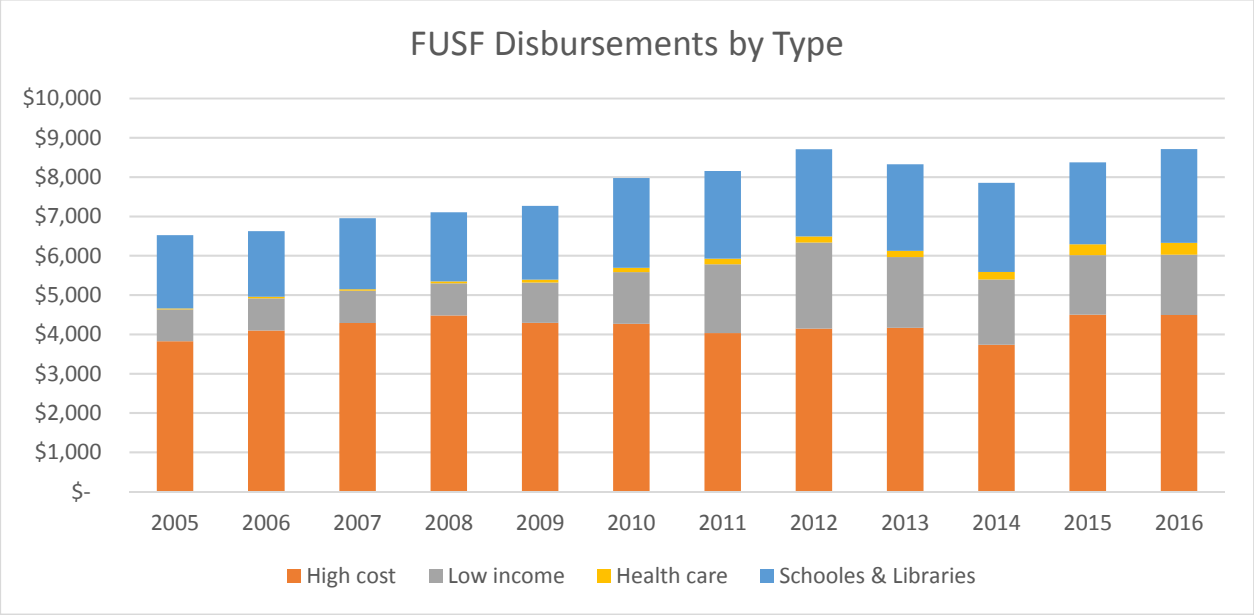


Figure 9: Federal Universal Service Fund Disbursements by Type; USMR Table 1.10 Universal Service Disbursements 2001-2016 (in Millions of Dollars)

The disbursements by program for 2015 and 2016 are depicted on the following charts.

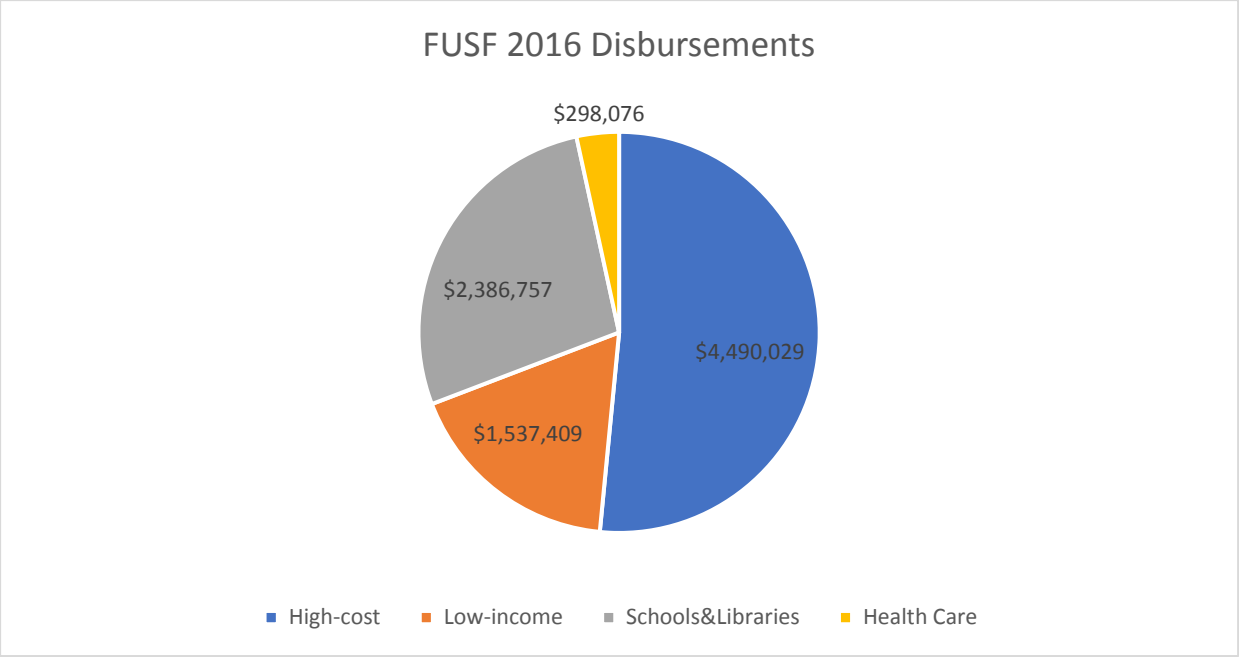


Figure 10: FUS 2016 Disbursements; USMR Table 1.9 Universal Service Support Mechanisms by State: 2016 (Annual Payments and Contributions in Thousands of Dollars)

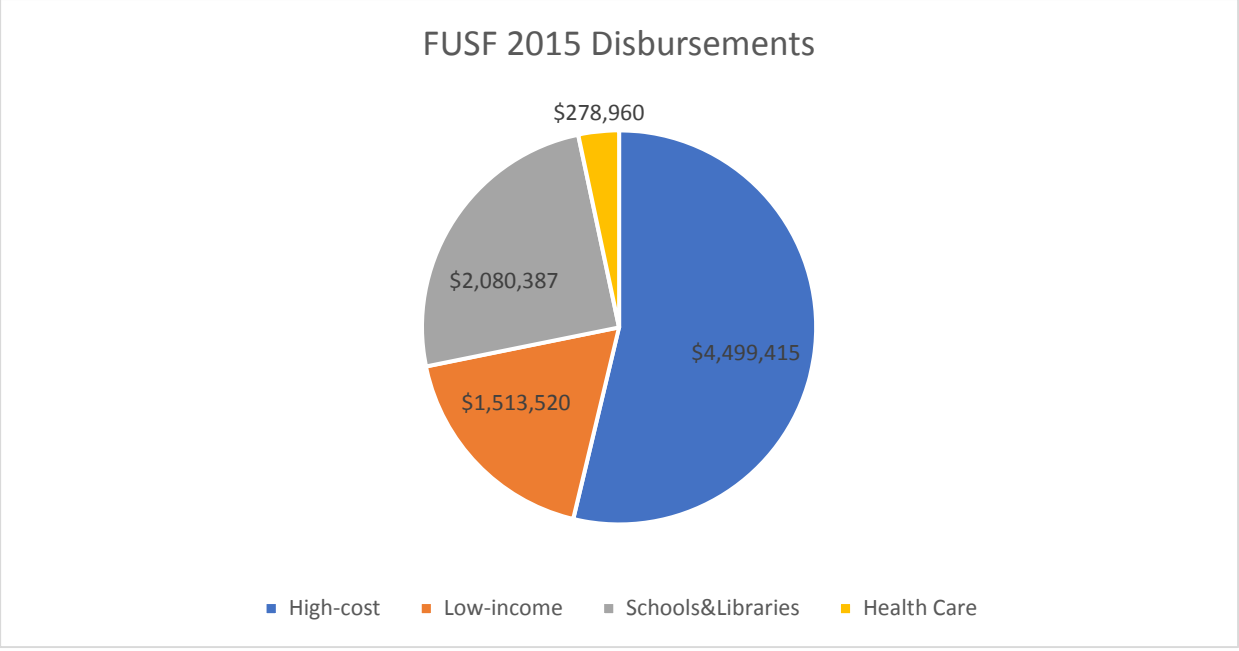
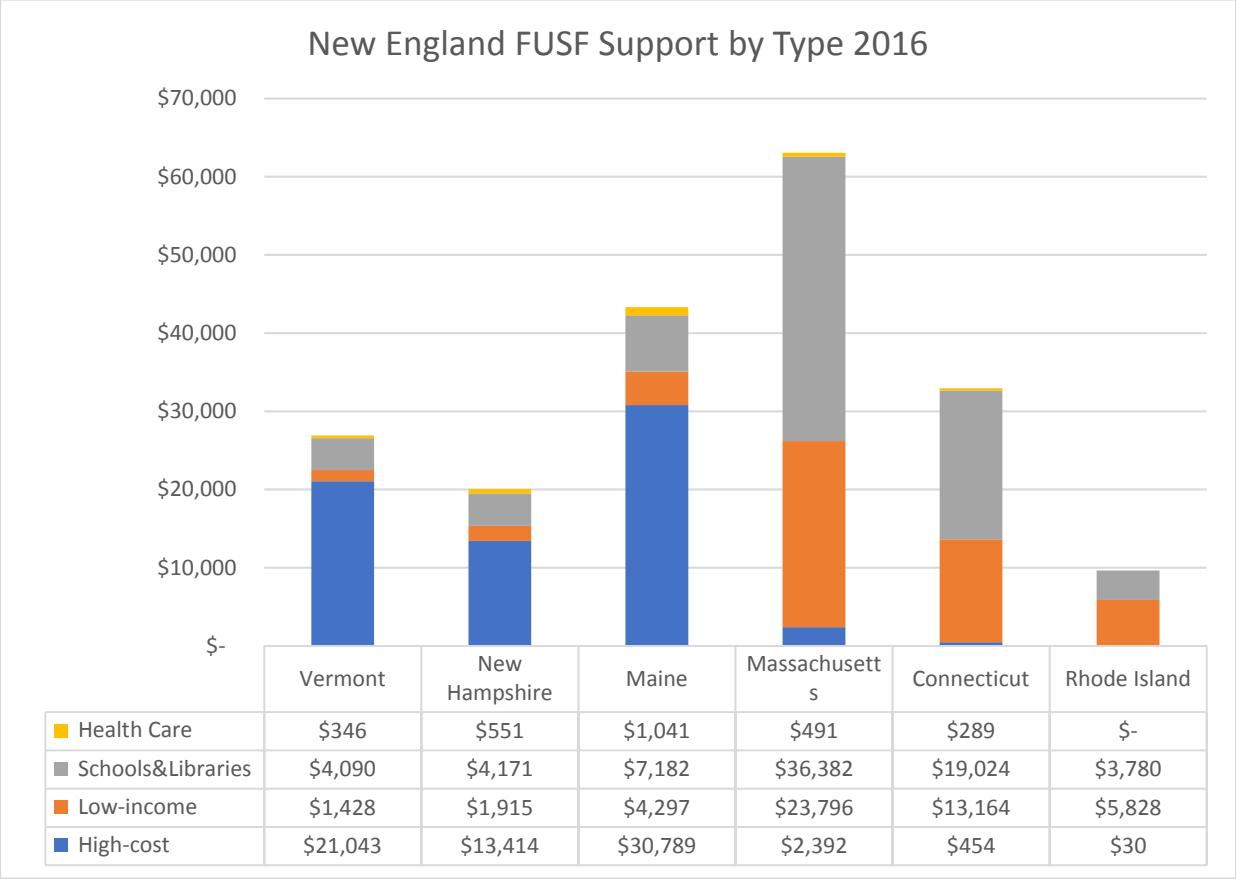


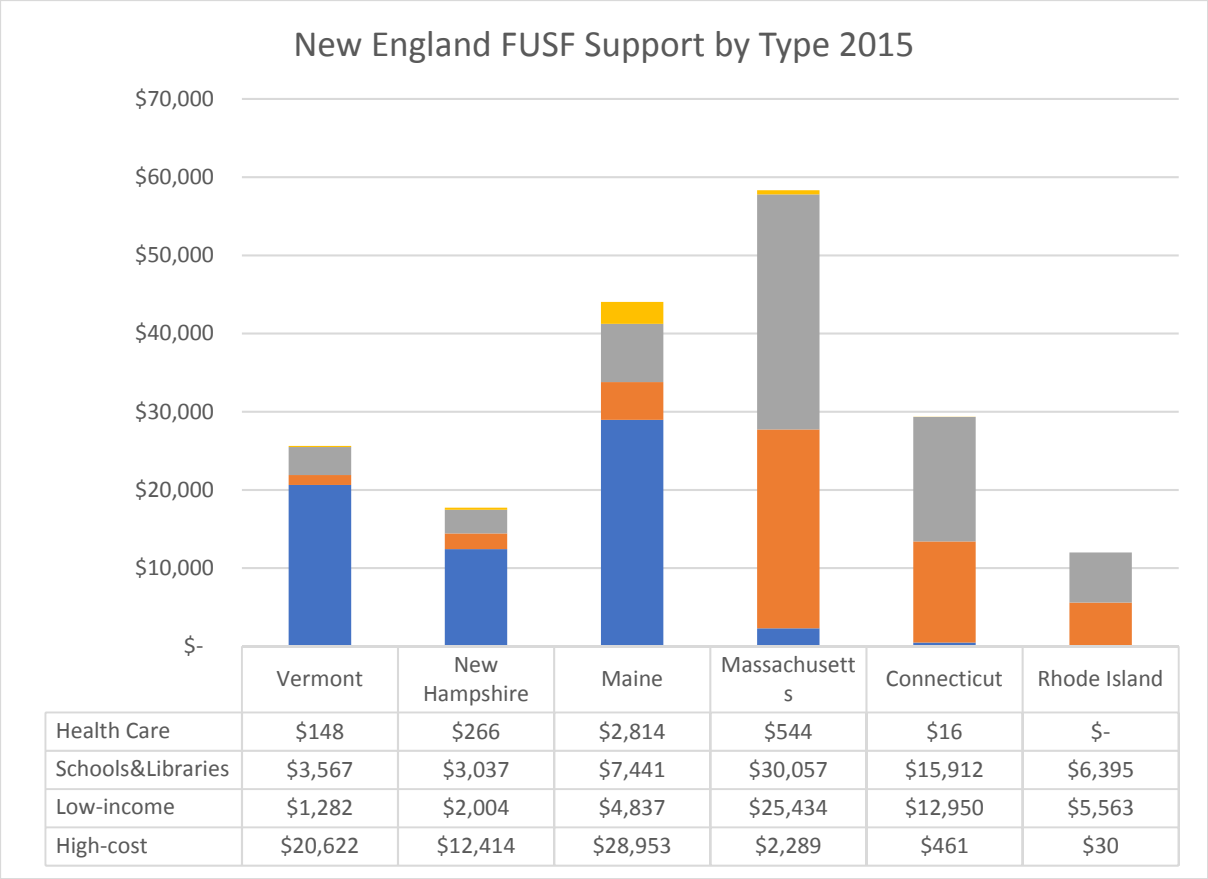
Figure 11: FUSF 2015 Disbursements; USMR 2015 Table 1.9 Universal Service Support Mechanisms by State: 2015 (Annual Payments and Contributions in Thousands of Dollars)

The charts below depict the breakdown of support for these services in New England states.



	Vermont	New Hampshire	Maine	Massachusetts	Connecticut	Rhode Island
Health Care	$346	$551	$1,041	$491	$289	$-
Schools&Libraries	$4,090	$4,171	$7,182	$36,382	$19,024	$3,780
Low-income	$1,428	$1,915	$4,297	$23,796	$13,164	$5,828
High-cost	$21,043	$13,414	$30,789	$2,392	$454	$30

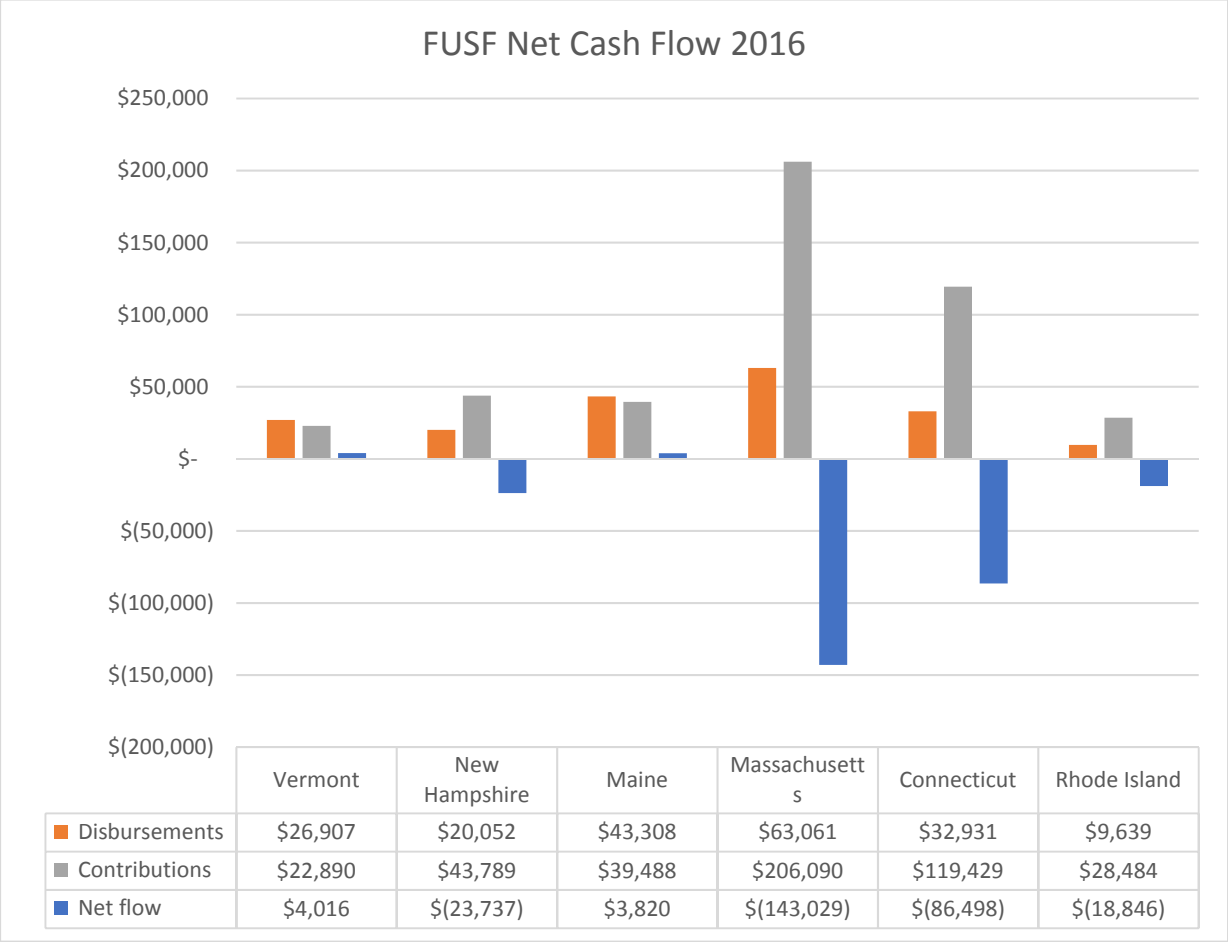
Figure 12: New England FUSF Support by Type 2016; USMR Table 1.9 Universal Service Support Mechanisms by State: 2016 (Annual Payments and Contributions in Thousands of Dollars)



	Vermont	New Hampshire	Maine	Massachusetts	Connecticut	Rhode Island
Health Care	$148	$266	$2,814	$544	$16	$-
Schools&Libraries	$3,567	$3,037	$7,441	$30,057	$15,912	$6,395
Low-income	$1,282	$2,004	$4,837	$25,434	$12,950	$5,563
High-cost	$20,622	$12,414	$28,953	$2,289	$461	$30

Figure 13: New England FUSF Support by Type 2015; USMR 2015 Table 1.9 Universal Service Support Mechanisms by State: 2015 (Annual Payments and Contributions in Thousands of Dollars)

The charts below depict the contributions made to the fund in grey, the disbursements made from the fund in orange, and the net cash flow in blue, for New England states in 2016.



	Vermont	New Hampshire	Maine	Massachusetts	Connecticut	Rhode Island
Disbursements	$26,907	$20,052	$43,308	$63,061	$32,931	$9,639
Contributions	$22,890	$43,789	$39,488	$206,090	$119,429	$28,484
Net flow	$4,016	$(23,737)	$3,820	$(143,029)	$(86,498)	$(18,846)

Figure 14: FUSF Net Cash Flow 2016; USMR Table 1.9 Universal Service Support Mechanisms by State: 2016 (Annual Payments and Contributions in Thousands of Dollars)

Lifeline is a program to support service for low-income people. The program had a budget of $1.5 billion and 13 million subscribers in 2016.

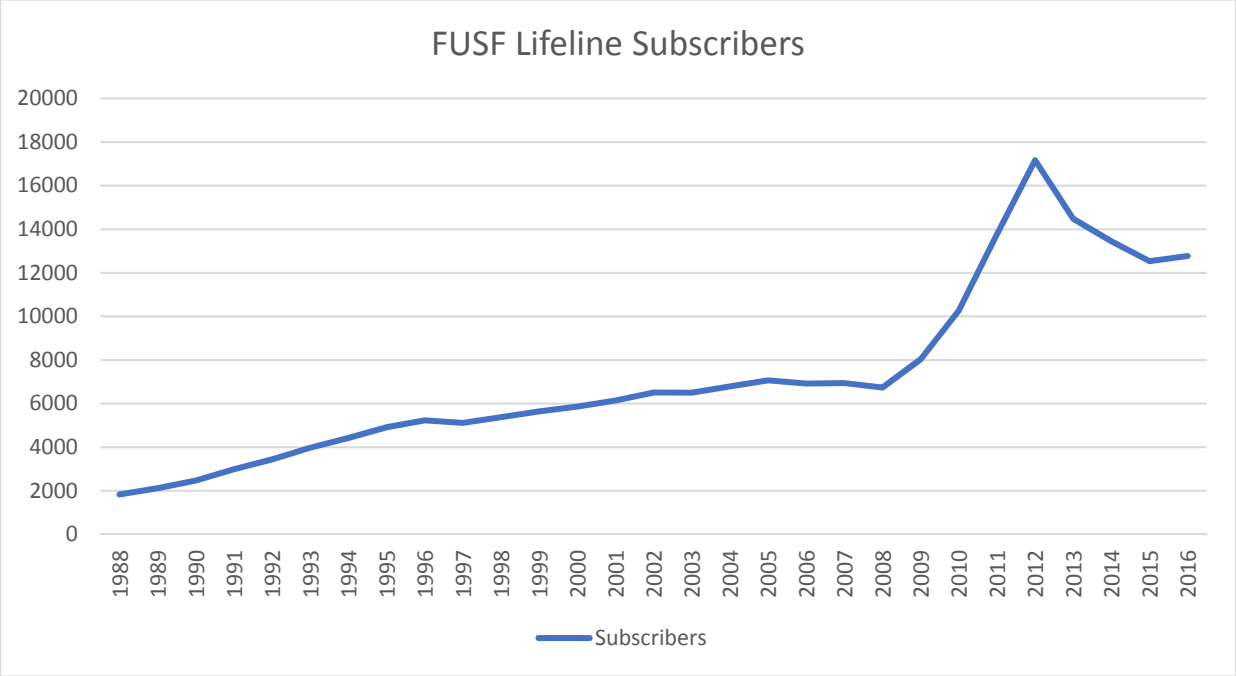


Figure 15: Source: USMR Table 2.1 Lifeline Subscribers (in Thousands)

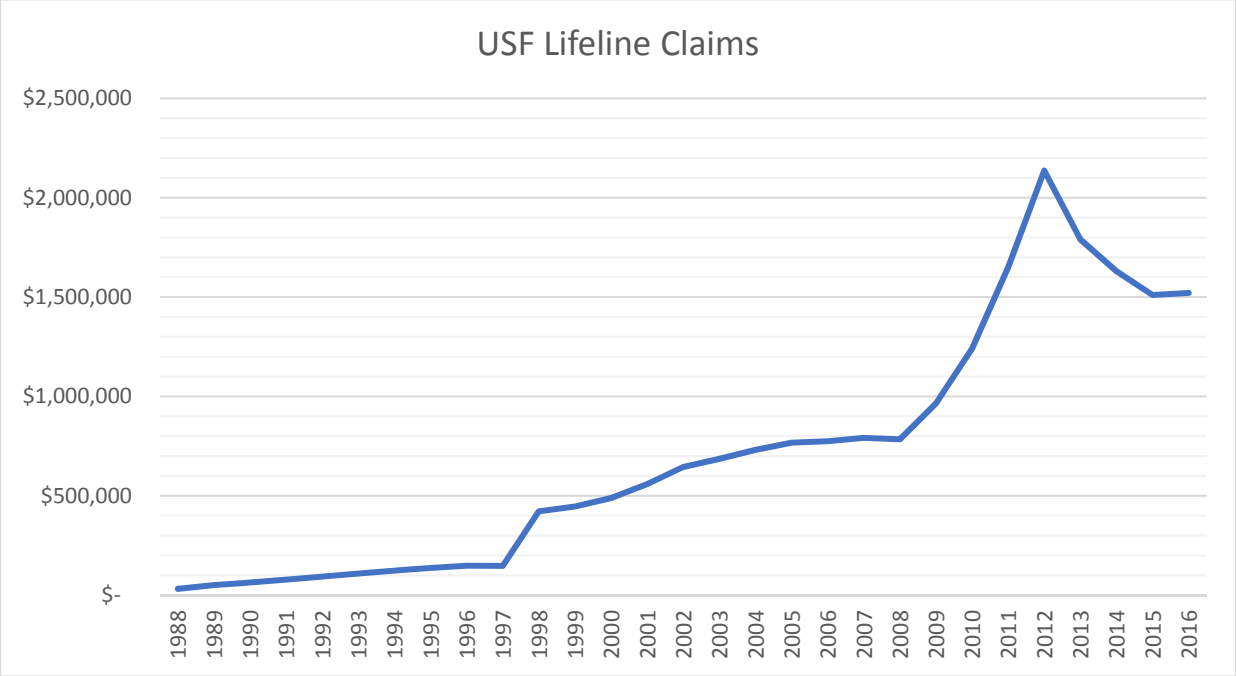


Figure 16: Source: USMR Table 2.2 Low-Income Claims (in Thousands of Dollars)

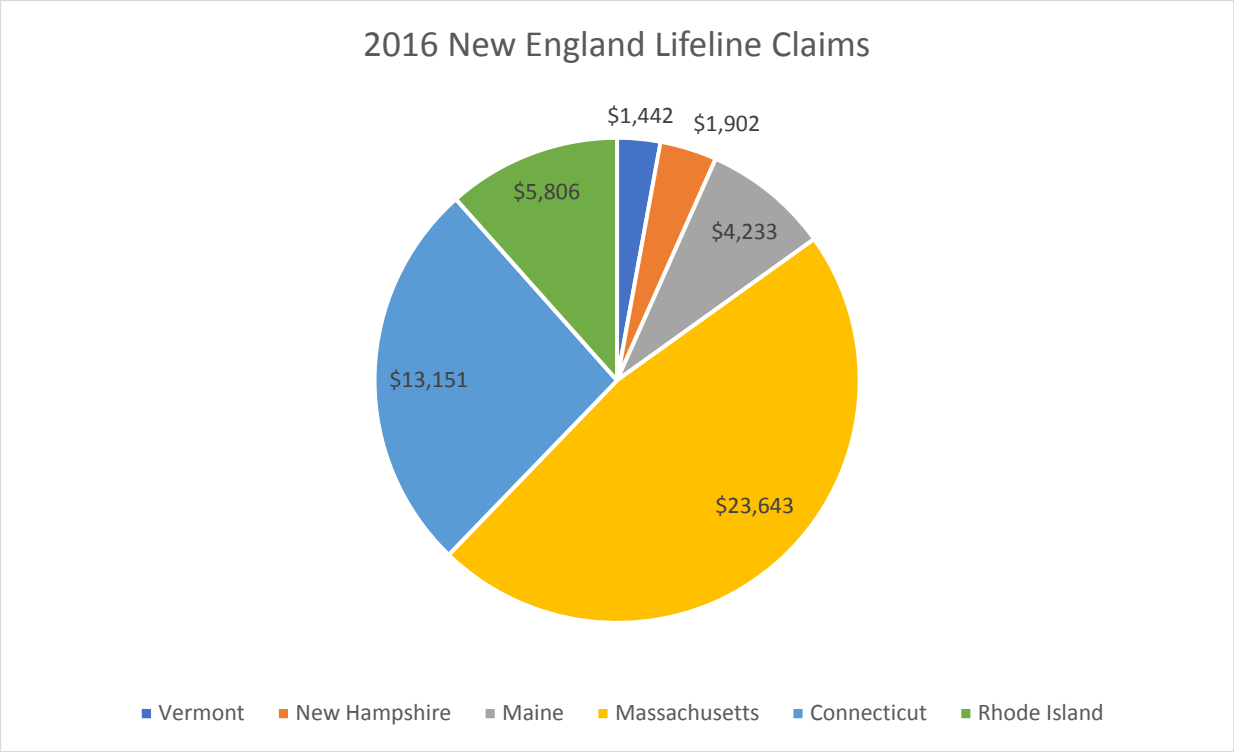


Figure 17: Source: USMR Table 2.3 Low-Income Claims by State: 2016 (in Thousands of Dollars)

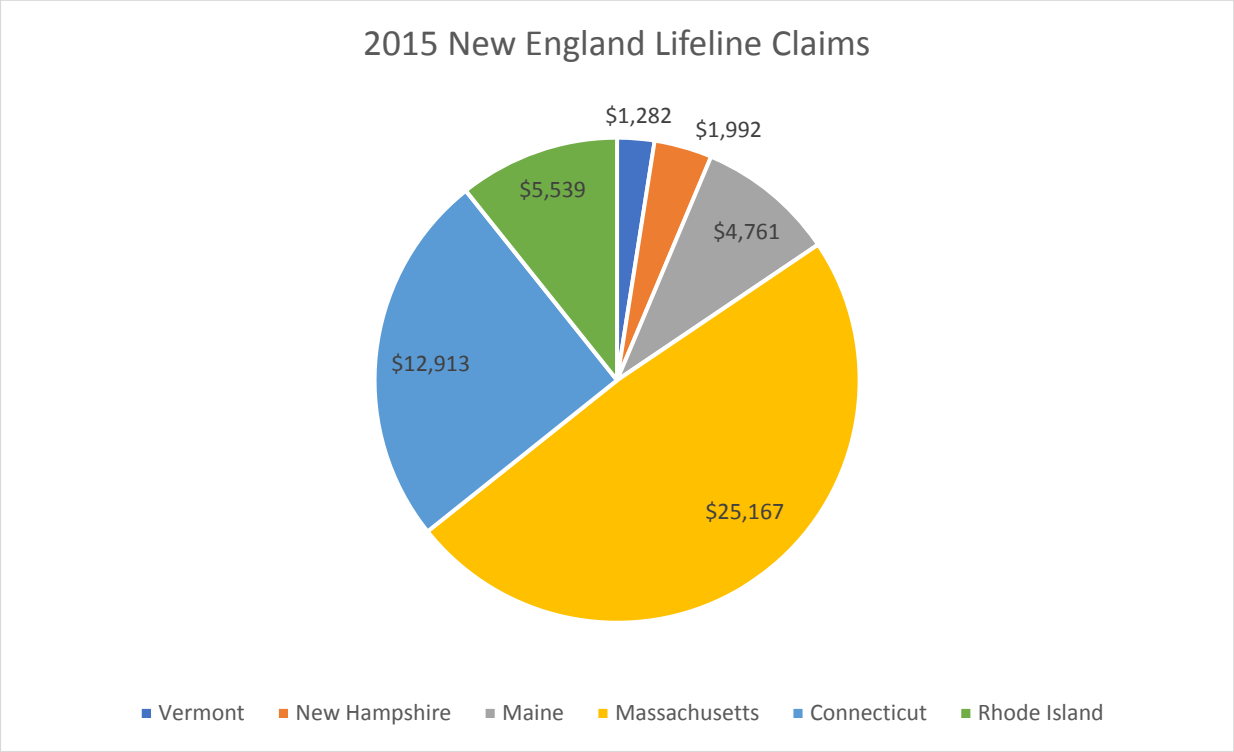


Figure 18: Source: USMR 2015 Table 2.3 Low-Income Claims by State: 2015 (in Thousands of Dollars)

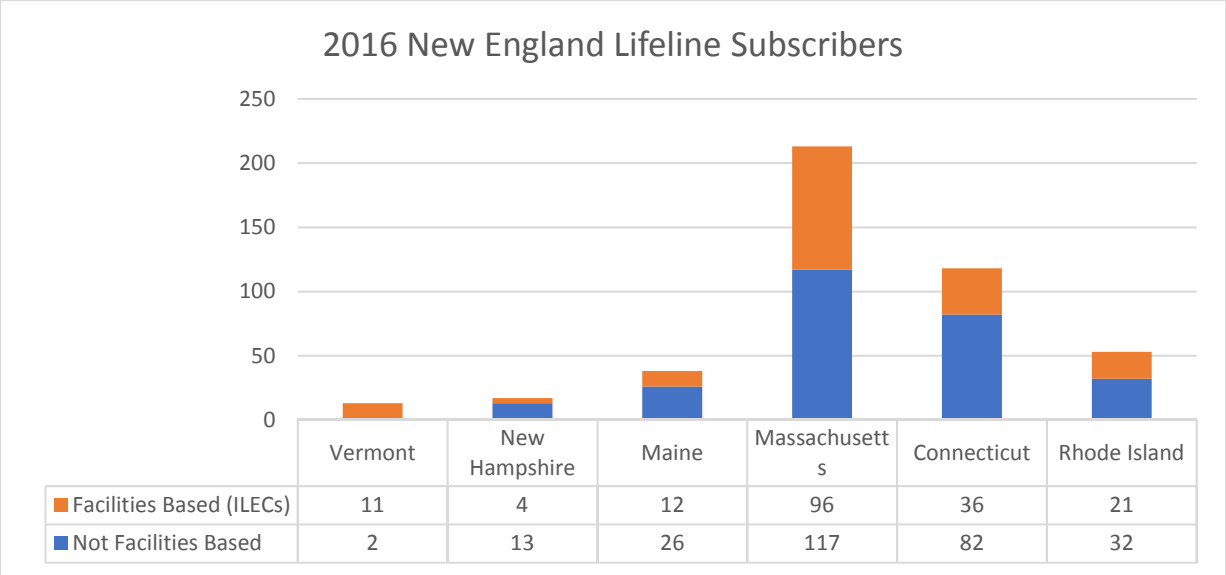


Figure 19: Source: USMR Table 2.8 Non-Facilities Based Low-Income Subscribers by State in 2016 (in Thousands)

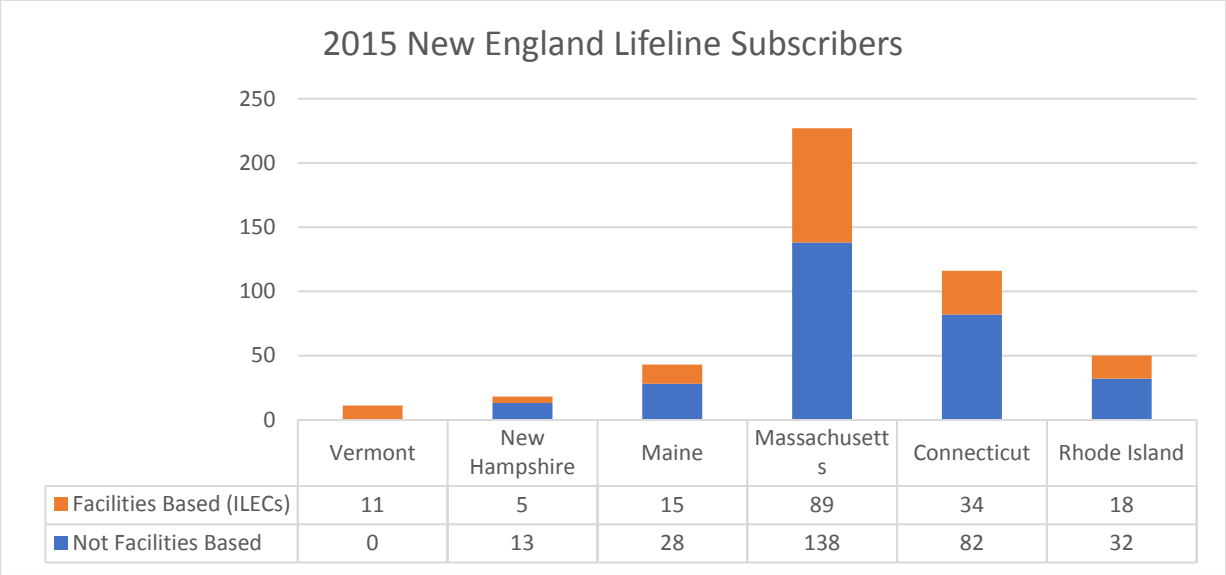
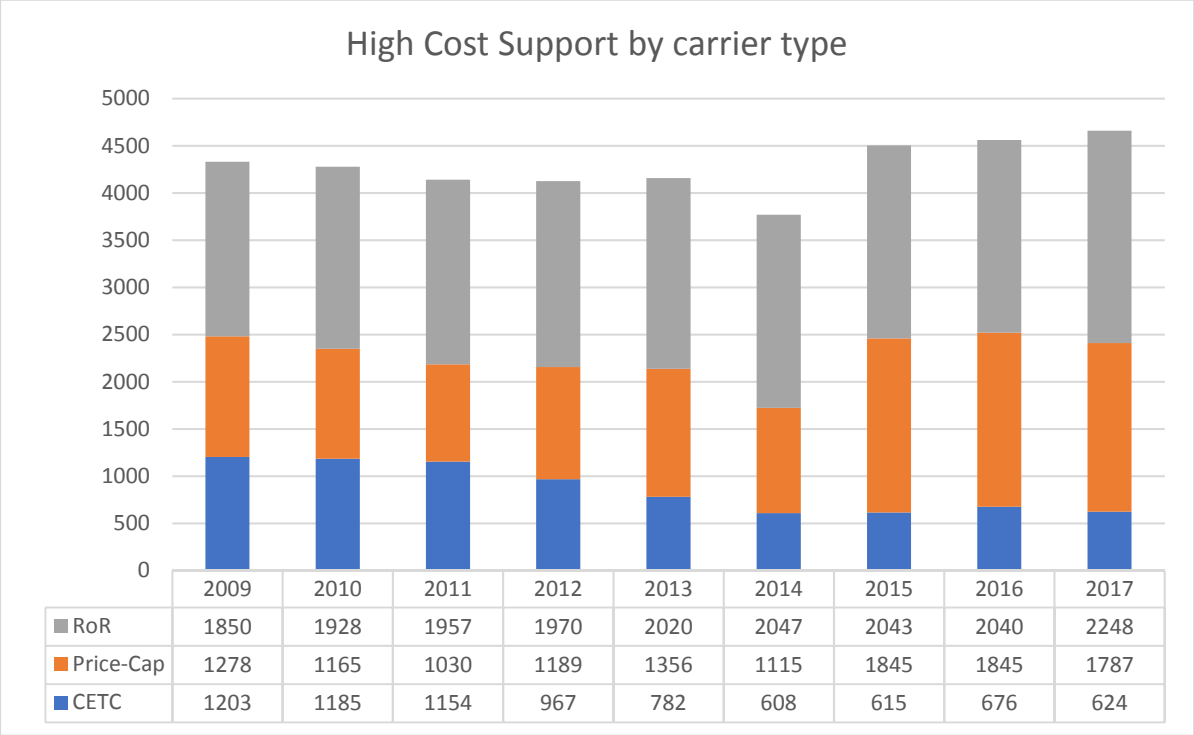


Figure 20: Source: USMR 1015 Table 2.8 Non-Facilities Based Low-Income Subscribers by State in 2015 (in Thousands)

Another important program funded by the Federal USF is high-cost support. This program provides subsidies to the incumbent telephone companies that operate in rural area. The program provided $4.6B in support in 2017. The table below breaks down the support nationwide for three categories of companies. RoR refers to Rate of Return carriers, also referred to as Rural Local Exchange Carriers (RLECs). Price-Cap refers to the former Regional Bell Operating Companies (RBOCs). In Vermont, the RBOC (Legacy Verizon territory) is Consolidated Communications. The third category, CETC, refers to Competitive Eligible Telecommunications Companies, also referred to as Competitive Local Exchange Carriers (CLECs).



	2009	2010	2011	2012	2013	2014	2015	2016	2017
RoR	1850	1928	1957	1970	2020	2047	2043	2040	2248
Price-Cap	1278	1165	1030	1189	1356	1115	1845	1845	1787
CETC	1203	1185	1154	967	782	608	615	676	624

Figure 21: High Cost Support by Carrier Type; USMR Table 3.1 High-Cost Support Fund Claim History - Price Cap and Rate-of-Return ILECs (in Millions of Dollars)

The term Universal Service was originally coined to refer to obtaining universal adoption of telephone service (Voice subscribership). The orange line in the chart below shows the number of households in the US (left bar) and also depicts voice subscribership as a percentage of these households in blue (right bar).

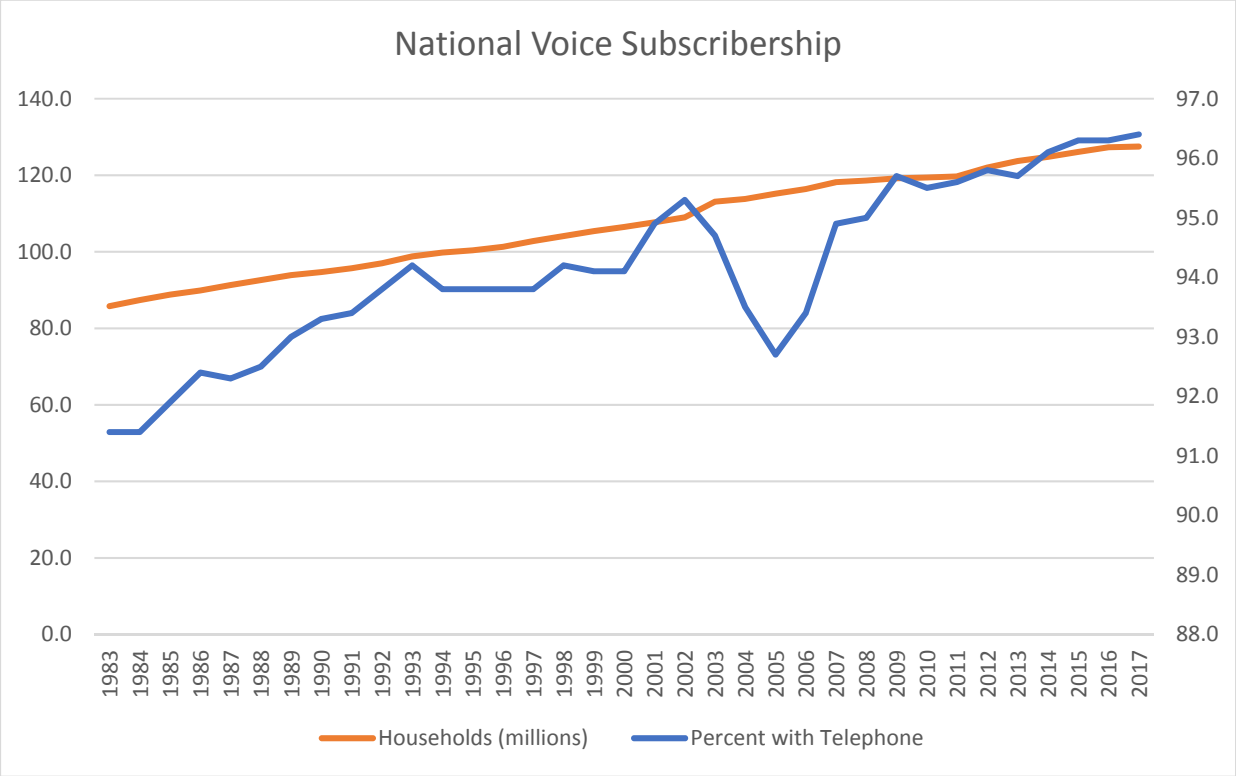


Figure 22: National Voice Subscribership; USMR Table 6.1 Household Voice Subscribership in the United States, 1983 – 2017

Although Internet access has been treated as an interstate information service and is not subject to USF contributions, the FCC has recently brought USF support to certain internet service providers.

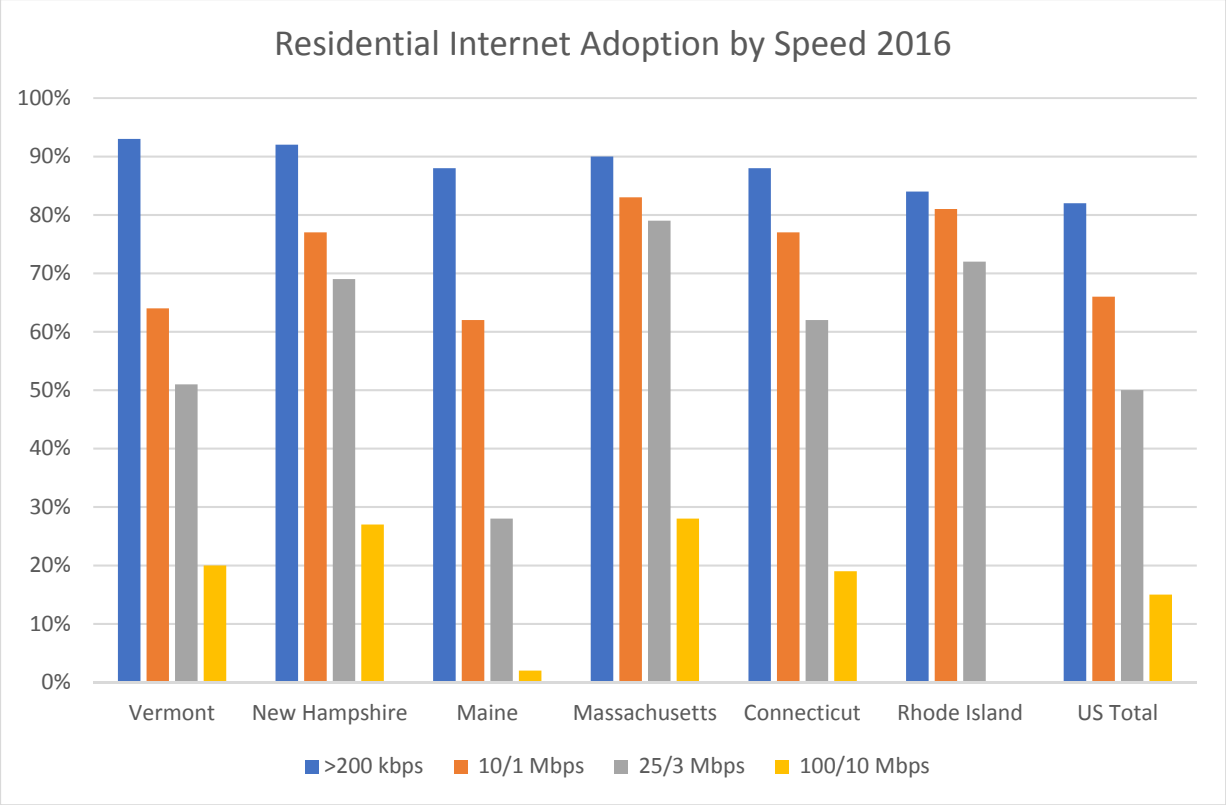


Figure 23: Residential Internet Adoption by Speed 2016; USMR Table 6.11 Residential Fixed Connections per Household by Speed Tier as of December 31, 2015 (Households and Subscribers in thousands) Too few carriers reported 100/10 service in RI to make it possible to calculate.

The following data are pulled from the FCC 2018 Broadband Deployment Report (BDR), adopted February 2, 2018. FCC-18-10A1. This information is based on information submitted by broadband service providers to the FCC on form 477 about availability of service on a census block basis. It should be noted that this will overstate coverage because if a single location in the census block has access, the entire census block is considered served. This approach differs significantly from that employed for broadband availability analysis by the State of Vermont, where broadband availability is tracked and reported on an individual address basis.

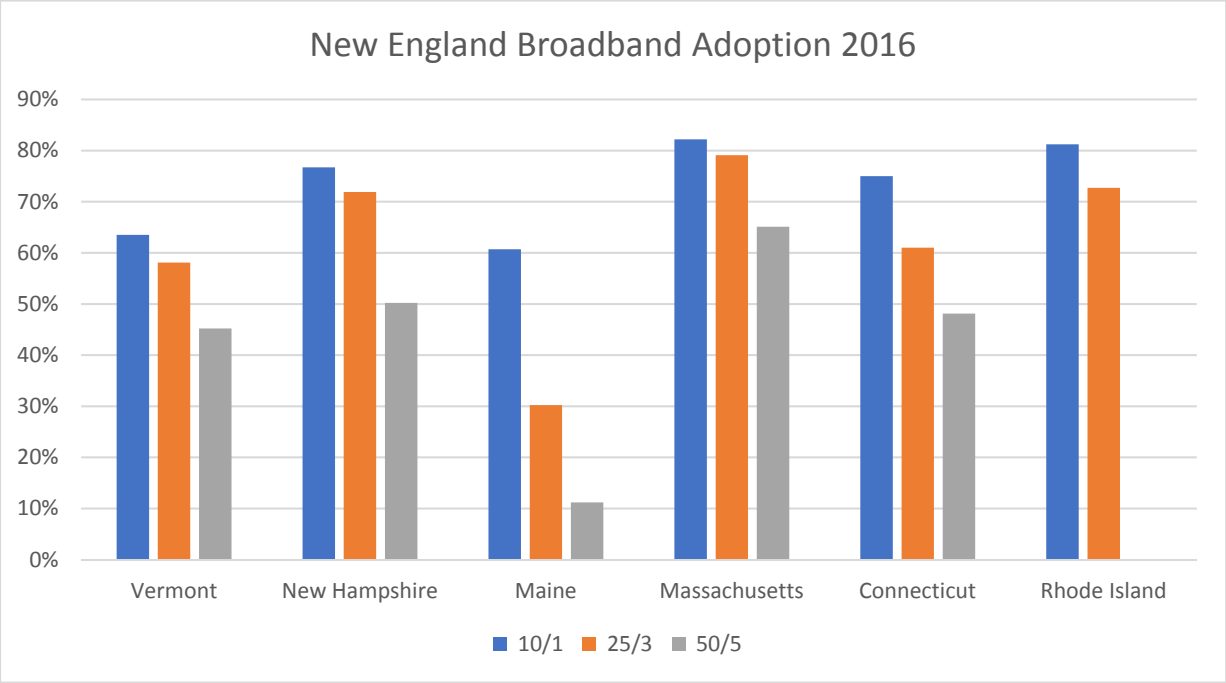


Figure 24: New England Broadband Adoption 2016; BDR Appendix H Overall Adoption Rate for Fixed Terrestrial Services by State (2016) (12/31/16 Form 477)

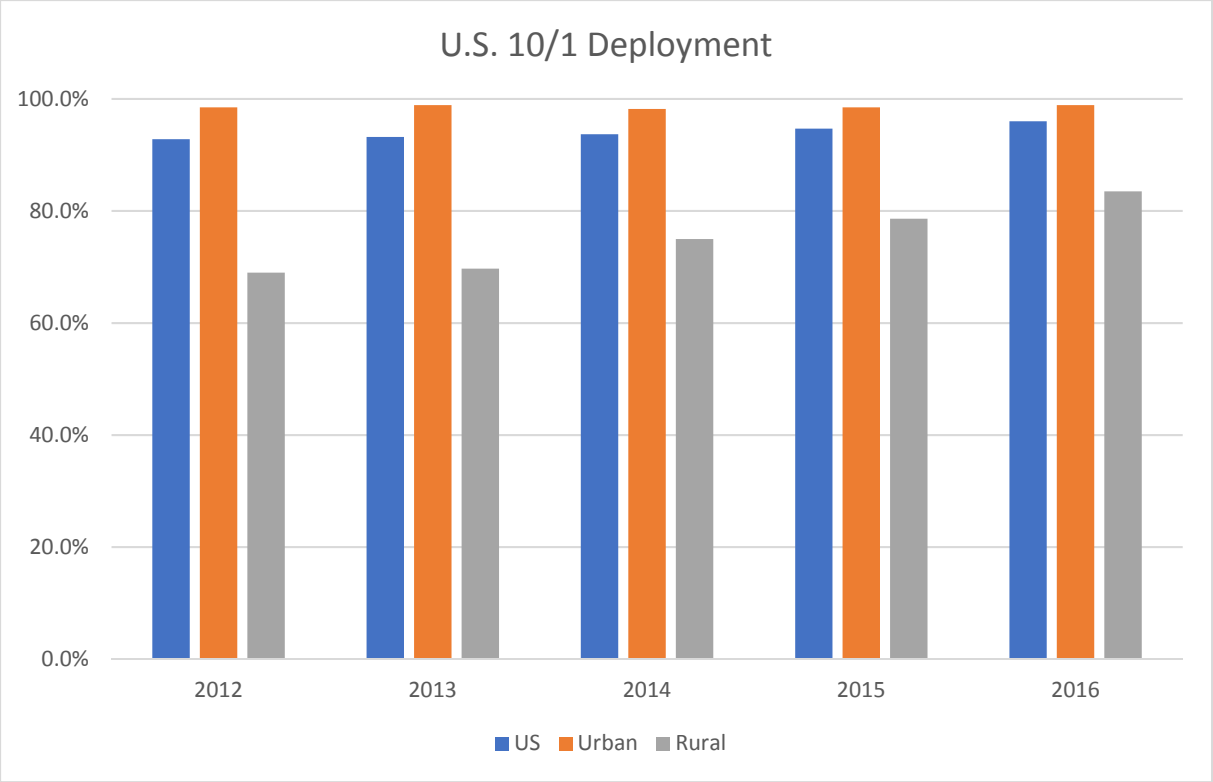


Figure 25: U.S. 10/1 Deployment

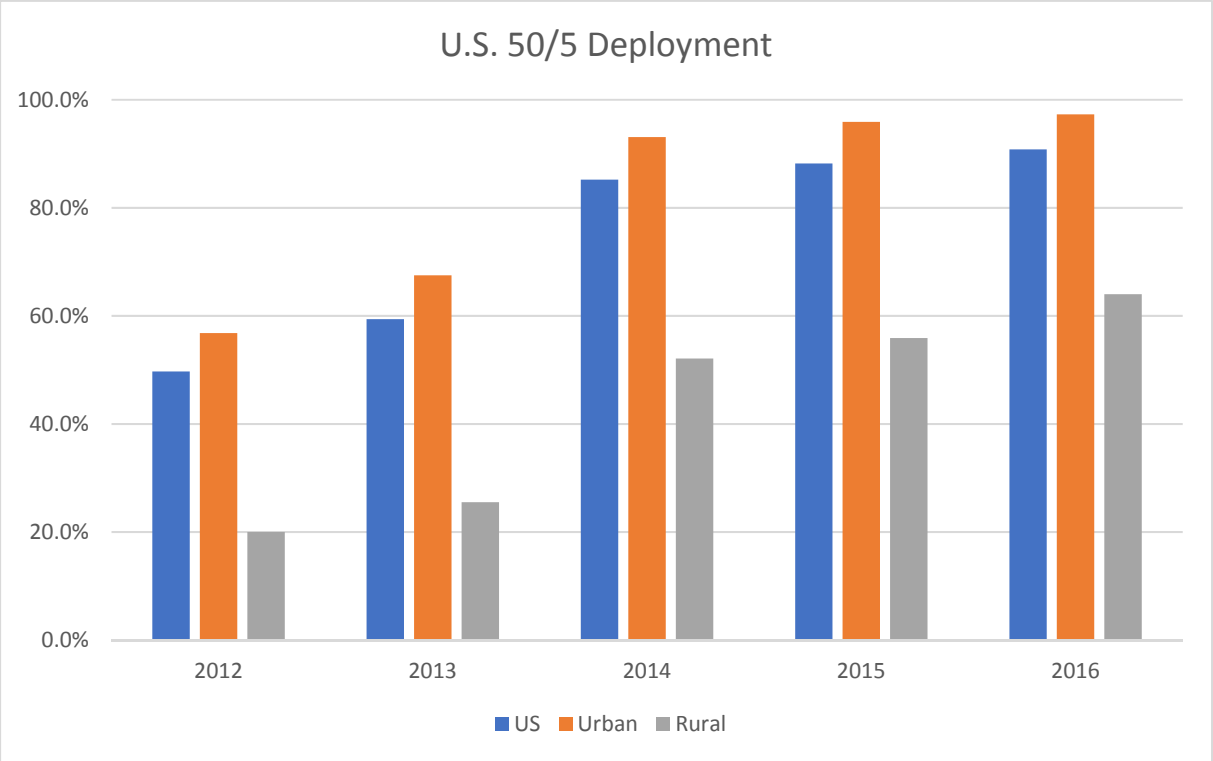


Figure 26: U.S. 50/5 Deployment; BDR Table 4 Deployment (Millions) of Fixed Terrestrial Services at Different Speed Tiers (2012-2016)

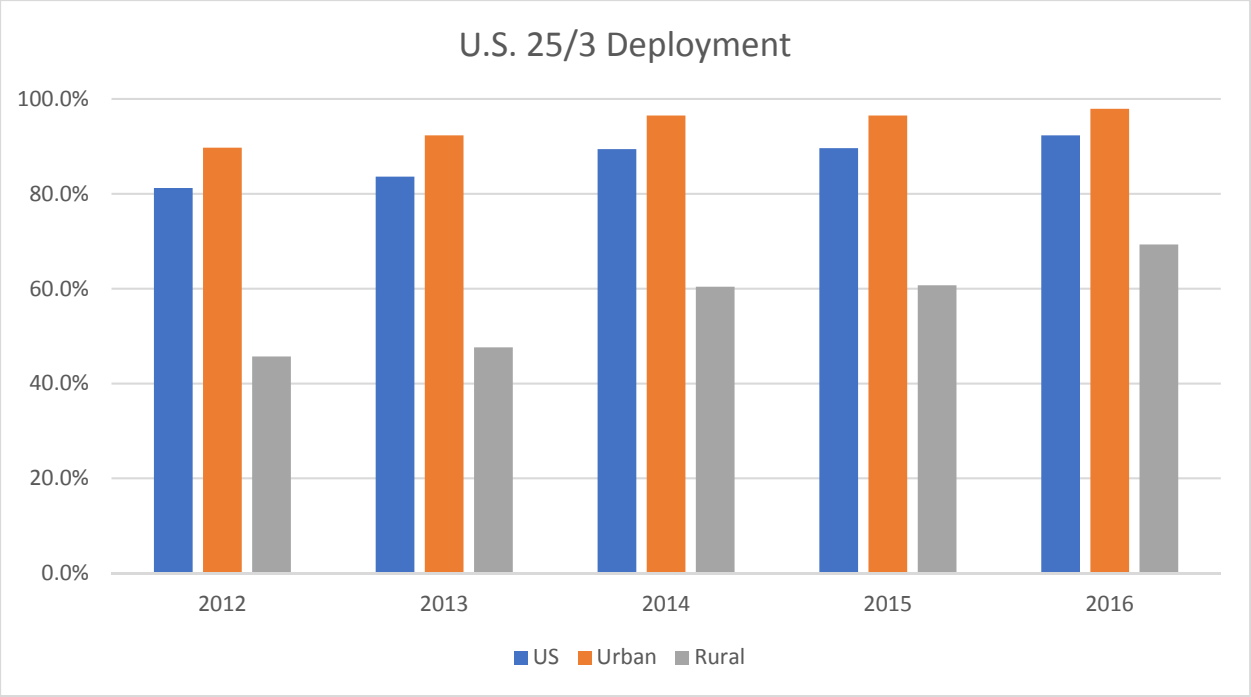


Figure 27: U.S. 25/3 Deployment; BDR Table 1 Deployment (Millions) of Fixed Terrestrial 25 Mbps/3 Mbps Services

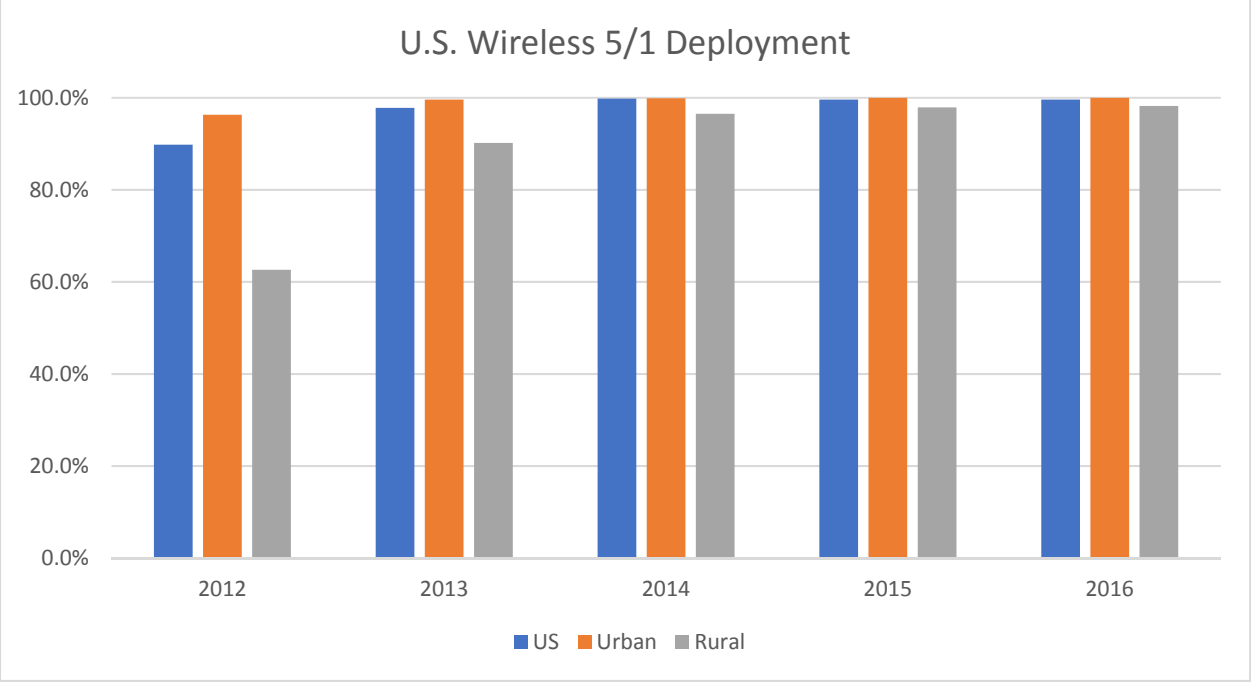


Figure 28: U.S. Wireless 5/1 Mbps Deployment; BDR Table 2a Deployment (Millions) of Mobile LTE with a Speed of 5 Mbps/1 Mbps

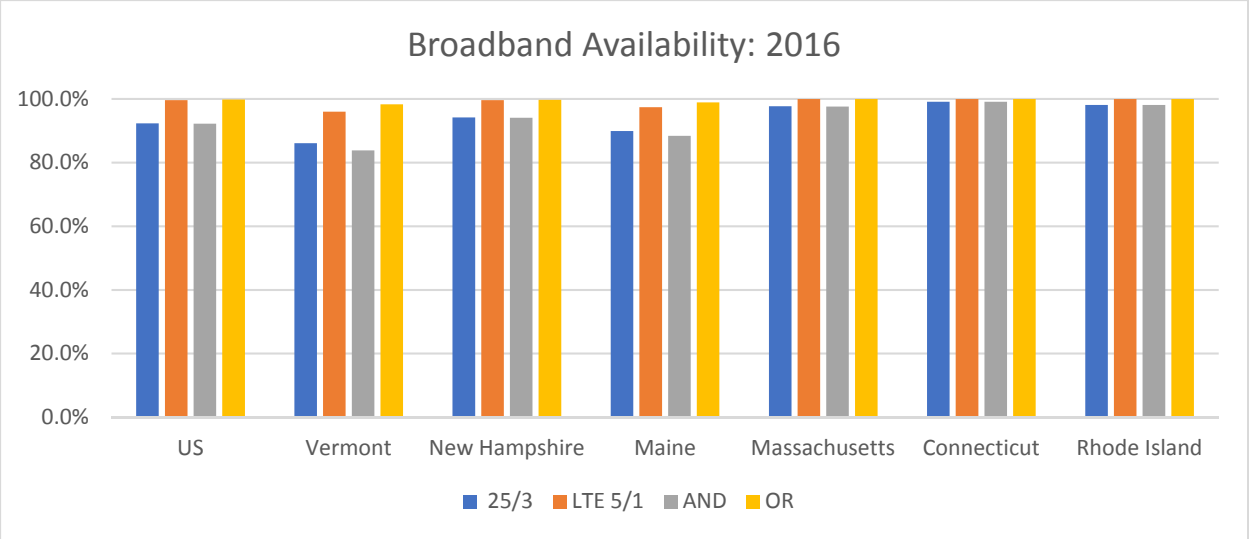


Figure 29:

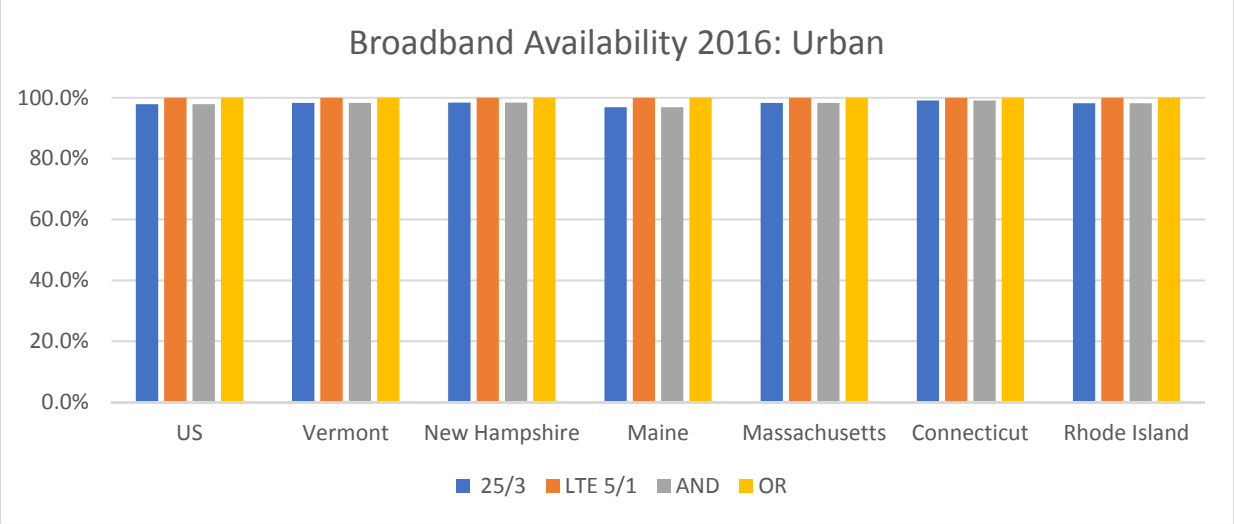


Figure 30:

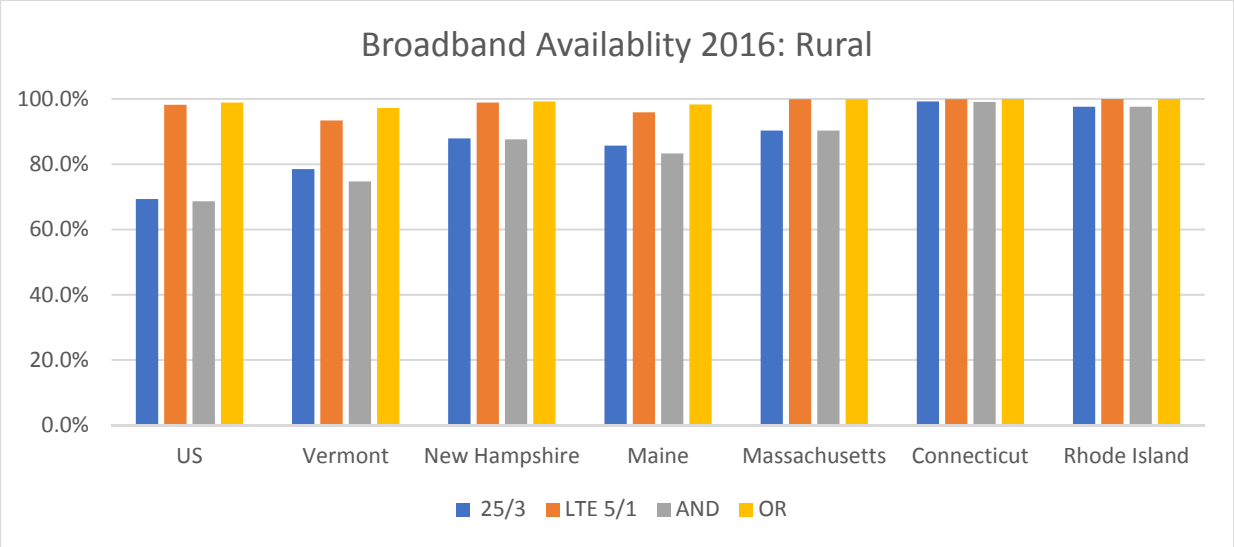


Figure 31: BDR Appendix D Americans (Millions) With Access to Fixed Terrestrial 25 Mbps/3 Mbps Service and Mobile LTE by State

Published prices for fixed wireless and satellite services available in Vermont are depicted in the chart below. Generally, the practice is to set a monthly recurring price for a service depending on the number of GigaBytes of data that the package allows the consumer to download each month. In the case of Viasat, the company also offers one package with a speed limit of 12 Mbps, and a second with higher data caps at the higher 25 Mbps speed.

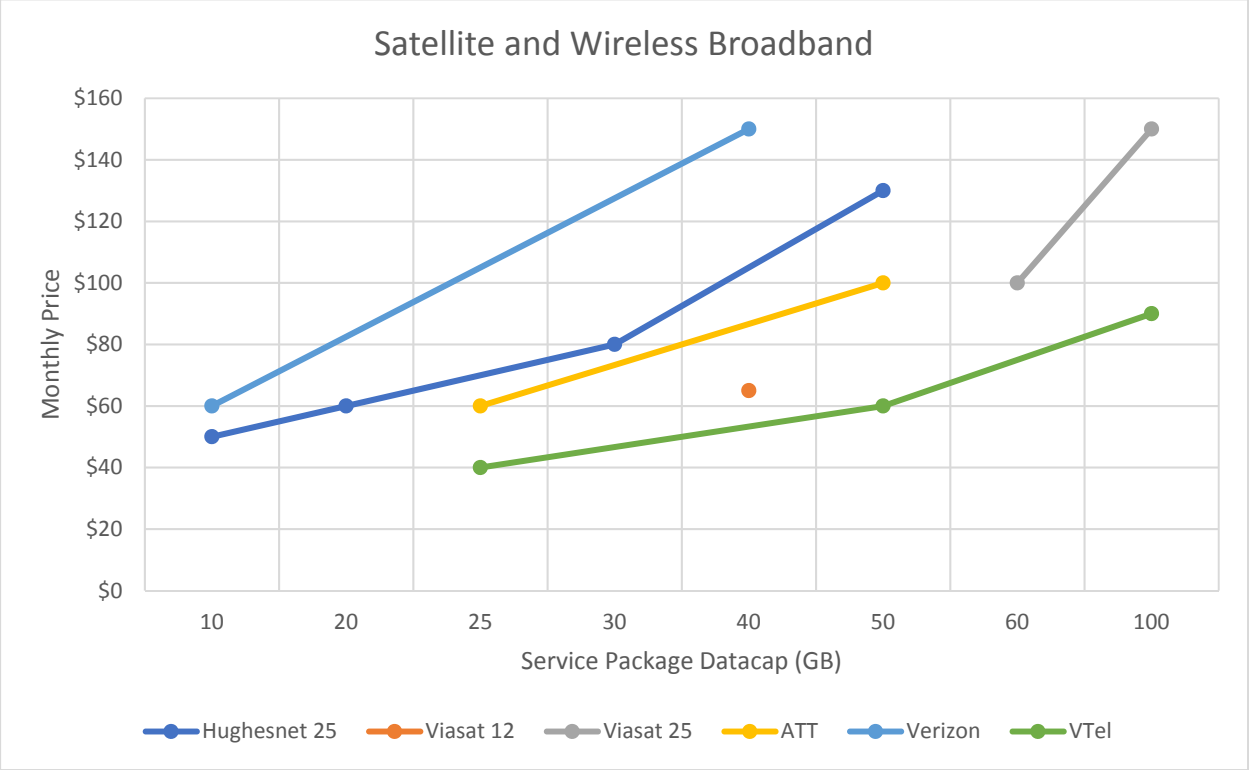


Figure 32: Satellite and Wireless Broadband

The table below depicts the relationship between the monthly price per month per GB on the vertical scale, and the quantity of GB included in the service package on the horizontal scale. The chart illustrates that the price remains roughly steady at about $2 per GB per month above the started packages of 20 GB per month.

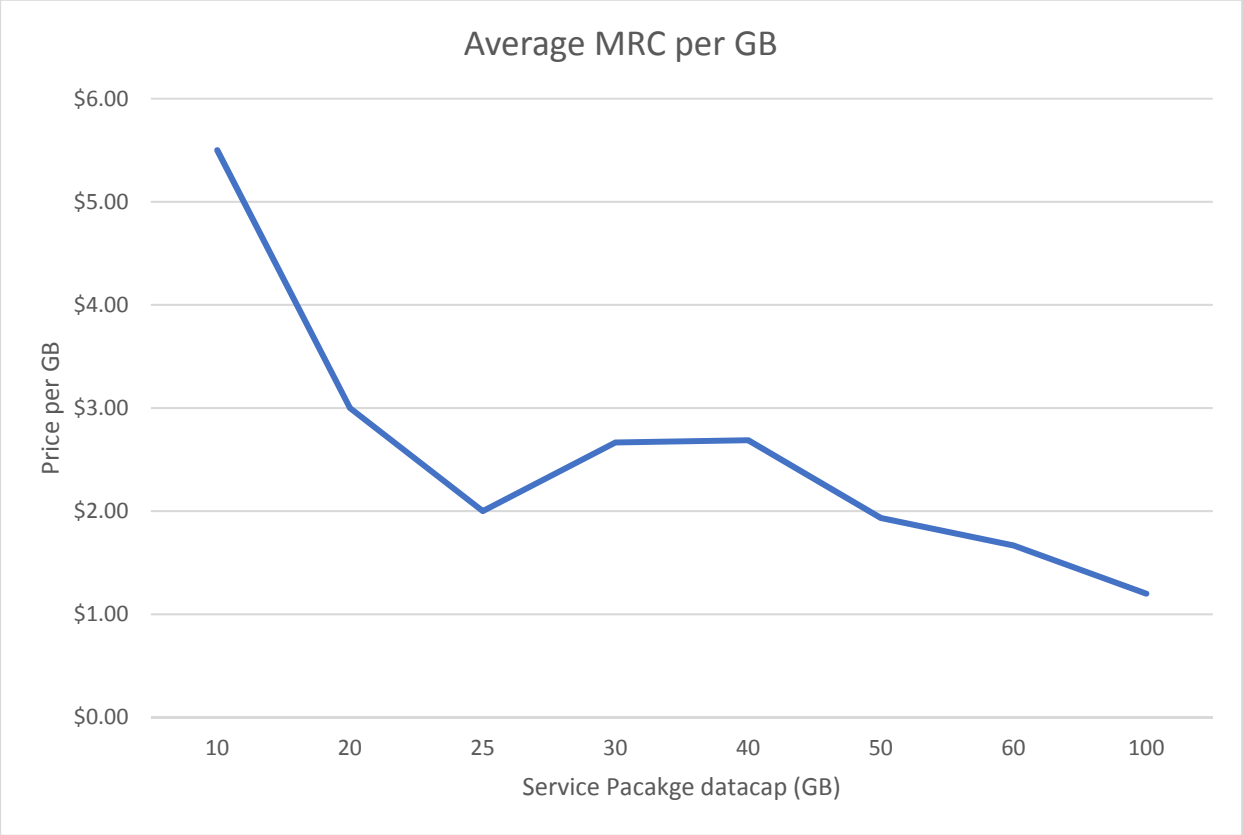


Figure 33: Average Monthly recurring charge per GB in the package

The tables below were drawn from an FCC report Measuring Broadband America. In 2016 the FCC deployed equipment to measure the actual broadband speeds realized by business and residential consumers who volunteered for the project. The charts below compare the actual observed speeds with the advertised speeds for several carriers.

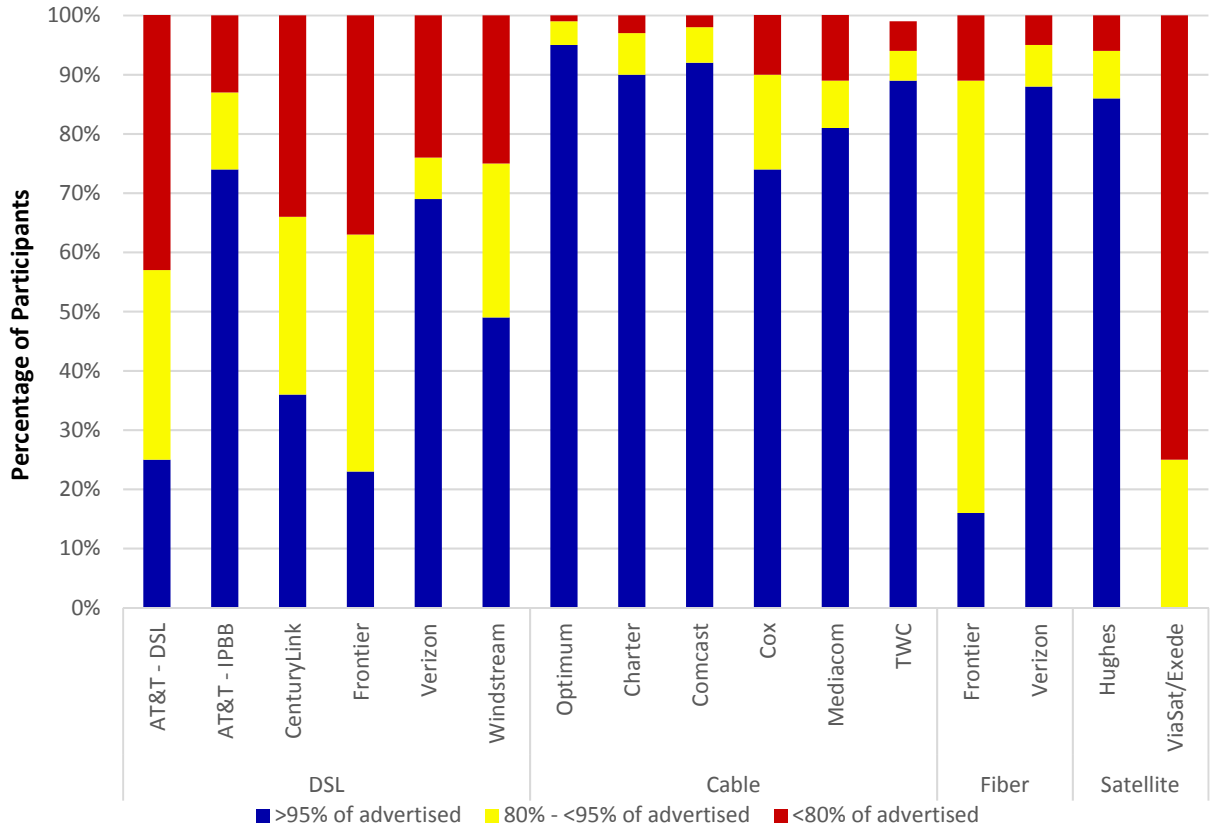


Figure 34: : Broadband report chart 5: IPS comparison total DOWNLOAD weekday peak hours; FCC Measuring Broadband America 2016

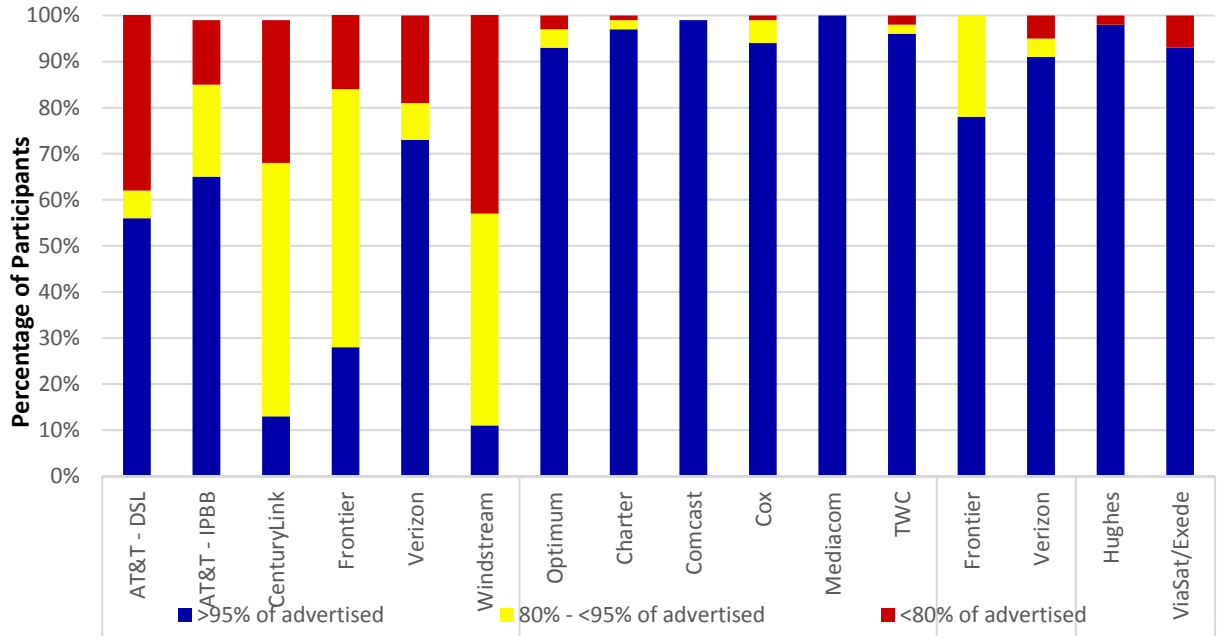


Figure 35: Broadband report chart 14: IPS comparison total UPLOAD weekday peak hours; FCC Measuring Broadband America 2016

The charts below depict information pulled from the annual reports from Vermont's Cable TV operators. Vermont has 9 cable operators. These operators include Comcast, Charter, Stowe Cable, VTel, Waitsfield Champlain Valley Telecom, Topsham Communications, Southern Vermont Cable, and Duncan Cable. The charts include information on cable subscribers, gross receipts, Public/Educational/Government fees, and investments in cable TV plant.

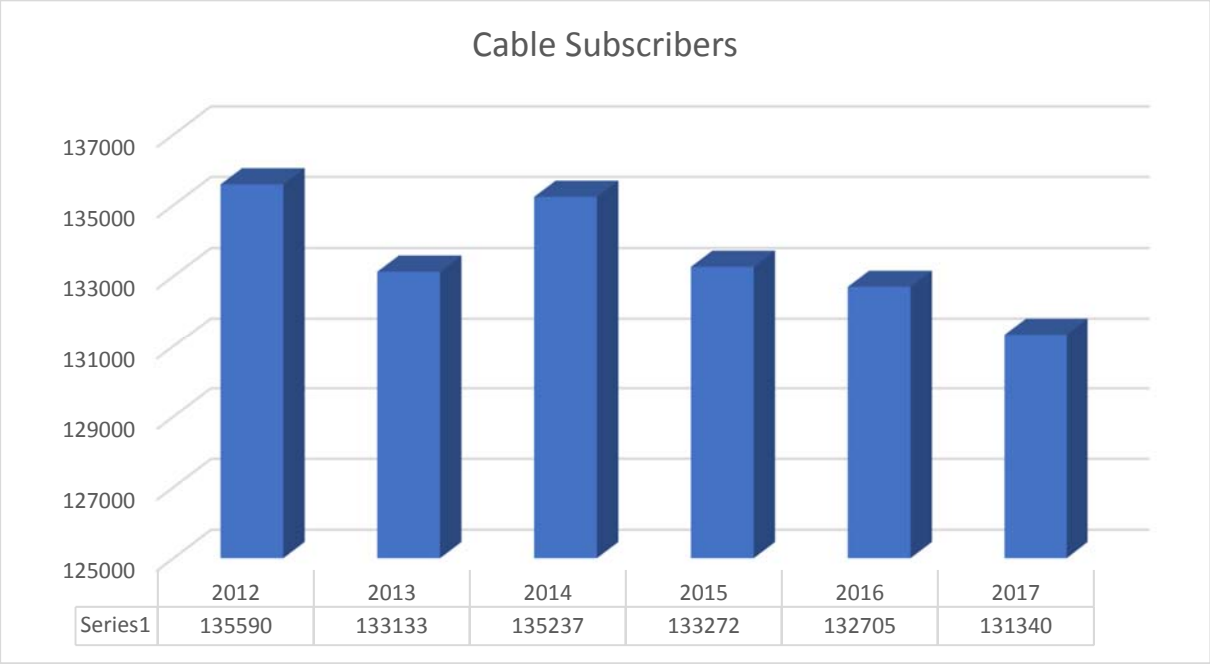


Figure 36: Total Vermont Cable Subscribers by year; Cable TV Annual Reports

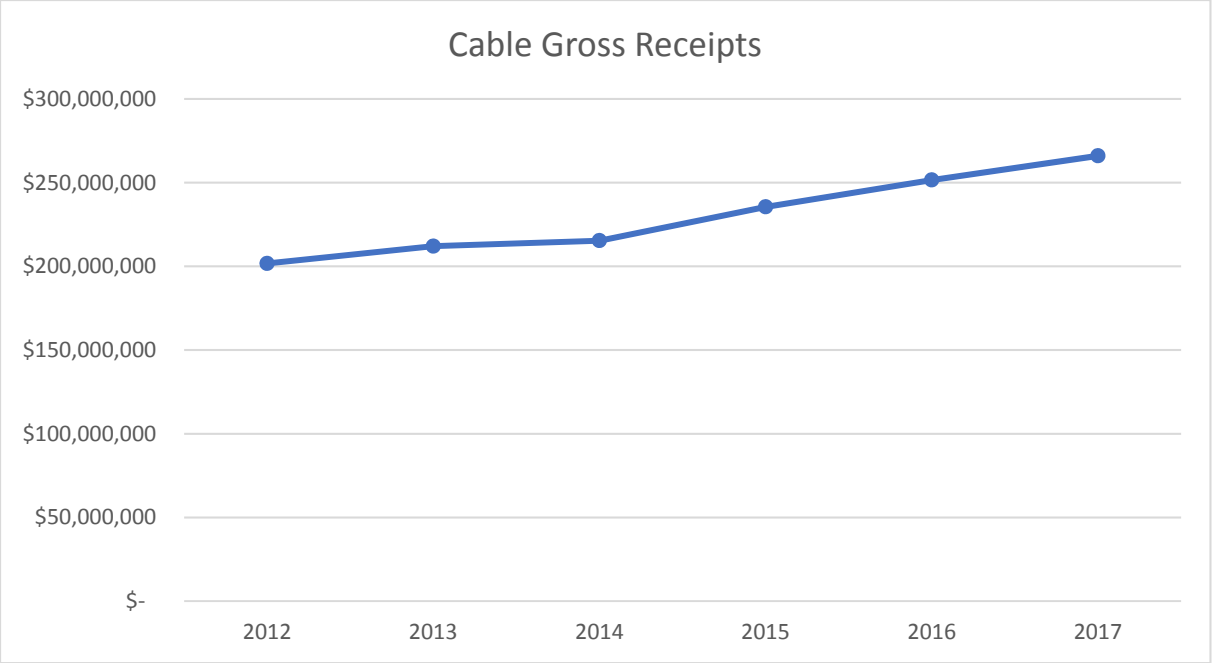


Figure 37: Total Vermont Cable Gross Receipts by year; Cable TV Annual Reports

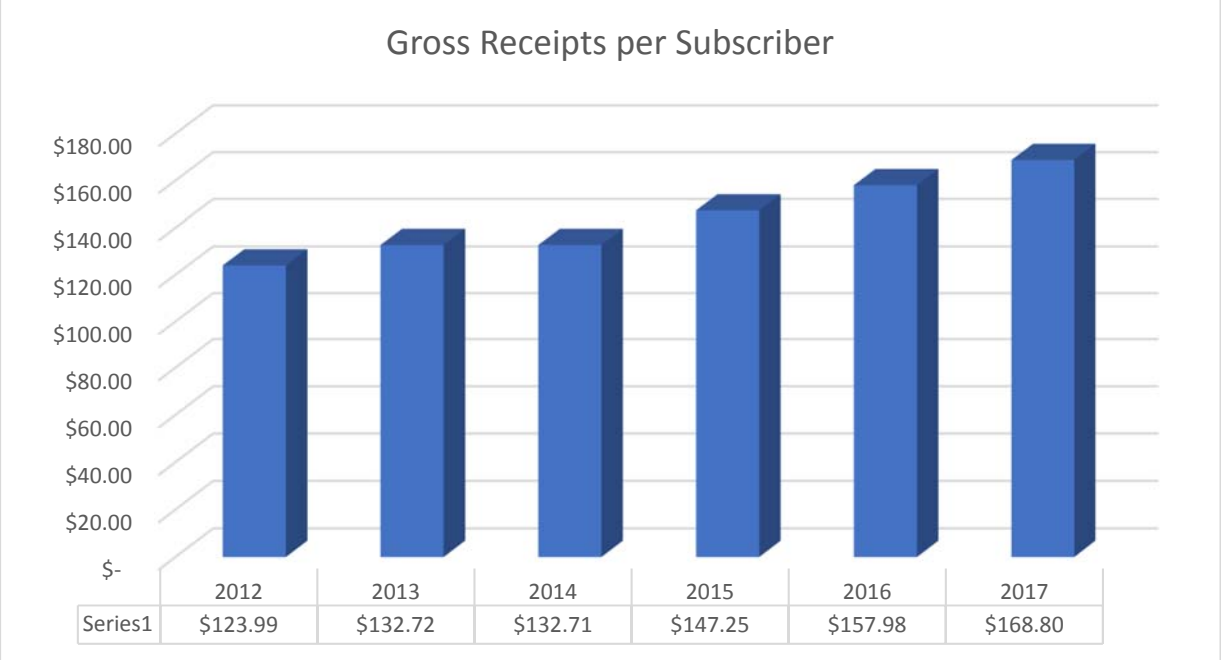


Figure 38: Vermont Gross Receipts per Subscriber by year, Cable TV annual reports

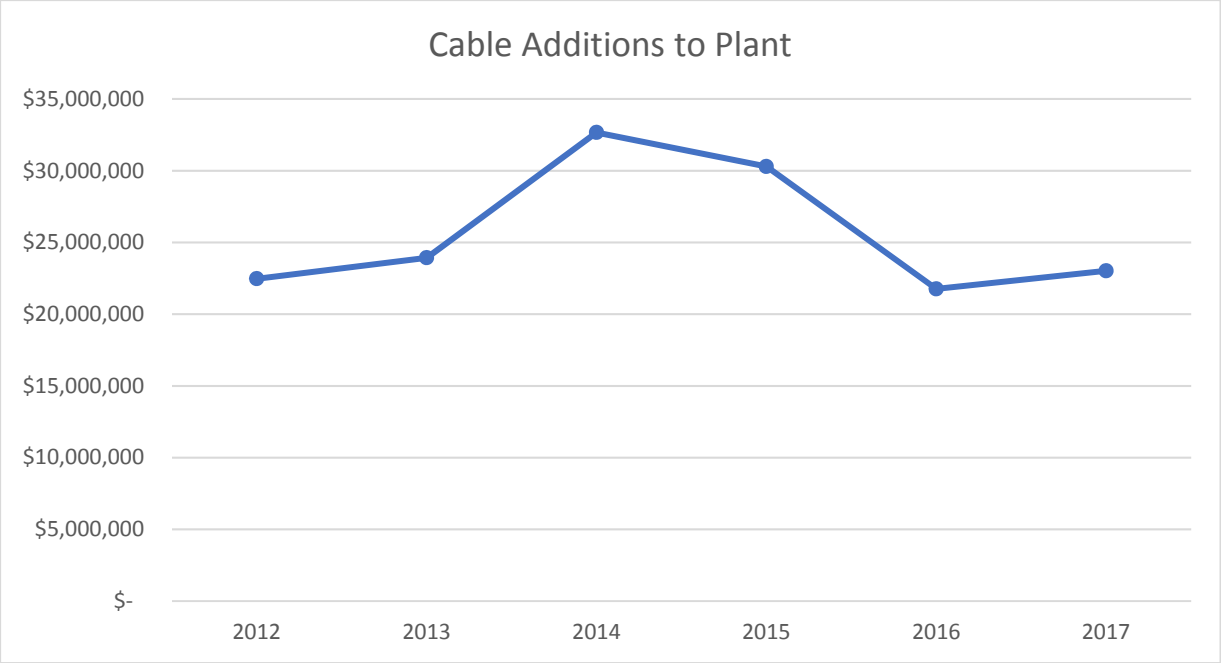


Figure 39: Total additions to Vermont Cable TV plant, by Year; Cable TV annual reports

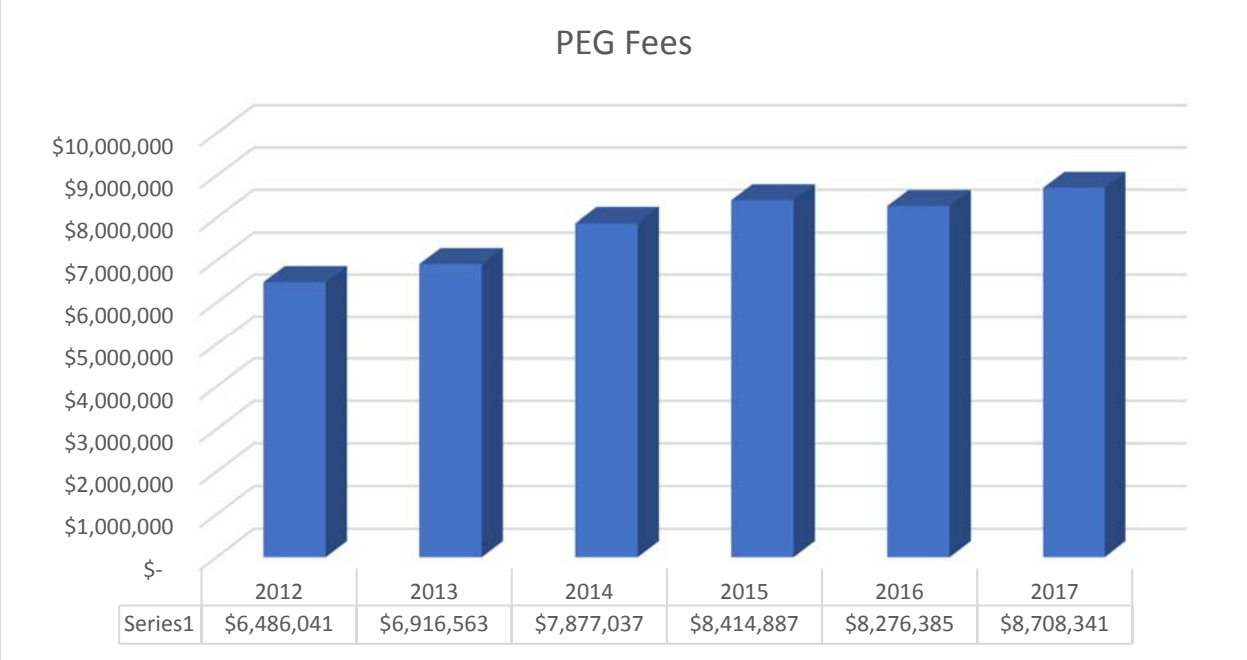


Figure 40: Total Vermont Public Access TV fees by Year; Cable TV annual reports

Telecommunications Surveys

Introduction

The Telecommunications Planning Statute directs the Department of Public Service to conduct one or more surveys of Vermont residents and businesses to determine what telecommunications services are needed now and in the succeeding 10 years. The statute calls upon the Department to focus on the education, healthcare, public safety, and workforce development sectors.[31] To that end the Department conducted a survey of Vermont residents and businesses in the Fall of 2017. In addition, the Department drew upon resources at the Agency of Education, Department of Public Safety, Department of Labor, and the Department of Health. The information gathered in the telecommunications planning process was used to inform our understanding of what Vermonters expect for telecommunications service over the next 10 years. Not surprisingly, access to high-speed broadband and mobile wireless voice service topped the list. This section includes a brief discussion of the Department's efforts and the final residential and business surveys.

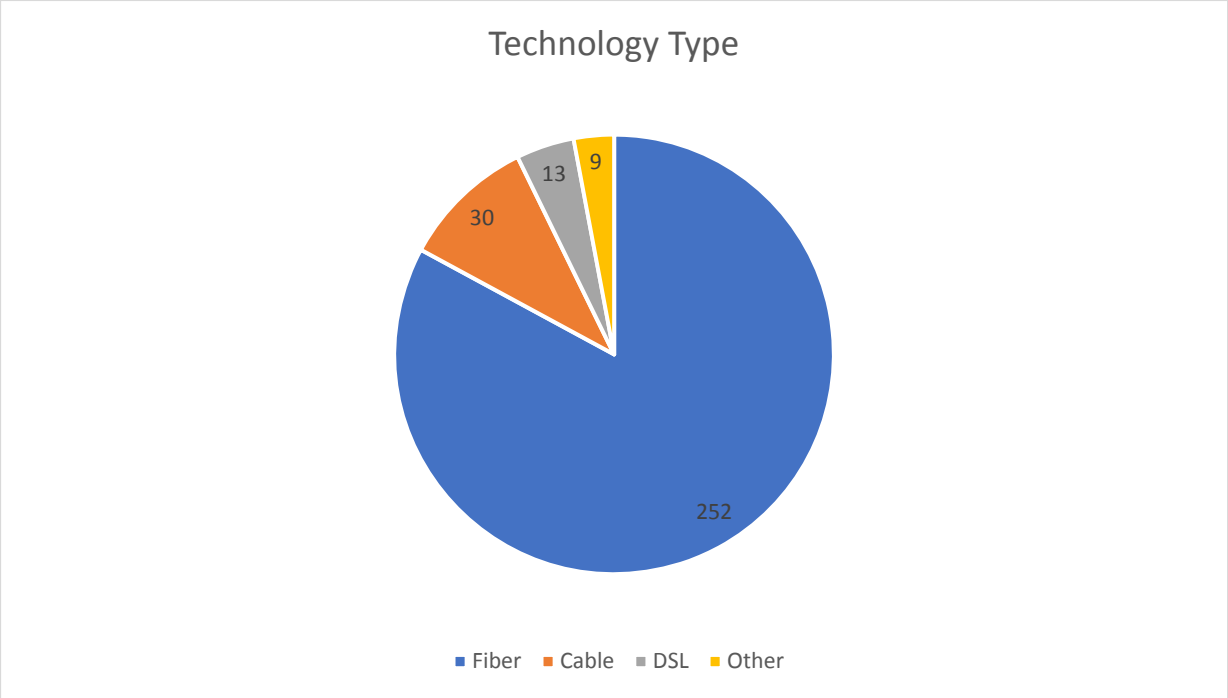
Education

The Vermont Agency of Education is a valuable resource in determining the telecommunication needs of the school systems throughout the state. The Agency's Educational Technology program works to provide guidance in policy and practice related to implementing Digital Learning programs at schools. Some of the areas of focus include providing vision on sound education technology practices through the State Digital Learning Plan, leveraging broadband acquisition, providing information on E-rate and other federal funding programs, bringing opportunities for expanded learning with technology to schools, keeping schools abreast of promising trends and maintaining a sound working relationship with educators on the local

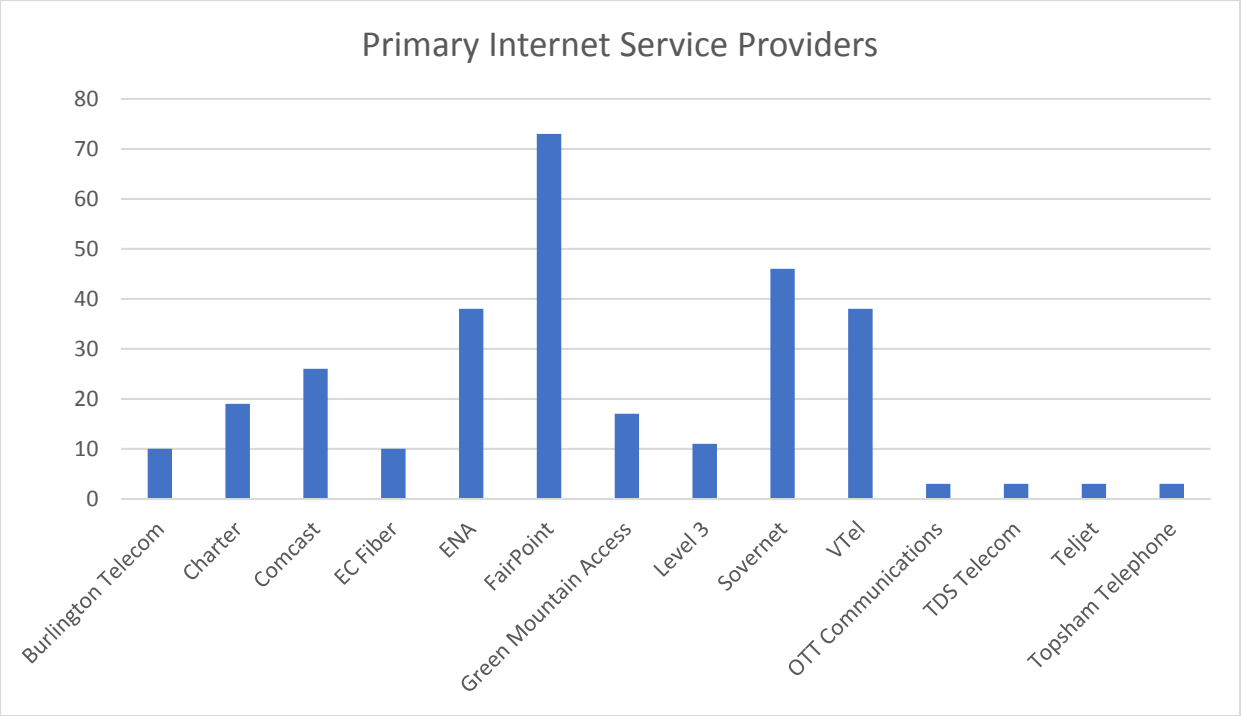
[31] 30 V.S.A. 202d(b)(2)

level. A noted focus is on providing opportunities for ways technology can support aspects of Act 77, an Act related to providing flexible pathways for learning for all students.

Each year, the Agency of Education conducts a Technology Survey for all state schools. The Annual Education Technology Survey is required of all Vermont schools, and an effort to collect important data about many aspects of the education technology landscape. This survey is to be answered on the school level for each public school in Vermont, and the information gleaned through the process is used by legislators, state and local policymakers. It is also referenced in both state and national press with regards Vermont's status around education technology.



The survey demonstrates that there is a healthy market for these services, and lists 14 providers that offer services to Vermont schools. The table below lists the quantity of schools served by each of these providers.



1

The Survey of schools highlight the great progress Vermont has made in connecting schools. The new challenge, as the residential survey suggests, will be connecting students in their homes to the new educational opportunities that new technology provides.

Healthcare and Telemedicine

Based on advances in information and communications technologies, medical professionals as well as other "health and care" providers can now offer increasingly robust, remote (from their location to another), interactive (two-way) services to consumers, patients and caregivers. The terms used to describe these broadband-enabled interactions include telehealth, telemedicine and telecare. "Telehealth" evolved from the word "telemedicine."

Telemedicine can be defined as using telecommunications technologies to support the delivery of all kinds of medical, diagnostic and treatment-related services usually by doctors. For example, this includes conducting diagnostic tests, closely monitoring a patient's progress after

treatment or therapy and facilitating access to specialists that are not located in the same place as the patient.

Telehealth is similar to telemedicine but includes a wider variety of remote healthcare services beyond the doctor-patient relationship. It often involves services provided by nurses, pharmacists or social workers, for example, who help with patient health education, social support and medication adherence, and troubleshooting health issues for patients and their caregivers.

Telecare generally refers to technology that allows consumers to stay safe and independent in their own homes. For example, telecare may include consumer-oriented health and fitness apps, sensors and tools that connect consumers with family members or other caregivers, exercise tracking tools, digital medication reminder systems or early warning and detection technologies

Healthcare technology can better serve the aging population by helping people live independently longer, and manage chronic disease more effectively. Current trends include baby boomer caregivers that will soon move into the senior population themselves. We are only at the beginning of understanding how wearable technologies and sensors can improve health, including managing chronic disease for the elderly. Today, caregivers and family members are looking for healthcare technology that keeps tabs on parents and grandparents. Popular solutions include medication management apps and activity sensors. Developers must keep in mind that the older population wants their opinion to be heard and considered, including privacy concerns.

Broadband networks are increasingly important to our national well-being and everyday lives. As such, we must maximize their availability and ensure that all Americans can take

advantage of the variety of services that broadband enables, including 21st century health care. In a Public Notice issued in April 2017, the FCC sought information on how it could help enable the adoption and accessibility of broadband-enabled health care solutions, especially in rural and other underserved areas of the country.

The Vermont Department of Health issued two separate surveys, in collaboration with the Department of Public Service, to healthcare providers around the state, requesting information from members of the healthcare community and asking for feedback to assist in the formation of an understanding of the current telecommunication usage, trends, and access to services throughout the state. Healthcare professionals were able to provide valuable data regarding healthcare provision, healthcare management, telehealth, and telemedicine, amongst other topics. The surveys canvased over four hundred health and wellness personnel throughout the state.

The Department received a total of two responses. Of those that responded, it appears that both are well covered with wireline broadband. Most healthcare facilities are located in village or urban centers and we would expect them to be well served with wireline broadband access. The level access afforded to healthcare institutions may be a reason why the response rate was so low.

However, both surveys indicated the need for cell coverage. Cell coverage in the community is necessary for doctors, patients, and first responders. Cell coverage is needed both on and off the medical campus to effectuate good healthcare. Similarly, better internet in the community is necessary for healthcare professionals to deliver care as more telemedicine services are deployed. Care in the home will require applications such as remote monitoring, videoconferencing, and high-definition imaging among others.

Public Safety

From June to September 2015, the Vermont Public Safety Broadband Network Commission initiated a data collection process to gather information on the mobile wireless data usage of Vermont first responders. A small outreach team was assembled to distribute a national survey to collect data that was then used by FirstNet to guide the preliminary plans for the NPSBN. The goal of the survey was to better understand the mobile wireless usage of Vermont's first responders. There were 591 public safety entities in Vermont that completed the survey, representing almost 75 percent of the public safety entities in the state. There were approximately 18,700 Vermont public safety personnel represented in the survey response. The majority of public safety agencies in the state do not provide or pay for personal cell phones for their employees. Other key survey findings included:

- **Device Use:** 89 percent of traditional first responders are allowed to use personal devices to do public safety work; 63 percent are using texting or paging daily or weekly; 62 percent are using emails and the Internet on a daily or weekly basis.
- **Limitations to Ability to Adopt Wireless Technologies:** 68 percent of traditional first responders cited coverage as the biggest limitation; 57 percent cited reliability of service; 53 percent cited cost of services; and 29 percent cited a lack of personal expertise.

Due to historically poor cell phone service in Vermont, the first responders were cautious about the ability for the terrestrial towers to provide coverage in topographically challenged areas throughout the state. Further, the Vermont outreach team heard from many first responders that they foresee local town zoning ordinances as a major barrier to the future FirstNet network and fear that towns throughout Vermont will not approve towers to serve their critical communications needs. First responders foremost expressed a cautious optimism that FirstNet

would address their telecommunication needs. The top three topics the outreach team fielded questions on were: cost, coverage, and timeline of deployment. The PSBC has consistently communicated to FirstNet these concerns for robust coverage, expeditious build-out and cost containment.

Labor

The Vermont Department of Labor's mission is to promote Vermont's economic strength by assisting employers with job creation, retention and recruitment; coordinating the education and training of our workforce for Vermont's current and future job opportunities; ensuring that Vermont workers have well-paying jobs in safe work environments; administering economic support and reemployment assistance to workers who suffer a job loss or workplace injury; and providing labor market information and analysis to the enable effective planning and decision-making relating to economic, education, labor and employment policies and direction.

The Vermont Department of Labor has four main Divisions that are overseen by the Commissioner.

- Workforce Development and Training
    - The Director of the Workforce Development Director oversees 12 regional American Jobs Centers (formerly known as Career Resource Centers)
- Unemployment Insurance and Wage & Hour
- Labor Market Information
- Workers' Compensation and Workplace Safety

Each Division Director was asked to outline their telecom and connectivity challenges and/or opportunities

Unemployment Insurance and Wage & Hour

The Department of Labor is currently undergoing an Unemployment Insurance (UI) Modernization project that will update an antiquated computer system, and after the go-live date of October 1, 2018 the Department will be pushing/mandating that UI claims be processed online. This may be difficult for those with limited access to the internet. Although the American Job Centers are available to assist those with limited access, this will create a burden on some individuals to access UI benefits. If claimants around the state are facing telecom and connectivity challenges, this will lead to people calling our claims center and taking the staff away from other duties.

The UI Division is located at the central office in Montpelier and suffers from a lack of cell coverage not only at the main office, but in areas across the State. This affects people trying to file through their phone or tablets leading to an incomplete filing because the service did not allow the claim to come through. Also, when we are trying to conduct adjudications to determine eligibility, lack of service leads to spotty calls or no calls at all.

Lastly, the UI Division has tax auditors interspersed throughout the Vermont. Lack of cell coverage is a deep concern to the Division Director and the Employer Services Supervisors. The lack of ability to check in on them while in the field is a concern. As far as employers go, the auditors commented that a small number of employers they encounter do not have internet.

Workforce Development Division

Vermont has one certified “One-Stop” center (per federal requirements) in Burlington. This “One-Stop” will eventually be required offer access to ALL workforce development programs. The division is in the beginning stages of coordinating those efforts. The One-Stop is required to design ways to provide virtual services, counseling, and trainings to customers at regional AJCs (formerly career resource centers) and, eventually, wherever the customer is.

Other states have come to rely on electronic forms, web-based trainings, and real-time virtual interactions to help meet needs of customers who live remotely, don't have access to transportation, have childcare/scheduling/or other barriers to in-person experiences, are housed in correctional facilities, etc. Partners are contemplating ways to expand services that can be modified as access to technology improves.

From the perspective and experience of regional managers, regional office staff, and Division Director, there are a number Vermonters who do not have telecom access (and for a number of reasons.) Availability in rural areas and areas with higher levels of poverty preclude individuals from accessing valuable WD resources.

Unfortunately, there is a population that must travel to access online WD resources. The cost of travel for some families in poverty adds an additional stress to already stretched family budgets. Although interactions with computers has greatly increased, the ability for some individuals to access computers and the internet has become increasingly important in order access a variety of resources. However, not everyone has access to this technology, hence the "digital divide" which refers to the growing gap between the underprivileged members of Vermont, rural, elderly, and handicapped portion of the population who do not have access to computers or the internet.

Regional American Jobs Centers are planning on providing certain services and career exploration resources on line with in a virtual environment. While we are not there yet, there is a sense that the federal government will require these services to be virtually available sooner rather than later.

Workers' Compensation Division

The safety and efficiency of all (VOSHA, WorkSAFE, workers' compensation investigators, and Tramway) field staff is often inhibited by lack of cell service or poor cell service and inadequate or nonexistent wireless internet service.

The lack of cell service is a safety issue since all are often working alone dealing with employers who are not happy to see them.

If broadband and wireless were more available throughout the state, efficiency could be improved by permitting database checks and filing reports (etc.) remotely.

Number of Locations by Wire Center

Prepared by the Public Service Department pursuant to 30 V.S.A. § 7501(b)(7)
This table lists the number of business and residential locations from the Vermont E-911 database located in each Vermont wire center.

Wire Center	Exchange	Telephone Company	CLLI	SGAT	Locations
ADDISON	ADDISON	Waitsfield – Fayston Telephone Co., Inc.	ADSNVTXARS1	O	958
ALBANY	ALBANY	Telephone Operating Company of Vermont LLC	ORLNVTIRRS1	R2	547
ALBURG	ALBURG	FairPoint Vermont, Inc.	ALBGVTXADS0	V	2,324
ARLINGTON	ARLINGTON	Telephone Operating Company of Vermont LLC	ARTNVTSCRS1	R	2,348
BARNET	BARNET	Telephone Operating Company of Vermont LLC	BARNVTCHRS1	R	940
BARRE	BARRE	Telephone Operating Company of Vermont LLC	BARRVTELRS1	S	7,580
BARTON	BARTON	Telephone Operating Company of Vermont LLC	BARTVTELRS1	R	2,424
BELLOWS FALLS	BELLOWS FALLS	Telephone Operating Company of Vermont LLC	BLFLVTHERS1	S	1,985
BENNINGTON	BENNINGTON	Telephone Operating Company of Vermont LLC	BGTNVTPLDS0	S	8,749
BENSON	BENSON	SHOREHAM Telephone, LLC	BNSNVTXARS1	O	604
BETHEL	BETHEL	Telephone Operating Company of Vermont LLC	BETHVTMARS1	R	2,130
BLOOMFIELD	BLOOMFIELD	Telephone Operating Company of Vermont LLC	NSFRNHMA962	R3	426
BRADFORD	BRADFORD	Telephone Operating Company of Vermont LLC	BRFRVTPGRS1	R	1,236
BRANDON	BRANDON	Telephone Operating Company of Vermont LLC	BRNDVTCARS1	R	2,854
BRATTLEBORO	BRATTLEBORO	Telephone Operating Company of Vermont LLC	BRBOVTMADS0	S	11,007
BRIDGEWATER	BRIDGEWATER	Vermont Telephone Company	BRWRVTXARS1	O	1,349
BRIDPORT	BRIDPORT	Waitsfield – Fayston Telephone Co., Inc.	BRPTVTXARS1	O	780
BRISTOL	BRISTOL	Waitsfield – Fayston Telephone Co., Inc.	BRSTVTAARS1	O	4,279
BROOKFIELD	BROOKFIELD	Telephone Operating Company of Vermont LLC	BRFDVTBCRS1	R	656
BURLINGTON	BURLINGTON	Telephone Operating Company of Vermont LLC	BURLVTMADS0	U	23,004
CABOT	CABOT	FairPoint Vermont, Inc.	CABTVTXADS6	V	1,275
CANAAN	CANAAN	Telephone Operating Company of Vermont LLC	WSTWNHBS266	R3	721
CASTLETON	CASTLETON	Telephone Operating Company of Vermont LLC	CSTNVTSORS1	R	1,284
CHARLOTTE	CHARLOTTE	Waitsfield – Fayston Telephone Co., Inc.	CHRLVT01RS1	O	2,694
CHELSEA	CHELSEA	Telephone Operating Company of Vermont LLC	CHLSVTMARS1	R	1,378
CHESTER	CHESTER	Vermont Telephone Company	CHESVTXARS1	O	2,798
CONCORD	CONCORD	Telephone Operating Company of Vermont LLC	CNCRVTMARS1	R	1,072
CORNWALL	CORNWALL	SHOREHAM Telephone, LLC	CRNWVTXARS1	O	607
CRAFTSBURY	CRAFTSBURY	Telephone Operating Company of Vermont LLC	GNBOVTGB586	R2	831
CUTTINGSVILLE	CUTTINGSVILLE	Vermont Telephone Company	CTVLVTXARS1	O	477
DANBY	DANBY	Vermont Telephone Company	DNBYVTXARS1	O	779
DANVILLE	DANVILLE	Telephone Operating Company of Vermont LLC	DAVLVTYARS1	R	961
DERBY	DERBY	Telephone Operating Company of Vermont LLC	DRBYVTMARS1	S	1,388
DERBY LINE	DERBY LINE	Telephone Operating Company of Vermont LLC	DRBYVTMARS1	N	406
DORSET	DORSET	Telephone Operating Company of Vermont LLC	DRSTVTYARS1	R	795
E. CALAIS	E. CALAIS	Telephone Operating Company of Vermont LLC	PLFDVTYARS1	R2	853
E. FAIRFIELD	E. FAIRFIELD	Telephone Operating Company of Vermont LLC	EFFDVTMARS1	R	995
EAST CORINTH	EAST CORINTH	Topsham Telephone Company	ECRNVTXADS0	O	2,750
ENOSBURG FALLS	ENOSBURG FALLS	Telephone Operating Company of Vermont LLC	ENFLVTMARS1	R	2,980
ESSEX JCT.	ESSEX JCT.	Telephone Operating Company of Vermont LLC	ESJTVTLIDS0	S	14,214
FAIR HAVEN	FAIR HAVEN	Telephone Operating Company of Vermont LLC	FRHNVTMARS1	R	1,972
FAIRFAX	FAIRFAX	Telephone Operating Company of Vermont LLC	FRFXVTMARS1	R	2,525
FAIRLEE	FAIRLEE	Telephone Operating Company of Vermont LLC	FARLVTMLRS1	R	1,841
FRANKLIN	FRANKLIN	Franklin Telephone Company	FKLNVTXADS1	O	971
GRAFTON	GRAFTON	Vermont Telephone Company	GFTNVTXARS1	O	392
GRAND ISLE	GRAND ISLE	Telephone Operating Company of Vermont LLC	GDISVTYARS1	R	3,942
GREENSBORO	GREENSBORO	Telephone Operating Company of Vermont LLC	GNBOVTGBRS1	R	1,290
GROTON	GROTON	FairPoint Vermont, Inc.	CABTVTXADS6	V	1,792
GUILDHALL	GUILDHALL	Telephone Operating Company of Vermont LLC	LNCSNHHIRS2	N	434
HARDWICK	HARDWICK	Telephone Operating Company of Vermont LLC	HRWKVTPKRS1	R	2,025
HARTLAND	HARTLAND	Vermont Telephone Company	HRLDVTXARS1	O	1,215
HINESBURG	HINESBURG	Waitsfield – Fayston Telephone Co., Inc.	HNBGVTXARS1	O	2,300
HUBBARDTON	HUBBARDTON	SHOREHAM Telephone, LLC	HBTNVTXARS1	O	1,336
ISLAND POND	ISLAND POND	Telephone Operating Company of Vermont LLC	ISPNVTALRS1	R	1,664
ISLE LA MOTTE	ISLE LA MOTTE	FairPoint Vermont, Inc.	ALBGVTXADS0	V	592
JACKSONVILLE	JACKSONVILLE	Telephone Operating Company of Vermont LLC	JCVLVTSCRS1	R	1,681
JAMAICA	JAMAICA	Telephone Operating Company of Vermont LLC	JAMCVTMARS1	R	1,302

Wire Center	Exchange	Telephone Company	CLLI	SGAT	Locations
JEFFERSONVILLE	JEFFERSONVILLE	Telephone Operating Company of Vermont LLC	JFVLVTVARS1	R	2,421
JOHNSON	JOHNSON	Telephone Operating Company of Vermont LLC	JHSNVTRARS1	R	2,432
LEMINGTON	LEMINGTON	Telephone Operating Company of Vermont LLC	CLBKNHMA277	R3	157
LUDLOW	LUDLOW	Ludlow Telephone Company	LDLWVTXADS0	O	2,975
LUNENBURG	LUNENBURG	Telephone Operating Company of Vermont LLC	LNBGVTECRS1	R	1,291
LYNDONVILLE	LYNDONVILLE	Telephone Operating Company of Vermont LLC	LYVLVTCERS1	R	3,934
MAIDSTONE	MAIDSTONE	Telephone Operating Company of Vermont LLC	GVTNNHSTRS2	N	441
MANCHESTER	MANCHESTER	Telephone Operating Company of Vermont LLC	MNCHVTSCRS1	S	3,780
MARSHFIELD	MARSHFIELD	FairPoint Vermont, Inc.	CABTVTXADS6	V	743
MENDON	RUTLAND	Telephone Operating Company of Vermont LLC	RTLDVTWEDS0	S	562
IDDLE TOWN SPRIN	MIDDLE TOWN SPRING	Vermont Telephone Company	MDSPVTXARS1	O	1,004
MIDDLEBURY	MIDDLEBURY	Telephone Operating Company of Vermont LLC	MDLBVTCCRS1	S	3,683
MILTON	MILTON	Telephone Operating Company of Vermont LLC	MLTNVTELRS1	S	5,619
MONTGOMERY	MONTGOMERY	FairPoint Vermont, Inc.	MTGMVTXADS0	V	936
MONTPELIER	MONTPELIER	Telephone Operating Company of Vermont LLC	MTPLVTSCDS0	S	6,921
MORGAN	MORGAN	Telephone Operating Company of Vermont LLC	MRGNVTTORS1	R	1,589
MORRISVILLE	MORRISVILLE	Telephone Operating Company of Vermont LLC	MRVLVTUNRS1	R	5,082
MOUNT HOLLY	MOUNT HOLLY	Vermont Telephone Company	MTHLVTXARS1	O	1,427
N. SPRINGFIELD	N. SPRINGFIELD	Vermont Telephone Company	NSFDVTXARS1	O	905
N. TROY	N. TROY	Telephone Operating Company of Vermont LLC	TROYVTYARS1	R2	1,137
NEWBURY	NEWBURY	Telephone Operating Company of Vermont LLC	NWBYVTPCRS1	R	336
NEWFANE	NEWFANE	Telephone Operating Company of Vermont LLC	NWFNVTYARS1	R	1,661
NEWPORT	NEWPORT	Telephone Operating Company of Vermont LLC	NWPTVTSERS1	S	3,933
NORTHFIELD	NORTHFIELD	Northfield Telephone Company	NRFDVTXADS0	O	2,846
NORTON	NORTON	Telephone Operating Company of Vermont LLC	ISPNVTAL822	N	628
NORWICH	NORWICH	Telephone Operating Company of Vermont LLC	HNVRNHSCDS2	N	1,587
ORLEANS	ORLEANS	Telephone Operating Company of Vermont LLC	ORLNVTIRRS1	R	2,106
ORWELL	ORWELL	SHOREHAM Telephone, LLC	ORWLVTXARS1	O	799
PANTON	PANTON	Waitsfield – Fayston Telephone Co., Inc.	PNTNVTXARS1	O	683
PAWLET	PAWLET	Vermont Telephone Company	PWLTVTXARS1	O	855
PEACHAM	PEACHAM	FairPoint Vermont, Inc.	CABTVTXADS6	V	513
PERKINSVILLE	PERKINSVILLE	Perkinsville Telephone Company, Inc.	PKVLVTXARS1	O	1,002
PITTSFIELD	PITTSFIELD	Telephone Operating Company of Vermont LLC	PTFDVTMARS1	R	639
PITTSFORD	PITTSFORD	Telephone Operating Company of Vermont LLC	PTFRVTYARS1	R	1,879
PLAINFIELD	PLAINFIELD	Telephone Operating Company of Vermont LLC	PLFDVTYARS1	R	941
POULTNEY	POULTNEY	Telephone Operating Company of Vermont LLC	PLTNVTBERS1	S	1,597
POWNAL	POWNAL	Telephone Operating Company of Vermont LLC	PWNLVTBERS1	R	1,387
PROCTOR	PROCTOR	Telephone Operating Company of Vermont LLC	PRCTVTPIRS1	S	782
PROCTORSVILLE	PROCTORSVILLE	Ludlow Telephone Company	PRVLVTXARS1	O	809
PUTNEY	PUTNEY	Telephone Operating Company of Vermont LLC	PTNYVTCHRS1	R	1,822
QUECHEE	WHITE RIVER JCT.	Telephone Operating Company of Vermont LLC	WRJTVTGADS0	S	1,517
RANDOLPH	RANDOLPH	Telephone Operating Company of Vermont LLC	RNDHVTPLRS1	R	3,031
READING	READING	Telephone Operating Company of Vermont LLC	RDNGVTMIRS1	R	1,377
READSBORO	READSBORO	Telephone Operating Company of Vermont LLC	RDBOVTTURS1	R	580
RICHFORD	RICHFORD	Telephone Operating Company of Vermont LLC	RCFRVTINRS1	R	1,286
RICHMOND	RICHMOND	Waitsfield – Fayston Telephone Co., Inc.	RCMDVTXADS1	O	3,730
ROCHESTER	ROCHESTER	Telephone Operating Company of Vermont LLC	ROCHVTSPRS1	R	1,486
RUPERT	RUPERT	Telephone Operating Company of Vermont LLC	RPRTVTGRRS1	R	400
RUTLAND	RUTLAND	Telephone Operating Company of Vermont LLC	RTLDVTWEDS0	S	9,862
S. LONDONDERRY	S. LONDONDERRY	Telephone Operating Company of Vermont LLC	SLNDVTYARS1	R	2,953
S. ROYALTON	S. ROYALTON	Telephone Operating Company of Vermont LLC	SRYLVTYARS1	R	2,270
S. STRAFFORD	S. STRAFFORD	Telephone Operating Company of Vermont LLC	SSFRVTYARS1	R	625
SALISBURY	SALISBURY	Telephone Operating Company of Vermont LLC	SLBRVTBARS1	R	989
SAXTONS RIVER	SAXTONS RIVER	Vermont Telephone Company	SXRVVTXARS1	O	1,170
SHELBURNE	BURLINGTON	Telephone Operating Company of Vermont LLC	SHLBVTPHRS1	S	3,247
SHERBURNE	SHERBURNE	Vermont Telephone Company	SHBNVTXARS1	O	1,271
SHOREHAM	SHOREHAM	SHOREHAM Telephone, LLC	SHHMVTXADS0	O	700
SPRINGFIELD	SPRINGFIELD	Vermont Telephone Company	SPFDVTXADS0	O	3,165
ST. ALBANS	ST. ALBANS	Telephone Operating Company of Vermont LLC	STALVTBARS1	S	9,429
ST. JOHNSBURY	ST. JOHNSBURY	Telephone Operating Company of Vermont LLC	STBYVTSMDS0	S	4,512
STAMFORD	STAMFORD	Telephone Operating Company of Vermont LLC	RDBOVTTURS1	R2	491
STOWE	STOWE	Telephone Operating Company of Vermont LLC	STOWVTHIRS1	S	3,617

Wire Center	Exchange	Telephone Company	CLLI	SGAT	Locations
STRATTON	S. LONDONDERRY	Telephone Operating Company of Vermont LLC	SRTNVTARRS1	R	2,212
SWANTON	SWANTON	Telephone Operating Company of Vermont LLC	SWTNVTYORS1	R	5,099
THETFORD	THETFORD	Telephone Operating Company of Vermont LLC	LYMENHYARS2	R3	1,025
TROY	TROY	Telephone Operating Company of Vermont LLC	TROYVTYARS1	R	1,368
TUNBRIDGE	TUNBRIDGE	Telephone Operating Company of Vermont LLC	TNBRVTYARS1	R	614
UNDERHILL	UNDERHILL	Telephone Operating Company of Vermont LLC	UNHLVTUCRS1	R	3,468
VERGENNES	VERGENNES	Telephone Operating Company of Vermont LLC	VRGSVTMORS1	R	2,216
W. BURKE	W. BURKE	Telephone Operating Company of Vermont LLC	WBURVTYARS1	R	1,929
W. RUTLAND	W. RUTLAND	Telephone Operating Company of Vermont LLC	WRTLVTBARS1	R	1,450
WAITSFIELD	WAITSFIELD	Waitsfield – Fayston Telephone Co., Inc.	WTFDVTXARS1	O	4,059
WALLINGFORD	WALLINGFORD	Vermont Telephone Company	WLFRVTXADS0	O	1,139
WARDSBORO	WARDSBORO	Telephone Operating Company of Vermont LLC	WRBOVTYARS1	R	1,173
WASHINGTON	WASHINGTON	Telephone Operating Company of Vermont LLC	BARRVTELRS1	N	487
WATERBURY	WATERBURY	Telephone Operating Company of Vermont LLC	WTRBVTSWRS1	S	3,302
WEATHERSFIELD	WEATHERSFIELD	Telephone Operating Company of Vermont LLC	WNDSVTPIRS1	N	33
WELLS	WELLS	Telephone Operating Company of Vermont LLC	PLTNVTBERS1	N	1,239
WELLS RIVER	WELLS RIVER	Telephone Operating Company of Vermont LLC	WDVLNHJLRS1	R3	311
WEST DOVER	WILMINGTON	Telephone Operating Company of Vermont LLC	WLMGVTDARS1	R	2,021
WEST NEWBURY	WEST NEWBURY	FairPoint Vermont, Inc.	CABTVTXADS6	V	659
WESTMINSTER	WESTMINSTER	Telephone Operating Company of Vermont LLC	WLPLNHWP722	R3	729
WEYBRIDGE	WEYBRIDGE	Waitsfield – Fayston Telephone Co., Inc.	WYBGVTXARS1	O	569
WHITE RIVER JCT.	WHITE RIVER JCT.	Telephone Operating Company of Vermont LLC	WRJTVTGADS0	S	3,776
WHITING	WHITING	SHOREHAM Telephone, LLC	WHNGVTXARS1	O	368
WILLIAMSTOWN	WILLIAMSTOWN	Telephone Operating Company of Vermont LLC	WLTWVTLARS1	R	1,330
WILLIAMSVILLE	WILLIAMSVILLE	Telephone Operating Company of Vermont LLC	NWFNVTYARS1	R2	997
WILMINGTON	WILMINGTON	Telephone Operating Company of Vermont LLC	WLMGVTDARS1	R	2,851
WINDSOR	WINDSOR	Telephone Operating Company of Vermont LLC	WNDSVTPIRS1	S	2,112
WINOOSKI	BURLINGTON	Telephone Operating Company of Vermont LLC	WNSKVTWARS1	U	3,141
WOODSTOCK	WOODSTOCK	Telephone Operating Company of Vermont LLC	WDSTVTGORS1	R	3,388
Total					327,329

The CLLI column lists the Common Language Location Identifier code maintained by Telcordia.
The SGAT column lists the wire center loop density zone in TOCVT Statement of Generally Available Terms section 5.5.1.2

Type	Description
N	Not listed*
R2	Served by TOC VT R
R3	Served by TOC NH R
O	Not FairPoint
R	Rural
S	Suburban
U	Urban
V	FairPoint Vermont

* These wire centers are served by TOCVT but are not listed in the Vermont SGAT.

Broadband Statistics Summary by Town as of January 11,2018

			Served locations are affirmatively reported as served by specific providers								Underserved locations	
County	Town	Total Buildings	Served 100/100 or Better	Percent Served 100/100 or Better	Served 25/3 or Better	Percent Served 25/3 or Better	Served 10/1 or Better	Percent Served 10/1 or Better	Served 4/1 or Better	Percent Served 4/1 or Better	Underserved	Percent Underserved
ADDISON	Addison	835	197	23.6%	250	29.9%	250	29.9%	807	96.6%	28	3.4%
ADDISON	Bridport	656	43	6.6%	51	7.8%	51	7.8%	568	86.6%	88	13.4%
ADDISON	Bristol	1601	429	26.8%	1,456	90.9%	1,456	90.9%	1,581	98.8%	20	1.2%
ADDISON	Cornwall	572	0	0.0%	0	0.0%	0	0.0%	539	94.2%	33	5.8%
ADDISON	Ferrisburgh	1659	98	5.9%	814	49.1%	939	56.6%	1,565	94.3%	94	5.7%
ADDISON	Goshen	139	0	0.0%	0	0.0%	0	0.0%	90	64.7%	49	35.3%
ADDISON	Granville	267	0	0.0%	0	0.0%	98	36.7%	212	79.4%	55	20.6%
ADDISON	Hancock	240	111	46.3%	111	46.3%	172	71.7%	213	88.8%	27	11.3%
ADDISON	Leicester	694	0	0.0%	650	93.7%	676	97.4%	680	98.0%	14	2.0%
ADDISON	Lincoln	677	127	18.8%	394	58.2%	394	58.2%	653	96.5%	24	3.5%
ADDISON	Middlebury	2917	0	0.0%	2,754	94.4%	2,815	96.5%	2,900	99.4%	17	0.6%
ADDISON	Monkton	873	50	5.7%	588	67.4%	641	73.4%	854	97.8%	19	2.2%
ADDISON	New Haven	792	119	15.0%	439	55.4%	439	55.4%	747	94.3%	45	5.7%
ADDISON	Orwell	742	0	0.0%	0	0.0%	0	0.0%	705	95.0%	37	5.0%
ADDISON	Panton	324	106	32.7%	126	38.9%	126	38.9%	308	95.1%	16	4.9%
ADDISON	Ripton	372	0	0.0%	0	0.0%	166	44.6%	285	76.6%	87	23.4%
ADDISON	Salisbury	830	0	0.0%	76	9.2%	390	47.0%	759	91.4%	71	8.6%
ADDISON	Shoreham	737	0	0.0%	0	0.0%	0	0.0%	701	95.1%	36	4.9%
ADDISON	Starksboro	914	101	11.1%	589	64.4%	589	64.4%	891	97.5%	23	2.5%
ADDISON	Vergennes	999	0	0.0%	993	99.4%	993	99.4%	995	99.6%	4	0.4%
ADDISON	Waltham	234	0	0.0%	87	37.2%	125	53.4%	196	83.8%	38	16.2%
ADDISON	Weybridge	404	37	9.2%	130	32.2%	130	32.2%	383	94.8%	21	5.2%
ADDISON	Whiting	183	0	0.0%	0	0.0%	0	0.0%	176	96.2%	7	3.8%
BENNINGTON	Arlington	1291	0	0.0%	1,085	84.0%	1,152	89.2%	1,195	92.6%	96	7.4%
BENNINGTON	Bennington	6028	0	0.0%	5,928	98.3%	5,934	98.4%	5,969	99.0%	59	1.0%
BENNINGTON	Dorset	1464	10	0.7%	1,160	79.2%	1,229	83.9%	1,345	91.9%	119	8.1%
BENNINGTON	Glastenbury	4	0	0.0%	0	0.0%	2	50.0%	4	100.0%	0	0.0%
BENNINGTON	Landgrove	177	0	0.0%	10	5.6%	69	39.0%	142	80.2%	35	19.8%
BENNINGTON	Manchester	2806	0	0.0%	2,693	96.0%	2,704	96.4%	2,774	98.9%	32	1.1%
BENNINGTON	Peru	517	0	0.0%	114	22.1%	228	44.1%	421	81.4%	96	18.6%
BENNINGTON	Pownal	1730	0	0.0%	1,542	89.1%	1,579	91.3%	1,637	94.6%	93	5.4%
BENNINGTON	Readsboro	529	0	0.0%	0	0.0%	287	54.3%	372	70.3%	157	29.7%
BENNINGTON	Rupert	497	110	22.1%	110	22.1%	202	40.6%	407	81.9%	90	18.1%
BENNINGTON	Sandgate	319	0	0.0%	19	6.0%	130	40.8%	259	81.2%	60	18.8%
BENNINGTON	Searsburg	132	0	0.0%	2	1.5%	41	31.1%	102	77.3%	30	22.7%
BENNINGTON	Shaftsbury	1695	0	0.0%	1,303	76.9%	1,471	86.8%	1,559	92.0%	136	8.0%
BENNINGTON	Stamford	470	0	0.0%	0	0.0%	195	41.5%	401	85.3%	69	14.7%
BENNINGTON	Sunderland	596	0	0.0%	549	92.1%	551	92.4%	565	94.8%	31	5.2%
BENNINGTON	Winhall	1700	0	0.0%	1,533	90.2%	1,542	90.7%	1,608	94.6%	92	5.4%
BENNINGTON	Woodford	381	0	0.0%	355	93.2%	355	93.2%	355	93.2%	26	6.8%
CALEDONIA	Barnet	1015	0	0.0%	201	19.8%	577	56.8%	794	78.2%	221	21.8%
CALEDONIA	Burke	1004	0	0.0%	549	54.7%	588	58.6%	688	68.5%	316	31.5%
CALEDONIA	Danville	1421	0	0.0%	770	54.2%	812	57.1%	975	68.6%	446	31.4%
CALEDONIA	Groton	705	0	0.0%	188	26.7%	572	81.1%	580	82.3%	125	17.7%
CALEDONIA	Hardwick	1426	16	1.1%	962	67.5%	1,013	71.0%	1,308	91.7%	118	8.3%
CALEDONIA	Kirby	274	0	0.0%	30	10.9%	54	19.7%	103	37.6%	171	62.4%
CALEDONIA	Lyndon	2277	0	0.0%	1,874	82.3%	1,898	83.4%	1,998	87.7%	279	12.3%
CALEDONIA	Newark	597	0	0.0%	0	0.0%	69	11.6%	289	48.4%	308	51.6%
CALEDONIA	Peacham	568	0	0.0%	292	51.4%	449	79.0%	464	81.7%	104	18.3%
CALEDONIA	Ryegate	674	0	0.0%	245	36.4%	537	79.7%	552	81.9%	122	18.1%
CALEDONIA	Sheffield	468	0	0.0%	108	23.1%	197	42.1%	319	68.2%	149	31.8%

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County	Town	Total Buildings	Served 100/100 or Better	Percent Served 100/100 or Better	Served 25/3 or Better	Percent Served 25/3 or Better	Served 10/1 or Better	Percent Served 10/1 or Better	Served 4/1 or Better	Percent Served 4/1 or Better	Underserved	Percent Underserved
CALEDONIA	St. Johnsbury	2890	0	0.0%	2,484	86.0%	2,553	88.3%	2,720	94.1%	170	5.9%
CALEDONIA	Stannard	141	0	0.0%	0	0.0%	20	14.2%	96	68.1%	45	31.9%
CALEDONIA	Sutton	487	0	0.0%	110	22.6%	141	29.0%	255	52.4%	232	47.6%
CALEDONIA	Walden	657	0	0.0%	84	12.8%	372	56.6%	593	90.3%	64	9.7%
CALEDONIA	Waterford	650	0	0.0%	106	16.3%	236	36.3%	469	72.2%	181	27.8%
CALEDONIA	Wheelock	500	0	0.0%	59	11.8%	161	32.2%	336	67.2%	164	32.8%
CHITTENDEN	Bolton	497	157	31.6%	248	49.9%	251	50.5%	480	96.6%	17	3.4%
CHITTENDEN	Buels Gore	16	13	81.3%	13	81.3%	13	81.3%	14	87.5%	2	12.5%
CHITTENDEN	Burlington	11615	10,574	91.0%	11,585	99.7%	11,585	99.7%	11,615	100.0%	0	0.0%
CHITTENDEN	Charlotte	1858	88	4.7%	1,195	64.3%	1,198	64.5%	1,818	97.8%	40	2.2%
CHITTENDEN	Colchester	6348	0	0.0%	6,176	97.3%	6,187	97.5%	6,259	98.6%	89	1.4%
CHITTENDEN	Essex	7228	0	0.0%	7,028	97.2%	7,038	97.4%	7,153	99.0%	75	1.0%
CHITTENDEN	Hinesburg	1902	213	11.2%	1,358	71.4%	1,358	71.4%	1,851	97.3%	51	2.7%
CHITTENDEN	Huntington	892	7	0.8%	625	70.1%	625	70.1%	881	98.8%	11	1.2%
CHITTENDEN	Jericho	1987	0	0.0%	1,812	91.2%	1,816	91.4%	1,847	93.0%	140	7.0%
CHITTENDEN	Milton	4274	0	0.0%	3,849	90.1%	3,933	92.0%	4,115	96.3%	159	3.7%
CHITTENDEN	Richmond	1718	416	24.2%	1,565	91.1%	1,565	91.1%	1,699	98.9%	19	1.1%
CHITTENDEN	Shelburne	3176	0	0.0%	3,043	95.8%	3,065	96.5%	3,098	97.5%	78	2.5%
CHITTENDEN	South Burlington	6954	170	2.4%	6,829	98.2%	6,830	98.2%	6,871	98.8%	83	1.2%
CHITTENDEN	St. George	316	0	0.0%	291	92.1%	295	93.4%	312	98.7%	4	1.3%
CHITTENDEN	Underhill	1238	0	0.0%	937	75.7%	1,056	85.3%	1,189	96.0%	49	4.0%
CHITTENDEN	Westford	830	0	0.0%	725	87.3%	743	89.5%	796	95.9%	34	4.1%
CHITTENDEN	Williston	4251	0	0.0%	4,073	95.8%	4,117	96.8%	4,195	98.7%	56	1.3%
CHITTENDEN	Winooski	1736	2	0.1%	1,730	99.7%	1,733	99.8%	1,736	100.0%	0	0.0%
ESSEX	Averill	245	0	0.0%	0	0.0%	0	0.0%	19	7.8%	226	92.2%
ESSEX	Averys Gore	8	0	0.0%	0	0.0%	0	0.0%	0	0.0%	8	100.0%
ESSEX	Bloomfield	236	0	0.0%	0	0.0%	57	24.2%	161	68.2%	75	31.8%
ESSEX	Brighton	930	0	0.0%	589	63.3%	613	65.9%	748	80.4%	182	19.6%
ESSEX	Brunswick	76	0	0.0%	0	0.0%	7	9.2%	22	28.9%	54	71.1%
ESSEX	Canaan	621	279	44.9%	279	44.9%	372	59.9%	454	73.1%	167	26.9%
ESSEX	Concord	889	0	0.0%	265	29.8%	456	51.3%	688	77.4%	201	22.6%
ESSEX	East Haven	214	0	0.0%	0	0.0%	82	38.3%	137	64.0%	77	36.0%
ESSEX	Ferdinand	77	0	0.0%	0	0.0%	3	3.9%	13	16.9%	64	83.1%
ESSEX	Granby	101	0	0.0%	0	0.0%	36	35.6%	66	65.3%	35	34.7%
ESSEX	Guildhall	183	0	0.0%	0	0.0%	53	29.0%	138	75.4%	45	24.6%
ESSEX	Lemington	91	30	33.0%	30	33.0%	30	33.0%	54	59.3%	37	40.7%
ESSEX	Lewis	47	0	0.0%	0	0.0%	0	0.0%	0	0.0%	47	100.0%
ESSEX	Lunenburg	886	0	0.0%	0	0.0%	392	44.2%	668	75.4%	218	24.6%
ESSEX	Maidstone	360	0	0.0%	0	0.0%	71	19.7%	173	48.1%	187	51.9%
ESSEX	Norton	221	0	0.0%	0	0.0%	52	23.5%	149	67.4%	72	32.6%
ESSEX	Victory	102	0	0.0%	0	0.0%	13	12.7%	71	69.6%	31	30.4%
ESSEX	Warners Grant	2	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	100.0%
ESSEX	Warren Gore	59	0	0.0%	0	0.0%	0	0.0%	4	6.8%	55	93.2%
FRANKLIN	Bakersfield	646	0	0.0%	210	32.5%	308	47.7%	550	85.1%	96	14.9%
FRANKLIN	Berkshire	721	0	0.0%	88	12.2%	324	44.9%	597	82.8%	124	17.2%
FRANKLIN	Enosburg	1264	0	0.0%	659	52.1%	865	68.4%	1,153	91.2%	111	8.8%
FRANKLIN	Fairfax	1730	0	0.0%	731	42.3%	1,117	64.6%	1,568	90.6%	162	9.4%
FRANKLIN	Fairfield	977	0	0.0%	88	9.0%	365	37.4%	769	78.7%	208	21.3%
FRANKLIN	Fletcher	628	0	0.0%	0	0.0%	206	32.8%	550	87.6%	78	12.4%
FRANKLIN	Franklin	923	381	41.3%	382	41.4%	421	45.6%	899	97.4%	24	2.6%
FRANKLIN	Georgia	2026	0	0.0%	1,729	85.3%	1,825	90.1%	1,944	96.0%	82	4.0%
FRANKLIN	Highgate	1823	87	4.8%	1,764	96.8%	1,766	96.9%	1,797	98.6%	26	1.4%
FRANKLIN	Montgomery	801	0	0.0%	227	28.3%	697	87.0%	699	87.3%	102	12.7%

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County	Town	Total Buildings	Served 100/100 or Better	Percent Served 100/100 or Better	Served 25/3 or Better	Percent Served 25/3 or Better	Served 10/1 or Better	Percent Served 10/1 or Better	Served 4/1 or Better	Percent Served 4/1 or Better	Underserved	Percent Underserved
FRANKLIN	Richford	1051	0	0.0%	721	68.6%	756	71.9%	903	85.9%	148	14.1%
FRANKLIN	Sheldon	948	67	7.1%	265	28.0%	378	39.9%	845	89.1%	103	10.9%
FRANKLIN	St. Albans City	2549	0	0.0%	2,549	100.0%	2,549	100.0%	2,549	100.0%	0	0.0%
FRANKLIN	St. Albans Town	3089	0	0.0%	2,847	92.2%	2,899	93.8%	3,011	97.5%	78	2.5%
FRANKLIN	Swanton	3076	0	0.0%	2,861	93.0%	2,871	93.3%	2,909	94.6%	167	5.4%
GRAND ISLE	Alburgh	1817	0	0.0%	0	0.0%	490	27.0%	792	43.6%	1,025	56.4%
GRAND ISLE	Grand Isle	1273	0	0.0%	1,261	99.1%	1,263	99.2%	1,266	99.5%	7	0.5%
GRAND ISLE	Isle La Motte	567	0	0.0%	0	0.0%	386	68.1%	386	68.1%	181	31.9%
GRAND ISLE	North Hero	1085	0	0.0%	1,003	92.4%	1,011	93.2%	1,013	93.4%	72	6.6%
GRAND ISLE	South Hero	1426	0	0.0%	1,384	97.1%	1,384	97.1%	1,389	97.4%	37	2.6%
LAMOILLE	Belvidere	226	0	0.0%	0	0.0%	83	36.7%	215	95.1%	11	4.9%
LAMOILLE	Cambridge	1672	0	0.0%	577	34.5%	878	52.5%	1,542	92.2%	130	7.8%
LAMOILLE	Eden	821	0	0.0%	0	0.0%	323	39.3%	613	74.7%	208	25.3%
LAMOILLE	Elmore	552	0	0.0%	0	0.0%	248	44.9%	471	85.3%	81	14.7%
LAMOILLE	Hyde Park	1382	0	0.0%	1,002	72.5%	1,124	81.3%	1,327	96.0%	55	4.0%
LAMOILLE	Johnson	1289	0	0.0%	917	71.1%	965	74.9%	1,130	87.7%	159	12.3%
LAMOILLE	Morristown	2394	0	0.0%	1,862	77.8%	1,972	82.4%	2,339	97.7%	55	2.3%
LAMOILLE	Stowe	3078	0	0.0%	1,880	61.1%	2,364	76.8%	3,028	98.4%	50	1.6%
LAMOILLE	Waterville	336	0	0.0%	0	0.0%	182	54.2%	313	93.2%	23	6.8%
LAMOILLE	Wolcott	838	0	0.0%	0	0.0%	358	42.7%	786	93.8%	52	6.2%
ORANGE	Bradford	1265	281	22.2%	886	70.0%	957	75.7%	1,193	94.3%	72	5.7%
ORANGE	Braintree	677	198	29.2%	491	72.5%	535	79.0%	604	89.2%	73	10.8%
ORANGE	Brookfield	715	46	6.4%	49	6.9%	182	25.5%	415	58.0%	300	42.0%
ORANGE	Chelsea	729	185	25.4%	304	41.7%	416	57.1%	575	78.9%	154	21.1%
ORANGE	Corinth	924	0	0.0%	0	0.0%	1	0.1%	753	81.5%	171	18.5%
ORANGE	Fairlee	669	476	71.2%	477	71.3%	538	80.4%	606	90.6%	63	9.4%
ORANGE	Newbury	1367	12	0.9%	804	58.8%	1,001	73.2%	1,157	84.6%	210	15.4%
ORANGE	Orange	550	0	0.0%	40	7.3%	208	37.8%	470	85.5%	80	14.5%
ORANGE	Randolph	2021	330	16.3%	1,785	88.3%	1,798	89.0%	1,858	91.9%	163	8.1%
ORANGE	Strafford	630	609	96.7%	609	96.7%	609	96.7%	612	97.1%	18	2.9%
ORANGE	Thetford	1384	1,340	96.8%	1,355	97.9%	1,357	98.0%	1,357	98.0%	27	2.0%
ORANGE	Topsham	741	6	0.8%	6	0.8%	32	4.3%	632	85.3%	109	14.7%
ORANGE	Tunbridge	768	192	25.0%	270	35.2%	404	52.6%	620	80.7%	148	19.3%
ORANGE	Vershire	460	290	63.0%	290	63.0%	348	75.7%	415	90.2%	45	9.8%
ORANGE	Washington	616	0	0.0%	198	32.1%	266	43.2%	517	83.9%	99	16.1%
ORANGE	West Fairlee	422	108	25.6%	108	25.6%	254	60.2%	347	82.2%	75	17.8%
ORANGE	Williamstown	1456	0	0.0%	837	57.5%	1,078	74.0%	1,359	93.3%	97	6.7%
ORLEANS	Albany	615	20	3.3%	20	3.3%	285	46.3%	534	86.8%	81	13.2%
ORLEANS	Barton	1478	0	0.0%	931	63.0%	991	67.1%	1,297	87.8%	181	12.2%
ORLEANS	Brownington	558	0	0.0%	323	57.9%	438	78.5%	500	89.6%	58	10.4%
ORLEANS	Charleston	768	0	0.0%	460	59.9%	506	65.9%	637	82.9%	131	17.1%
ORLEANS	Coventry	531	0	0.0%	242	45.6%	289	54.4%	376	70.8%	155	29.2%
ORLEANS	Craftsbury	720	58	8.1%	58	8.1%	214	29.7%	621	86.3%	99	13.8%
ORLEANS	Derby	2473	0	0.0%	1,908	77.2%	2,057	83.2%	2,260	91.4%	213	8.6%
ORLEANS	Glover	806	0	0.0%	119	14.8%	371	46.0%	655	81.3%	151	18.7%
ORLEANS	Greensboro	824	7	0.8%	82	10.0%	355	43.1%	764	92.7%	60	7.3%
ORLEANS	Holland	458	0	0.0%	5	1.1%	133	29.0%	338	73.8%	120	26.2%
ORLEANS	Irasburg	628	0	0.0%	178	28.3%	246	39.2%	402	64.0%	226	36.0%
ORLEANS	Jay	538	0	0.0%	341	63.4%	341	63.4%	355	66.0%	183	34.0%
ORLEANS	Lowell	556	0	0.0%	0	0.0%	181	32.6%	315	56.7%	241	43.3%
ORLEANS	Morgan	809	0	0.0%	533	65.9%	583	72.1%	702	86.8%	107	13.2%
ORLEANS	Newport City	1879	0	0.0%	1,858	98.9%	1,860	99.0%	1,870	99.5%	9	0.5%
ORLEANS	Newport Town	865	0	0.0%	408	47.2%	481	55.6%	749	86.6%	116	13.4%

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ORLEANS	Troy	879	0	0.0%	682	77.6%	711	80.9%	779	88.6%	100	11.4%
ORLEANS	Westfield	375	0	0.0%	121	32.3%	182	48.5%	218	58.1%	157	41.9%
ORLEANS	Westmore	590	0	0.0%	0	0.0%	165	28.0%	467	79.2%	123	20.8%
RUTLAND	Benson	607	0	0.0%	0	0.0%	0	0.0%	508	83.7%	99	16.3%
RUTLAND	Brandon	1850	0	0.0%	1,609	87.0%	1,671	90.3%	1,780	96.2%	70	3.8%
RUTLAND	Castleton	2212	0	0.0%	2,032	91.9%	2,073	93.7%	2,174	98.3%	38	1.7%
RUTLAND	Chittenden	718	1	0.1%	598	83.3%	606	84.4%	645	89.8%	73	10.2%
RUTLAND	Clarendon	1203	17	1.4%	1,150	95.6%	1,152	95.8%	1,155	96.0%	48	4.0%
RUTLAND	Danby	770	769	99.9%	769	99.9%	769	99.9%	770	100.0%	0	0.0%
RUTLAND	Fair Haven	1143	0	0.0%	1,050	91.9%	1,065	93.2%	1,116	97.6%	27	2.4%
RUTLAND	Hubbardton	645	0	0.0%	66	10.2%	66	10.2%	618	95.8%	27	4.2%
RUTLAND	Ira	223	155	69.5%	208	93.3%	208	93.3%	210	94.2%	13	5.8%
RUTLAND	Killington	1362	1,117	82.0%	1,352	99.3%	1,356	99.6%	1,360	99.9%	2	0.1%
RUTLAND	Mendon	643	2	0.3%	568	88.3%	575	89.4%	589	91.6%	54	8.4%
RUTLAND	Middletown Springs	448	446	99.6%	446	99.6%	446	99.6%	446	99.6%	2	0.4%
RUTLAND	Mount Holly	1102	1,085	98.5%	1,086	98.5%	1,086	98.5%	1,101	99.9%	1	0.1%
RUTLAND	Mount Tabor	141	141	100.0%	141	100.0%	141	100.0%	141	100.0%	0	0.0%
RUTLAND	Pawlet	834	482	57.8%	727	87.2%	727	87.2%	753	90.3%	81	9.7%
RUTLAND	Pittsfield	409	393	96.1%	393	96.1%	394	96.3%	397	97.1%	12	2.9%
RUTLAND	Pittsford	1412	0	0.0%	1,247	88.3%	1,255	88.9%	1,318	93.3%	94	6.7%
RUTLAND	Poultney	1693	3	0.2%	1,442	85.2%	1,493	88.2%	1,609	95.0%	84	5.0%
RUTLAND	Proctor	769	0	0.0%	758	98.6%	759	98.7%	760	98.8%	9	1.2%
RUTLAND	Rutland	1828	0	0.0%	1,791	98.0%	1,791	98.0%	1,826	99.9%	2	0.1%
RUTLAND	Rutland City	6103	0	0.0%	6,103	100.0%	6,103	100.0%	6,103	100.0%	0	0.0%
RUTLAND	Shrewsbury	605	434	71.7%	579	95.7%	585	96.7%	595	98.3%	10	1.7%
RUTLAND	Sudbury	429	0	0.0%	0	0.0%	1	0.2%	415	96.7%	14	3.3%
RUTLAND	Tinmouth	361	361	100.0%	361	100.0%	361	100.0%	361	100.0%	0	0.0%
RUTLAND	Wallingford	1029	1,029	100.0%	1,029	100.0%	1,029	100.0%	1,029	100.0%	0	0.0%
RUTLAND	Wells	961	205	21.3%	928	96.6%	929	96.7%	939	97.7%	22	2.3%
RUTLAND	West Haven	136	0	0.0%	0	0.0%	82	60.3%	132	97.1%	4	2.9%
RUTLAND	West Rutland	949	0	0.0%	916	96.5%	919	96.8%	929	97.9%	20	2.1%
WASHINGTON	Barre City	2905	0	0.0%	2,869	98.8%	2,875	99.0%	2,905	100.0%	0	0.0%
WASHINGTON	Barre Town	3349	0	0.0%	3,178	94.9%	3,245	96.9%	3,346	99.9%	3	0.1%
WASHINGTON	Berlin	1378	0	0.0%	1,083	78.6%	1,105	80.2%	1,344	97.5%	34	2.5%
WASHINGTON	Cabot	855	0	0.0%	471	55.1%	691	80.8%	766	89.6%	89	10.4%
WASHINGTON	Calais	878	0	0.0%	314	35.8%	521	59.3%	853	97.2%	25	2.8%
WASHINGTON	Duxbury	664	0	0.0%	312	47.0%	463	69.7%	554	83.4%	110	16.6%
WASHINGTON	East Montpelier	1162	0	0.0%	783	67.4%	918	79.0%	1,148	98.8%	14	1.2%
WASHINGTON	Fayston	967	101	10.4%	201	20.8%	201	20.8%	951	98.3%	16	1.7%
WASHINGTON	Marshfield	761	0	0.0%	287	37.7%	575	75.6%	740	97.2%	21	2.8%
WASHINGTON	Middlesex	837	0	0.0%	429	51.3%	503	60.1%	688	82.2%	149	17.8%
WASHINGTON	Montpelier	2839	0	0.0%	2,823	99.4%	2,825	99.5%	2,839	100.0%	0	0.0%
WASHINGTON	Moretown	822	49	6.0%	416	50.6%	419	51.0%	716	87.1%	106	12.9%
WASHINGTON	Northfield	1923	0	0.0%	1,380	71.8%	1,380	71.8%	1,914	99.5%	9	0.5%
WASHINGTON	Plainfield	579	0	0.0%	243	42.0%	362	62.5%	564	97.4%	15	2.6%
WASHINGTON	Roxbury	498	0	0.0%	0	0.0%	0	0.0%	470	94.4%	28	5.6%
WASHINGTON	Waitsfield	1027	463	45.1%	500	48.7%	500	48.7%	1,003	97.7%	24	2.3%
WASHINGTON	Warren	1528	510	33.4%	564	36.9%	564	36.9%	1,491	97.6%	37	2.4%
WASHINGTON	Waterbury	2269	0	0.0%	2,031	89.5%	2,048	90.3%	2,091	92.2%	178	7.8%
WASHINGTON	Woodbury	769	0	0.0%	352	45.8%	442	57.5%	734	95.4%	35	4.6%
WASHINGTON	Worcester	465	0	0.0%	210	45.2%	242	52.0%	390	83.9%	75	16.1%
WINDHAM	Athens	258	258	100.0%	258	100.0%	258	100.0%	258	100.0%	0	0.0%
WINDHAM	Brattleboro	4671	0	0.0%	4,475	95.8%	4,536	97.1%	4,639	99.3%	32	0.7%

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WINDHAM	Brookline	310	0	0.0%	292	94.2%	295	95.2%	297	95.8%	13	4.2%
WINDHAM	Dover	2053	0	0.0%	1,667	81.2%	1,851	90.2%	2,026	98.7%	27	1.3%
WINDHAM	Dummerston	960	105	10.9%	667	69.5%	741	77.2%	800	83.3%	160	16.7%
WINDHAM	Grafton	556	556	100.0%	556	100.0%	556	100.0%	556	100.0%	0	0.0%
WINDHAM	Guilford	1158	0	0.0%	862	74.4%	918	79.3%	1,015	87.7%	143	12.3%
WINDHAM	Halifax	607	0	0.0%	0	0.0%	158	26.0%	339	55.8%	268	44.2%
WINDHAM	Jamaica	1094	0	0.0%	682	62.3%	809	73.9%	962	87.9%	132	12.1%
WINDHAM	Londonderry	1404	2	0.1%	1,143	81.4%	1,161	82.7%	1,273	90.7%	131	9.3%
WINDHAM	Marlboro	611	0	0.0%	1	0.2%	224	36.7%	437	71.5%	174	28.5%
WINDHAM	Newfane	1099	80	7.3%	785	71.4%	848	77.2%	944	85.9%	155	14.1%
WINDHAM	Putney	1143	164	14.3%	821	71.8%	887	77.6%	1,080	94.5%	63	5.5%
WINDHAM	Rockingham	2173	619	28.5%	2,108	97.0%	2,114	97.3%	2,133	98.2%	40	1.8%
WINDHAM	Somerset	26	0	0.0%	0	0.0%	0	0.0%	0	0.0%	26	100.0%
WINDHAM	Stratton	628	0	0.0%	367	58.4%	410	65.3%	517	82.3%	111	17.7%
WINDHAM	Townshend	807	28	3.5%	496	61.5%	567	70.3%	685	84.9%	122	15.1%
WINDHAM	Vernon	876	0	0.0%	804	91.8%	814	92.9%	849	96.9%	27	3.1%
WINDHAM	Wardsboro	866	0	0.0%	0	0.0%	374	43.2%	707	81.6%	159	18.4%
WINDHAM	Westminster	1612	181	11.2%	1,411	87.5%	1,458	90.4%	1,558	96.7%	54	3.3%
WINDHAM	Whitingham	949	0	0.0%	0	0.0%	497	52.4%	786	82.8%	163	17.2%
WINDHAM	Wilmington	2361	104	4.4%	1,838	77.8%	1,932	81.8%	2,218	93.9%	143	6.1%
WINDHAM	Windham	444	222	50.0%	223	50.2%	377	84.9%	419	94.4%	25	5.6%
WINDSOR	Andover	464	463	99.8%	463	99.8%	463	99.8%	463	99.8%	1	0.2%
WINDSOR	Baltimore	110	0	0.0%	0	0.0%	0	0.0%	108	98.2%	2	1.8%
WINDSOR	Barnard	756	708	93.7%	708	93.7%	737	97.5%	745	98.5%	11	1.5%
WINDSOR	Bethel	1024	312	30.5%	675	65.9%	807	78.8%	899	87.8%	125	12.2%
WINDSOR	Bridgewater	641	592	92.4%	592	92.4%	602	93.9%	635	99.1%	6	0.9%
WINDSOR	Cavendish	958	0	0.0%	726	75.8%	726	75.8%	932	97.3%	26	2.7%
WINDSOR	Chester	1754	1,751	99.8%	1,752	99.9%	1,752	99.9%	1,754	100.0%	0	0.0%
WINDSOR	Hartford	4800	4	0.1%	4,511	94.0%	4,611	96.1%	4,784	99.7%	16	0.3%
WINDSOR	Hartland	1575	1,138	72.3%	1,532	97.3%	1,539	97.7%	1,562	99.2%	13	0.8%
WINDSOR	Ludlow	2416	0	0.0%	2,141	88.6%	2,141	88.6%	2,412	99.8%	4	0.2%
WINDSOR	Norwich	1530	640	41.8%	1,377	90.0%	1,405	91.8%	1,449	94.7%	81	5.3%
WINDSOR	Plymouth	834	618	74.1%	731	87.6%	731	87.6%	833	99.9%	1	0.1%
WINDSOR	Pomfret	566	492	86.9%	494	87.3%	537	94.9%	559	98.8%	7	1.2%
WINDSOR	Reading	513	56	10.9%	240	46.8%	297	57.9%	416	81.1%	97	18.9%
WINDSOR	Rochester	831	131	15.8%	422	50.8%	511	61.5%	744	89.5%	87	10.5%
WINDSOR	Royalton	1310	562	42.9%	808	61.7%	950	72.5%	1,213	92.6%	97	7.4%
WINDSOR	Sharon	746	229	30.7%	235	31.5%	391	52.4%	682	91.4%	64	8.6%
WINDSOR	Springfield	3764	3,757	99.8%	3,763	100.0%	3,763	100.0%	3,764	100.0%	0	0.0%
WINDSOR	Stockbridge	586	136	23.2%	136	23.2%	313	53.4%	529	90.3%	57	9.7%
WINDSOR	Weathersfield	1544	86	5.6%	1,242	80.4%	1,257	81.4%	1,520	98.4%	24	1.6%
WINDSOR	West Windsor	736	715	97.1%	716	97.3%	720	97.8%	728	98.9%	8	1.1%
WINDSOR	Weston	611	0	0.0%	504	82.5%	511	83.6%	541	88.5%	70	11.5%
WINDSOR	Windsor	1466	5	0.3%	1,407	96.0%	1,407	96.0%	1,413	96.4%	53	3.6%
WINDSOR	Woodstock	1887	165	8.7%	1,611	85.4%	1,719	91.1%	1,830	97.0%	57	3.0%
TOTALS		**303,835**	**40,838**	**13.4%**	**222,040**	**73.1%**	**241,962**	**79.6%**	**282,937**	**93.1%**	**20,898**	**6.9%**

3/1/2017

State of Vermont, Department of Public Service

Two Statistically Valid Telecommunication Surveys Report Draft

Presented to:

VERMONT

Clay Purvis & Sunni Eriksen
State of Vermont, Department of Public Service
112 State Street
Montpelier, Vermont 05620-2601

SENTENIUM™
Premium Data Processing & Survey Research

John Fogli and Eva Meng

By:

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Table of Contents

Background

In May of 2017, the State of Vermont, Department of Public Service sought qualified vendors and firms to submit proposals to facilitate and implement a two statistically valid telecommunication surveys. The qualified firm needed to produce, field, and analyze a set of two statistically valid telecommunication surveys to inform the State of Vermont, Department of Public Service regarding the perception of the existing telecommunication infrastructure, as well as any observations that can be drawn. After evaluations and discussions, the Department of Public Service selected Sentenium to help facilitate with the two statistically valid telecommunication surveys.

Sentenium is a survey research and data processing company that offers comprehensive outsourcing solutions to fulfill government and business research needs. Sentenium is a small, close-knit business composed of professional service employees and administrative support staff. Sentenium strives to deliver excellent customer service and quality research solutions. Sentenium's ability to offer several different methods of delivery for surveys accommodates the specific needs of a variety of organizations. Sentenium has developed and honed advanced procedures that ensure data quality, integrity, and accuracy throughout the course of its association with each of its clients. Sentenium strives to improve and grow with evolving survey industry standards.

The purpose of this study is to obtain feedback for the Department of Public Service on the attitudes and opinions of residents and businesses regarding their perception of the existing telecommunication infrastructure. Sentenium set out to understand the States needs and how to best approach this survey project. The State previously conducted these two surveys with a different agency. In 2017, the survey is a modified version of the 2014 version to streamline and adjust the survey flow.

Methodology

To meet the project objectives, we divided the project into five discrete phases: (1) Survey Planning, (2) Survey Design, (3) Survey Administration, (4) Data Collection and Analysis, and (5) Reporting.

During the planning phase in October 2017, Sentenium met with the Department of Public Service to discuss how to help the State more effectively gather information residents' and businesses' perception of the existing telecommunication infrastructure. Through these discussions, minor changes were made to the survey. These alterations ranged from changing question order and phrasing to the scaling of survey questions. During this process the timeline and reporting options were discussed and adjusted.

Given the population size of the State of Vermont, it was decided that 400 completed for residents and 400 completed surveys for business would yield a statistically valid representation with a 95% confidence and a ±5 point margin of error. Sentenium purchased 2 sample databases for this study. On October 19, 2017, the State gave Sentenium final approval and sign-off to begin programing the CATI and administer the surveys.

The telephone collection phase ran from October 21, 2017 to November 15, 2017. We completed 418 residential surveys and 400 business surveys to ultimately collect 818 completed surveys. All the residential telephone numbers were for personal telephone use rather than business.

Once all data were collected, we cleaned the data and ran a series of data screening checks to ensure the data were accurate (e.g., the responses were falling within the acceptable limits of the rating scale). The sample design and specifications of the study are summarized in the table below.

DESIGN	SPECIFICATION
Methodology	Telephone Survey
Population	Residents and Business of the State of Vermont
Sampling Plans	Business: Residential:
Actual Sample Size	Business: 400 Residential: 418
Sampling error	± 5.0 % (95% confidence level)
Data collection period	Business: October 26, 2017 to November 15, 2017 Residential: October 21, 2017 to October 28, 2017

Summary of Key Findings

Residential Survey

When looking at landlines for residents of Vermont, many residents who have a landline do not plan to cancel their landline service, whether or not they currently have a cell phone plan. Of those who have landlines 93.1% of respondents have 1 landline number for their household. Even though there are many service providers in the state, the telecommunication company with the largest landline market share is FairPoint with 41% of respondents said that is their provider. When asked about availability of other providers in their area, FairPoint, and Comcast seem to be the most prominent. People are also fairly satisfied with their service and service offerings and have an easy time reading and understanding their bills. Respondents were mixed about the importance having the whole state as a local calling area but were resoundingly unwilling to pay more for that service.

When asked about cell phone usage, a majority of people personally use a cell phone and spend, on average, about $116 on cell phone bills a month. There are mixed responses when asked if people would ever go back to a landline service. Of those who have previously had a landline service, about 60% would not go back and about 40% would go back to having a landline service. Most households in the state own about 2 cell phones. Verizon and AT&T make up the largest cell phone market share, though roughly 40% of respondents mention that cell phone carriers have no signal in their home. There were also mixed reviews about cell phone coverage across the state.

When asked about building new towers, responses were mixed, but leaned toward having more short towers. Residents would also support an initiative to place more towers in their community if it was necessary to improve two-way mobile radio communications for police, ambulance, or fire services.

About 85% of Vermont residents felt that it was important to fund phone service in rural areas and believe that rates should increase for all Vermonters to cover the costs.

When asked about access to the Internet, about 85% of respondents said they had internet available at their home and have an average of 2 people accessing the Internet. Comcast and FairPoint are the market share leaders for internet service to residents in Vermont. Most respondents access the Internet from home and

work the most. About 85% of respondents access the Internet on a daily basis. When asked whether residents would be interested in having a fiber connection in their home, 80% of respondents said "yes," However, about 30% respondents would be unwilling to pay an additional cost for a fiber connection.

About 2/3 of the respondents were employed, and of those there is over 50% who never telecommute. Of those who do not telecommute, about 90% do not plan to start telecommuting next year.

Though about 90% or respondents say that they have free internet access in their community only about 22% of respondents use the free internet terminals. Respondents are also mixed about needed more terminals for public use.

Most respondents have 1 to 2 televisions in their house and have cable or satellite dish service. When asked if they would consider taking up some subscription TV service, 90% of respondents said "no." About 60% of respondents are aware of the difference between Vermont Public Broadcasting System (PBS) and Public, Educational, and Governmental Access Channels (PEG), and 72% have watched a public access channel. However, most watch less than an hour of public access channels a week. Most respondents would find public access channels important.

Business Survey

Most of the businesses surveyed have only 1 location in Vermont. About 42% of businesses were home based businesses, and about 70% of businesses had 5 or less employees. About 60% of these businesses serve mostly in Vermont.

When asked about the number of phone extensions business had at their location, about 40% only had 1 extension, and about 45% had 2 to 5 extensions. FairPoint seems to hold the largest portion of the market share for business telephone lines at 33%. Most (78%) businesses purchase their telephone service on a month to month basis. When asked if their organization was considering changing its primary telephone service to a cell phone service over 90% said "no." Most businesses have not changed their primary telephone service in the past 3 years, however price is a main contributing factor for companies to switch providers. Once a business has switched providers they are unlikely to switch back. Most companies in Vermont have not eliminated a dedicated fax line in the past year. Most respondents do not have a secondary telephone or internet provider in case of an outage. However, those who do use a cell phone service as their secondary telephone service. Business respondents were mixed about the importance having the whole state as a local calling area but were resoundingly unwilling to pay more for that service. When asked how long they were willing to wait to speak with a representative from their telephone company about a repair, installation or telecommunication issue, most respondents would only be willing to wait 1 to 5 minutes on the phone.

About 20% of Vermont business respondents felt that it was important to fund phone service in rural areas but were mixed on how to cover the costs.

About 55% of business respondents said their organization subscribed to a cell phone service and on average have about 4 cell phones and on average 50% of their calls are made on a cell phone rather than a land line. Over 75% of these cellphone contracts are post-paid, with Verizon and AT&T having a majority of the market share as business cell phone service providers.

Most (72%) organizations who responded to the survey have not used a VoIP service, and less than half have used consumer grade VoIP to make calls. Less than 1/3 of respondents use video chat through nomadic VoIP services, but those who do use it relatively frequently.

Over 95% of businesses surveyed purchase internet for their location, with Comcast as the leading service provider, and FairPoint the being second leading service provider. About 48% of businesses use broadband service, with fiber being the second most used connection at 27%. Most respondents stated that their organization does not have an alternative or backup internet connection.

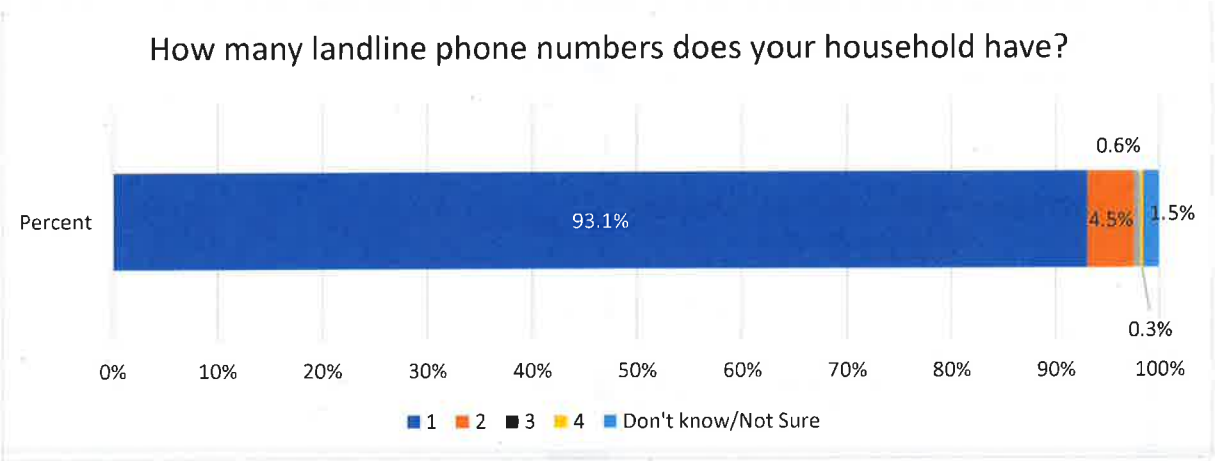
Survey Results

Residential Survey

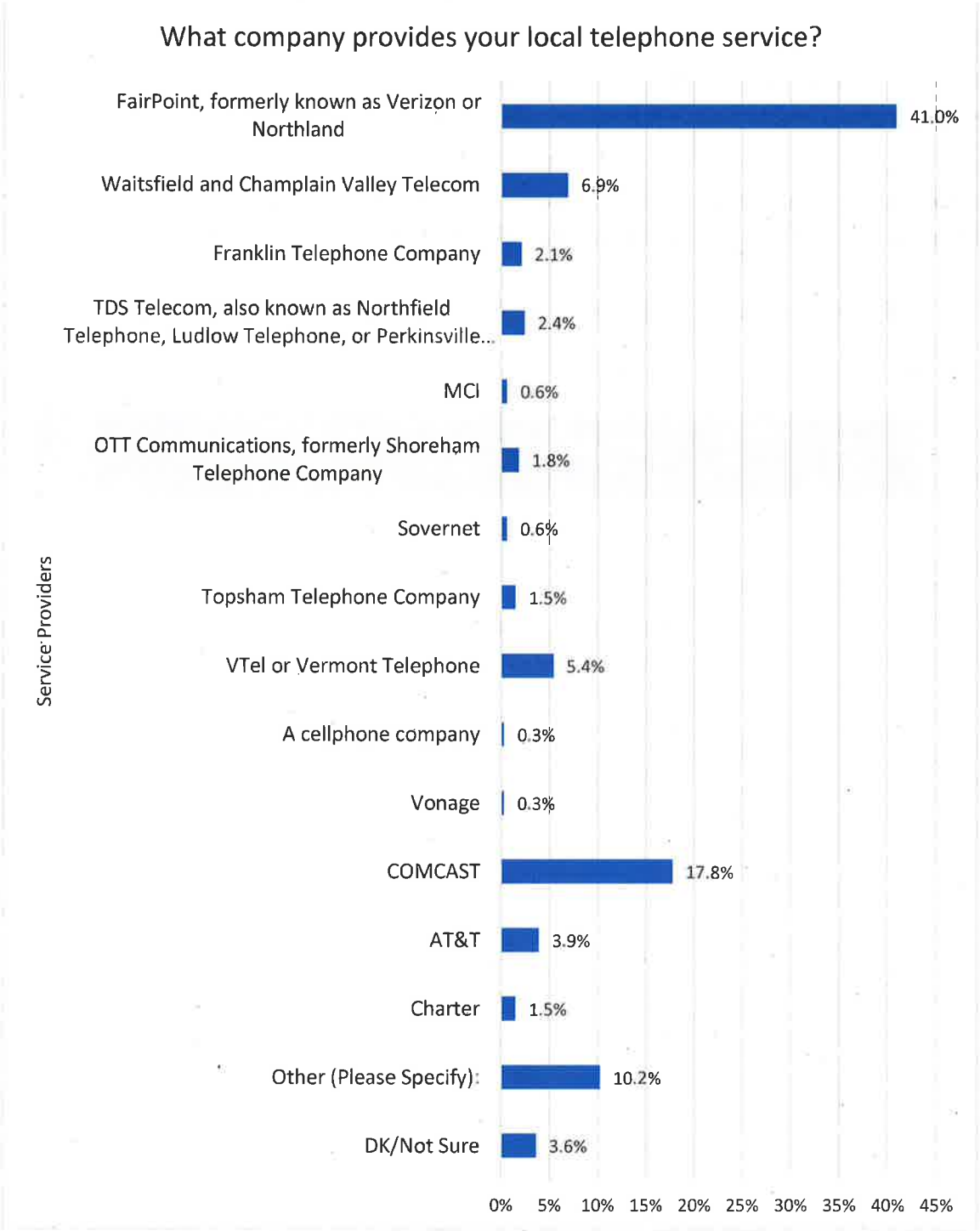
Landline Telephone

In this section of the survey, we asked Vermonters about the landline telephone services to better understand trends in landline usage and service, as well as respondent satisfaction with their current services.

A supermajority of Vermonters (over 90%) have one landline in their home; 4.5% of respondents have 2 landlines, less than 1% have 3 or 4 landlines and 1.5% of respondents don't know or were not sure.



When asked which company provides their local landline telephone service 41.0% of respondents mentioned FairPoint, followed by Comcast at 17.8%, other companies, held 10% or less of the landline market share for residential customers in Vermont.

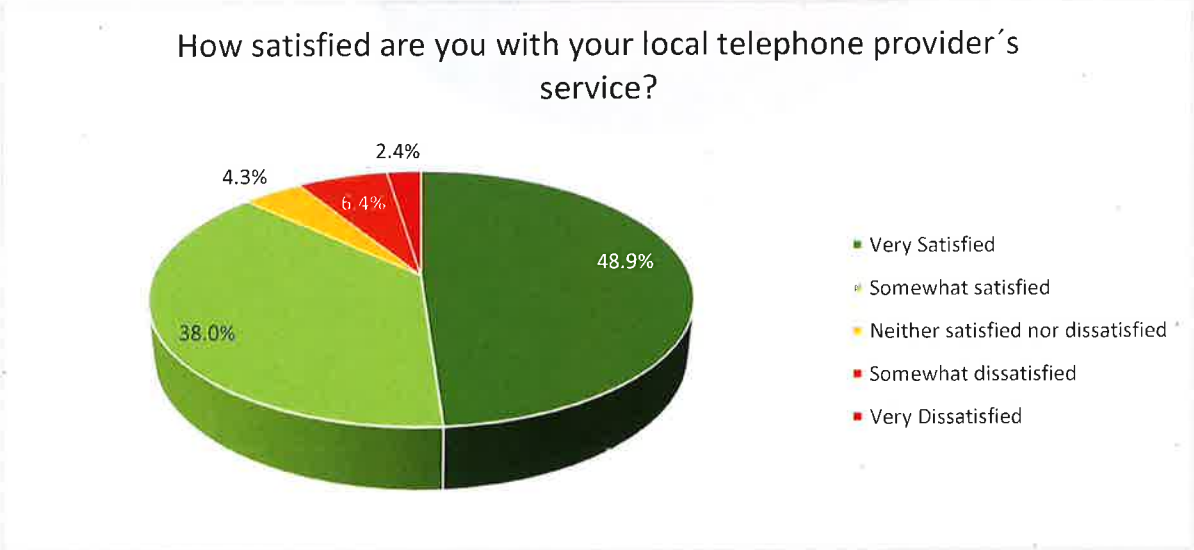


When asked what landline providers are available at their location, FairPoint seems to be the most widely available telephone service provider, with 64% of all respondents mentioning its availability in their area. Comcast is the second most widely available provider with roughly 28% of respondents mentioning its availability in their area.

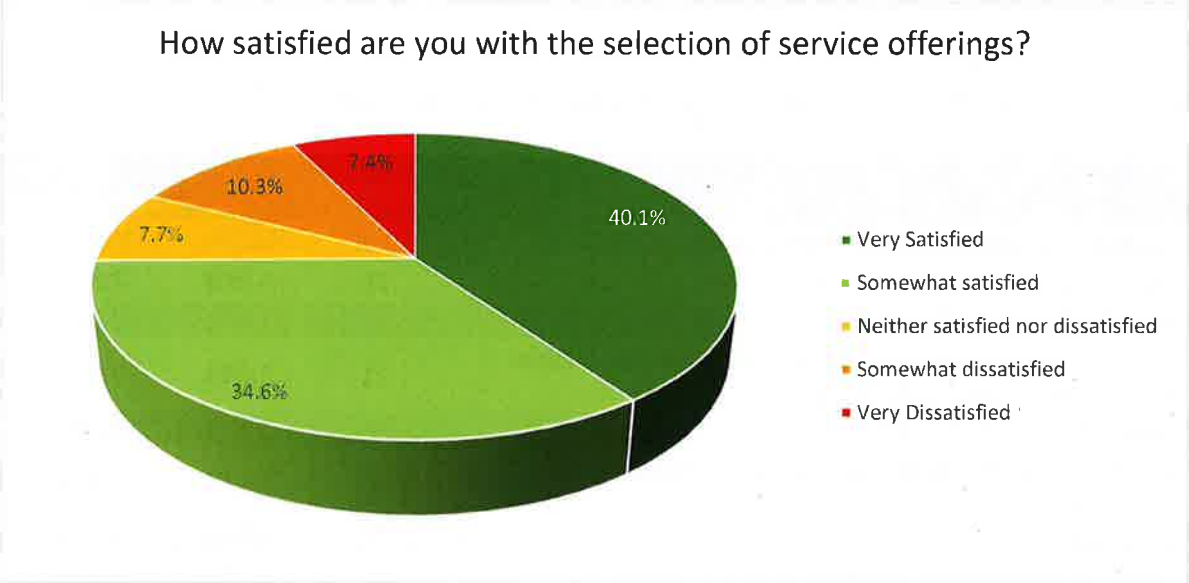
What other landline providers are available at your location?

	Frequency	% of Total	% of Respondents
FairPoint, formerly known as Verizon or Northland	213	40.19%	64.16%
Waitsfield and Champlain Valley Telecom	26	4.91%	7.83%
Franklin Telephone Company	8	1.51%	2.41%
TDS Telecom, also known as Northfield Telephone, Ludlow Telephone, or Perkinsville Telephone	11	2.08%	3.31%
MCI	3	0.57%	0.90%
OTT Communications, formerly Shoreham Telephone Company	8	1.51%	2.41%
Sovernet	5	0.94%	1.51%
Topsham Telephone Company	6	1.13%	1.81%
VTel or Vermont Telephone	24	4.53%	7.23%
A cellphone company	2	0.38%	0.60%
Vonage	3	0.57%	0.90%
COMCAST	92	17.36%	27.71%
AT&T	34	6.42%	10.24%
Charter	5	0.94%	1.51%
Other (Please Specify):	78	14.72%	23.49%
DK/Not Sure	12	2.26%	3.61%
Total	**332**	**100.00%**	**159.64%**

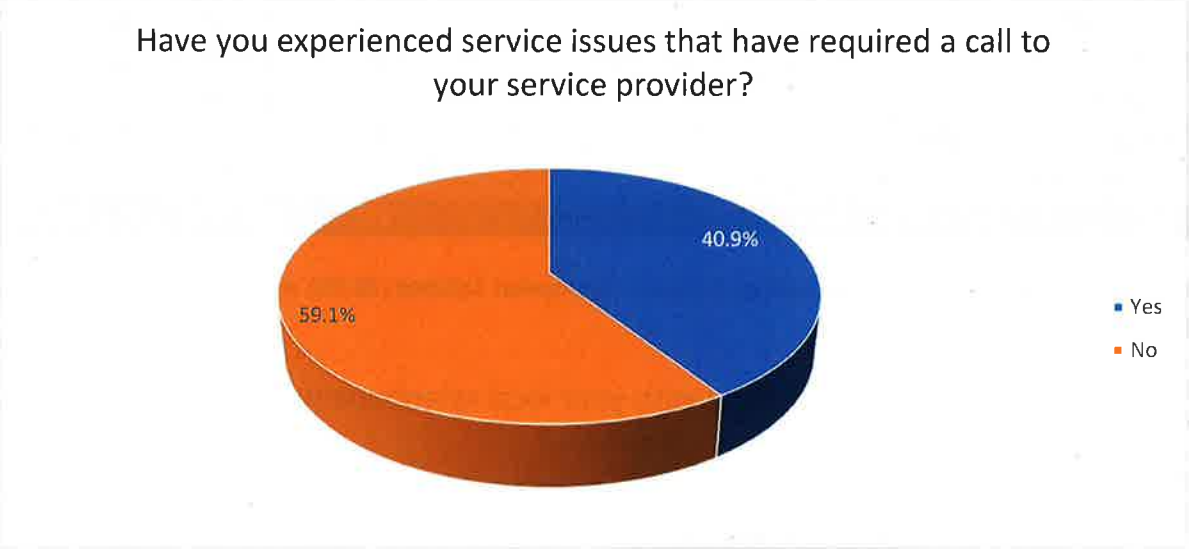
Most Vermonters are either Very Satisfied (48.9%) or Somewhat Satisfied (38.0%) with their local telephone provider's service.



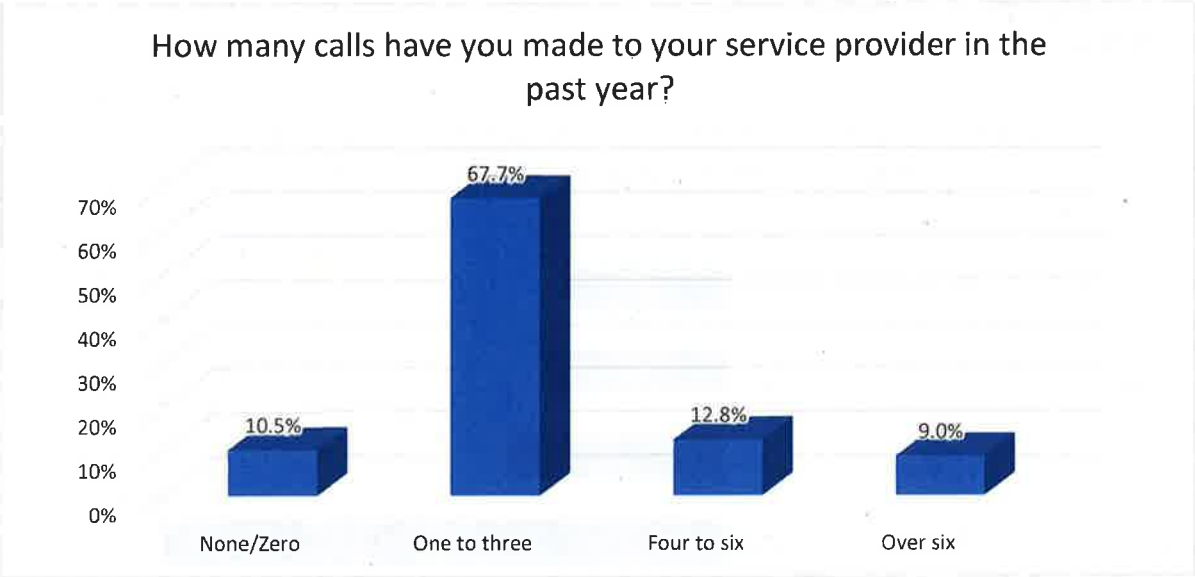
When asked about their satisfaction with the selection of service offerings, most respondents are either "Very Satisfied" (40.1%) or "Somewhat Satisfied" (34.6%);



Most Vermonters (59.1%) state the they have not experienced service issues that have required them to call their service provider.

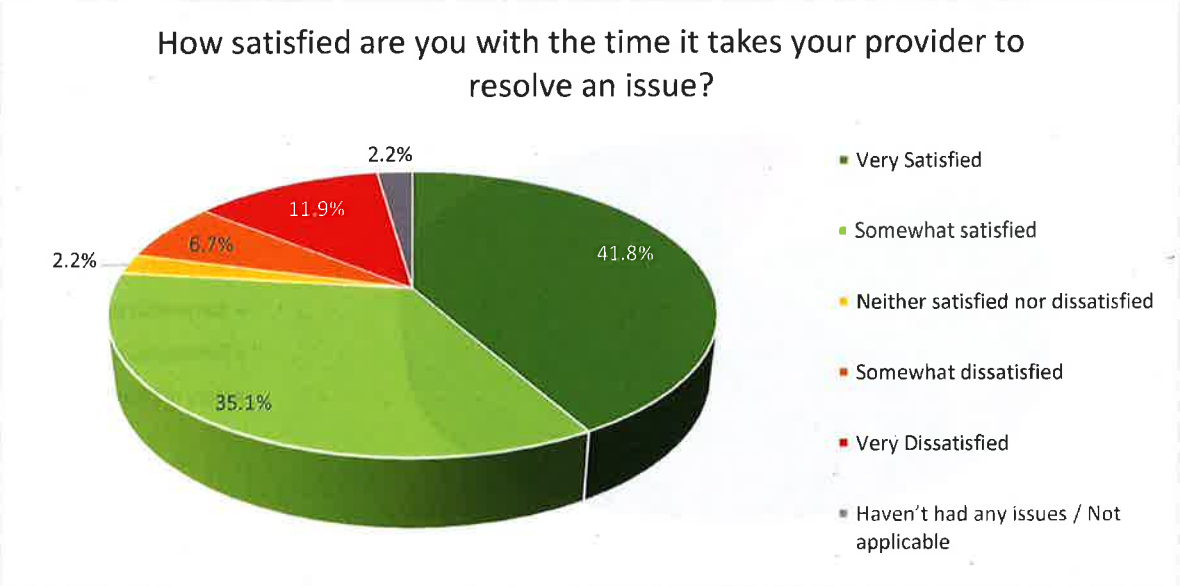


Of those 40.9% of respondents that needed to call their service provider, most (67.7%) have called their service provider one to three times in the past year.

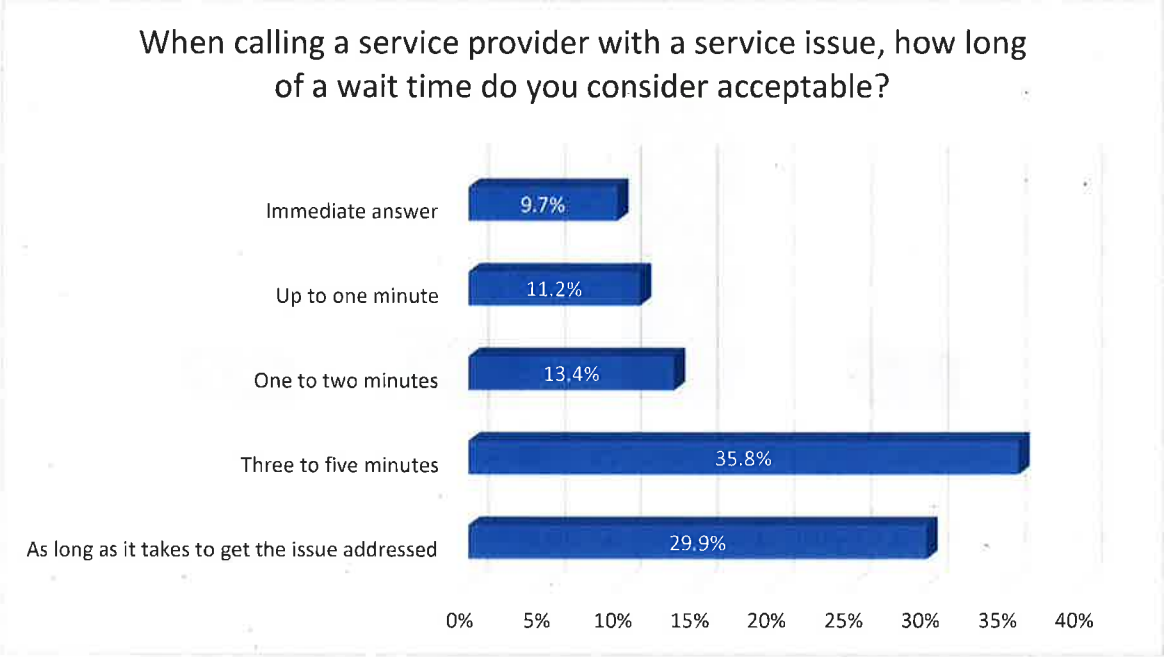


N=133 who have had issues and needed to call their service provider

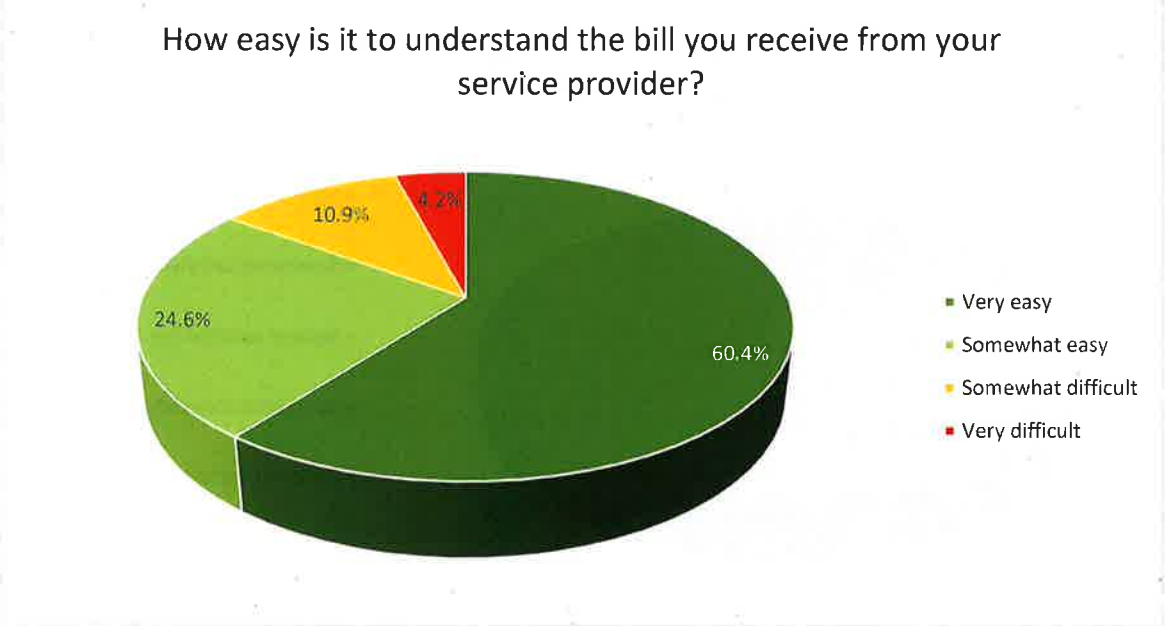
When as how satisfied they were with the time it takes for their provider to resolve an issue, most respondents were either "Very Satisfied" (41.8%) or "Somewhat Satisfied" (35.1%); 2.2% were "neither satisfied nor dissatisfied", 6.7% were "somewhat dissatisfied," 11.9% were "very dissatisfied," and 2.2% didn't have any issues.



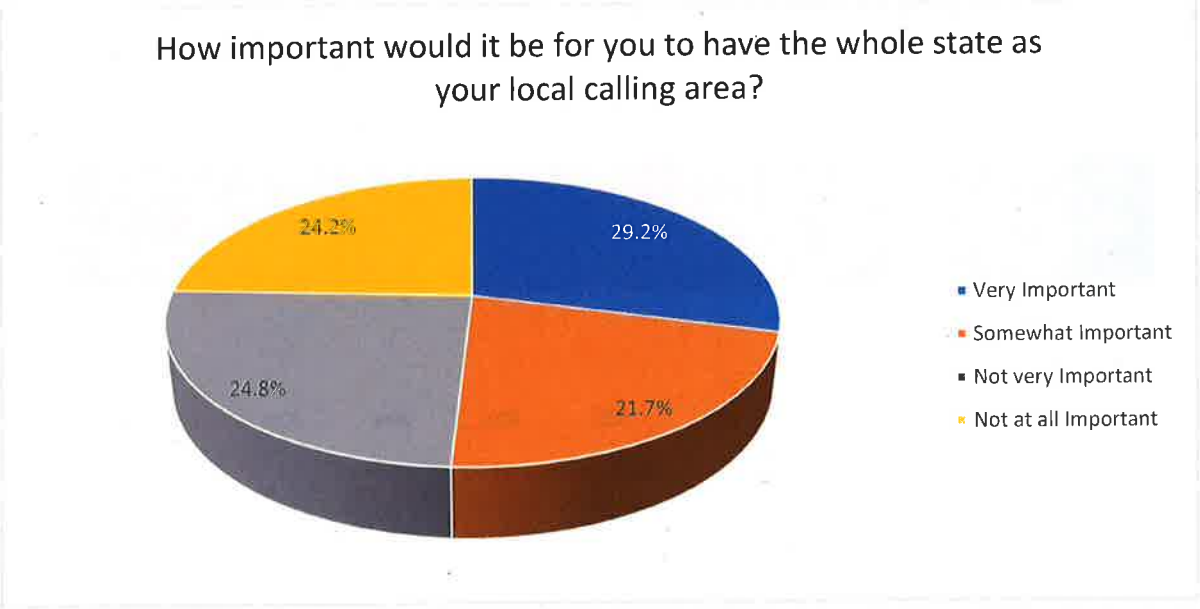
When asked how long of a wait they would consider acceptable when calling their service provider, 35.8% of respondents were willing to wait 3 to 5 minutes, 29.9% of respondents would wait as long as it takes to get the issue addressed, 13.4% would be willing to wit 1 to 2 minutes, 11.2% were willing to wait up to 1 minute, and 9.7% would want an immediate answer.



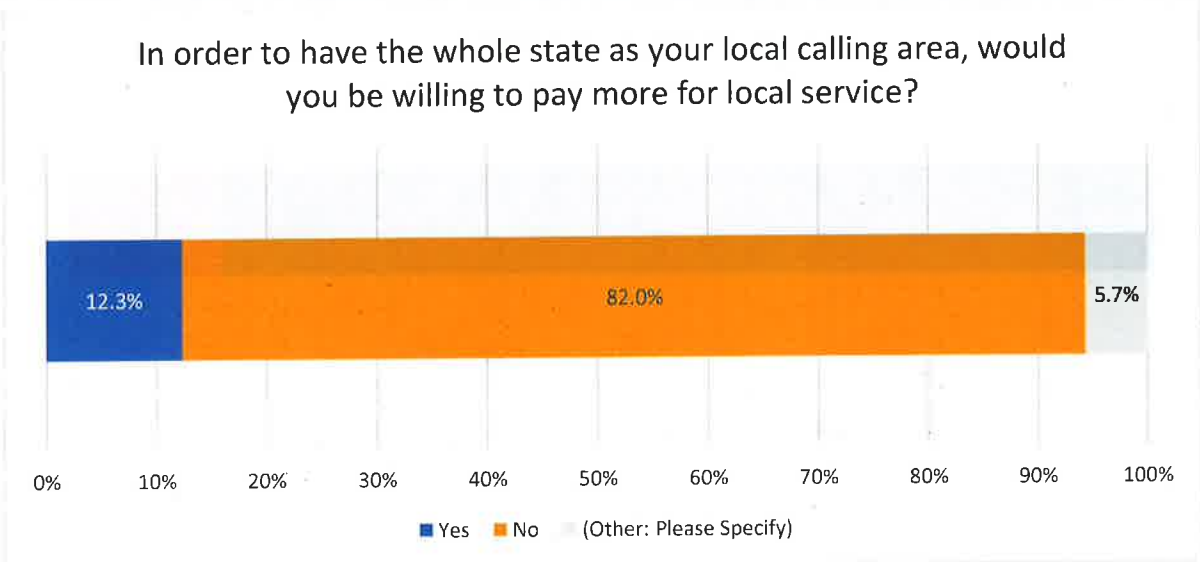
A majority of Vermonters (60.4%) believe that it is "Very easy" to understand the bill they receive from their service provider.



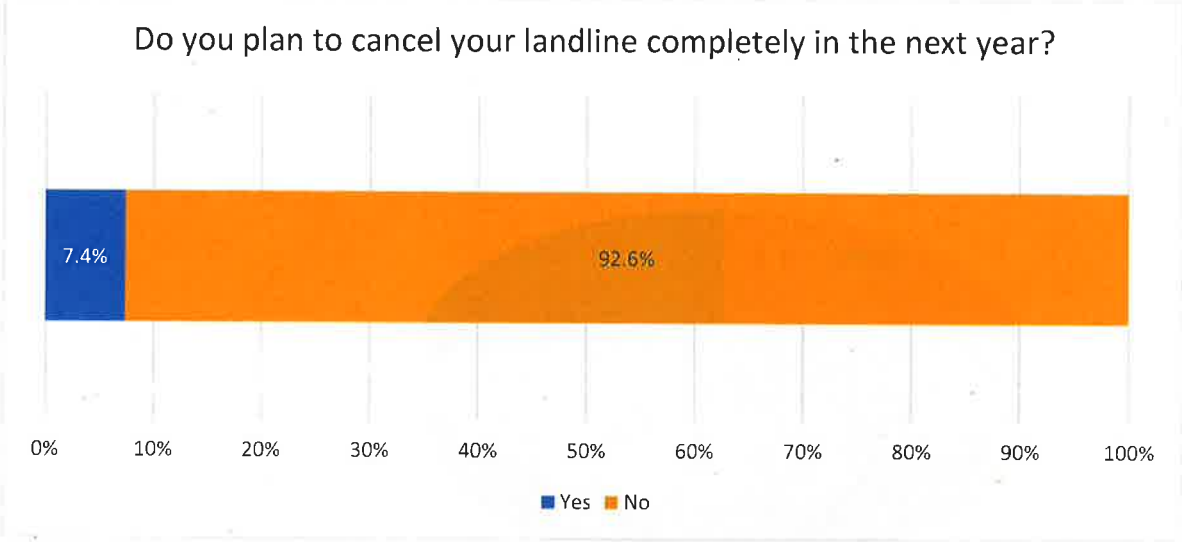
When asked how important it would be for them to have the whole state as their local calling area, responses were mixed among residents with 29.2% said "Very Important," 21.7% said "Somewhat Important," 24.8% said "Not very Important," and 24.2% said "Not at all Important."



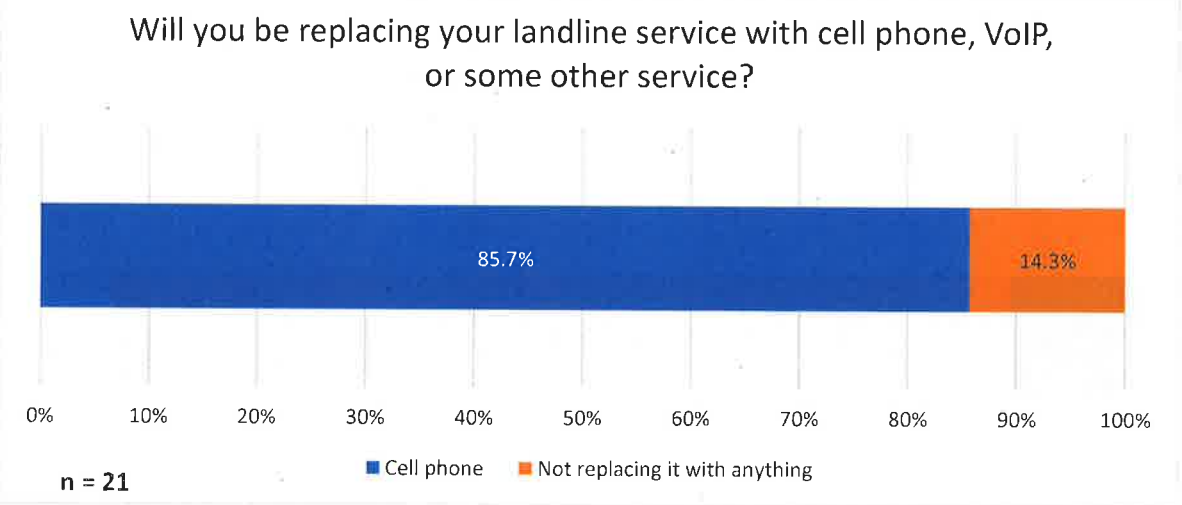
A super majority of Vermonters (82.0%) say that they would not be willing to pay more to have the whole state as their local calling area.



An overwhelming majority of Vermonters (92.6%) who have a landline service, do not plan to completely cancel their landline within next year.



Of those who would be replacing their landline service within the next year (21 respondents), 85.7% said they would replace their landline service with a cellphone service and 14.3% said they would not be replacing their landline service with anything.



When asked about what factors they considered in making their decision to disconnect their landline service, price (56.5%) seemed to be a major contributing factor, followed by mobility (26.1%).

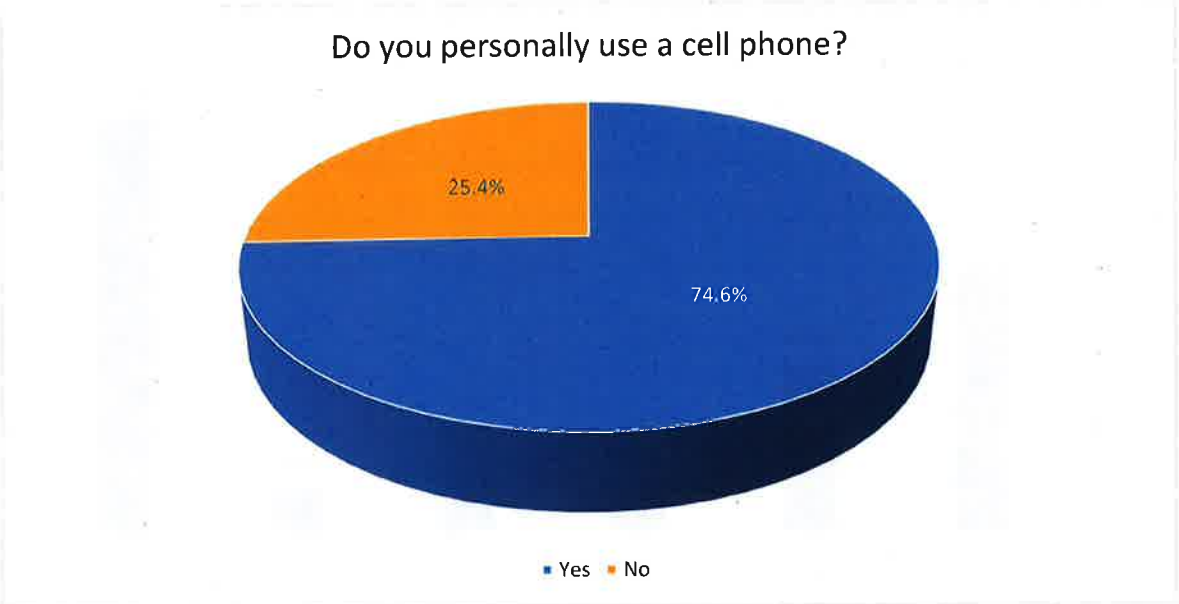
What factors did or would you consider in making a decision to disconnect your regular phone service?

	Frequency	% of Total	% of Respondents
Service quality (dropped calls, voice clarity, latency, etc.)	3	8.82%	13.04%
Price	13	38.24%	56.52%
Convenience of billing or account management	4	11.76%	17.39%
Mobility	6	17.65%	26.09%
Customer service	2	5.88%	8.70%
Other (Please specify)	6	17.65%	26.09%
Total	23	100.00%	147.83%

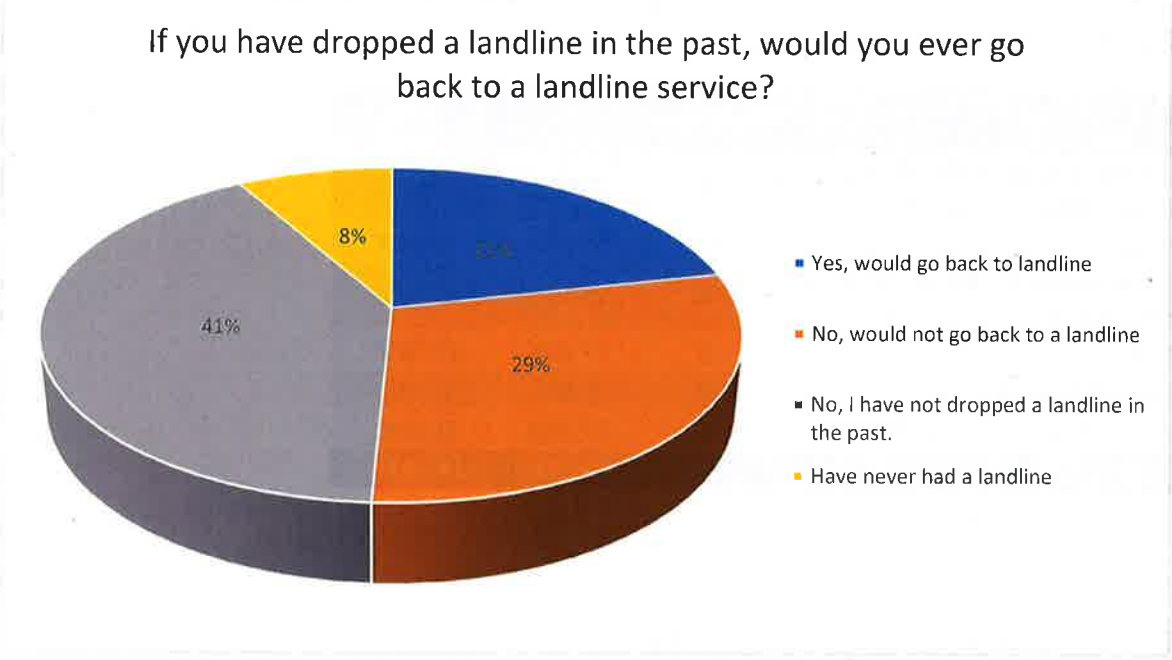
Cellular/Wireless/Mobile Telephone

In this section of the survey, we asked Vermonters about the cellular/wireless/mobile telephone services to better understand trends in usage and service, as well as respondent satisfaction with their current services.

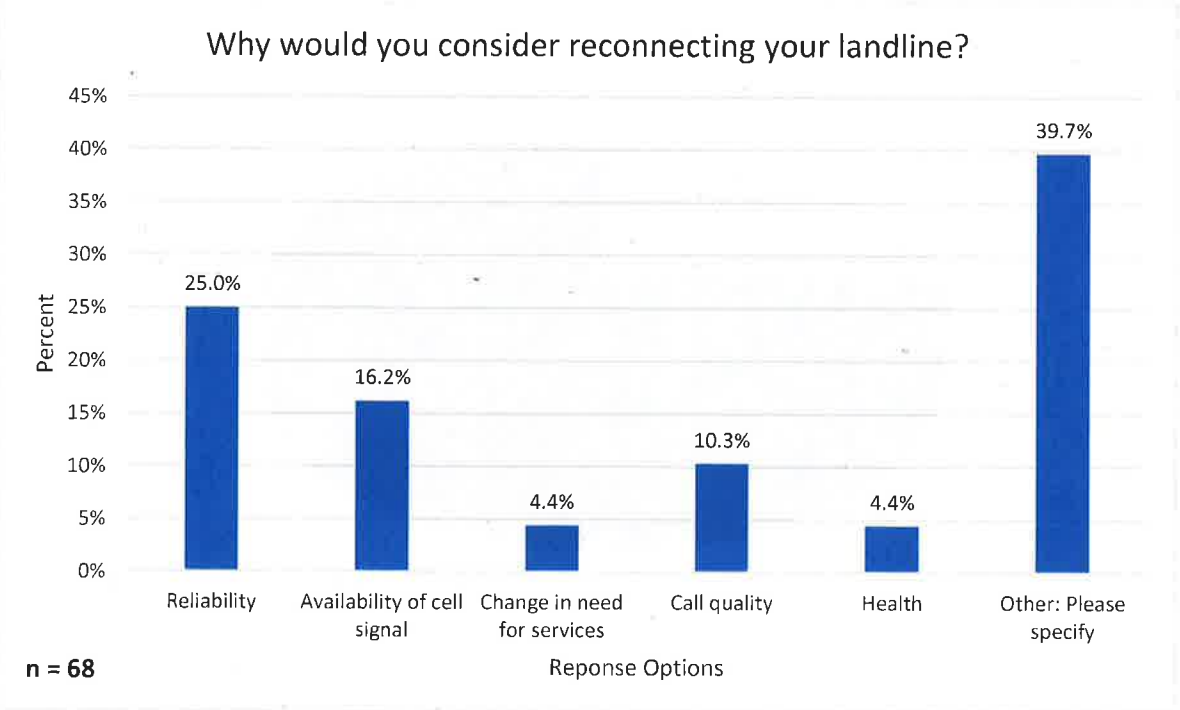
A majority of Vermonters (74.6%) personally use a cell phone, compared the 25.4% who said they do not personally use a cell phone.



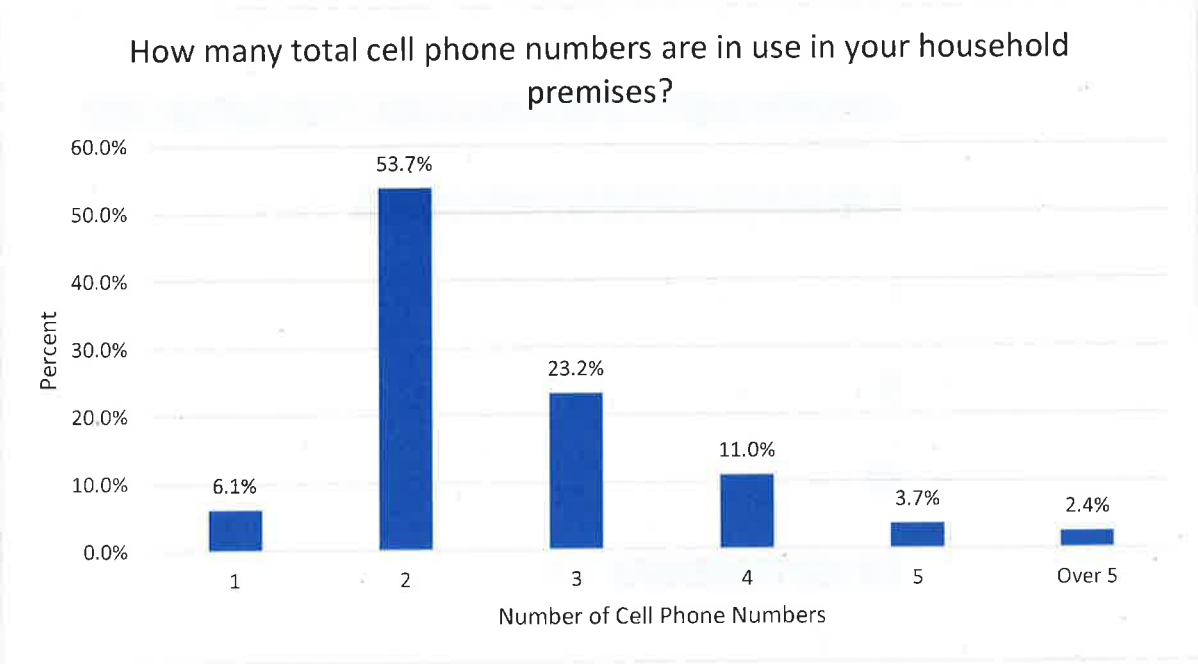
When asked if they would eve go back to a land line service, 21% of respondents said they would go back to a landline, 29% said they would not go back to a land line, 41% of respondents stated that they had never dropped a landline in the past, and 8% stated that they have never had a landline.



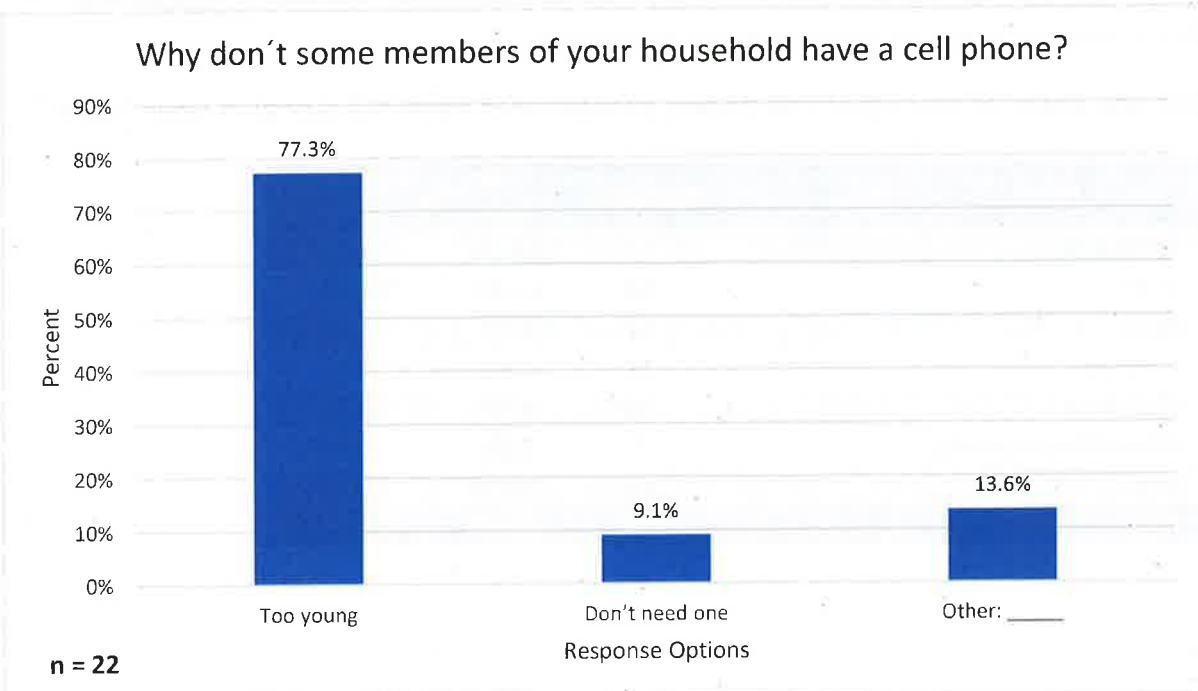
When we asked respondents, why they would consider reconnecting their landline, 25.0% stated reliability as the reason for reconnecting their landline; 16.2% stated the availability of cell signal, 10.3% stated call quality, 4.4% stated change in need for services, 4.4 stated health as the reason, and 39.7% said "Other."



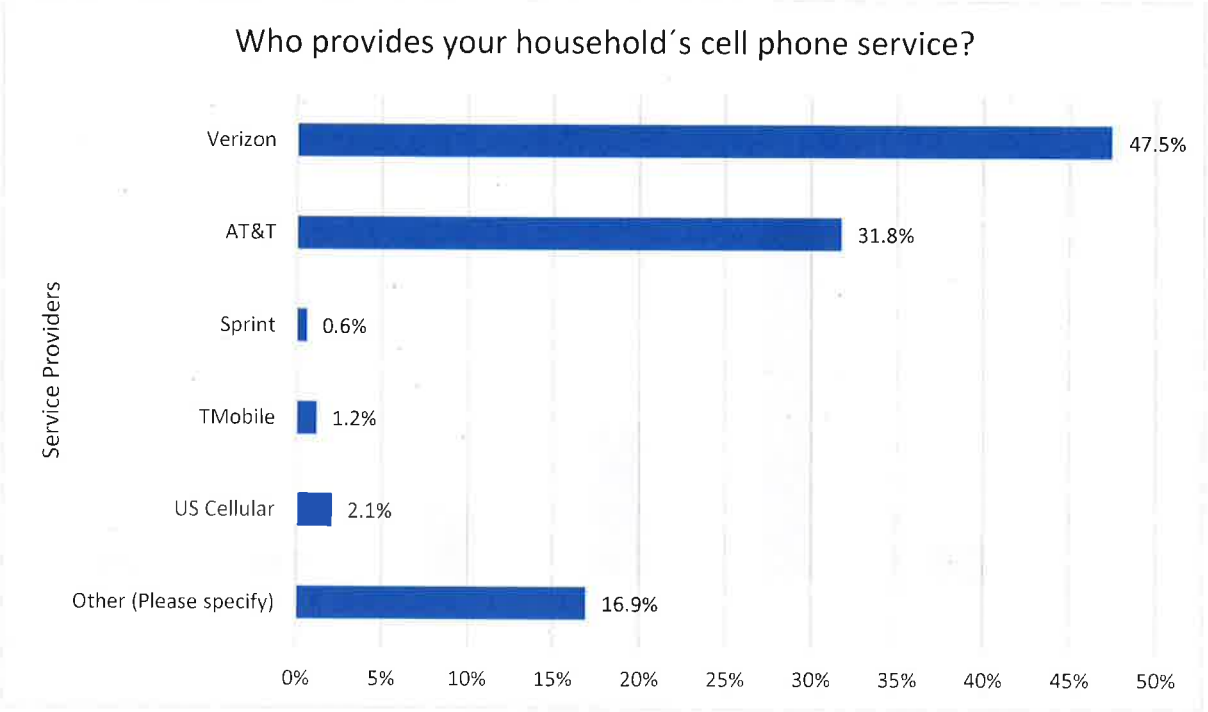
A majority of Vermonters (53.7%) have 2 cell phone numbers that they use in their household; 6.1% of households have only one cellphone on premise, 23.2% of households have 3 cell phones, and about 17% have 4 or more cellphones on premise.



When asked why some members of their household do not have a cell phone, the majority stated that those members of the household where "too young."



When asked about who provided their households cell phone service, the top two carriers that provide the majority of cell phone service to Vermonters are Verizon (47.5%) and AT&T (31.8%).



When respondents were asked if they knew of any other cell phone carriers that have cell signal in their home, a majority said either Verizon (33.6%) or AT&T (32.1%).

Do you know of any other cell phone carriers that have cell signal in your home?

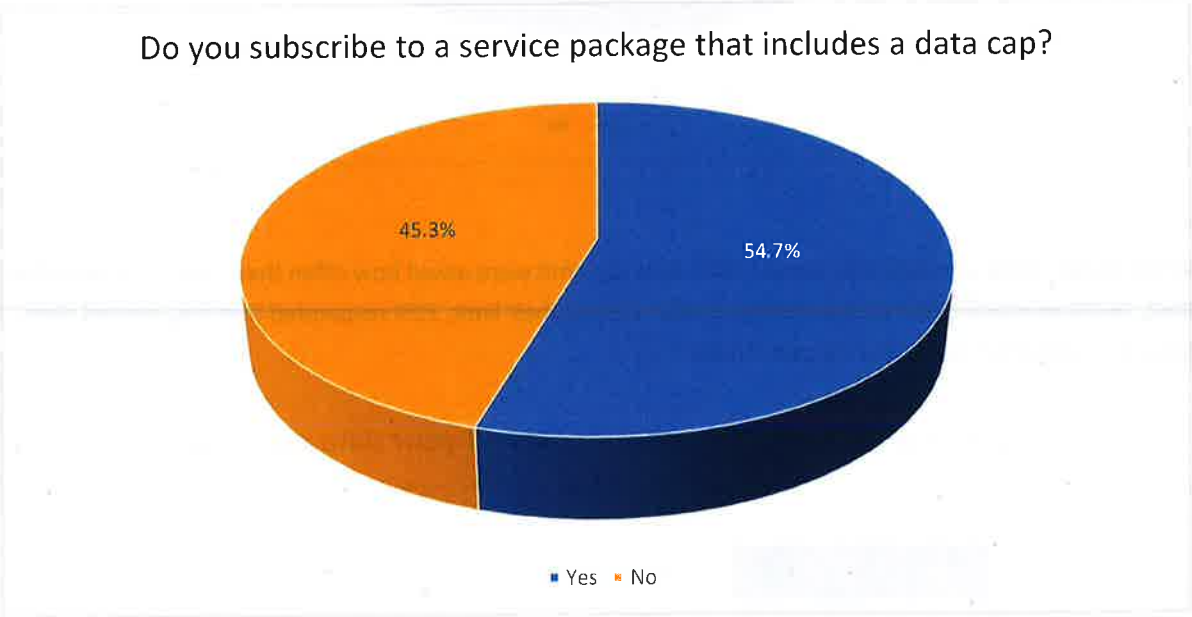
	Frequency	% of Total	% of Respondents
Verizon	92	26.1%	33.6%
AT&T	88	25.0%	32.1%
Sprint	34	9.7%	12.4%
T-Mobile	15	4.3%	5.5%
US Cellular	14	4.0%	5.1%
Other (Please specify)	7	2.0%	2.6%
None	102	29.0%	37.2%
Total	**274**	**100.0%**	**128.5%**

When asked what services are included in your cellphone plan, a vast majority of Vermonters (78.1%) have voice text and data services included in their cellphone plan.

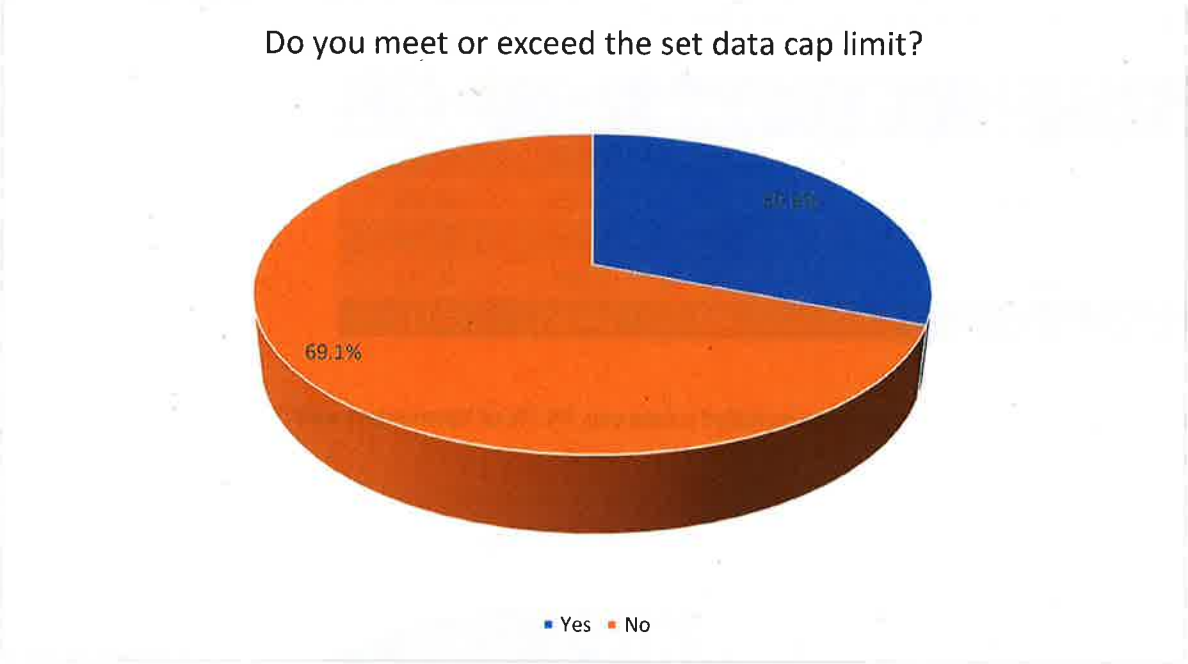
What services are included in your cell phone plan?

	Frequency	% of Total	% of Respondents
Voice	313	34.3%	92.6%
Text messaging	307	33.6%	90.8%
Data	277	30.3%	82.0%
Other: Please specify	16	1.8%	4.7%
Total	**338**	**100.0%**	**270.1%**

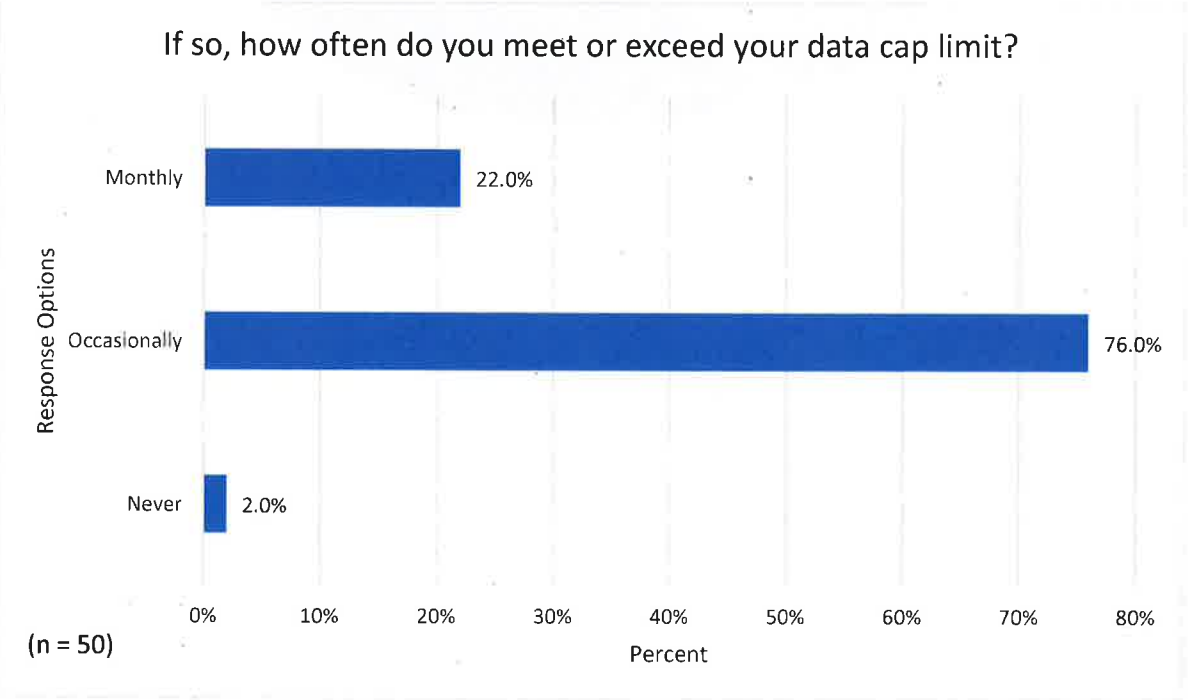
When asked if their service package included a data cap, 54.7% of Vermonters said "Yes," and 45.3% of Vermonters said "No."



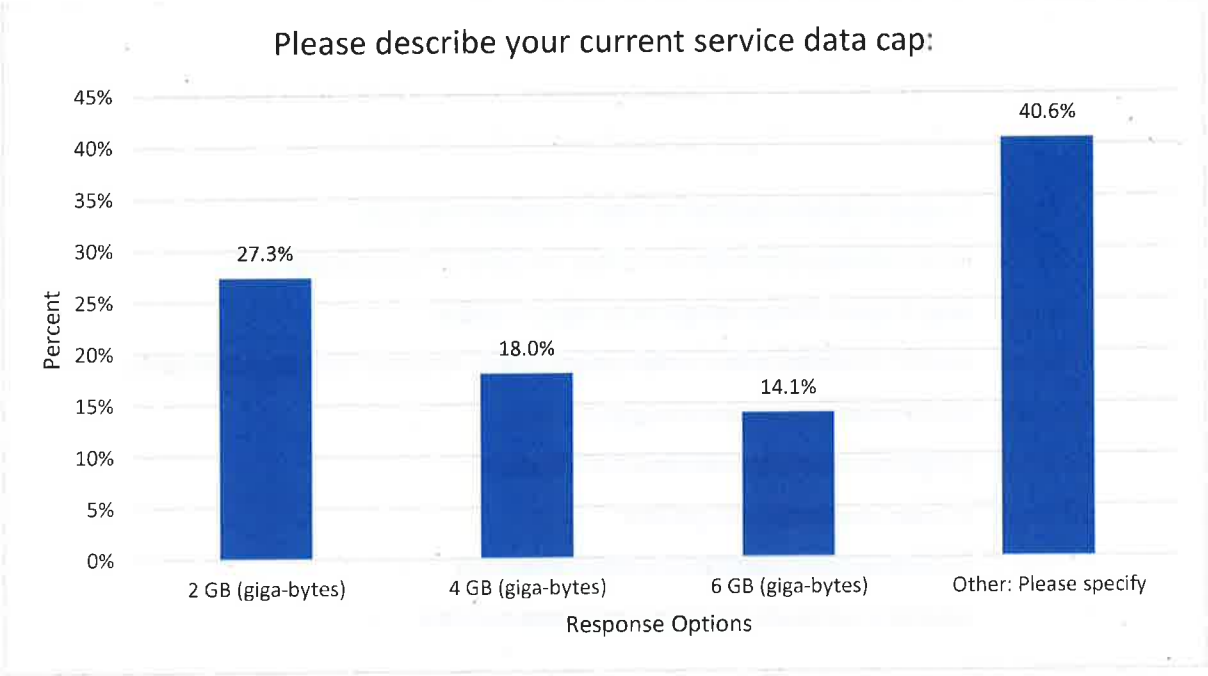
When asked if they meet or exceed the set data cap limit, a majority of respondents (69.1%) say "no;" 30.9% of respondents say "yes."



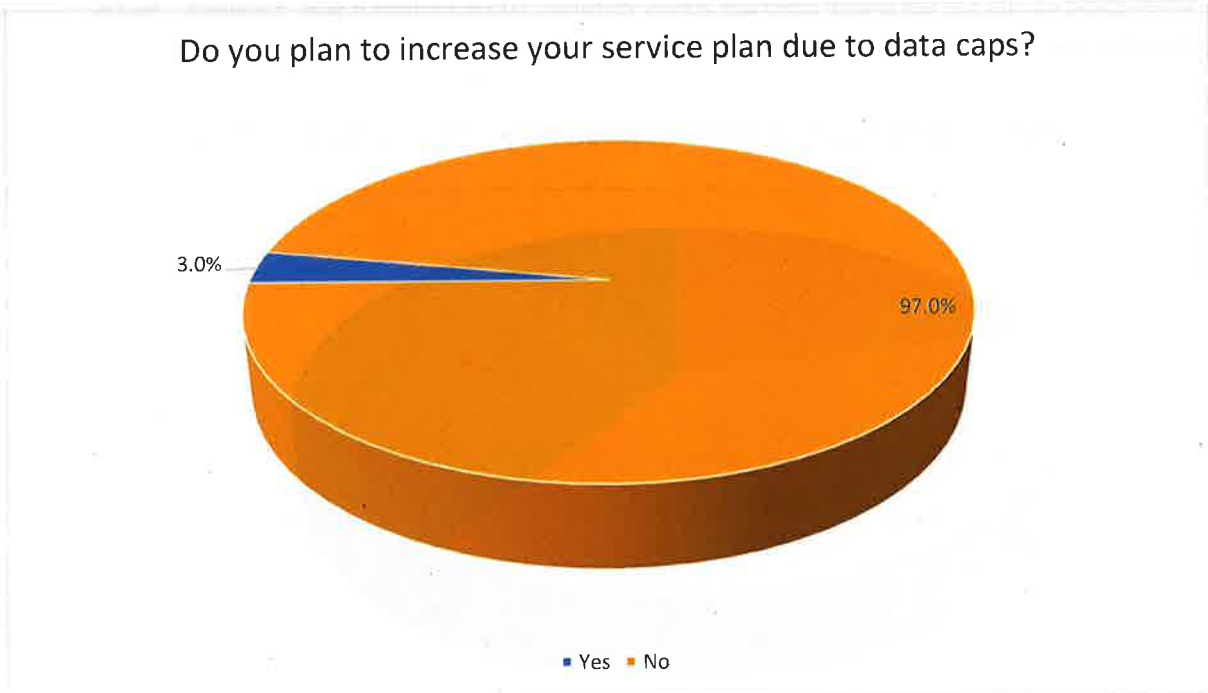
When respondents who said they exceed their data cap limit were asked how often they meet or exceed that limit, 76.0% of responded that they "Occasionally" exceed their limit, 22% responded that they exceed their limit on a "Monthly" basis, and 2% said "Never."



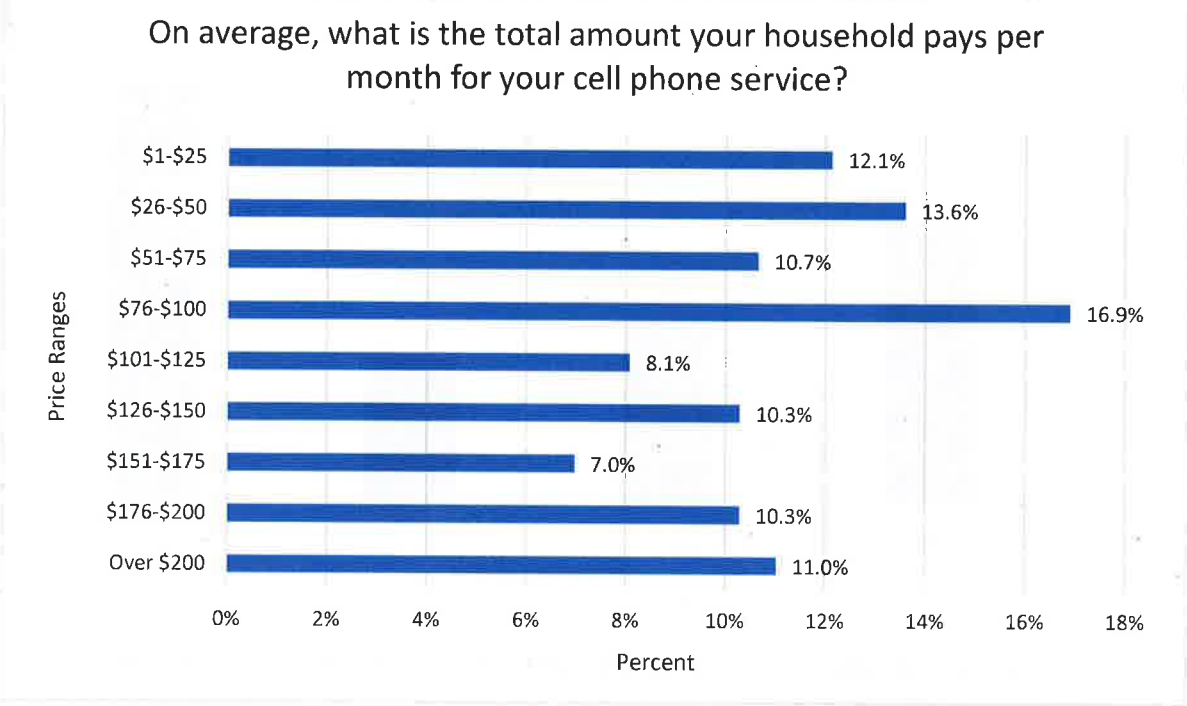
When asked about their current service data caps, 27.3% of respondents have a 2-gigabyte data cap, 18.0% of respondents have a 4-gigabyte data cap, 14.1% 6-gigabyte data cap, and 40.6 had some other data cap.



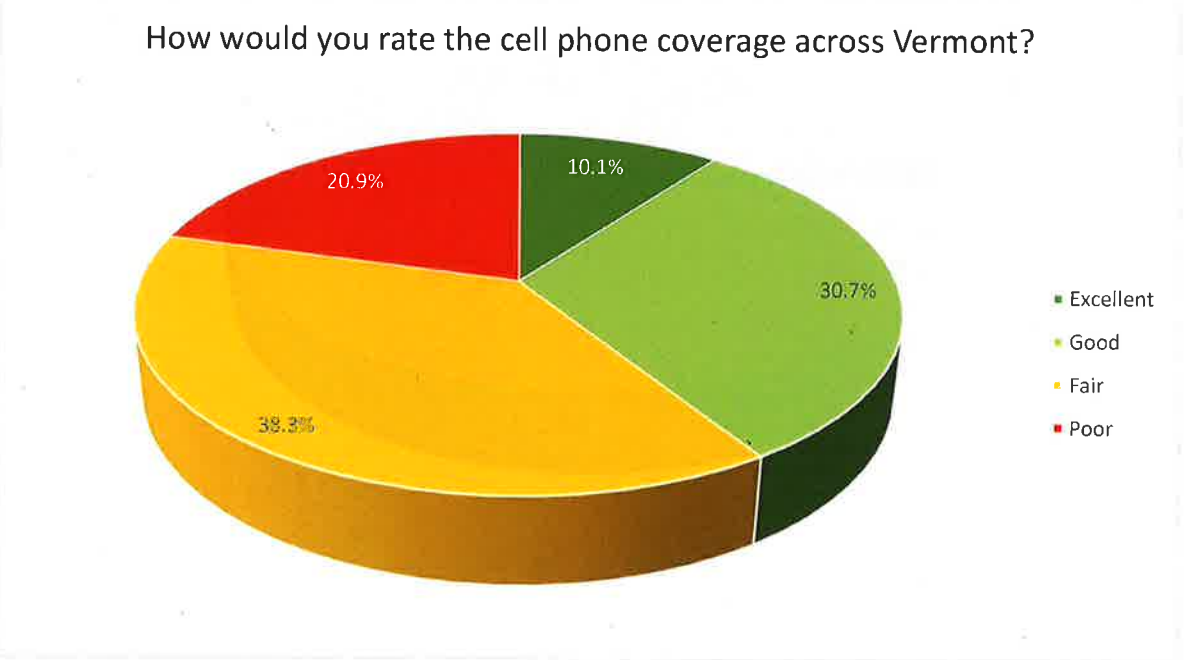
When those who have data caps were asked if they planned to increase their service plan due to data caps, an overwhelming amount (97%) said "No."



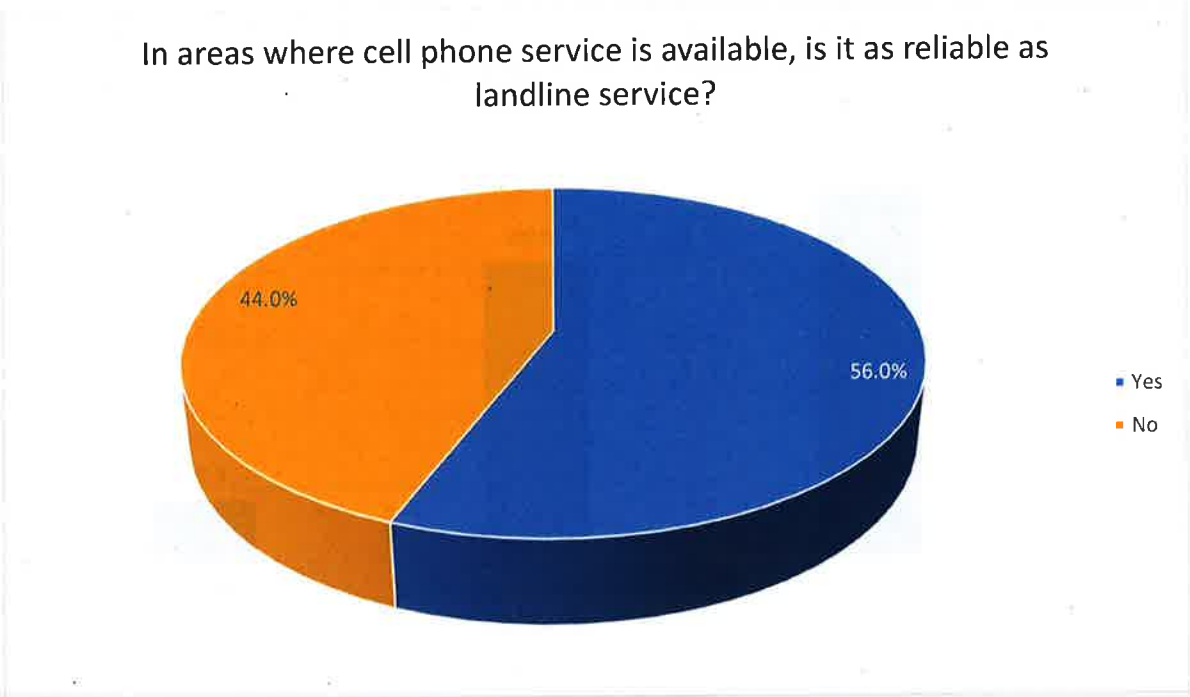
When asked about the total amount their household pays per month for their cell phone bill, 53.3% of respondents pay $100 or less per month, 35.7% pay between $101 to $200 per month, and 11.0% pay over $200 per month.



When asked to rate the cell phone coverage across Vermont, 10.1% thought it was "Excellent," 30.7% thought it was "Good," 38.3% thought it was "Fair," and 20.9% thought it was "Poor."

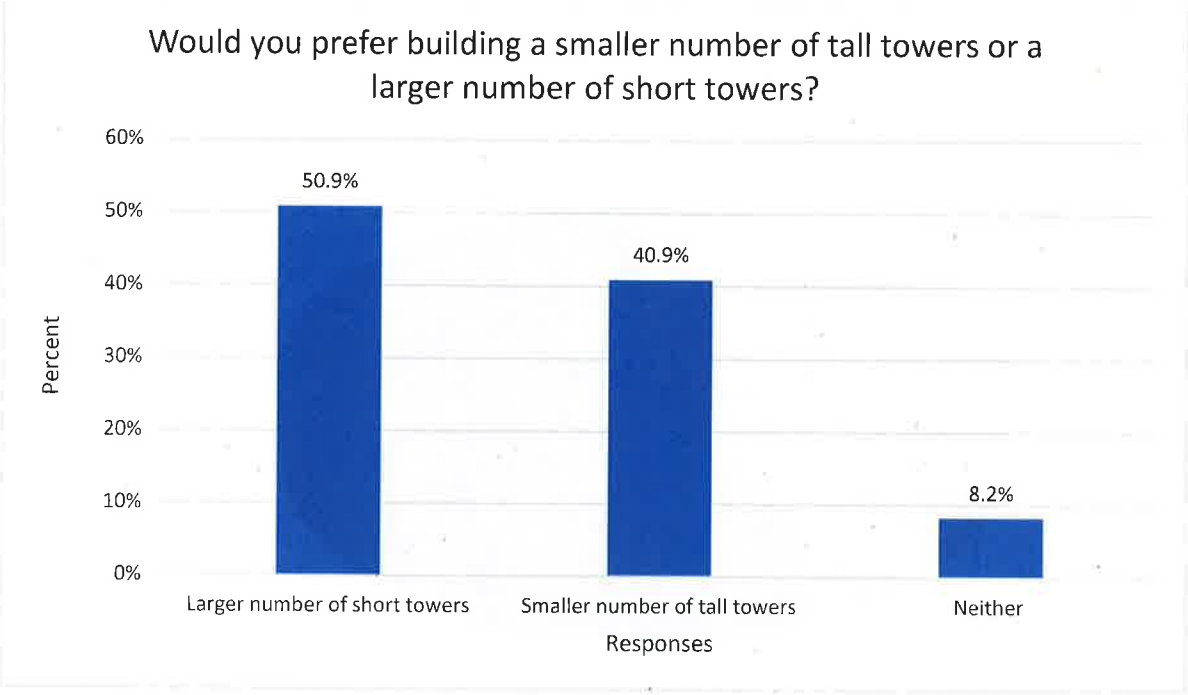


When asked about the reliability of cell phone service as compared to landline service where cell phone service is available, 56% of respondents said "yes" meaning that they perceived that where cell phone service is available, it was as reliable as landline service. In contrast, about 44% of respondents said "no" meaning that they did not perceive cell phone service to be as reliable as landline services where cell phone service is available.

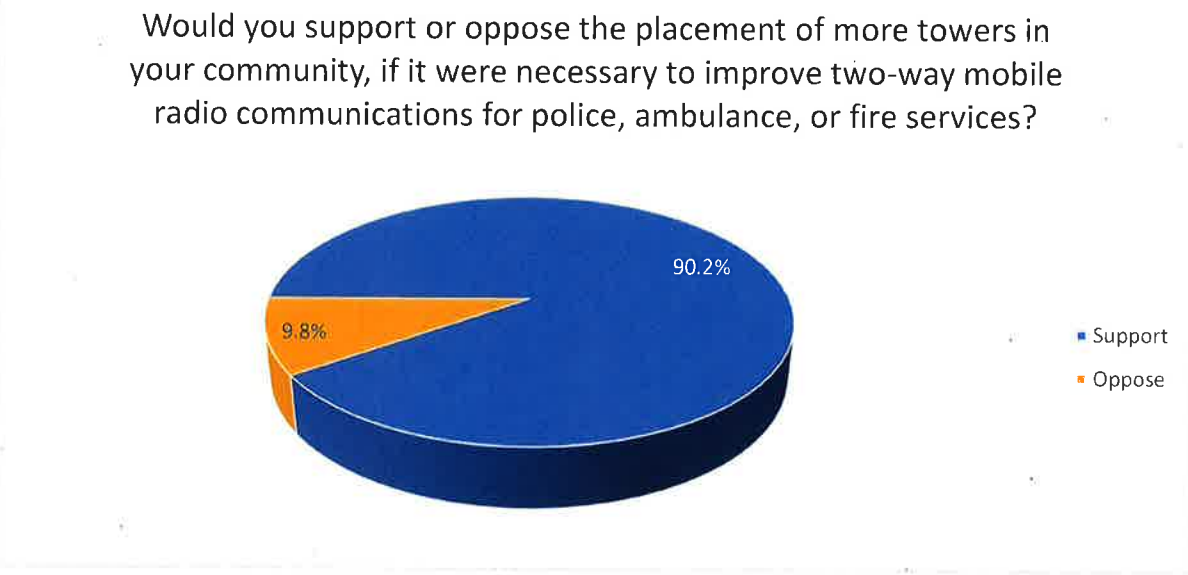


Cell Towers

When asked whether they prefer a smaller number of tall towers or a larger number of short towers, the majority (50.9%) of respondents preferred a larger number of short towers; 40.9% of respondents preferred a smaller number of tall tower, and 8.2% would want neither tall towers nor short towers.

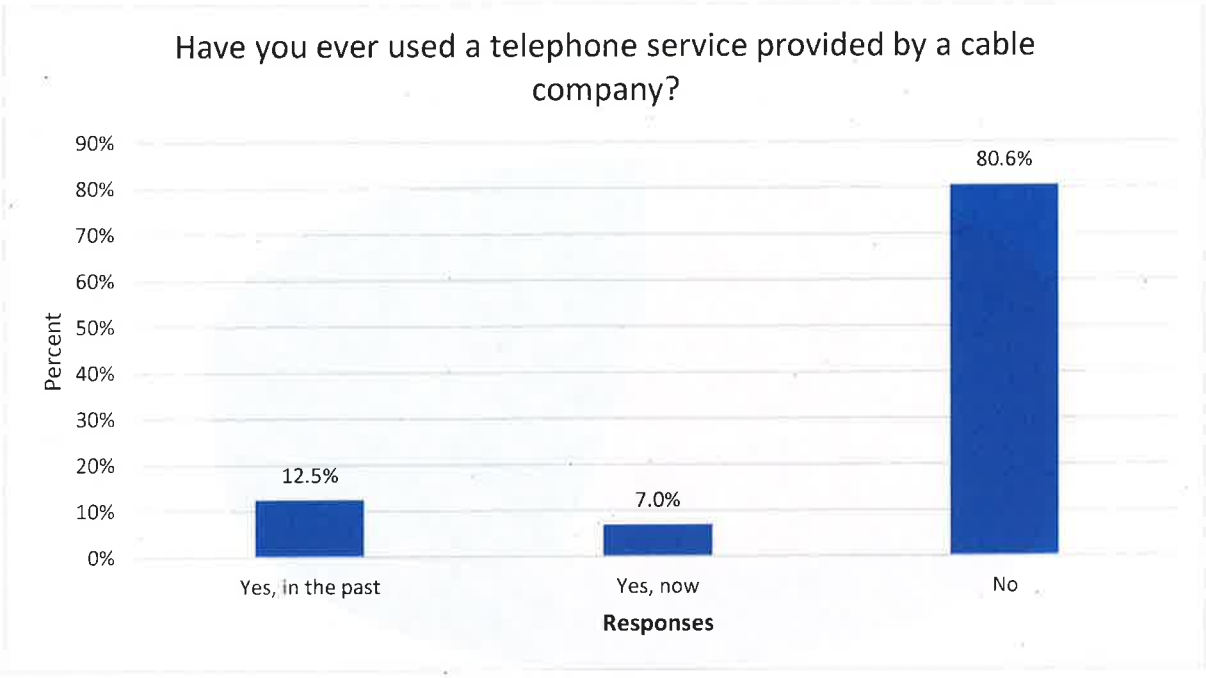


An overwhelming majority (90.2%) would support the placement of more towers in their community, if it were necessary to improve two-way mobile radio communications for police, ambulance, or fire service; only 9.8% would oppose.

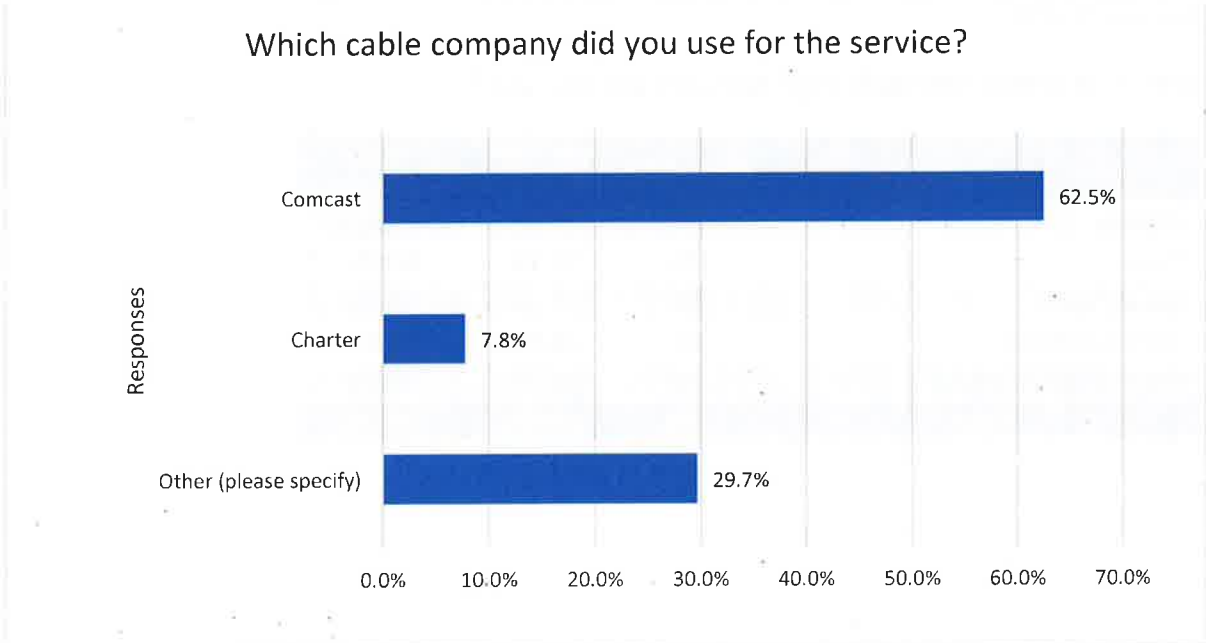


Fixed VoIP

A large majority (80.6%) of residents have not used a telephone service provided by a cable company; 12.5% said they have in the past, and 7.0% said they do now.

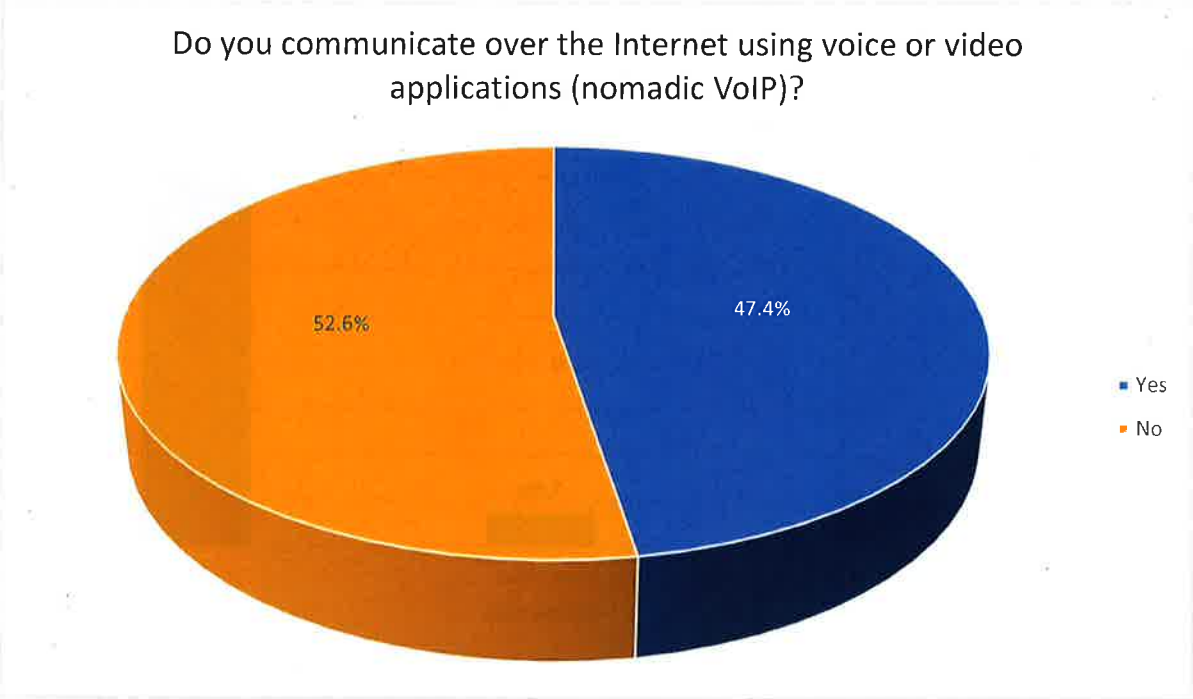


When respondents who use /used a cable company to provide their telephone service were asked which cable company they use/used, 62.3% of respondents said "Comcast," 7.8% said "Charter," and 29.7% said "other."



Nomadic VoIP

When asked if residents communicate over the Internet using voice or video applications, 52.6% of respondents responded "No," and 47.4% of respondents responded "Yes."



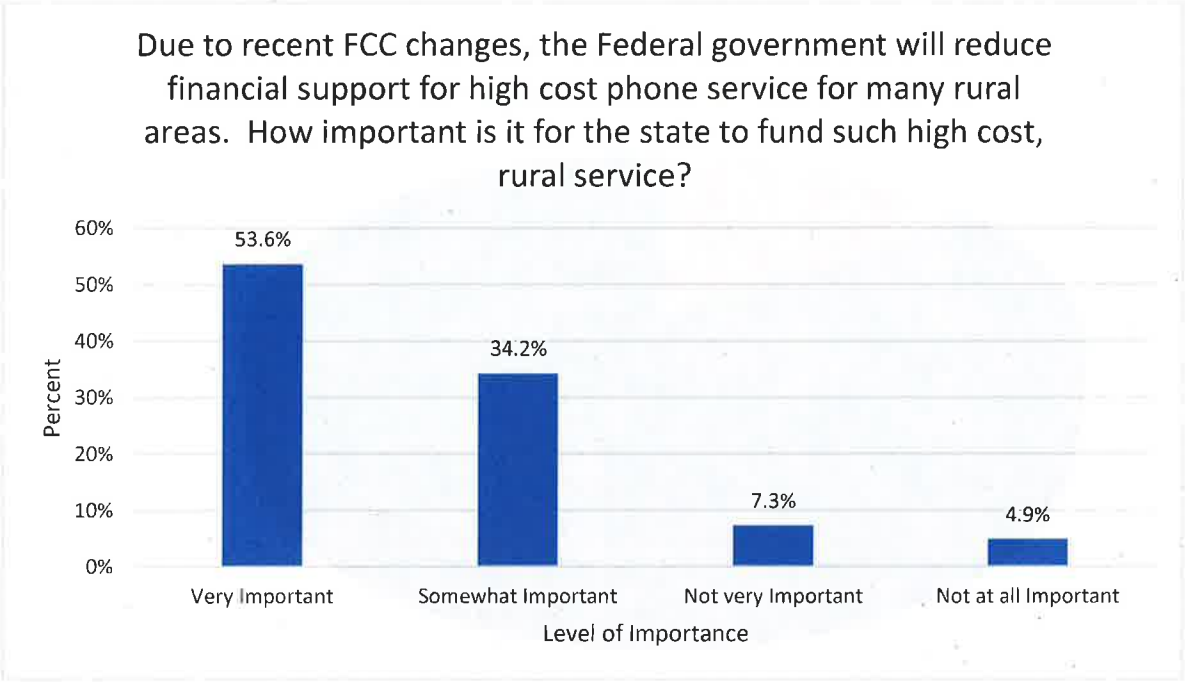
When asked about which nomadic VoIP services they used, most people used either Skype (56.9%) or Apple Facetime (43.6%).

Which of these nomadic VoIP services do you use?

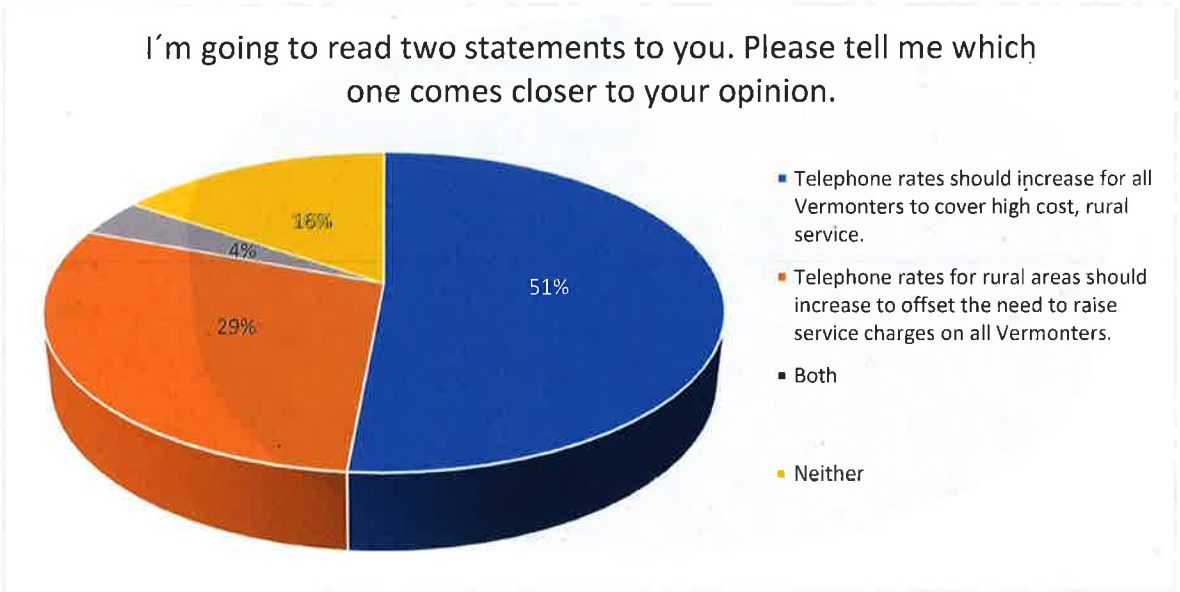
	Frequency	% of Total Responses	% of Respondents
Vonage	6	2.1%	3.2%
Skype	107	37.7%	56.9%
Google Voice	50	17.6%	26.6%
Apple Facetime	82	28.9%	43.6%
Other: (Please Specify)	39	13.7%	20.7%
Total	**188**	**100.0%**	**151.1%**

Universal Service

A majority of respondents thought it was "Very Important" (53.6%) or "Somewhat Important" (34.2%) for the state to fun high cost rural services.

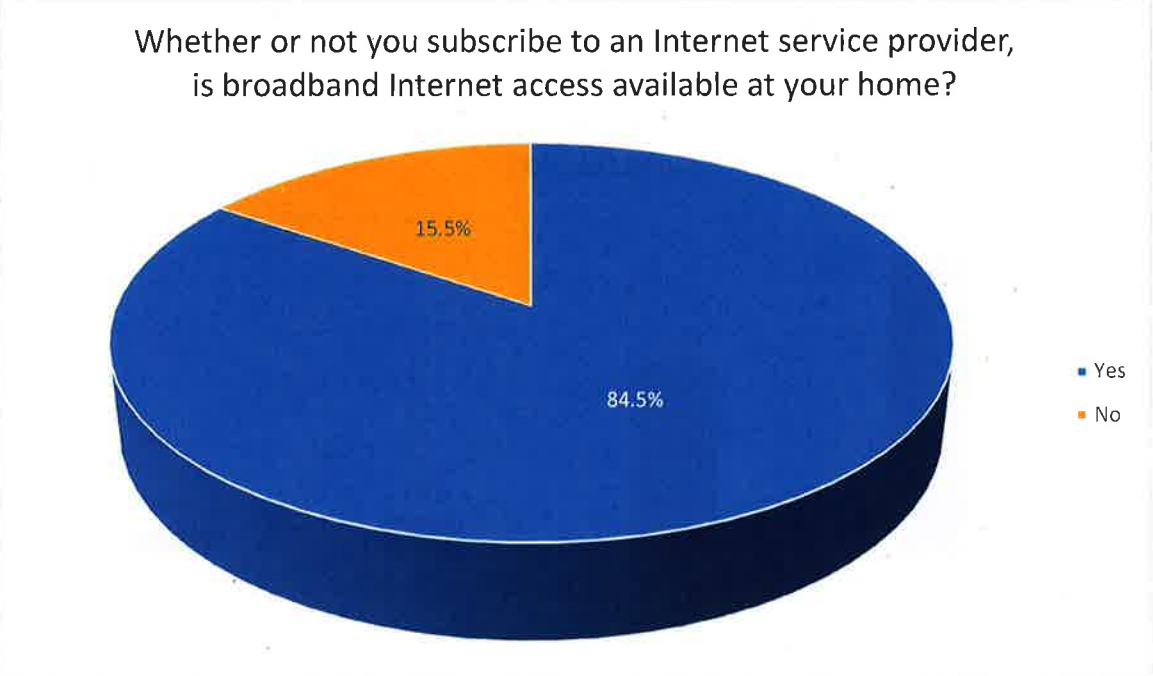


When residents were asked which of two options they would prefer to implement in resolving the higher costing rural telephone service, 51% of respondents would prefer an increase to all Vermonters to cover the costs, 29% would prefer an increase in rates to rural areas so as to offset the need to raise service charges to all Vermonters, 4% thing both options are good, and 16% like neither option.

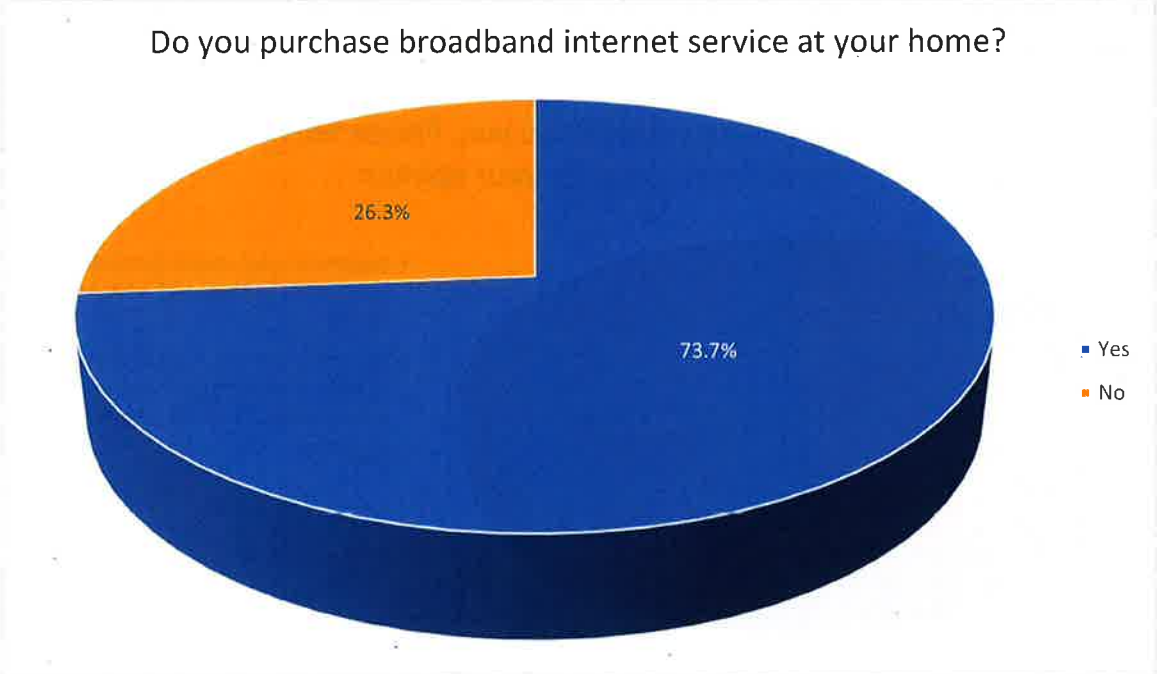


Internet

Similar to the 2014 survey where 85% of Vermonters believe they have access to broadband internet access where they live.



When asked if they purchase broadband in their home, 74% of Vermonters said "Yes" which is the result as the 2014 survey.

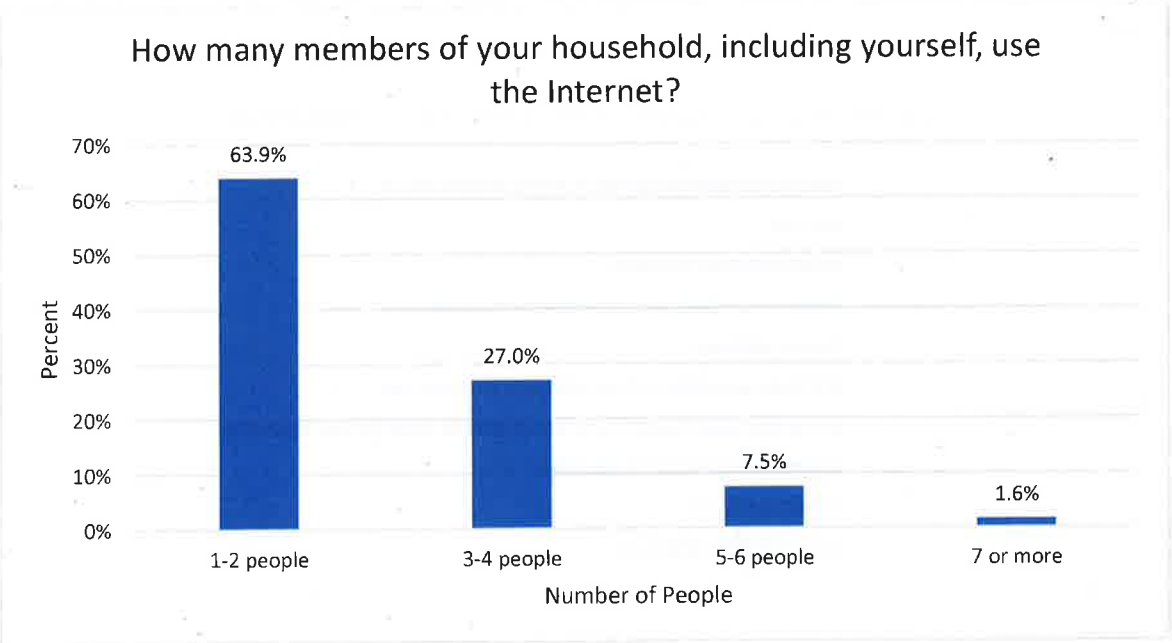


When we asked Vermonters where they have used the Internet in the last 12 months, a vast majority of respondents (89.6%) use the Internet at home, which is a 6% increase from 2014.

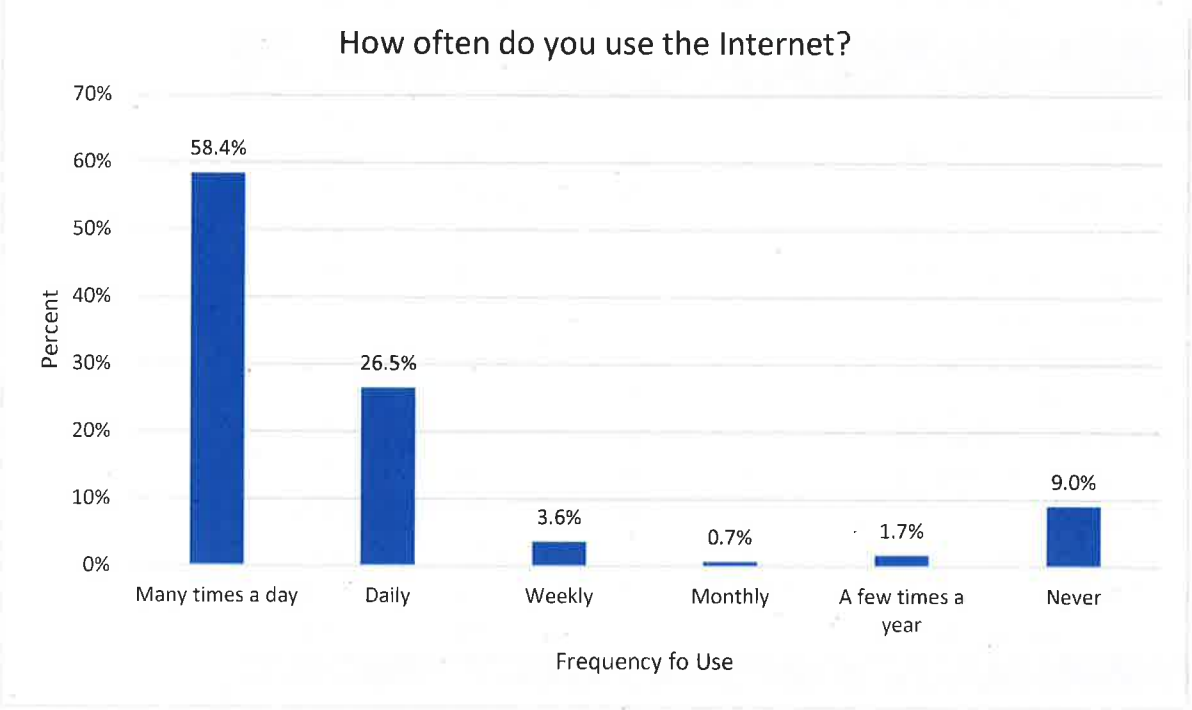
In the last 12 months, where have you used the Internet?

	Frequency	% of Total Responses	% of Respondents
At home	352	30.7%	89.6%
At work	205	17.9%	52.2%
At the library	60	5.2%	15.3%
At VT highway rest areas	35	3.0%	8.9%
At friend's house	81	7.1%	20.6%
At a senior center	11	1.0%	2.8%
At a place of worship	17	1.5%	4.3%
At town hall	20	1.7%	5.1%
At a college or university	48	4.2%	12.2%
At a café/restaurant/tavern	91	7.9%	23.2%
At a school	45	3.9%	11.5%
On mass transit	36	3.1%	9.2%
At hospital	57	5.0%	14.5%
Other: Please Specify	90	7.8%	22.9%
Total	393	100.0%	292.1%

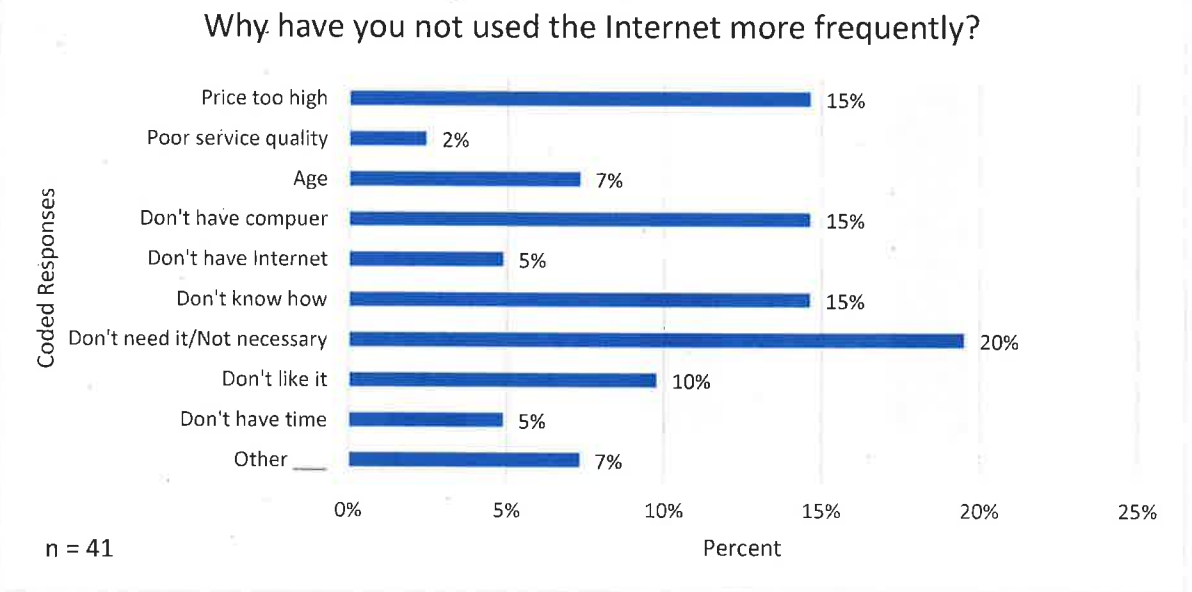
When asked the number members of their household that use the Internet, the majority of Vermonters (63.9%) have 1-2 people, 27.0% have 2 people, 7.5% have 5-6 people, and 1.6% have 7 or more people.



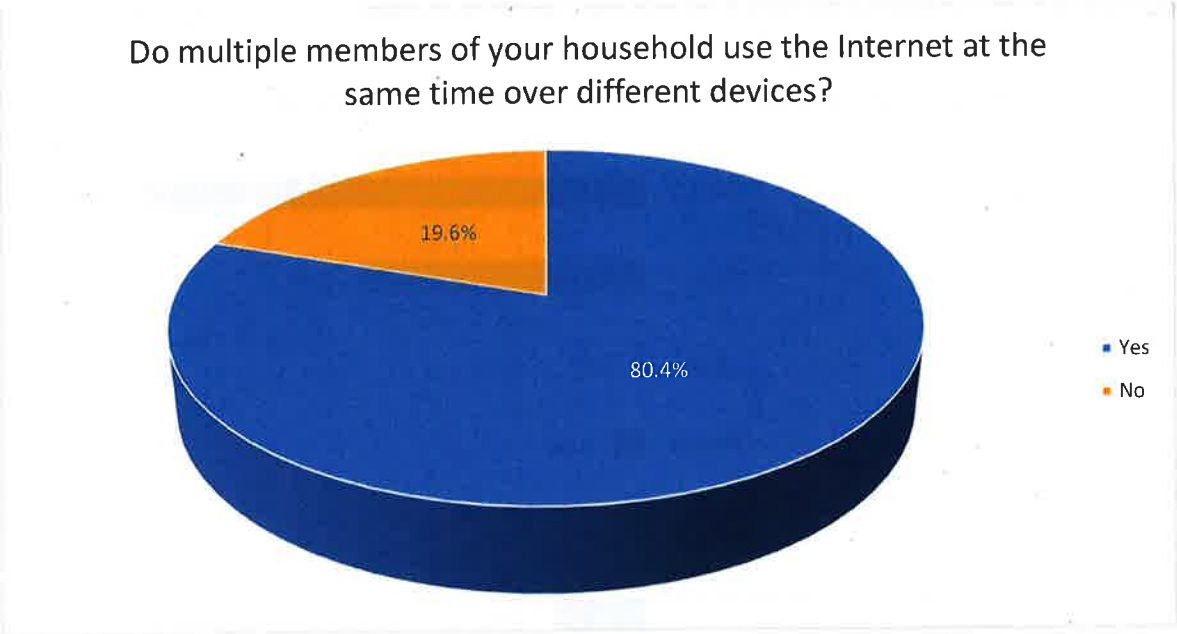
When asked about the frequency in which they use the Internet, Most Vermonters (58.4%) used the Internet many times a day, 26.5% used the Internet on a daily basis, 3.6% on a weekly basis, 0.7% on a monthly basis, 1.7% a few times a year, and 9% never use the Internet.



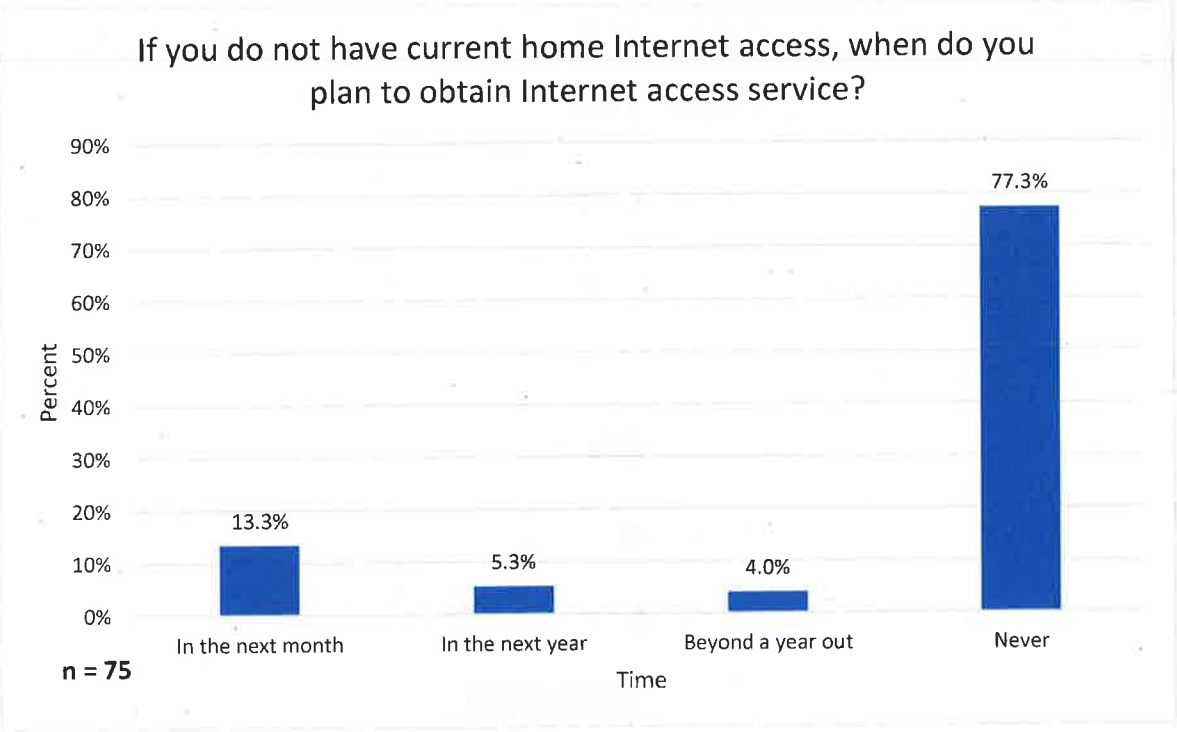
When asked of the people who use the Internet less than on a daily basis, why they do not use the Internet more frequently, 20% of respondents said that they don't need it or it wasn't necessary, followed by 15% who said the price was too high, 15% said they don't have a computer, and 15% don't know how to use the Internet.



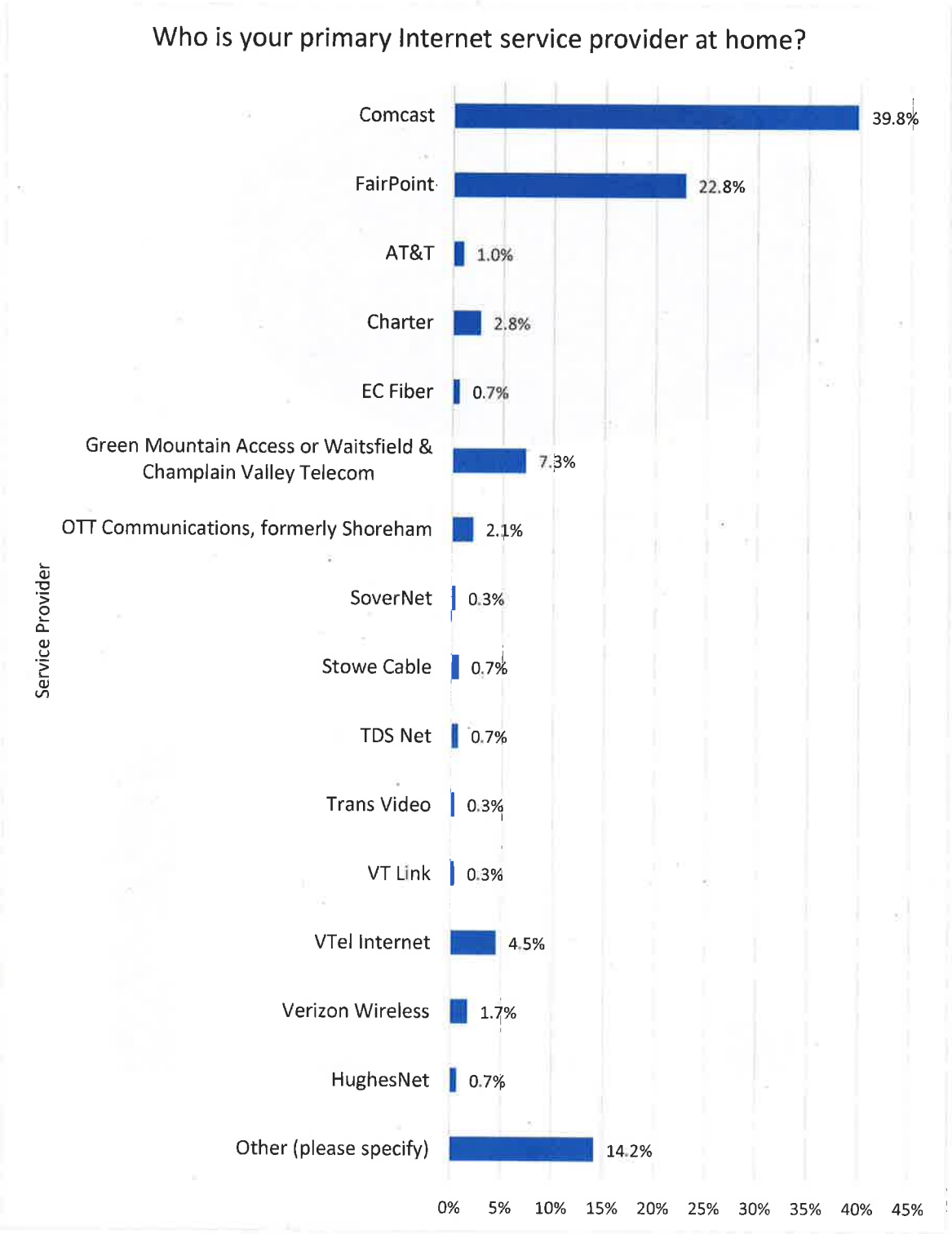
When asked if multiple people use the Internet at the same time over different devices, 80.4% of respondents said "Yes," compared to the 19.6% who said "No."



Those who did not have internet access at home were asked when they planned to obtain intent access, 73.3% said never, 13.3% said in the next month, 5.3% said in the next year, and 4.0% said beyond a year out.



When asked about their primary internet service provider at home, 39.8% said Comcast, 22.8% said FairPoint, 2.8% said Charter,7.3% said Green Mountain Access or Waitsfield & Champlain Valley Telecom, 4.5% said VTel Internet, 1.7% said Verizon Wireless, 1.0% said AT&T, and 0.7% EC Fiber.

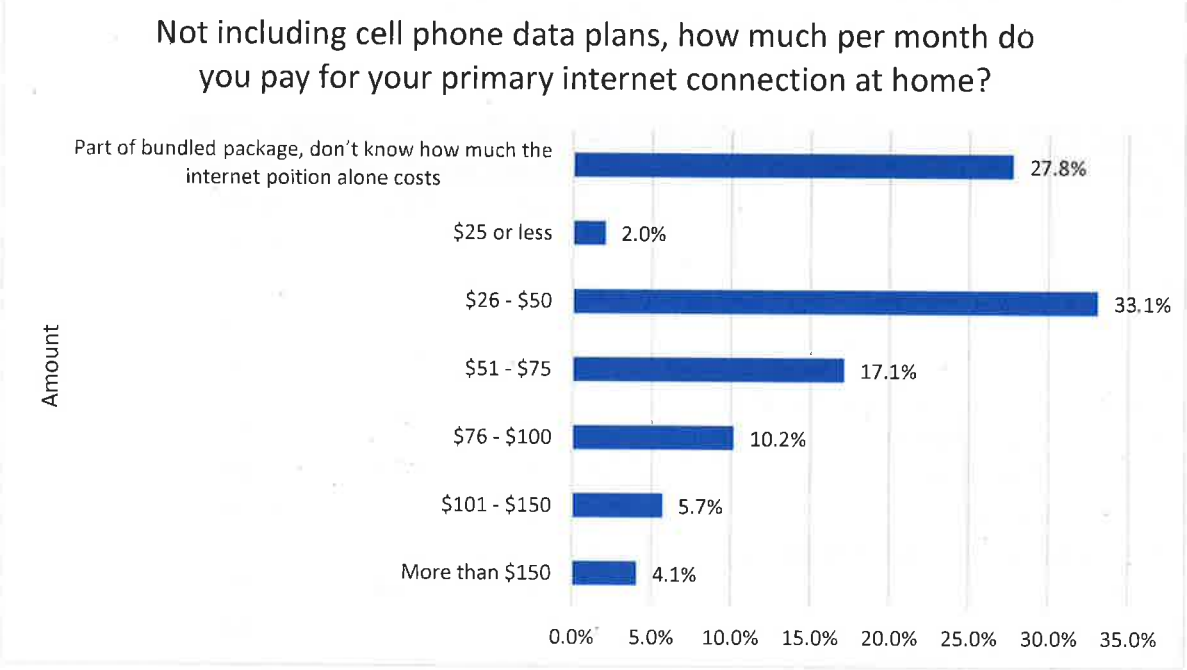


When asked what other Internet service providers are available to them at their home, Comcast and FairPoint seem to hold the largest market share with over 50% of people having access to or purchasing internet through them.

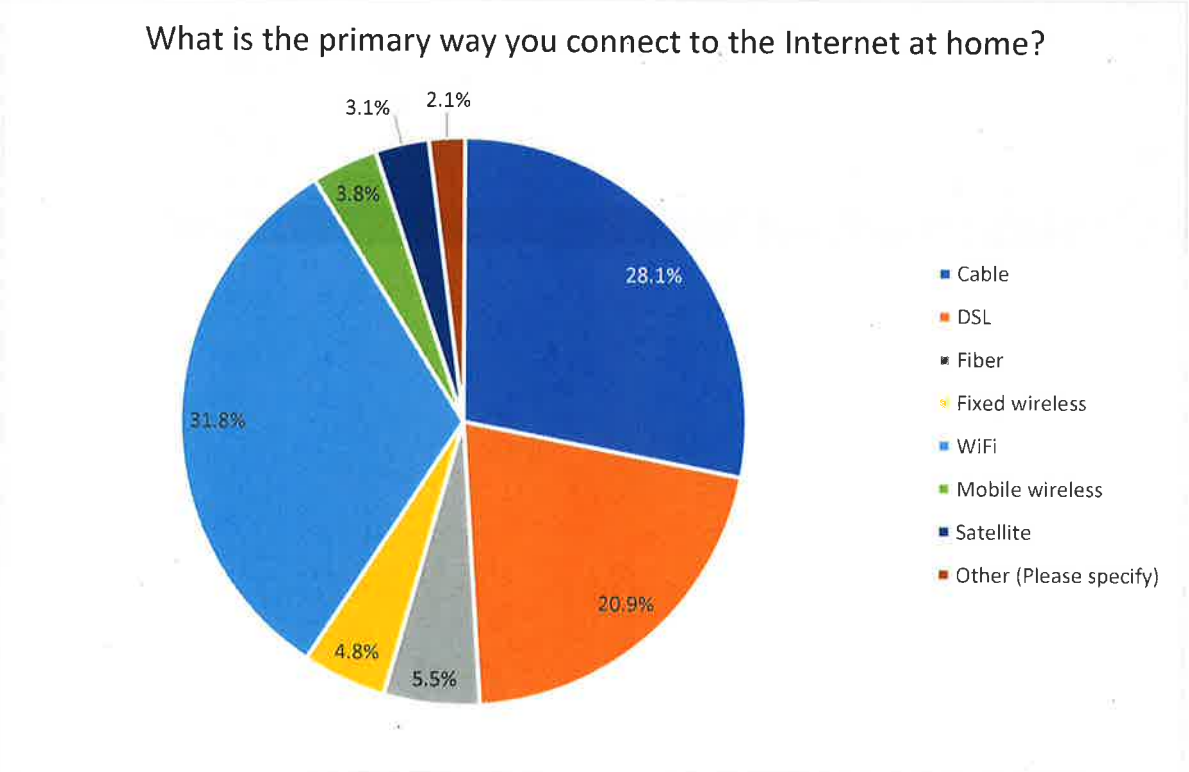
Are you aware of other Internet service providers that are available to you at your home?

	Frequency	% of Total	% of Respondents
Comcast	62	20.1%	31.8%
FairPoint	76	24.6%	39.0%
AT&T	21	6.8%	10.8%
Charter	4	1.3%	2.1%
EC Fiber	2	0.6%	1.0%
Green Mountain Access or Waitsfield & Champlain Valley Telecom	8	2.6%	4.1%
New England Wireless	1	0.3%	0.5%
Microsoft Network	1	0.3%	0.5%
OTT Communications, formerly Shoreham	2	0.6%	1.0%
Sover Net	9	2.9%	4.6%
Sprint	10	3.2%	5.1%
Stowe Cable	5	1.6%	2.6%
TDS Net	1	0.3%	0.5%
Valley Net	2	0.6%	1.0%
VT Link	8	2.6%	4.1%
VTel Internet	23	7.4%	11.8%
Verizon Wireless	7	2.3%	3.6%
WildBlue	2	0.6%	1.0%
HughesNet	12	3.9%	6.2%
Other (please specify)	53	17.2%	27.2%
Total	**195**	**100.0%**	**158.5%**

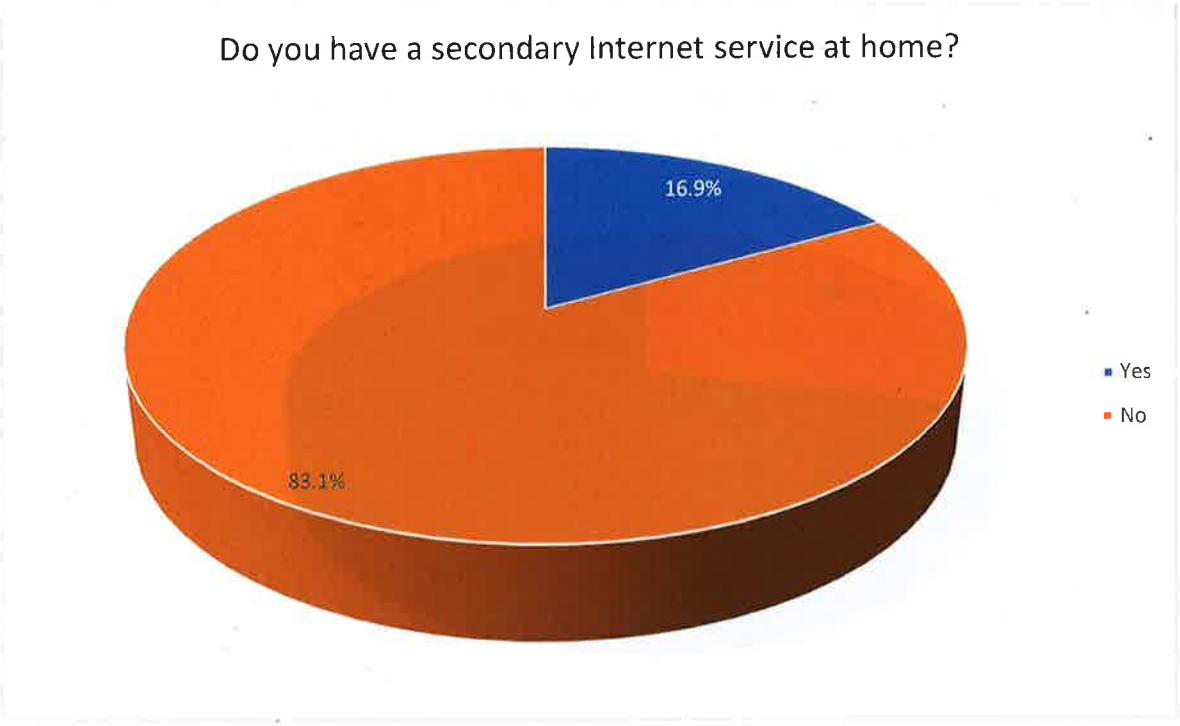
About 28% of Vermonters purchase their internet as part of a bundled package, meaning they don't recall the exact amount they pay for the Internet portion of their bill. A little over half (52.2%) of Vermonters pay $75 or less for their internet connection at home and are not part of a bundled package.



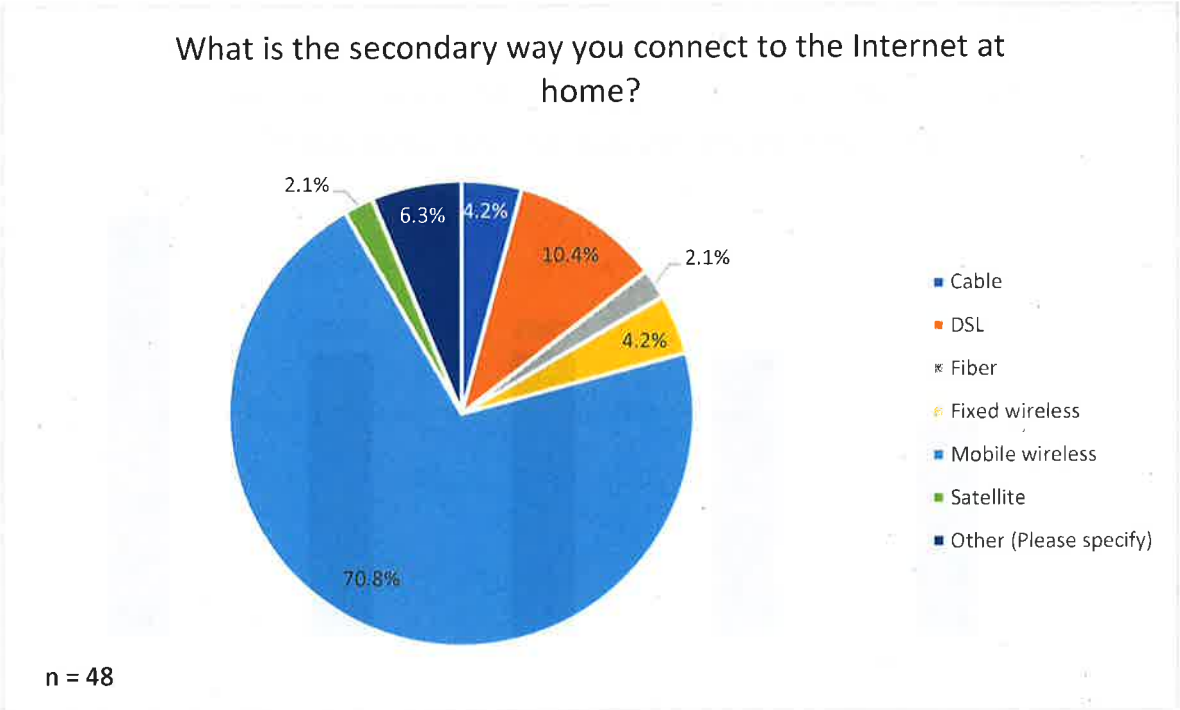
When asked about the primary way they connect to the Internet at home, 31.8% of respondents said Wi-Fi, 28.1% said Cable, and 20.9% said DSL.



When asked if they had a secondary Internet service at home, a vast majority of Vermonters (83.1%) indicated that they do not have a secondary Internet service and 16.9% said that they did.

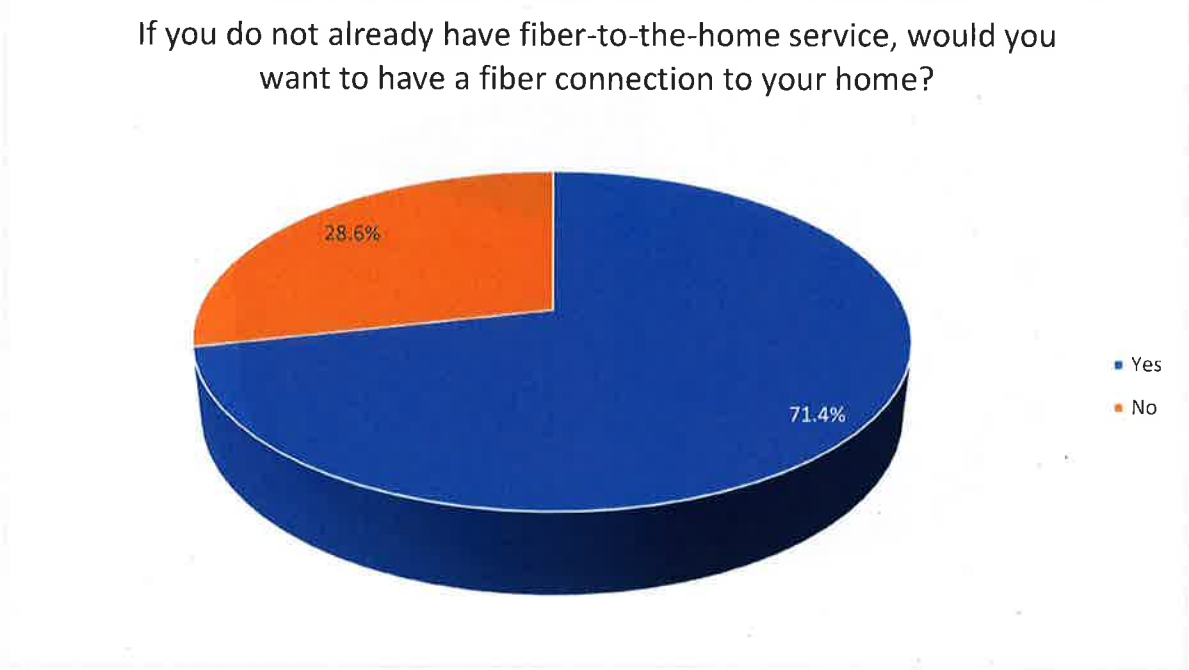


A large portion of Vermonters who do have a secondary Internet provider use a mobile wireless service (70.8%).

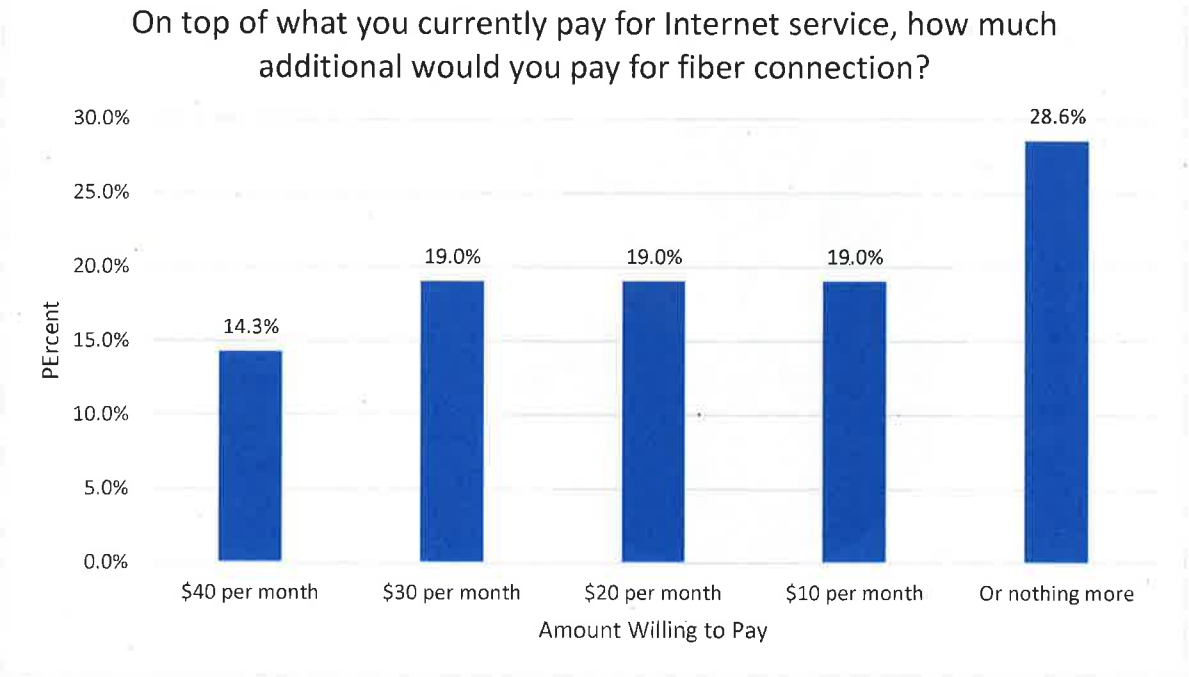


n = 48

When we asked residents, who do not already have fiber-to-the- home service if they would want to have a fiber connection to their home, 71.4% of respondents responded that they would, whereas 28.6% of respondents said they would not.



Residents who don't currently have a fiber connection were asked how much in addition they would be willing to pay for fiber service; the plurality of respondents would not be willing to pay anything more than they currently pay.

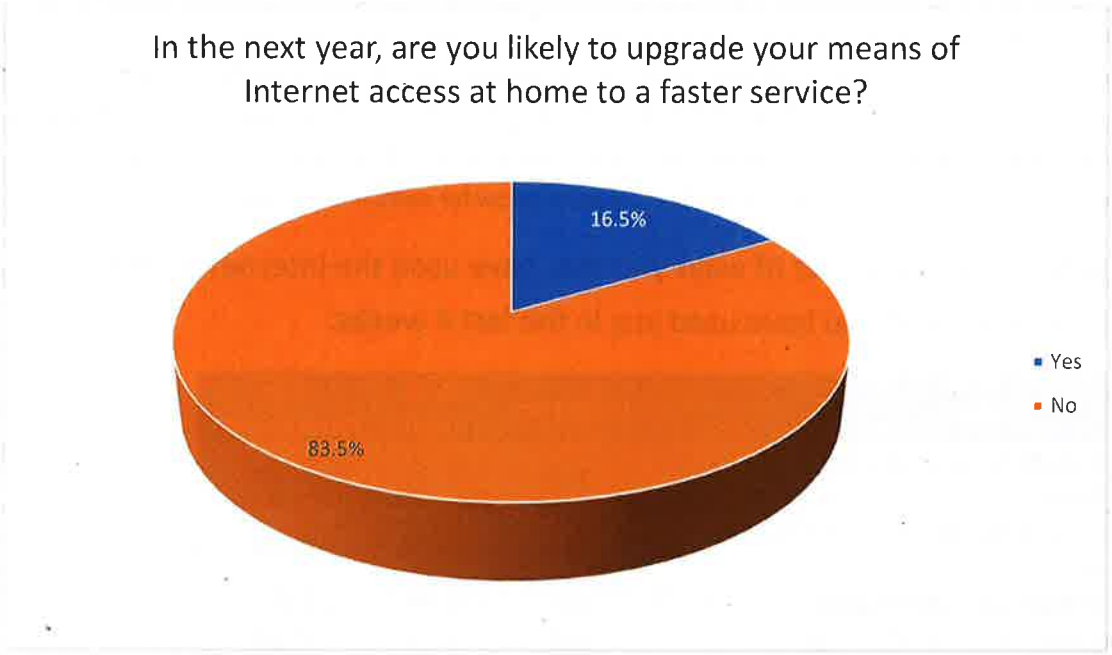


When asked about ways they have used the Internet at their home in the last 4 weeks, a vast majority of respondents (92.1%) said they used the Internet for personal email or other written communication, 79.8% of respondents said they used the Internet to pay bills or manage their money or finances, 76.4% said they have used the Internet to for social networking sites, 67.5% of respondents said they used the Internet for streaming media for entertainment, 57.9% of respondents used the Internet to get health or medical services, advice, or information, 57.9% used it for downloading music or video files, and 54.8% said they used it for voice or video communications. Though the question asked about other activities, those activities were reported by less than half of the respondents. See the table below for more information.

I am going to read you a list of ways you may have used the Internet at home, please let me know if you have used any in the last 4 weeks:

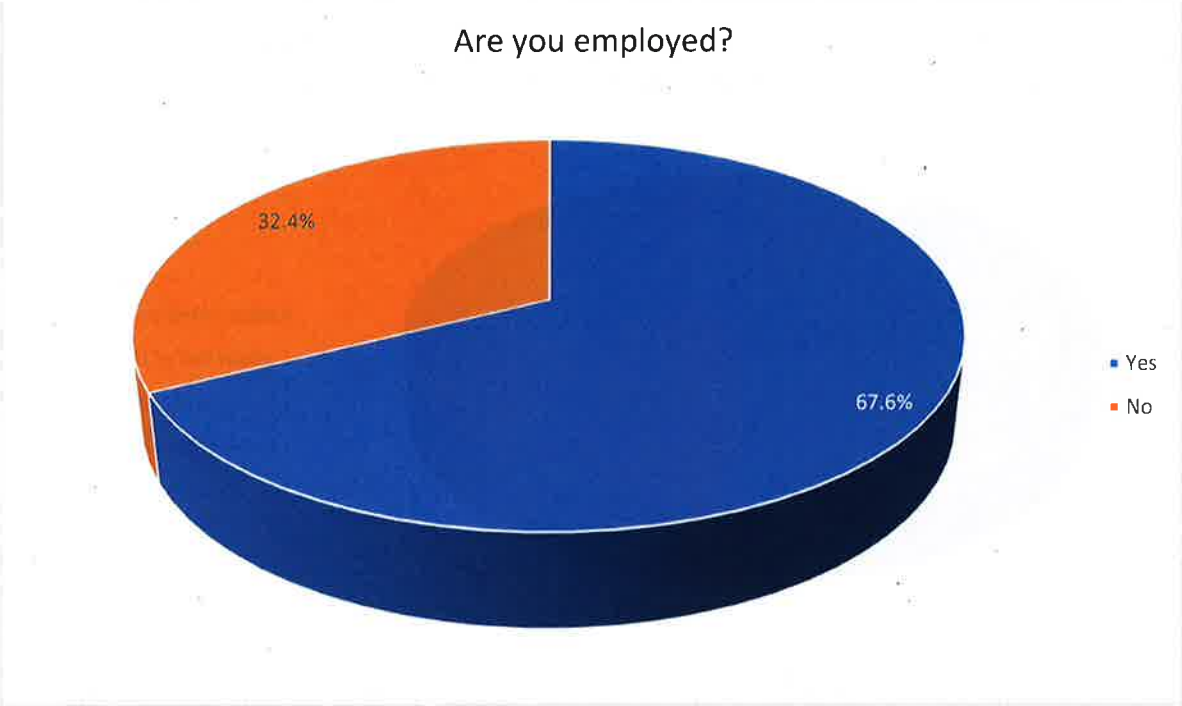
	Frequency	% of Total	% of Respondents
Getting health or medical services, advice or information	169	9.2%	57.9%
Paying bills or managing your money or finances	233	12.7%	79.8%
Distance learning/online classes	80	4.4%	27.4%
Downloading music or video files	169	9.2%	57.9%
Voice or video communication	160	8.7%	54.8%
Personal email or other written electronic communication	269	14.7%	92.1%
Social networking sites (Facebook, Twitter, LinkedIn, etc.)	223	12.2%	76.4%
Streaming media for entertainment	197	10.8%	67.5%
Home business	90	4.9%	30.8%
Telecommuting	78	4.3%	26.7%
Work	139	7.6%	47.6%
Other: Please specify	22	1.2%	7.5%
Total	**292**	**100.0%**	**626.4%**

The majority of Vermonters responded "No," when we asked respondents if they planned to upgrade their means of internet access at home to a faster service.

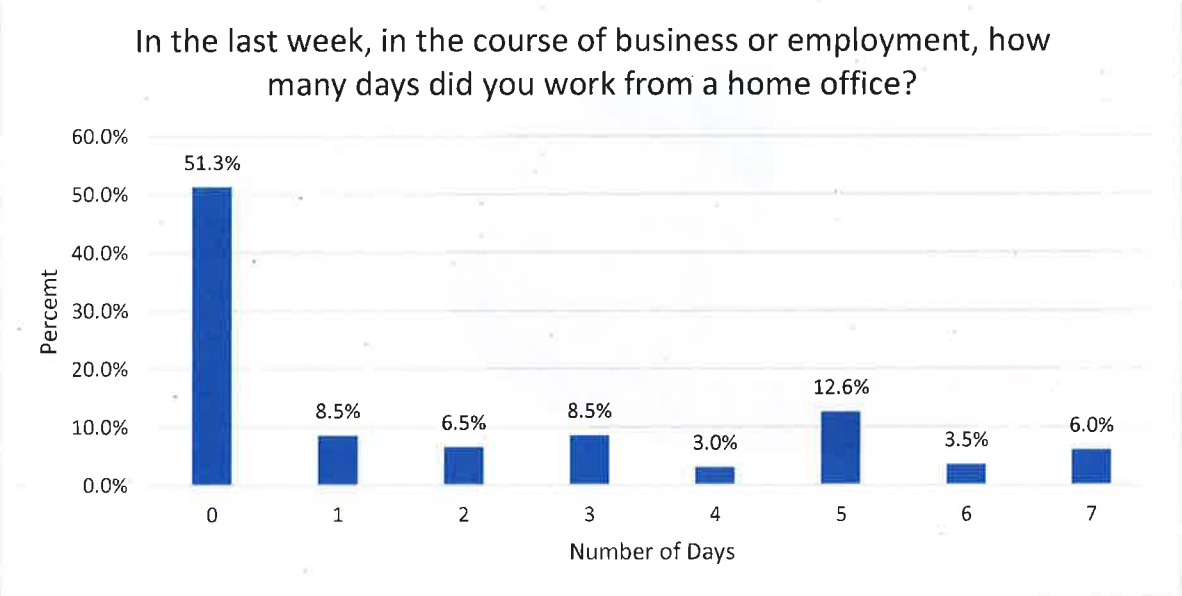


Tele-Work

A little over two-thirds of respondents said they were employed.

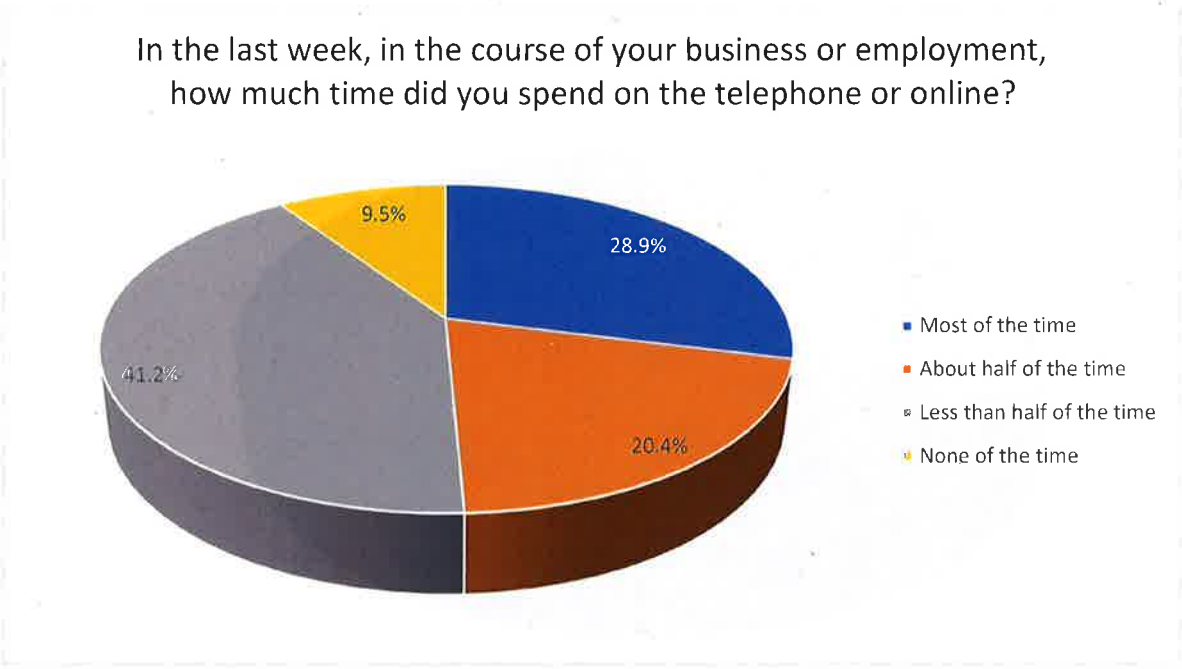


We asked respondents to tell us the number of days they work from a home office in the course of the previous week. A little over half of the respondents (51.3%) stated that they didn't work any days from a home office. About 23.5% of respondents work 1 to 3 days at home. 15.6% responded 4 to 5 days at home, and 9.5% worked more than 5 days at home.

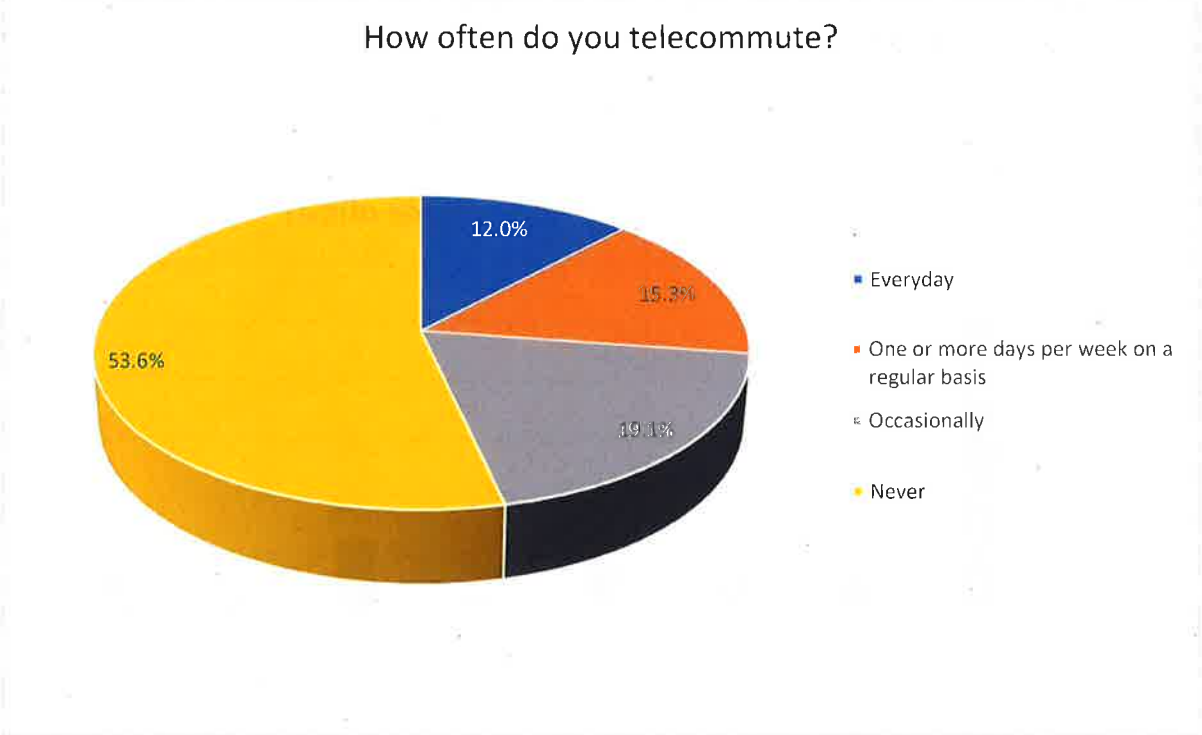


When we asked respondents regarding how much time they spent on the telephone or online during their course of business or employment, 41.2% of respondents spend less than half their time on the telephone or

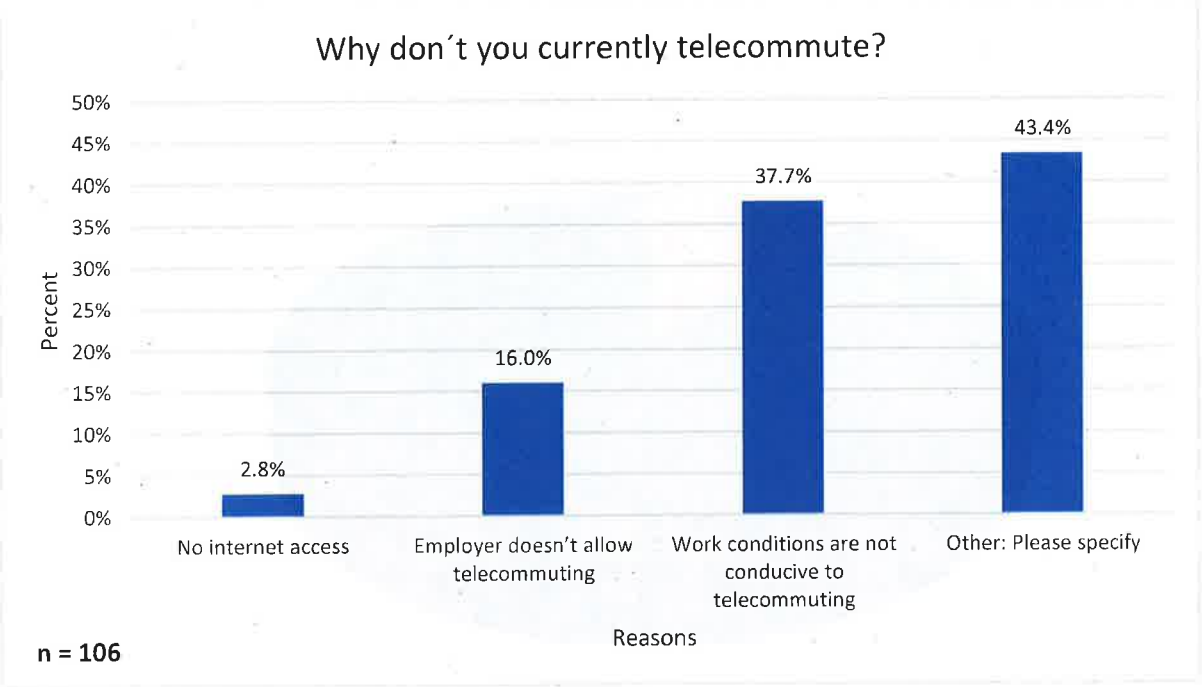
online, 28.9% said they spent most of the time on the telephone or online, 20.4% said they spent about half the time on the telephone or online, and 9.5% said they spent no time on the telephone or online.



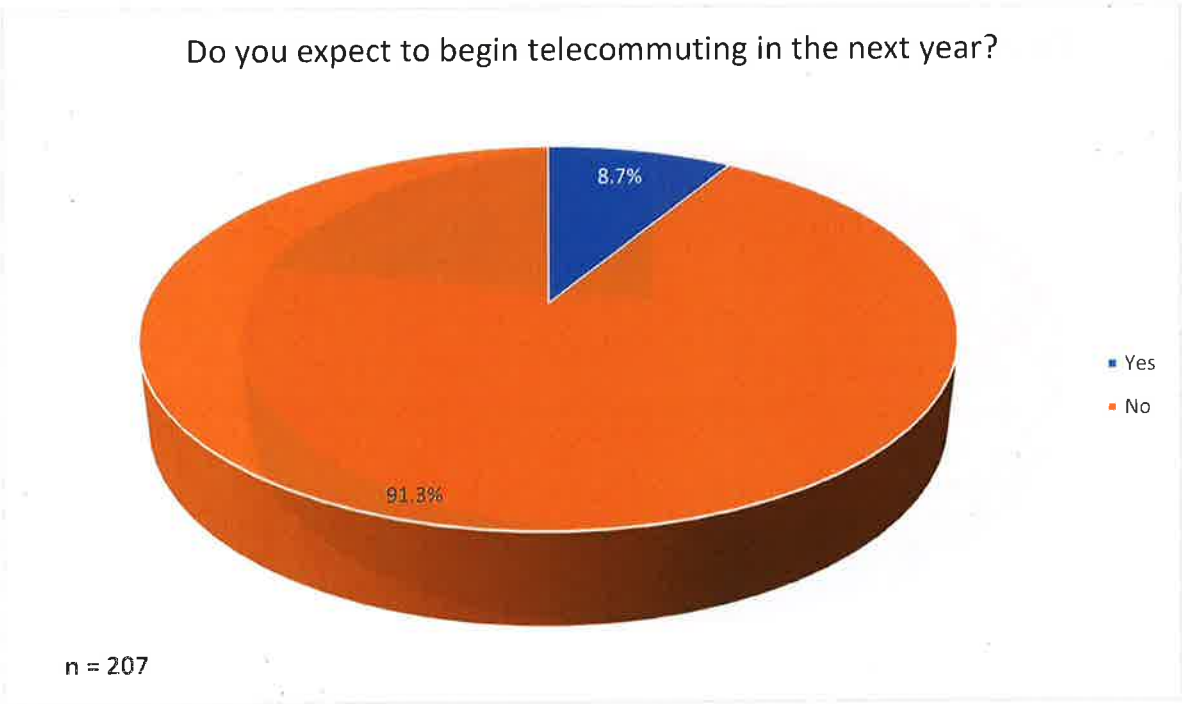
A majority of Vermonters (53.6%) of Vermonters do not telecommute, 12.0% of telecommute every day, 15.3% telecommute one or more days per week on a regular basis, and 19.1% telecommute occasionally.



Though there are various reasons for why respondents do not currently telecommute, 37.7% of respondents said that their work conditions were not conducive to telecommuting

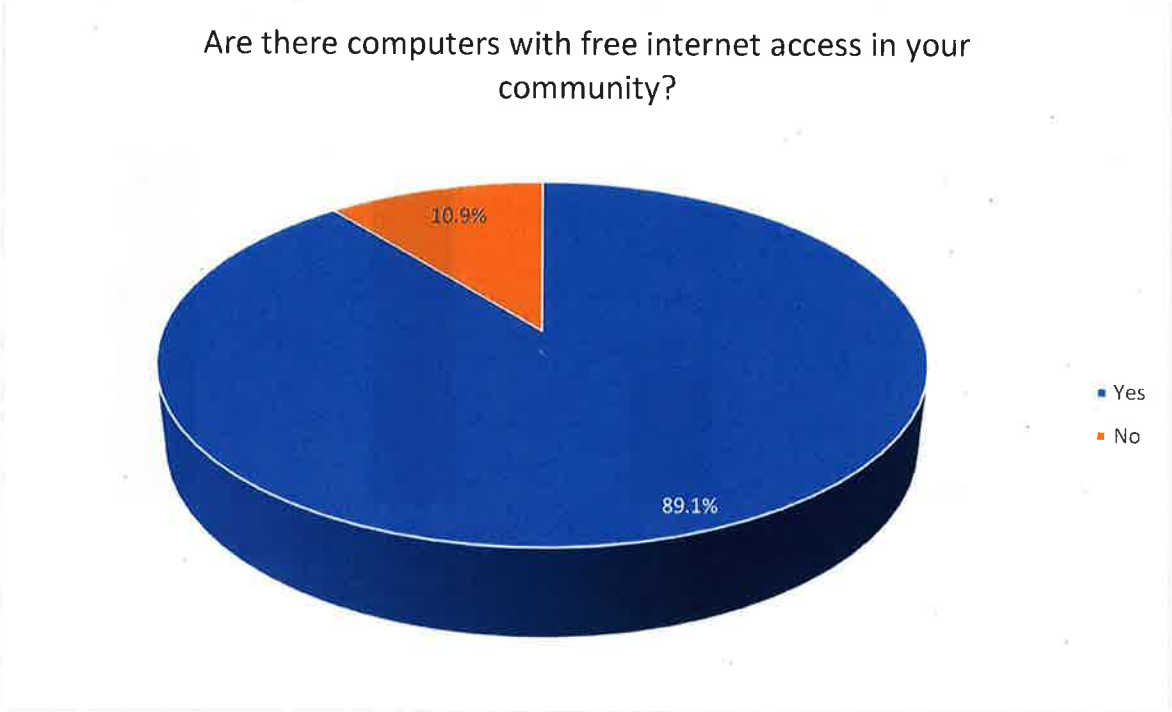


A supermajority (91.3%) of those who do not currently telecommute, also do not expect to be telecommuting in the next year. Less than 10% of respondents who don't currently telecommute, expect to start in the next year.

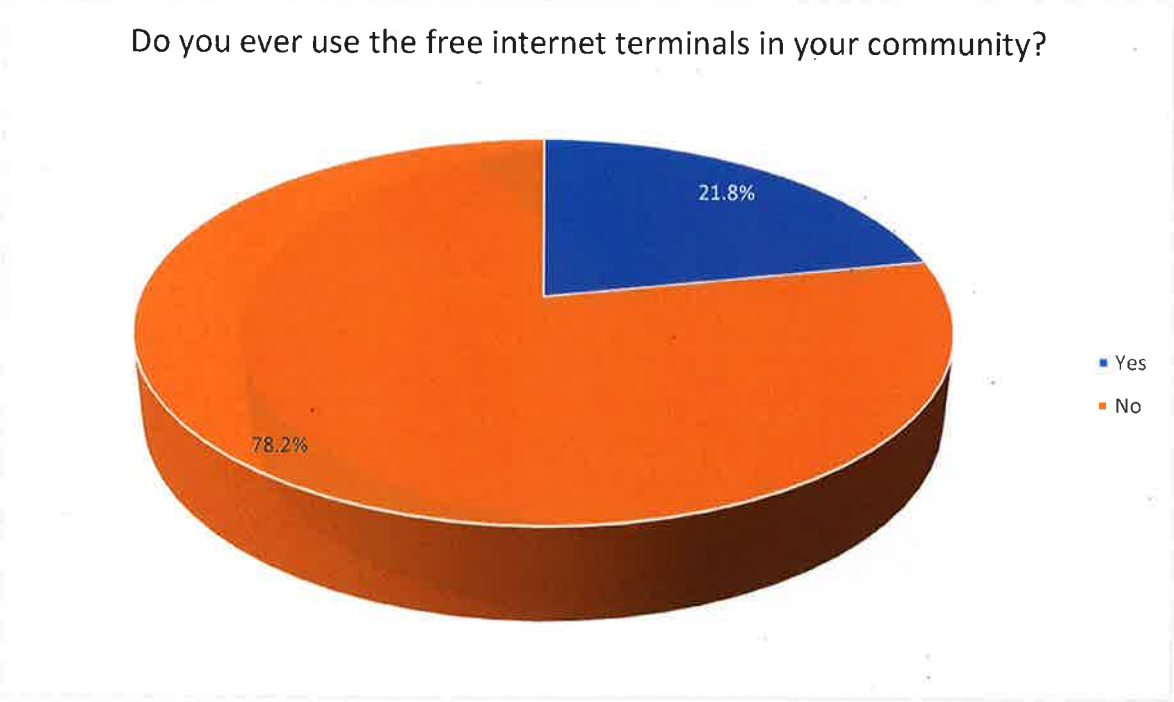


Community Access

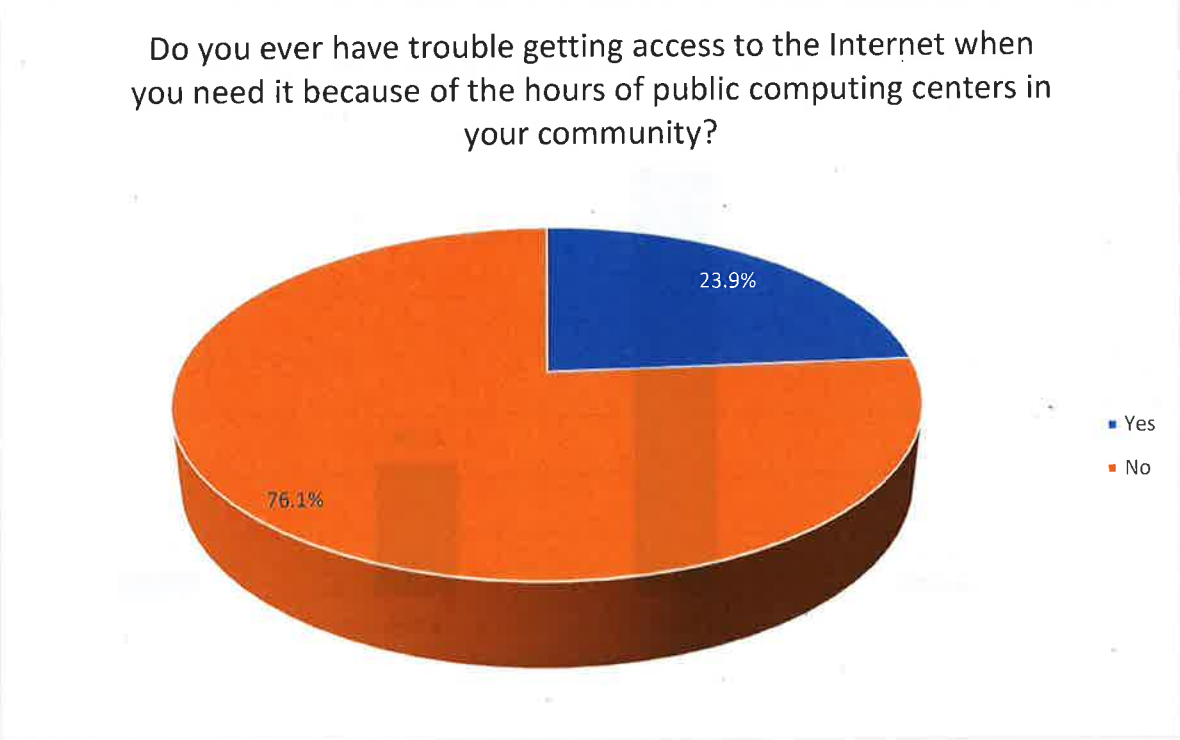
Close to 90% of Vermonters said that there are computers with free internet access in their community, this is a 20% increase from the study in 2014.



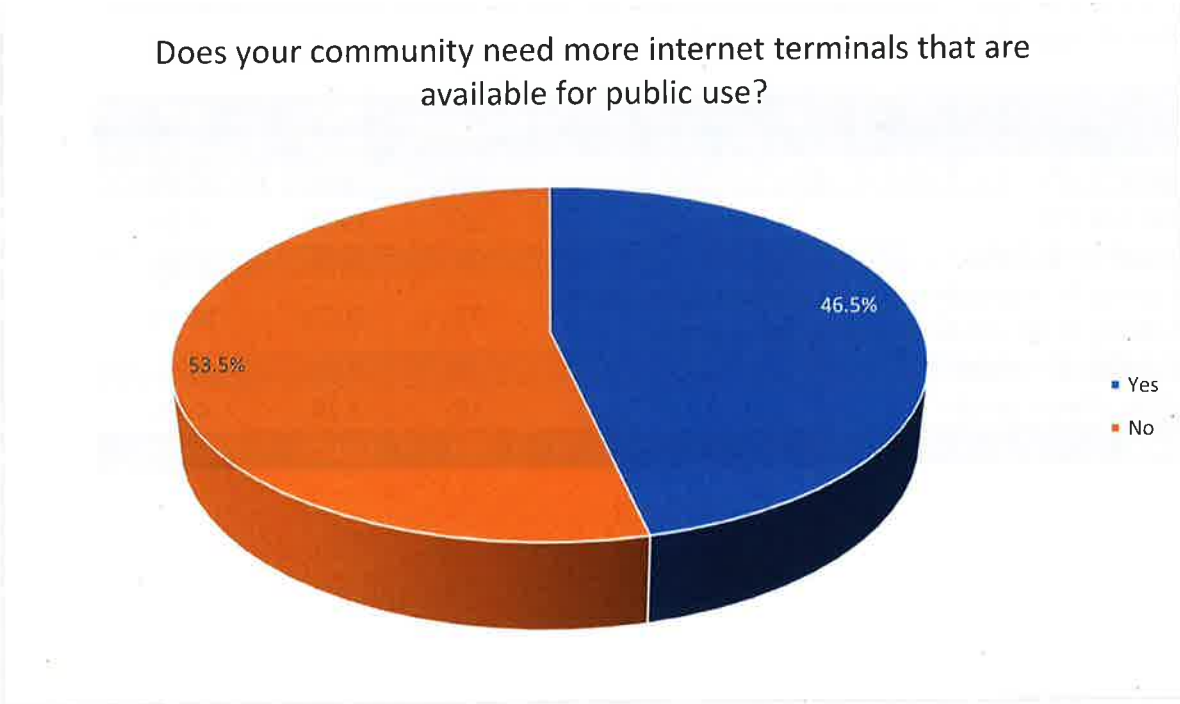
Though most Vermonters have access to free internet in their community, only about 22% of respondents actually used those resources. This statistic is similar to the study from 2014.



Of those who have used the free access resources in their community, 76.1% say that they have no trouble getting access to the computers when they needed them; similar to the 76% from 2014.

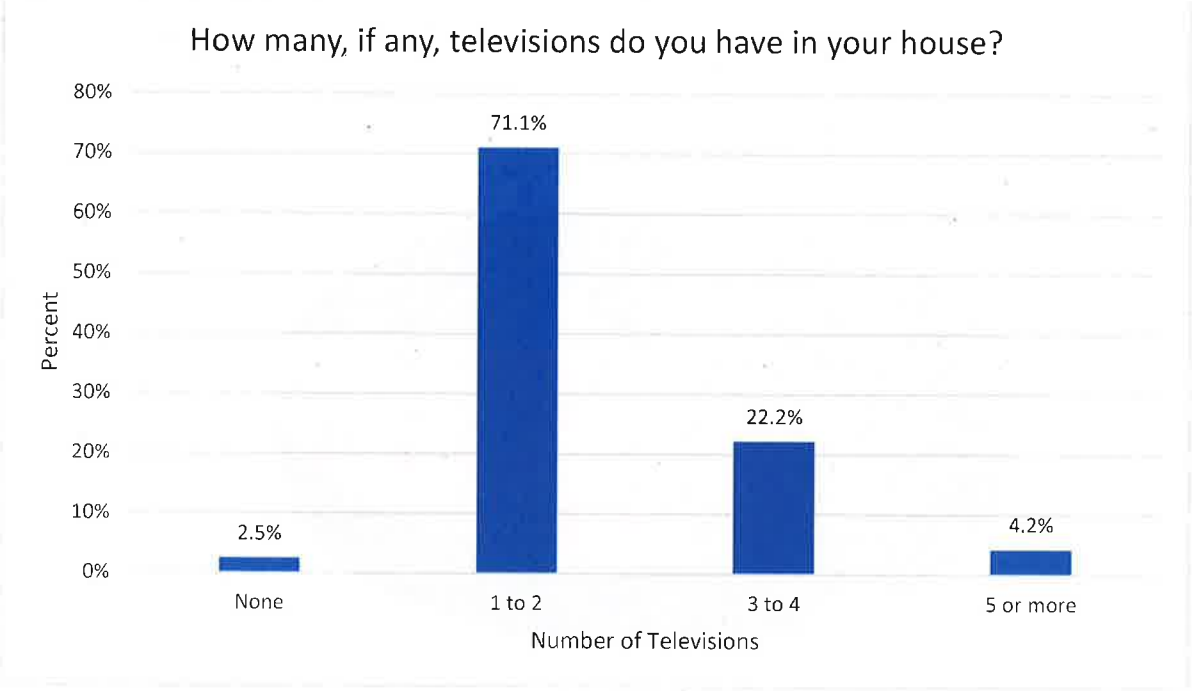


Even though only a small number of Vermonters utilize the free internet resources, 46.5% of respondents believe that their community needs more internet terminals to be available for public use.



Television

On average, Vermonters have about 2 televisions in their house.

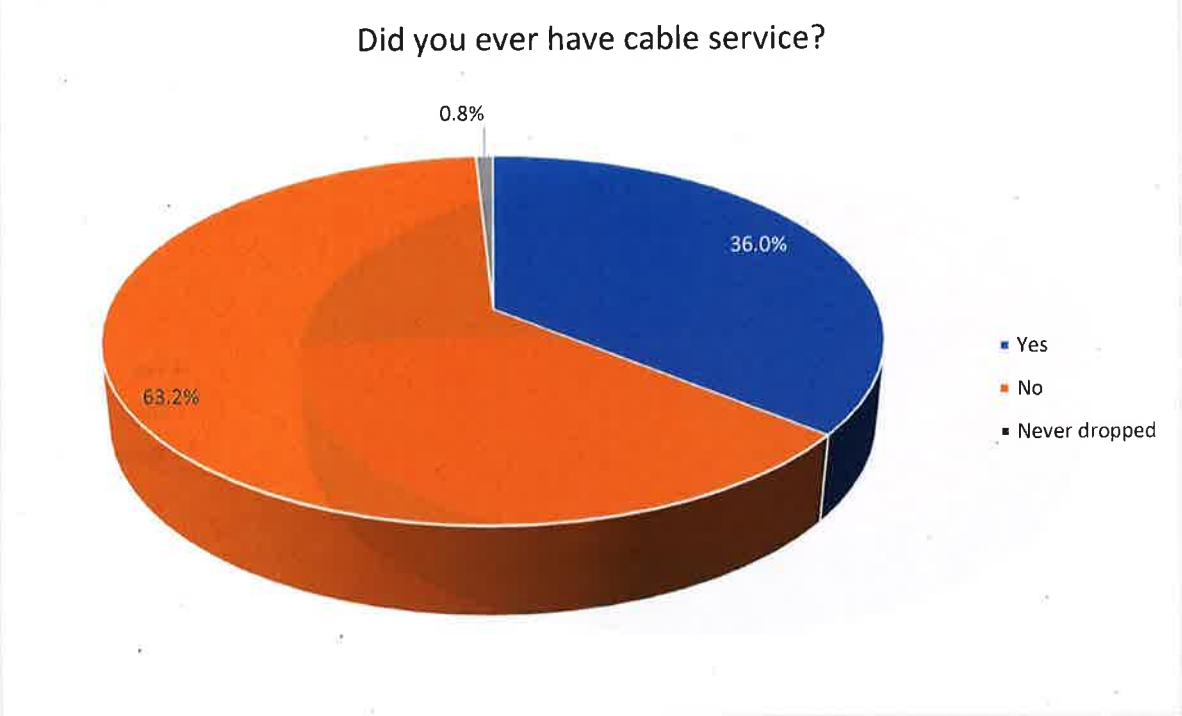


A plurality of Vermonters (42.3%) subscribe to cable for their TV service, and 32.0% use Satellite dish service, 18.1% get access through Internet TV (this is a 9% increase from 2014), and 6.5% use a broadcast antenna. Some households are using multiple means to get their television service.

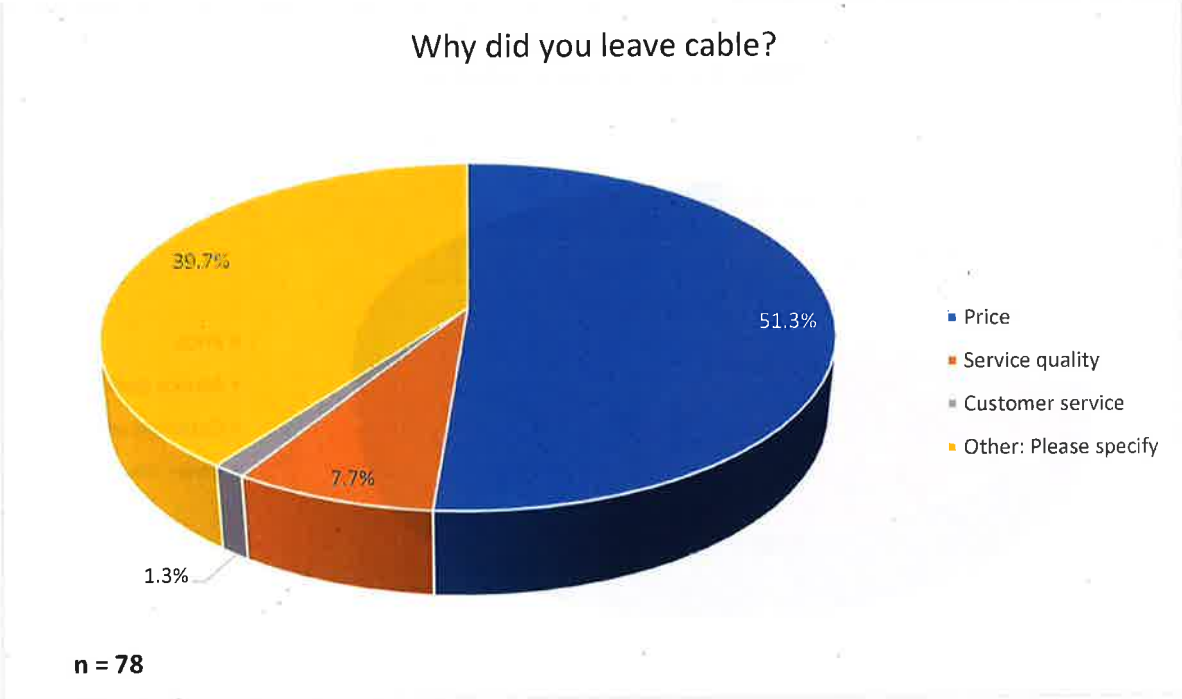
How do you get television service?

	Frequency	% of Total	% of Respondents
Cable	168	39.0%	42.3%
Satellite dish	127	29.5%	32.0%
Broadcast antenna	26	6.0%	6.5%
Internet TV (Netflix/Hulu/iTunes over computer, Game console, or set top device such as Roku, Applet)	72	16.7%	18.1%
Don't get TV reception	20	4.6%	5.0%
Other (Please specify)	18	4.2%	4.5%
Total	**397**	**100.0%**	**108.6%**

When we asked non-cable subscribers if they ever had cable service, 63.2% said they have not, 36.0% said they have, and 0.8% said they never dropped their cable service.

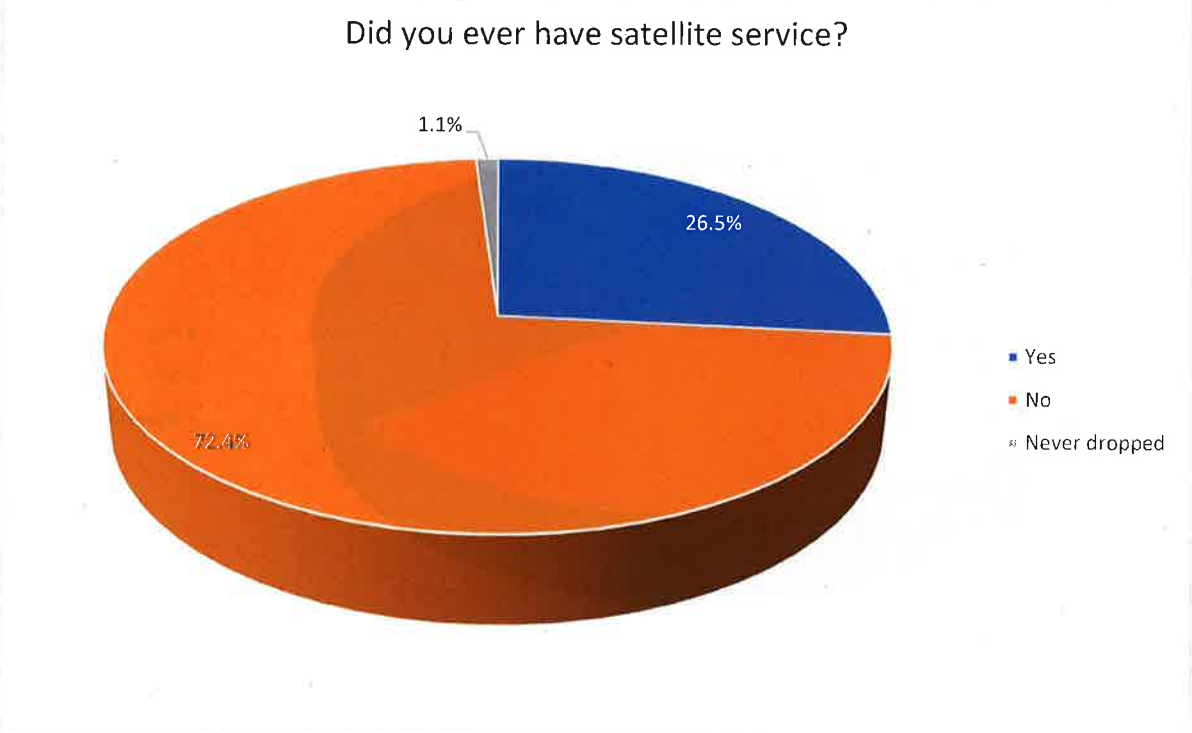


Of the respondents that dropped their cable service, 51.3% said they dropped their cable service due to price.

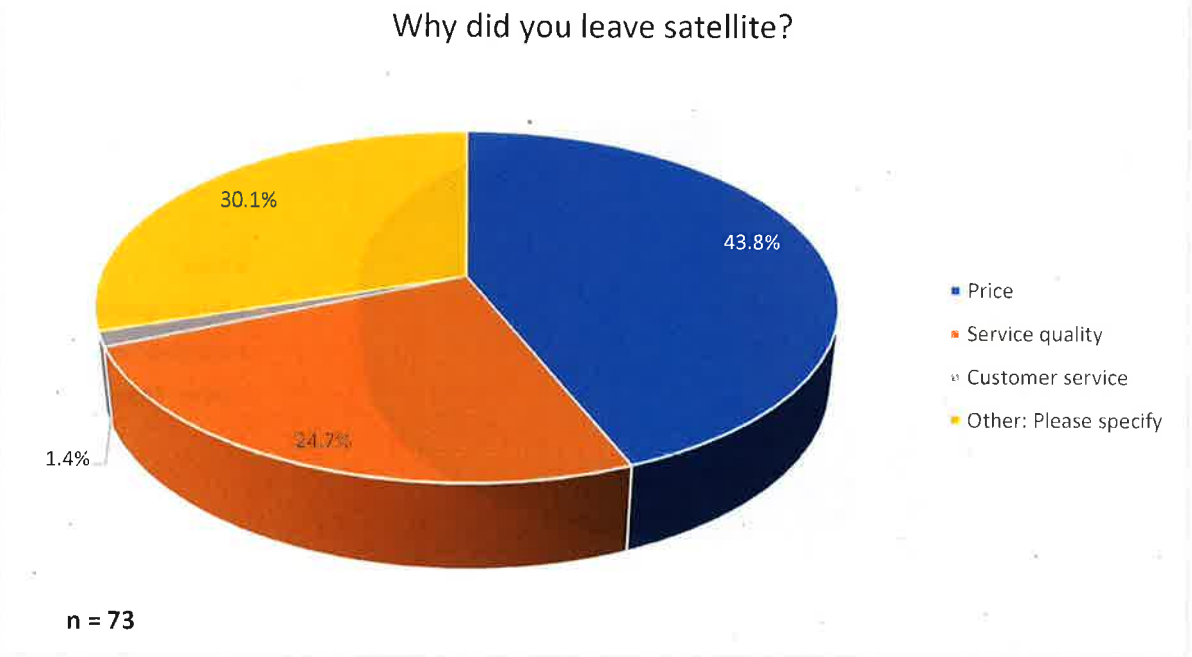


n = 78

When we asked non-satellite subscribers if they ever had satellite service, 72.4% said they have not, 26.5% said they have, and 1.1% said they never dropped their satellite service.

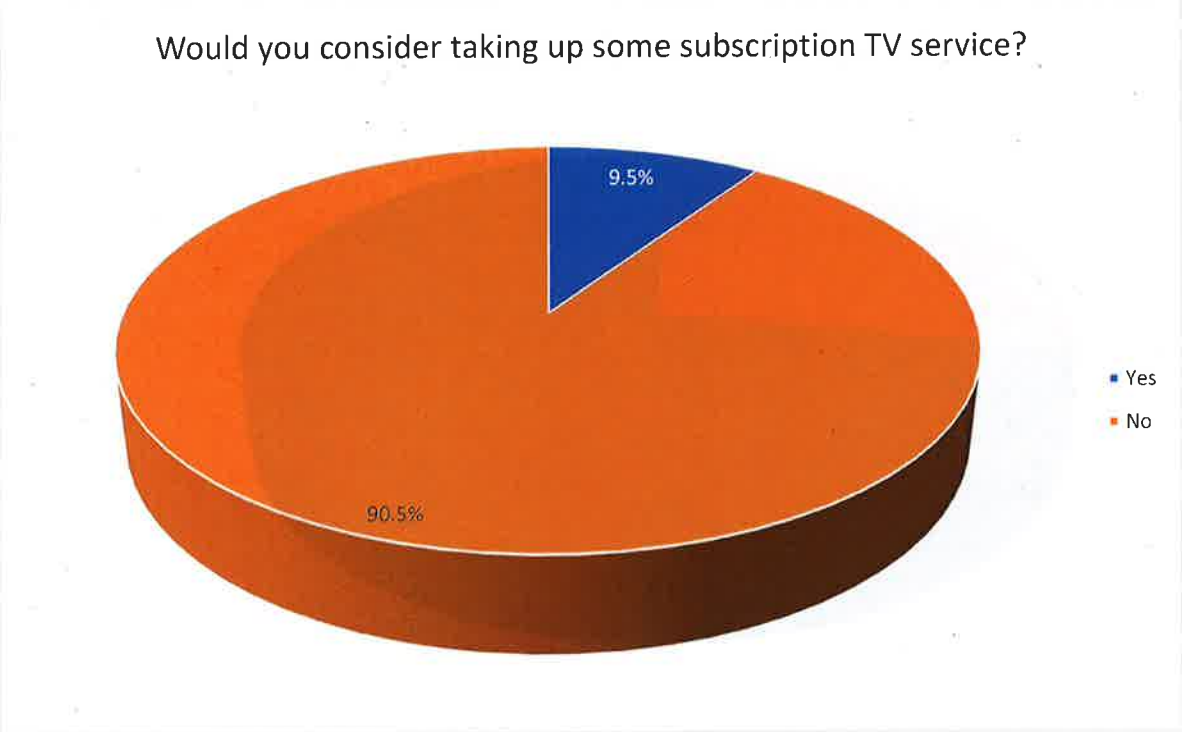


Of the respondents that dropped their satellite service, 43.3% said they dropped their satellite service due to price, and 24.7% said due to service quality.

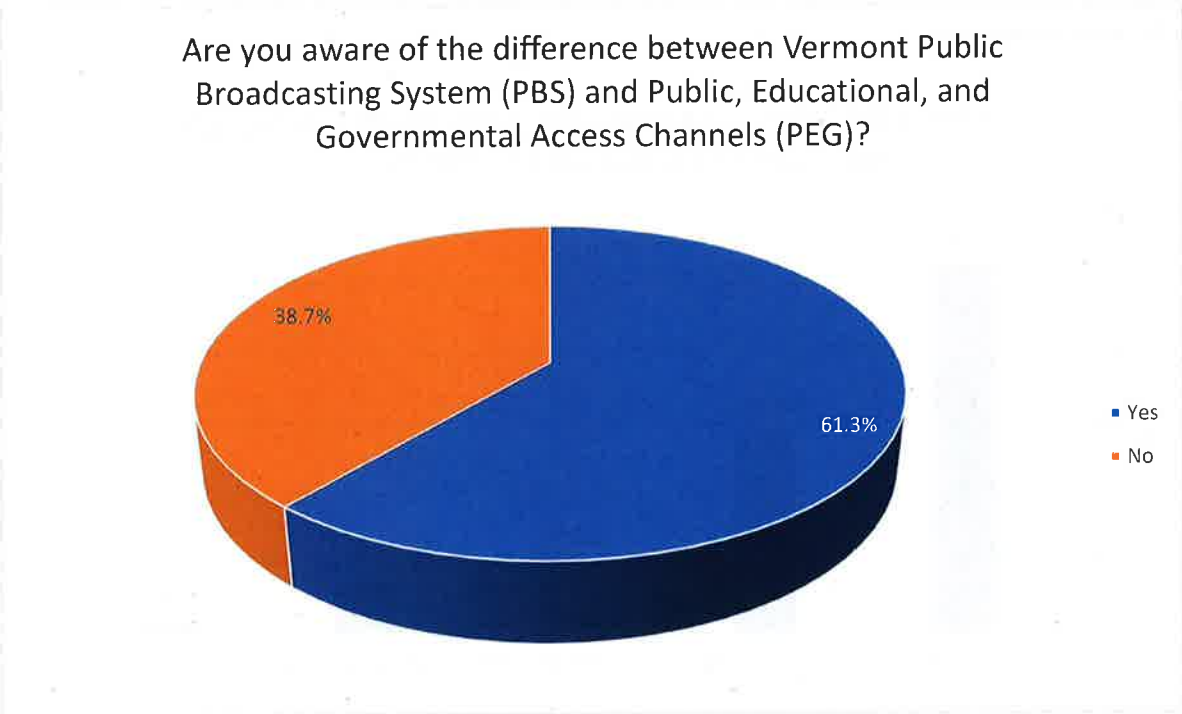


n = 73

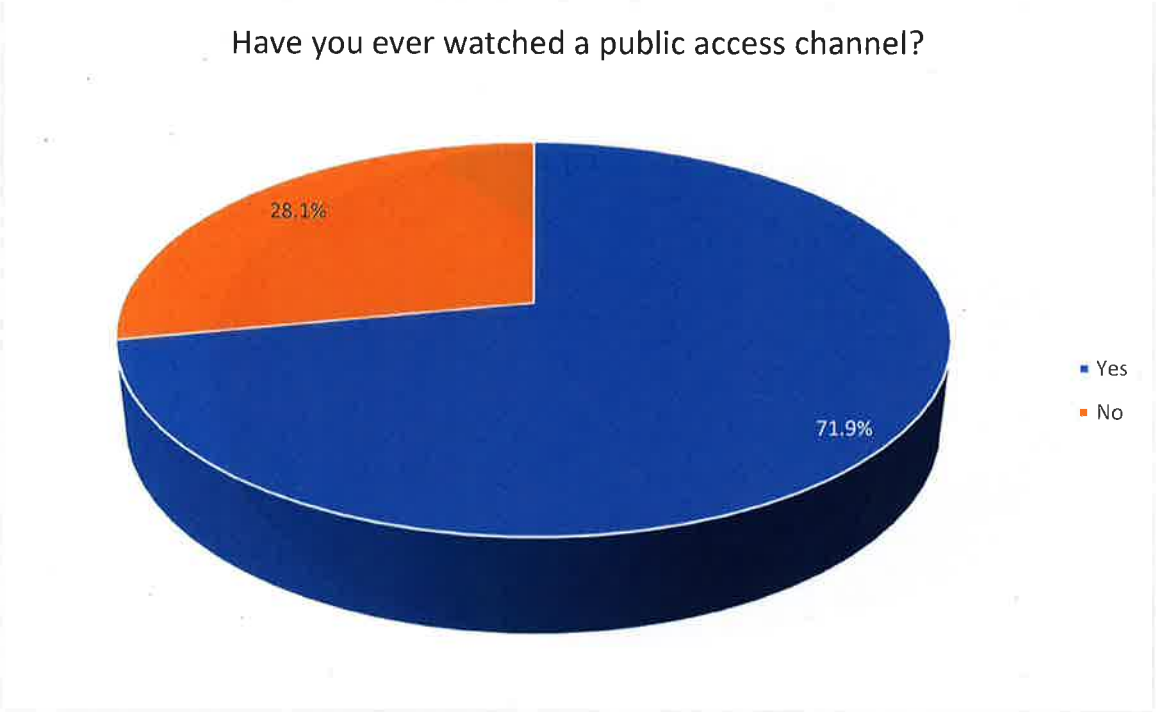
When asked of those who do not currently subscribe to a television service, if they would consider taking up some subscription TV service, 90.5% said that they would not.



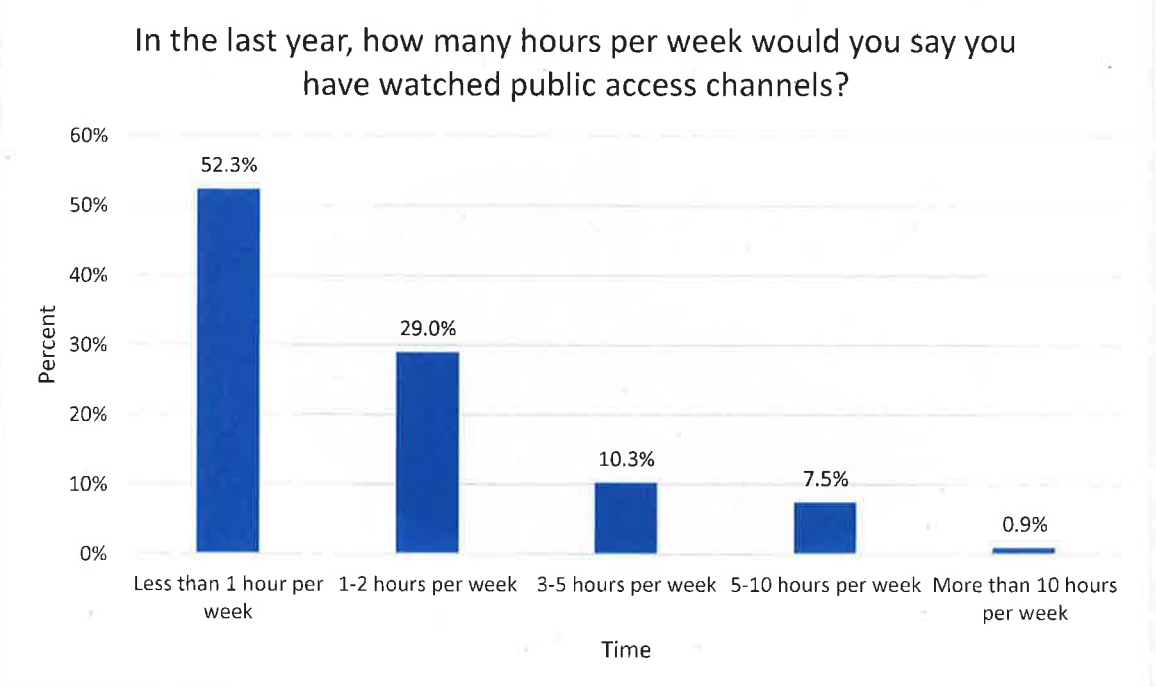
A little less than two-thirds of the population are aware of the difference between Vermont Public Broadcasting System (PBS) and Public, Educational, and Governmental Access Channels (PEG).



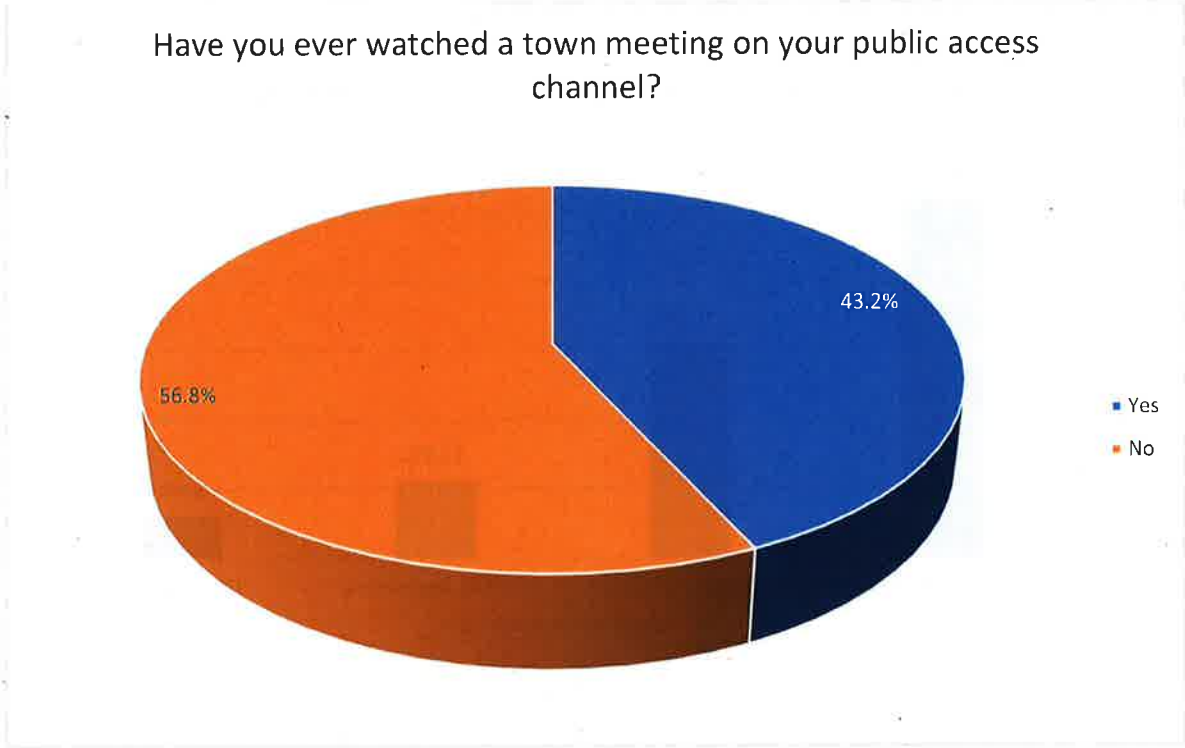
Similar to 2014, about two thirds of Vermonters have watched a public access channel. In 2014, about 68% said they had watched a public access channel.



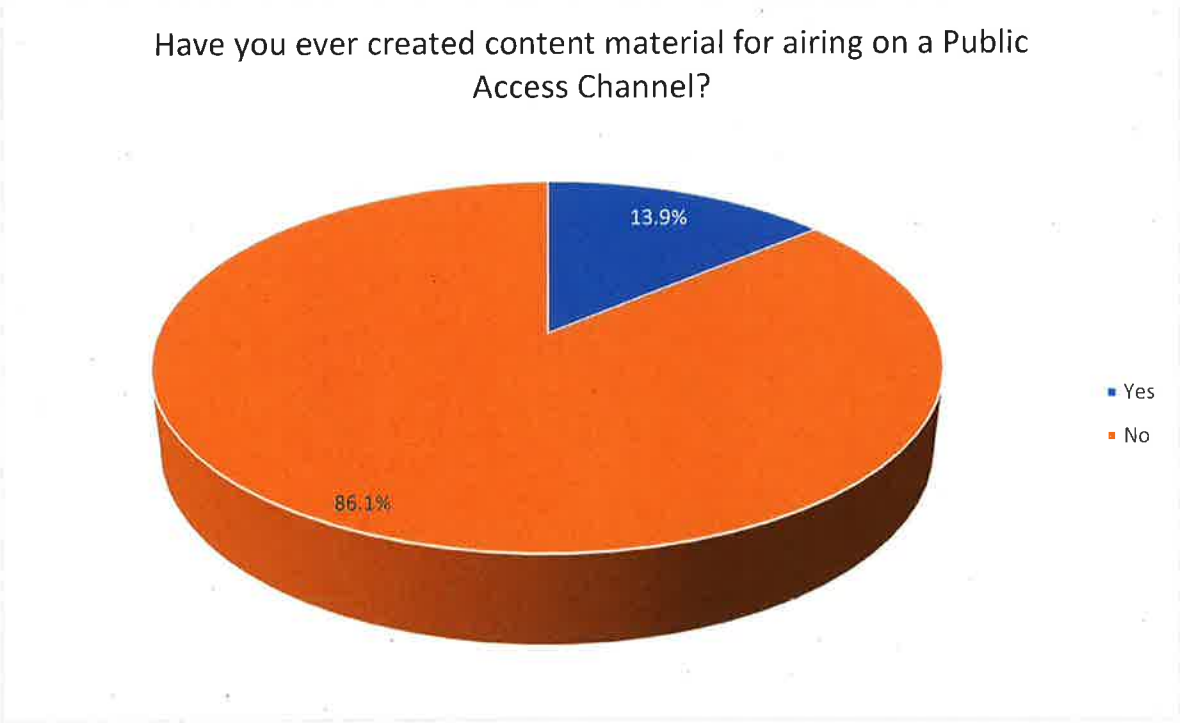
Even though most Vermonters have watched a public access channel, a little over half (52.3%) of respondents say they have watched less than an hour of public access television per week. The 2017 results are same compared to the 2014 survey results where 52% of Vermonters spent less than an hour per week to watch public access channels.



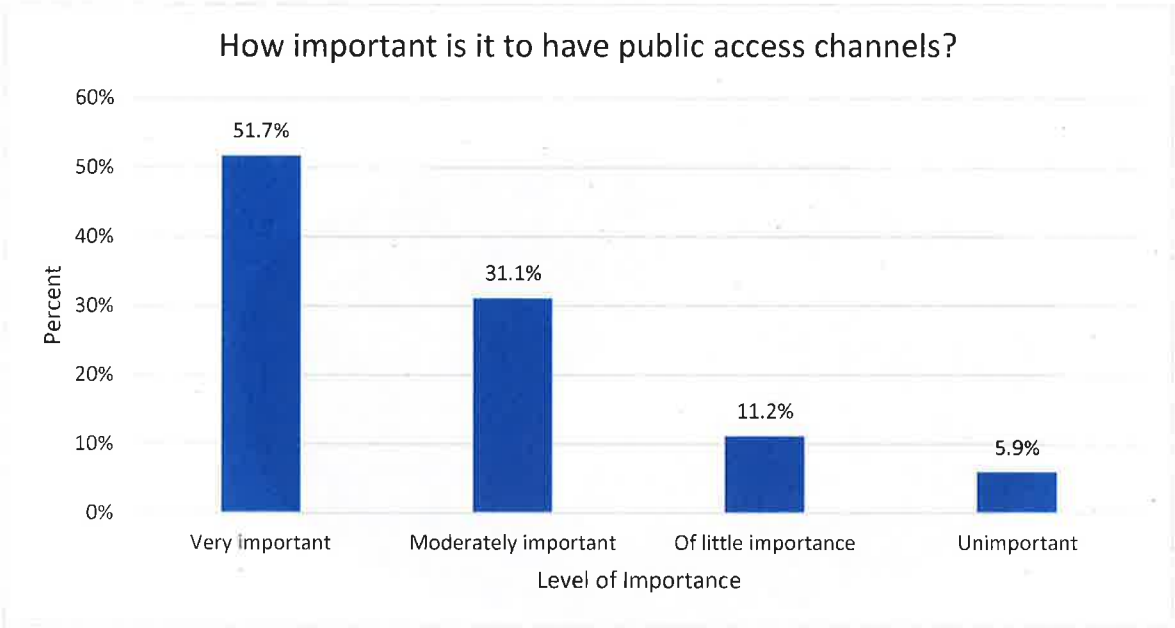
Of those who have watched public access channels, 43.2% say they have watched a town meeting on their public access channel. The number of Vermonters who have watched a town meeting on their public access channel had increased by about 15% since the 2014 survey.



When asked if Vermonters had ever created content for airing on a public access channel, most respondents (86.1%) said no they have not.



Regardless of whether they have watched public access channels, a majority of Vermonters (51.7%) say that it is very important to have public access channels, and 31.1% say it is moderately important. The overall importance of having public access channels has increase marginally by about 5% since 2014, with more people said that having public access channels are very important.

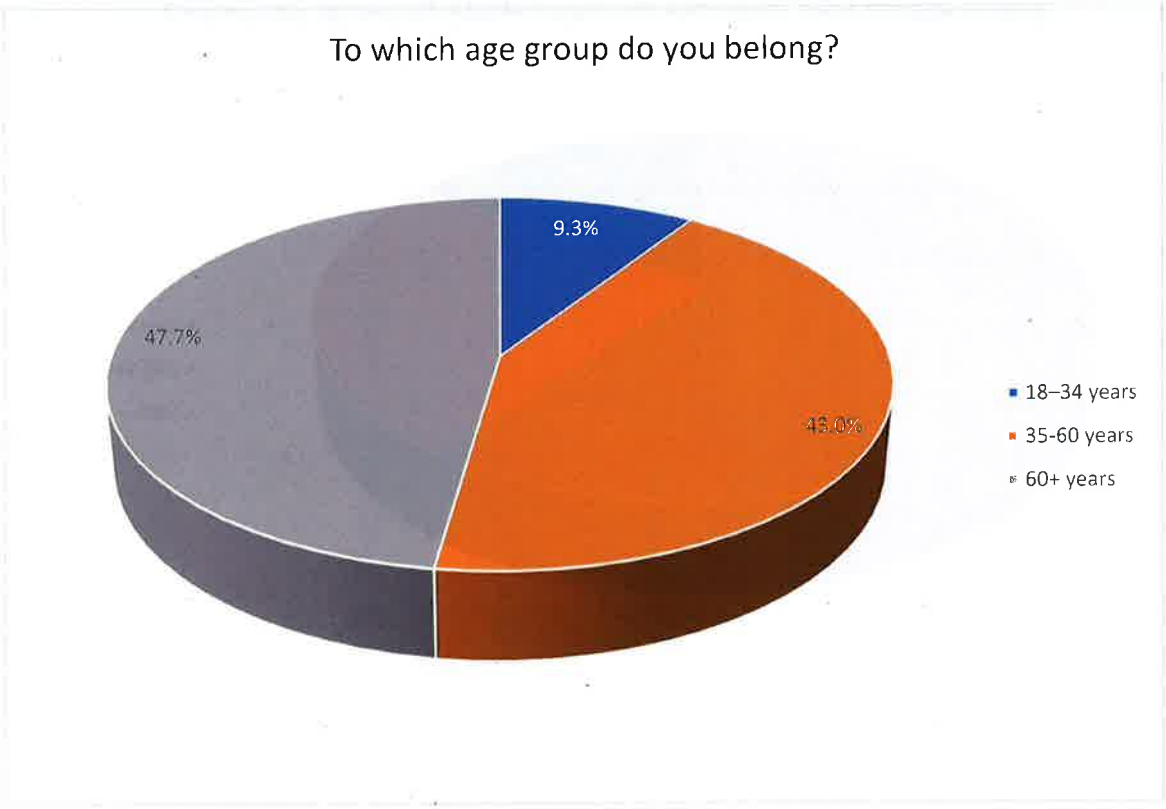


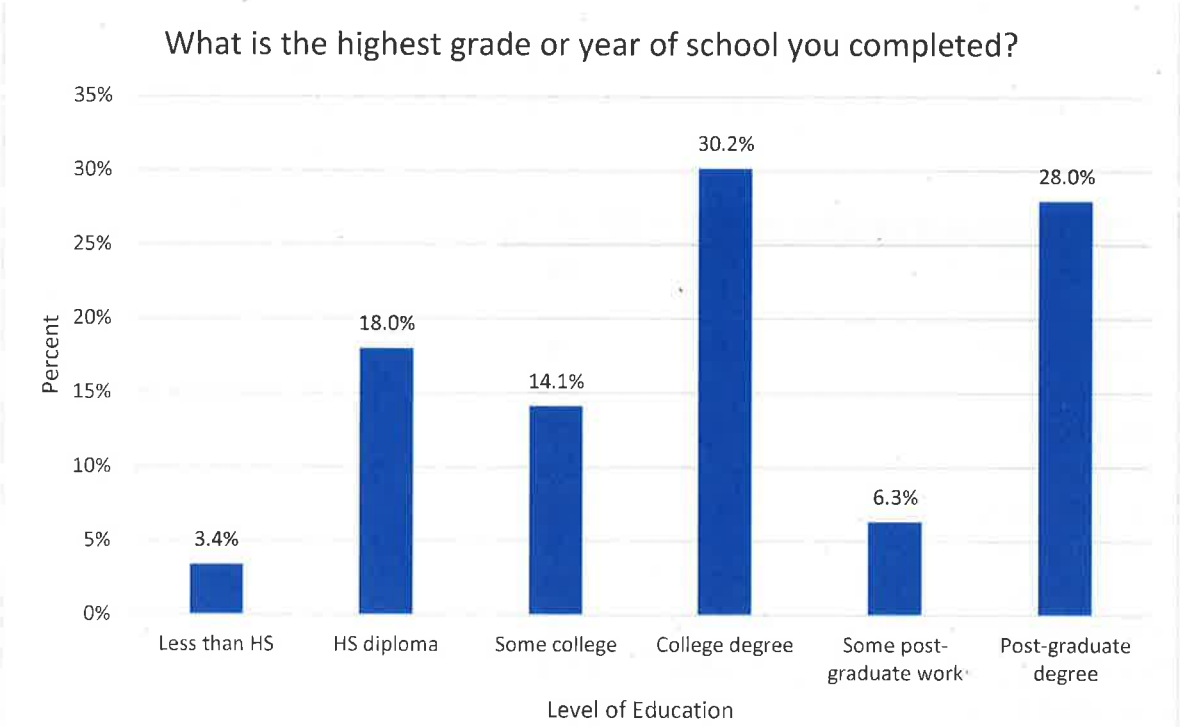
Demographics

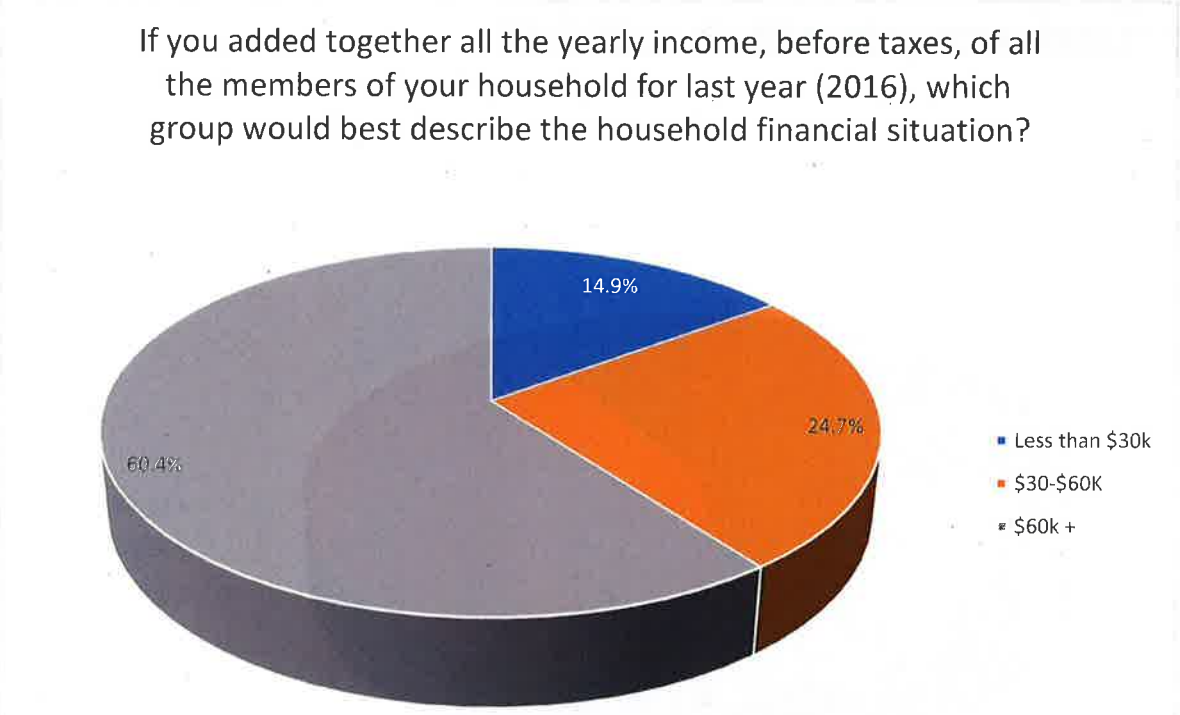
The sample demographics were balanced by county and gender, however were slightly skewed toward an older population. The tables below show the distribution of the select demographics.

County Representation:

County	Frequency	Percent
Addison County	27	6%
Bennington County	21	5%
Caledonia County	25	6%
Chittenden County	116	28%
Essex County	1	0%
Franklin County	21	5%
Grand Isle County	5	1%
Lamoille County	14	3%
Orange County	18	4%
Orleans County	18	4%
Rutland County	44	11%
Washington County	38	9%
Windham County	31	7%
Windsor County	39	9%
Total	**418**	**100%**



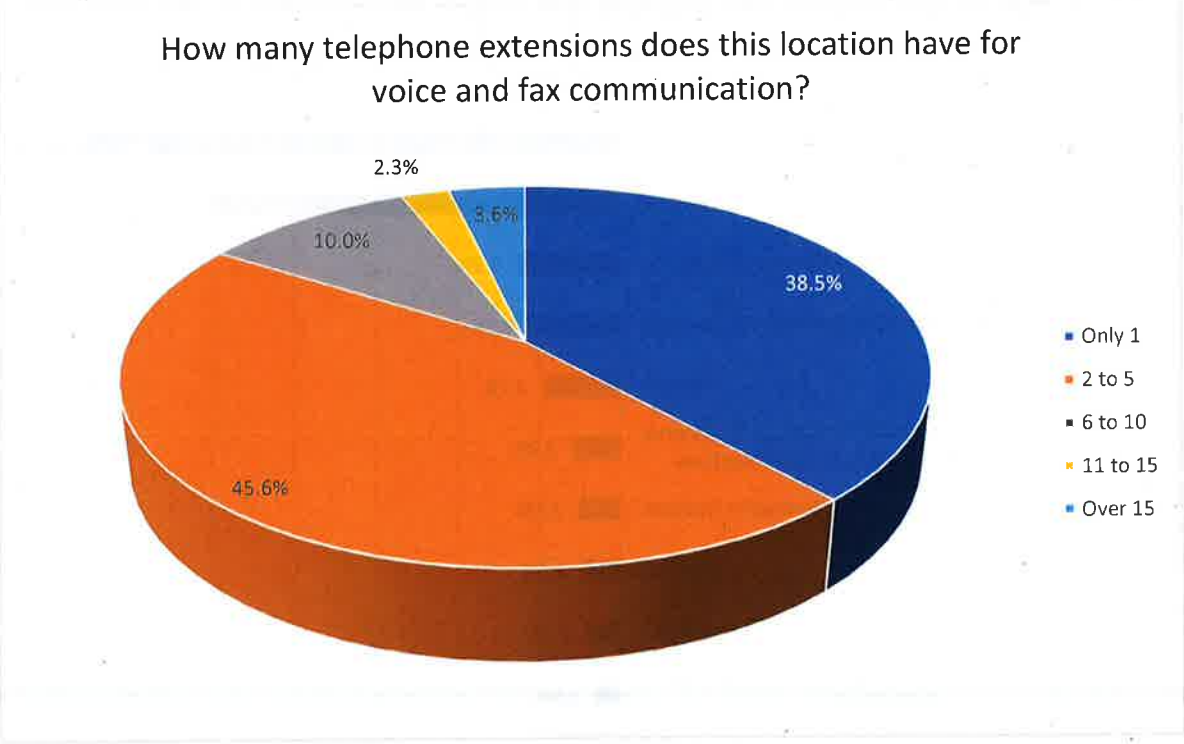

What is the highest grade or year of school you completed?
35%
30%
25%
20%
15%
10%
5%
0%
Percent
3.4%
18.0%
14.1%
30.2%
6.3%
28.0%
Less than HS
HS diploma
Some college
College degree
Some post-graduate work
Post-graduate degree
Level of Education


If you added together all the yearly income, before taxes, of all the members of your household for last year (2016), which group would best describe the household financial situation?
14.9%
24.7%
60.4%
Less than $30k
$30-$60K
$60k +

Business Survey

Telephone

On average respondents had about 4 phone extensions at their primary business location. This is down compared to the average of 19 extensions from the 2014 survey.



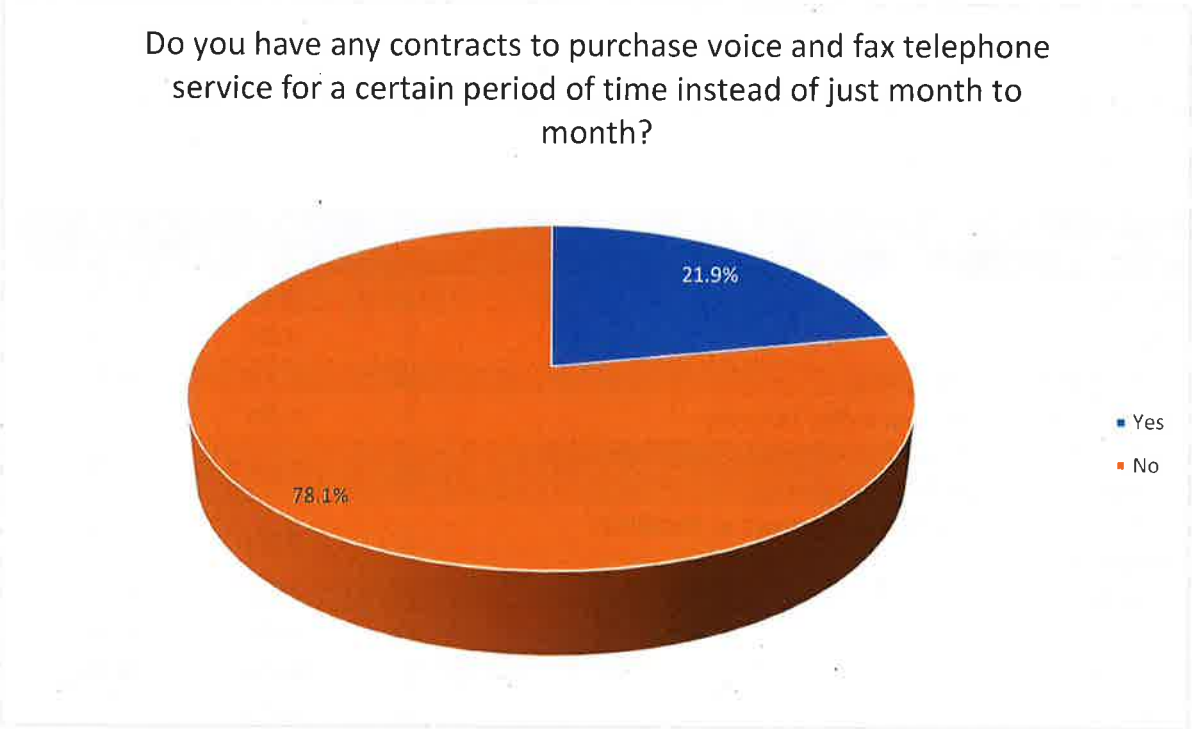
As with the residential service providers, FairPoint holds the largest market share for telephone service in Vermont but has lost market share since 2014. Comcast is the second market share leader with 24.9% of market. These results are similar to the 2014 survey where FairPoint lead the market and Comcast came in second.

When asked about other companies that provide voice communication services in your area, FairPoint seems to be the most readily available service with 52.3% of respondents acknowledging its availability for their company. Of the respondents who stated other, 39.3% said Comcast; that represents 16.3% of the total sample population.

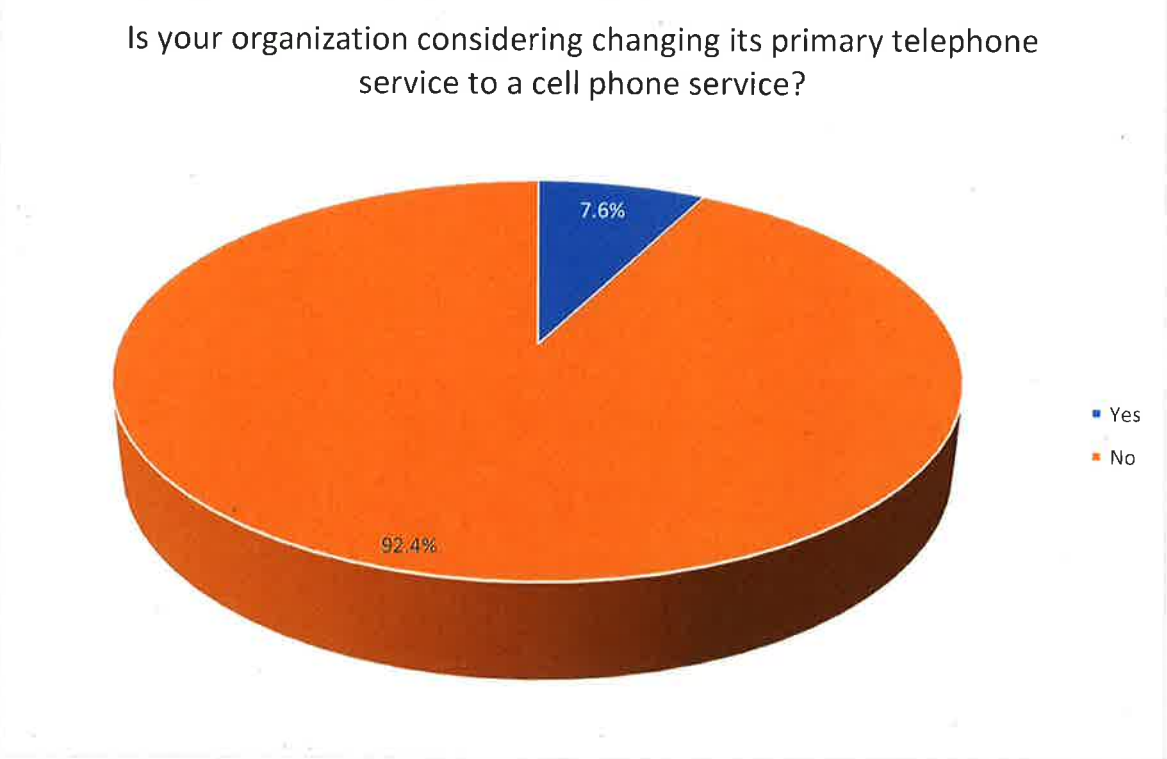
Are you aware of any other landline companies that provide voice communication services in your area?

Provider	Frequency	% of Total	% of Respondents
FairPoint	135	36.9%	52.3%
Level 3	3	0.8%	1.2%
VTEL or Vermont Telephone	26	7.1%	10.1%
Waitsfield and Champlain Valley Telecom	7	1.9%	2.7%
TDS Telecom, also known as Northfield Telephone, Ludlow Telephone or Perkinsville Telephone	6	1.6%	2.3%
OTT Communications (formally known as Shoreham Telephone)	6	1.6%	2.3%
Franklin Telephone	1	0.3%	0.4%
Sovernet	22	6.0%	8.5%
Verizon	37	10.1%	14.3%
AT&T	16	4.4%	6.2%
Other (please specify):	107	29.2%	41.5%
Total	**258**	**100.0%**	**141.9%**

When asked about whether businesses had contracts to purchase voice and fax telephone service for a certain period of time rather than month to month, over 75% of businesses responded no.



An overwhelming majority (92.4%) stated that their organization was not considering changing its primary telephone service to a cell phone service.

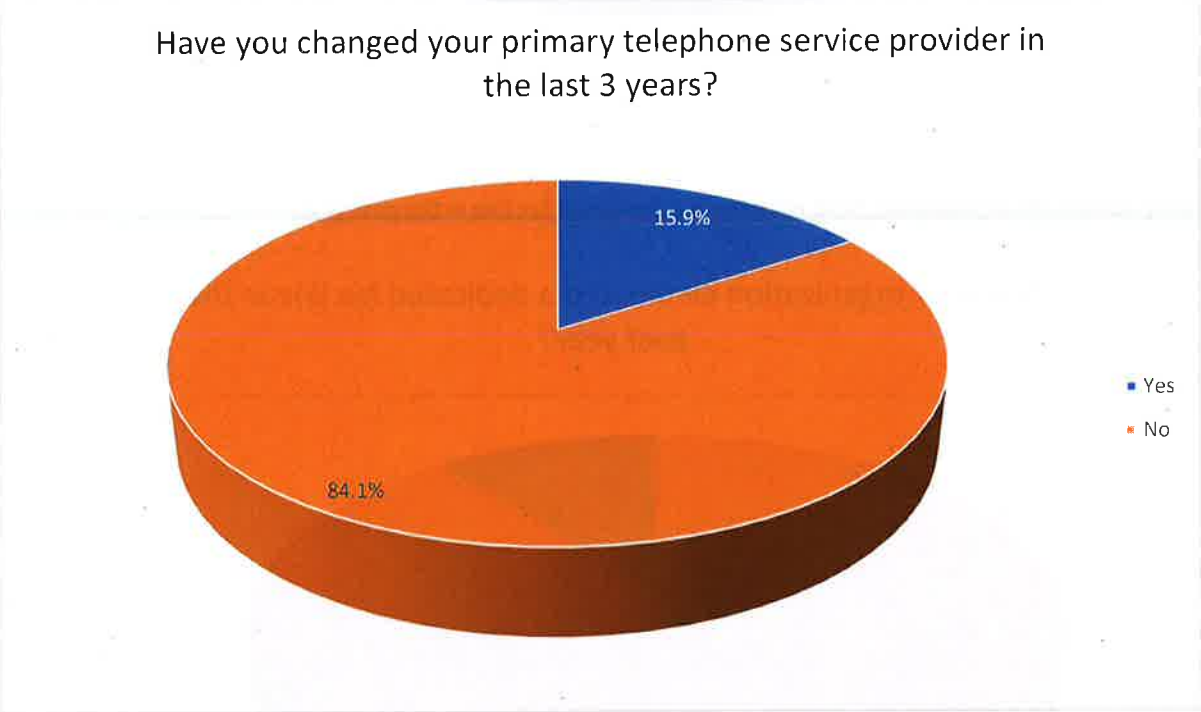


Businesses seem to be more price conscious when considering whether or not to switch landline services, with 88.1% of businesses stating that price was a leading factor for them to change providers. Service quality was second with 66.2% of respondents stating it as a factor for changing services.

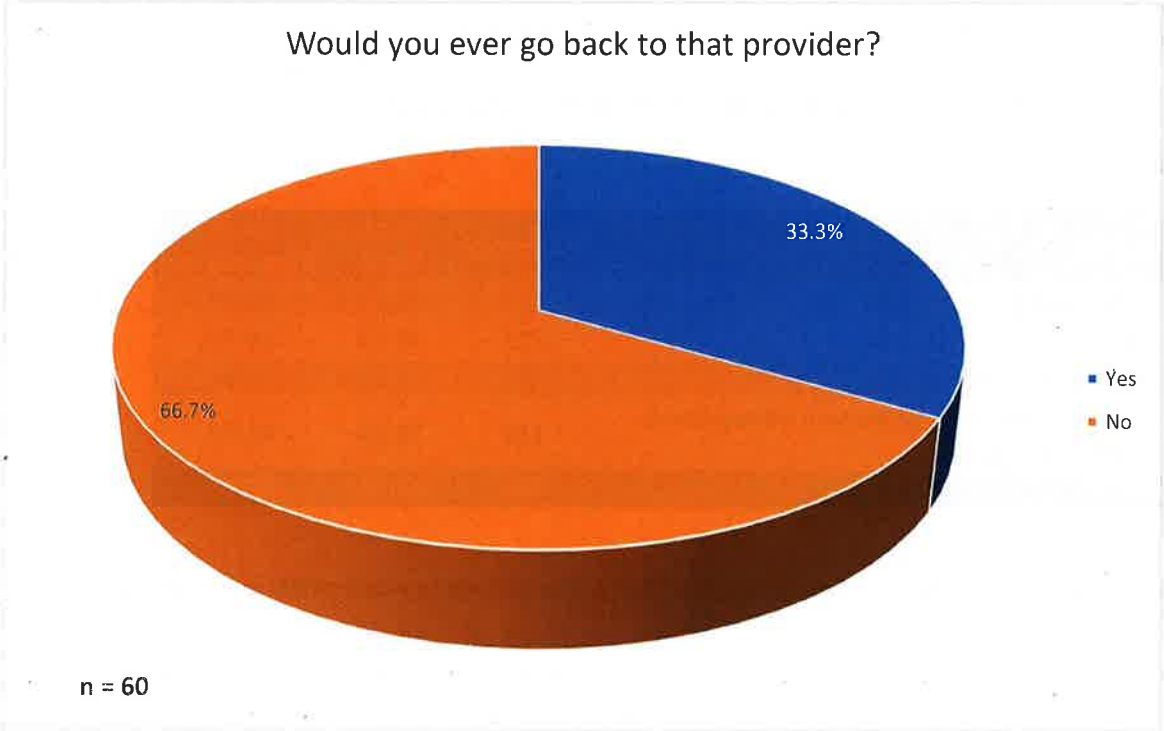
Would any of the following factors lead you to change your landline service to another provider?

Reasons	Frequency	% of Total	% of Respondents
Service quality	172	26.1%	66.2%
Price	229	34.7%	88.1%
Customer service	140	21.2%	53.8%
Convenience of billing or account management (bundled services)	119	18.0%	45.8%
Total	**260**	**100.0%**	**253.8%**

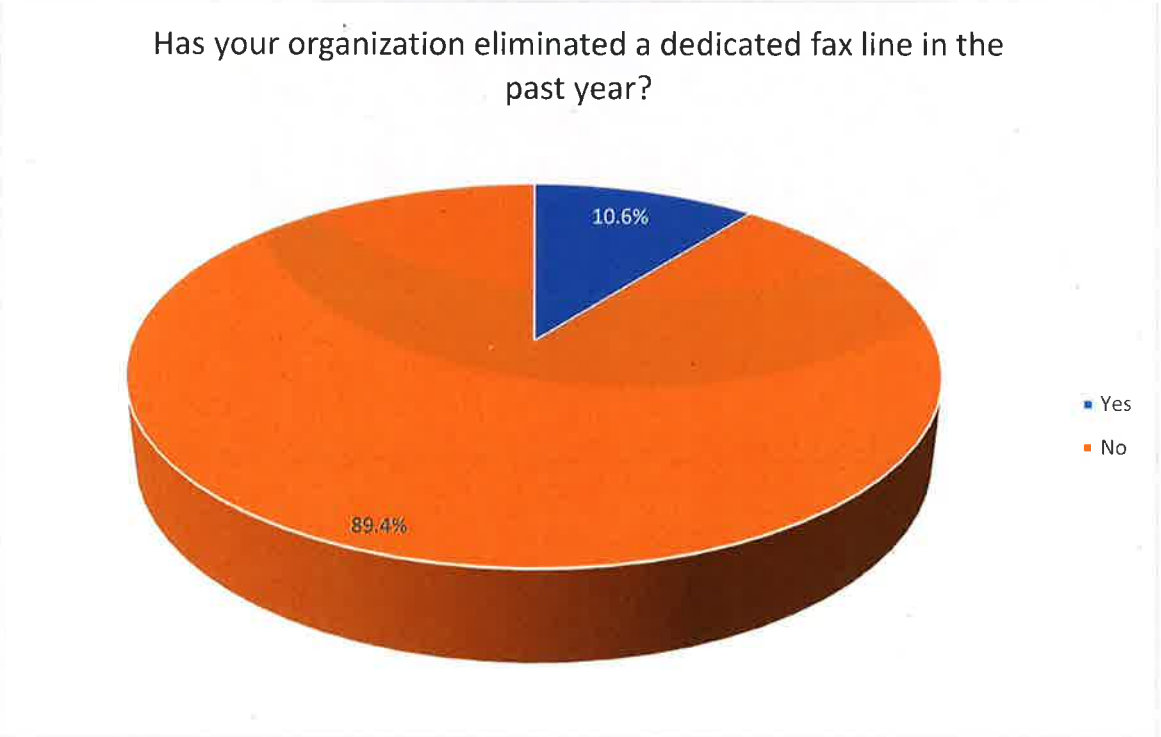
A large majority of businesses have not changed their primary phone service provider in the last 3 years.



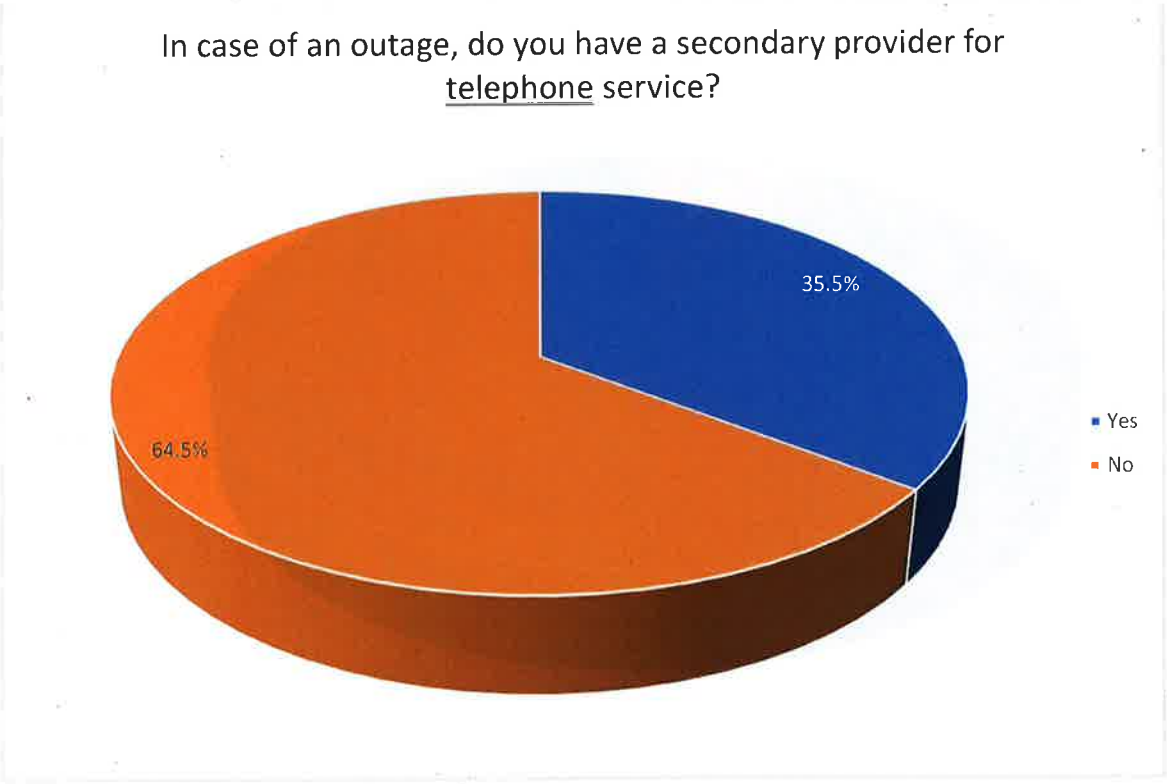
Of those who have switched providers, about two-thirds would not switch back to their previous provider.



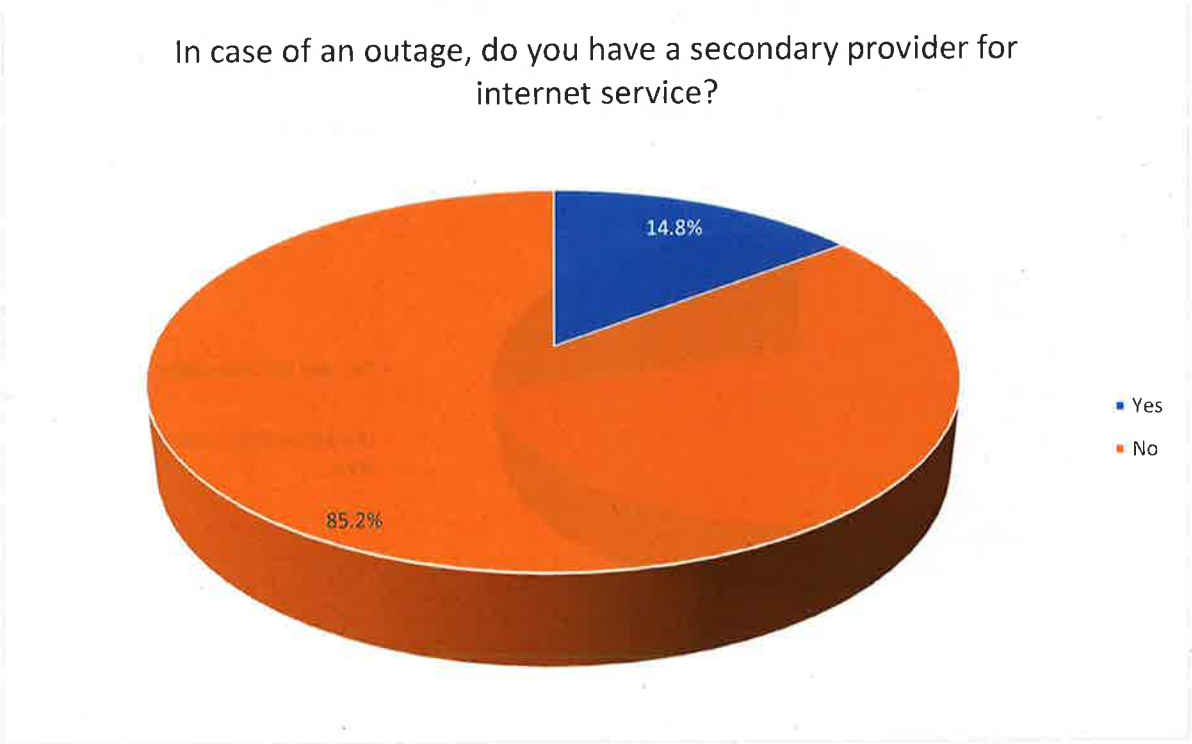
Only about 11% of businesses have eliminated a dedicated fax line in the past year.



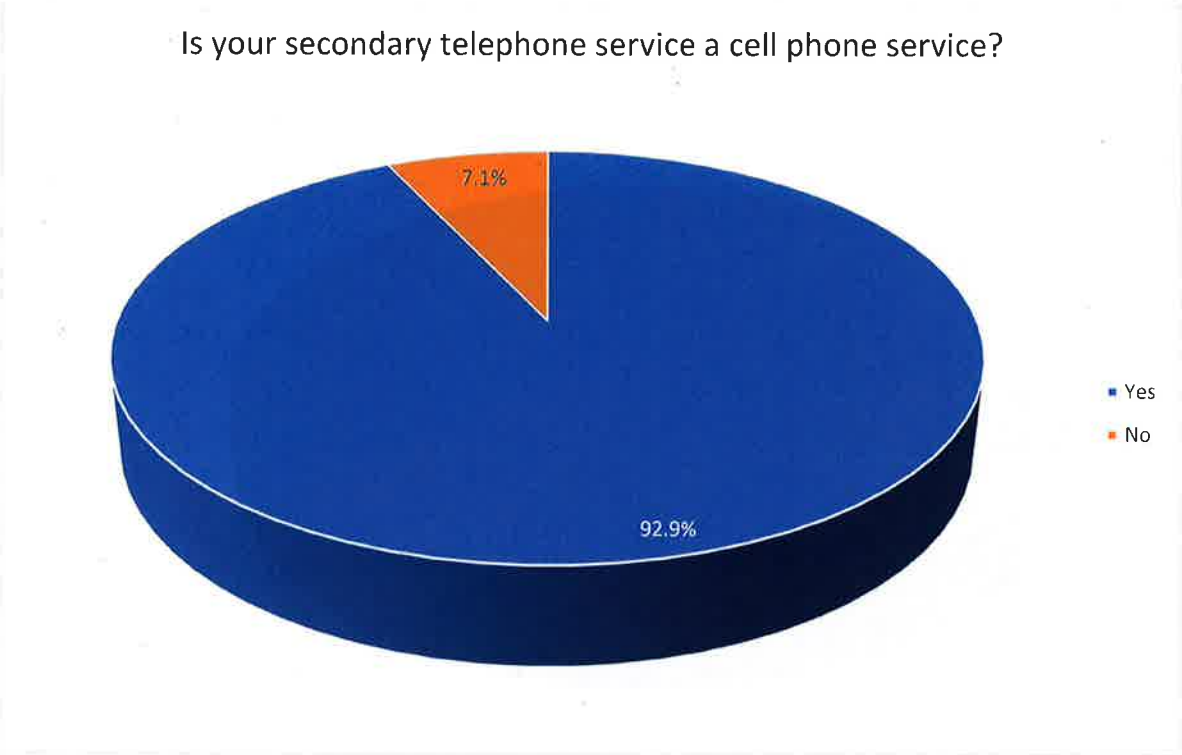
Only a little over one-third (35.5%) of businesses have a secondary telephone provider for service in case of an outage.



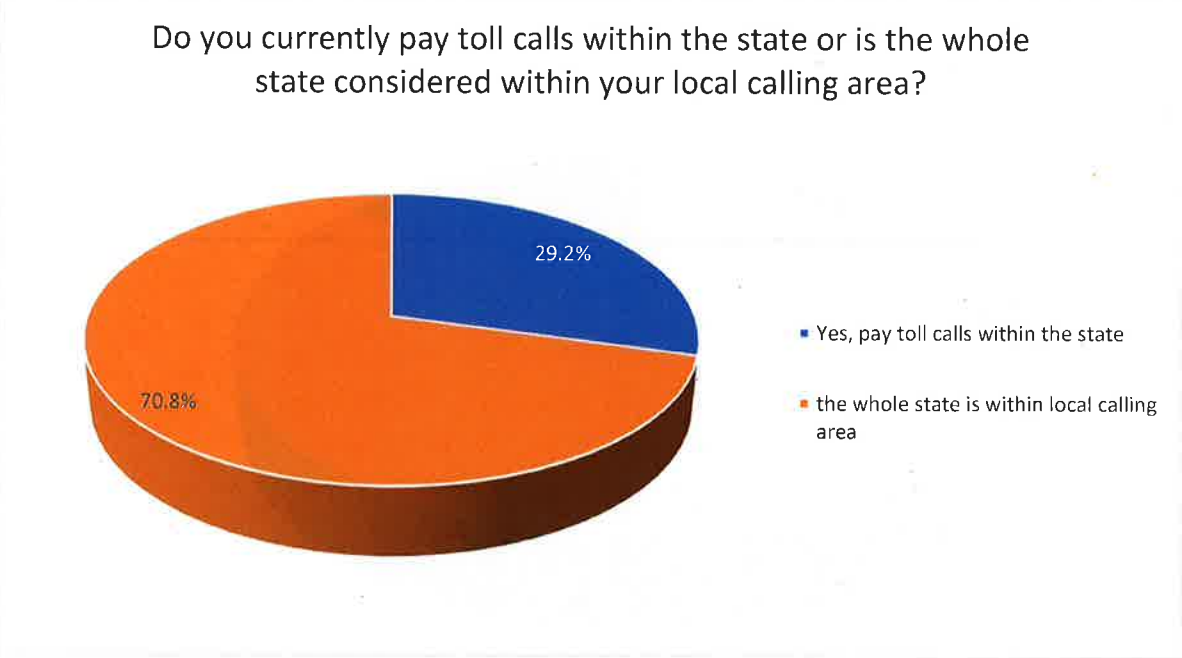
A vast majority of businesses (85.2%) do not have a secondary provider for internet in case of an outage.



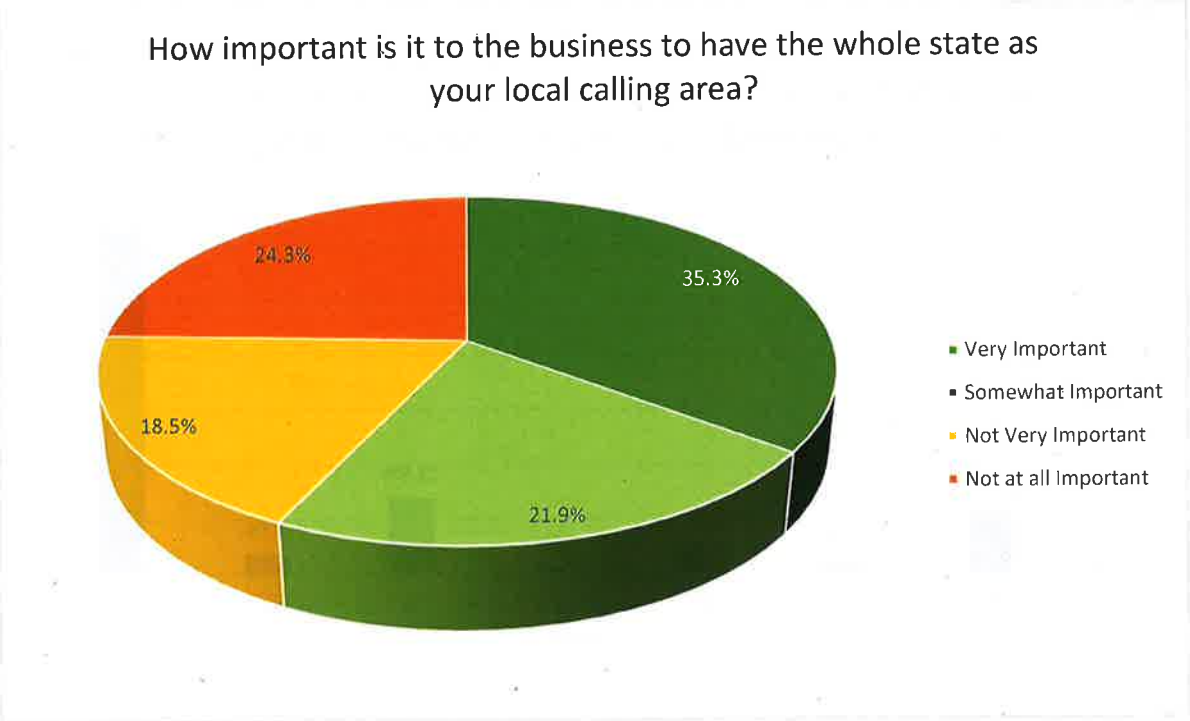
Of those who have a secondary telephone service, over 90% of respondents use a cell phone service as their secondary provider.



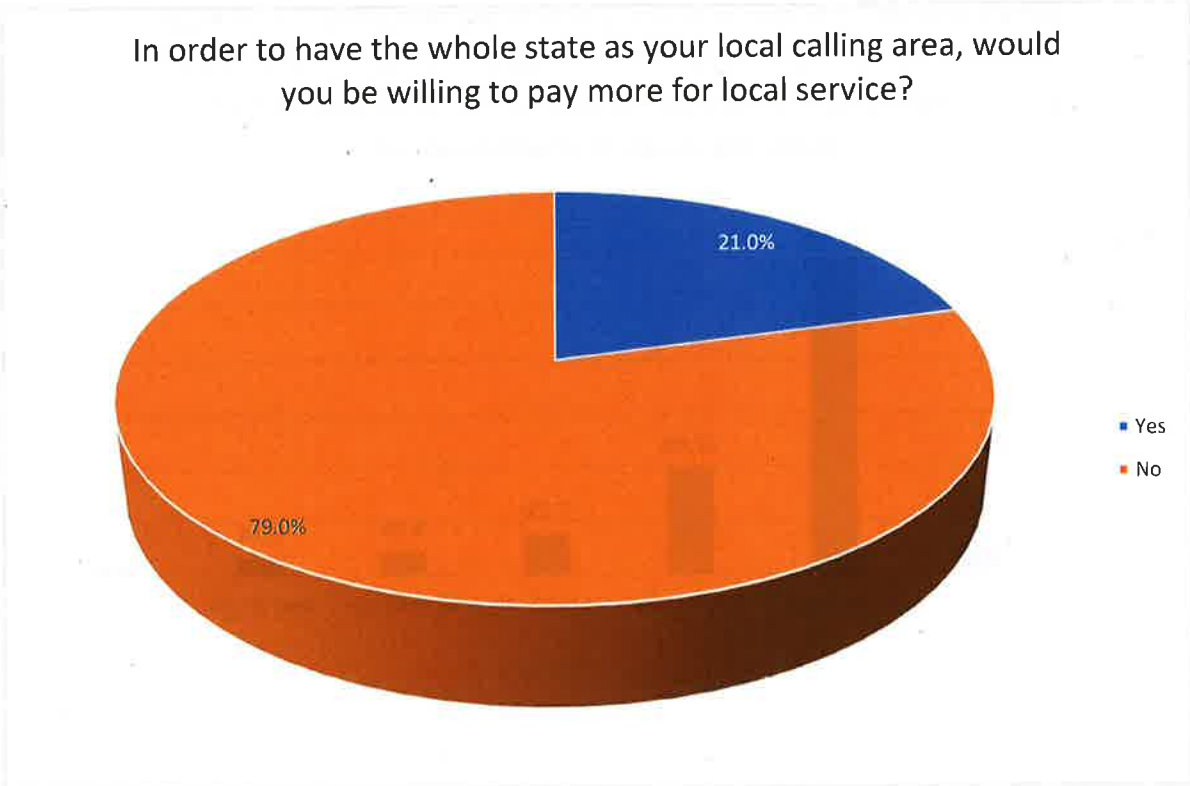
About 70% of businesses state that their telephone service includes that whole state as within their local calling area. A little less than 30% of businesses for toll calls within the state.



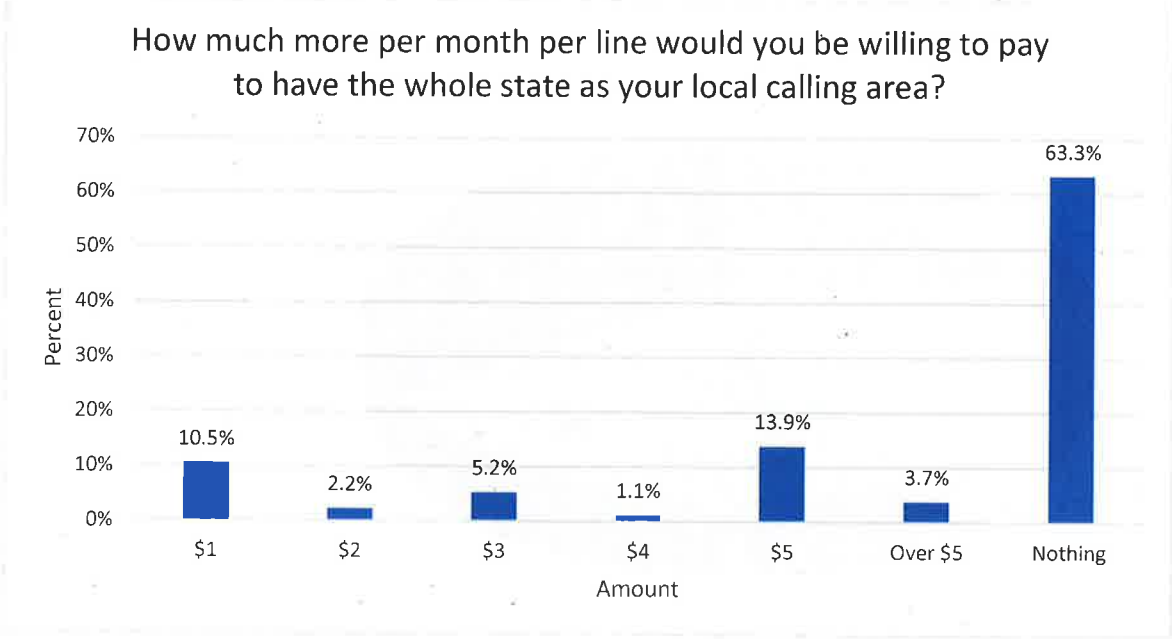
The majority of businesses find consider having the whole state as their local calling area as either "Very Important" or "Somewhat Important."



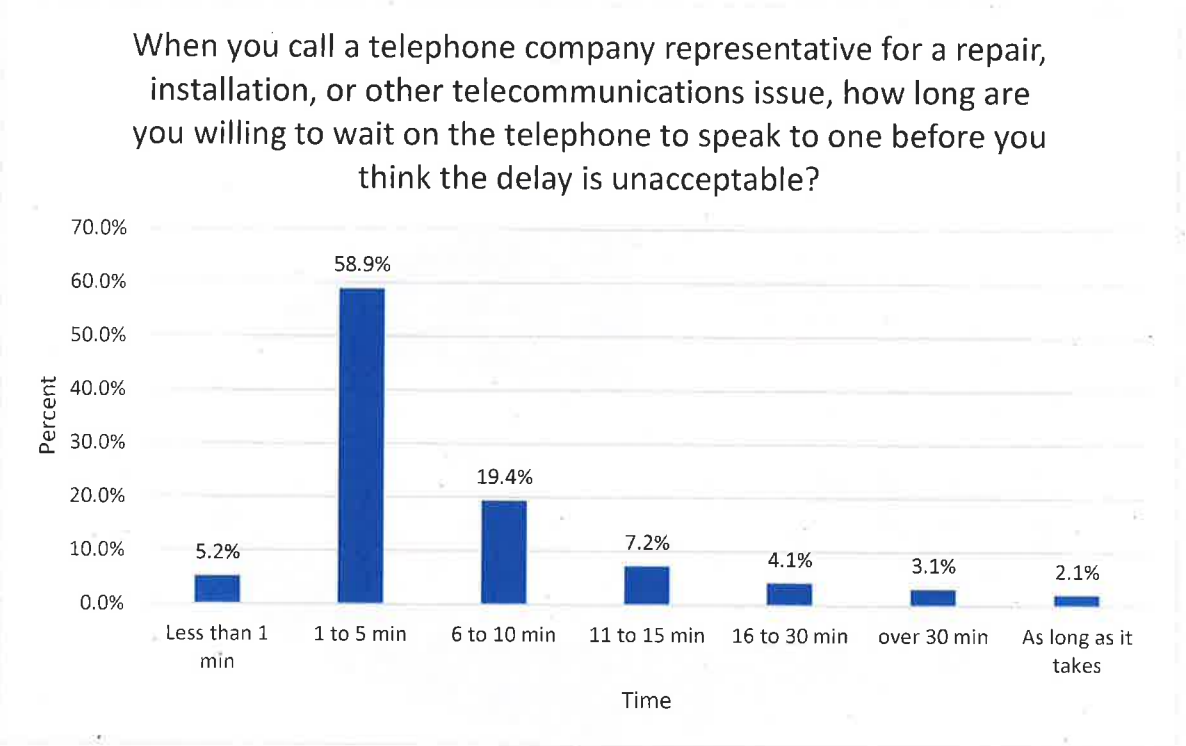
Though Vermont businesses consider it important to include the whole state as part of their local calling area, most respondents would not be willing to pay more to include the whole state as their local calling area.



When asked how much more they were willing to pay to include the whole state as their local calling area, almost two-thirds (63.3%) would not be willing to pay anything more than they currently pay per month for telephone service.



Most businesses (58.9%) are willing to wait between 1 to 5 minutes on the telephone to speak with a company representative before the delay becomes unacceptable.



A plurality of businesses (38.6%) would go to a competitive landline provider if the company was to take too long to install the new line, followed by 27.7% of respondents stated that they would wait for the landline, 18.9% said they would purchase a cellular service, 13.0% said they would choose some other method, and 8.1% said they would purchase a VoIP service.

If the company was going to take too long to install the new line, what other options would you consider?

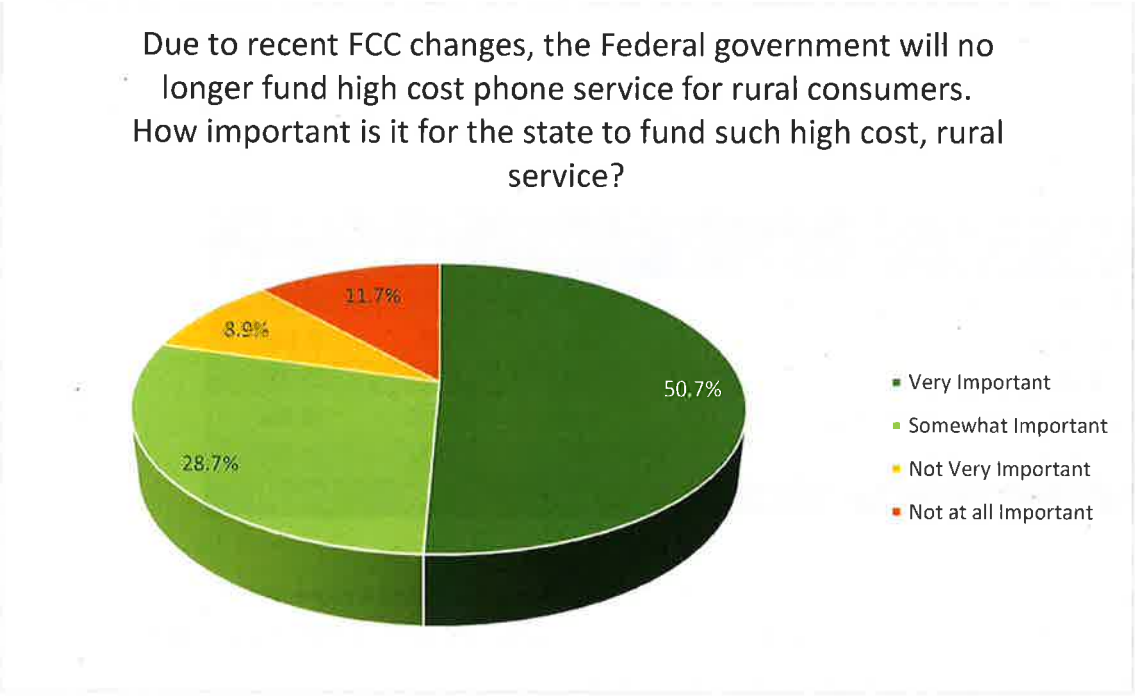
	Frequency	% of Total	% of Respondents
Purchasing cellular service	54	17.8%	18.9%
Purchasing a VoIP service	23	7.6%	8.1%
Waiting for the landline	79	26.1%	27.7%
Go to a competitive landline provider	110	36.3%	38.6%
Other	37	12.2%	13.0%
Total	**285**	**100.0%**	**106.3%**

When asked what local phone service carriers could offer that would make it more relevant or useful to businesses, the majority of respondents stated "price discounts." The second most stated response was "free long-distance calling" which resonated with 39.6% of respondents.

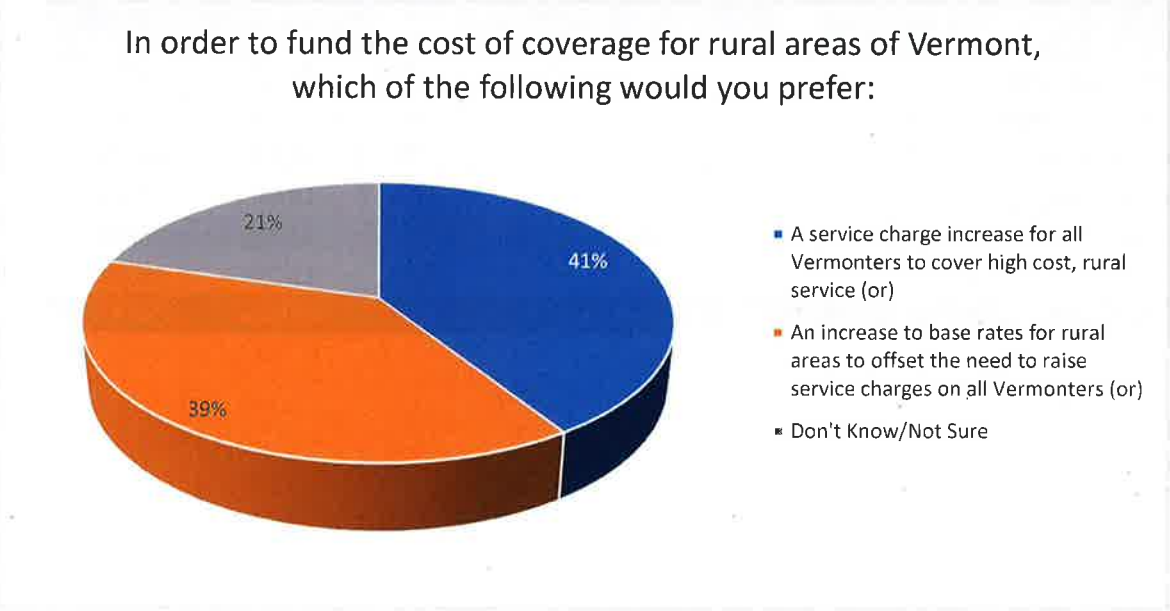
What could your local phone service carrier offer that would make it more relevant or useful to you?

	Frequency	% of Total	% of Respondents
Video conferencing	43	7.6%	14.7%
Free long-distance calling	116	20.5%	39.6%
Bundled service	93	16.5%	31.7%
Price discounts	163	28.8%	55.6%
Additional telecom features (i.e. voicemail, caller ID, etc.)	82	14.5%	28.0%
Other: Please Specify	68	12.0%	23.2%
Total	**293**	**100.0%**	**192.8%**

A majority of business respondents found it either "Very Important" (50.7%) or "Somewhat Important" (28.7%) for the state to fund high cost rural services.

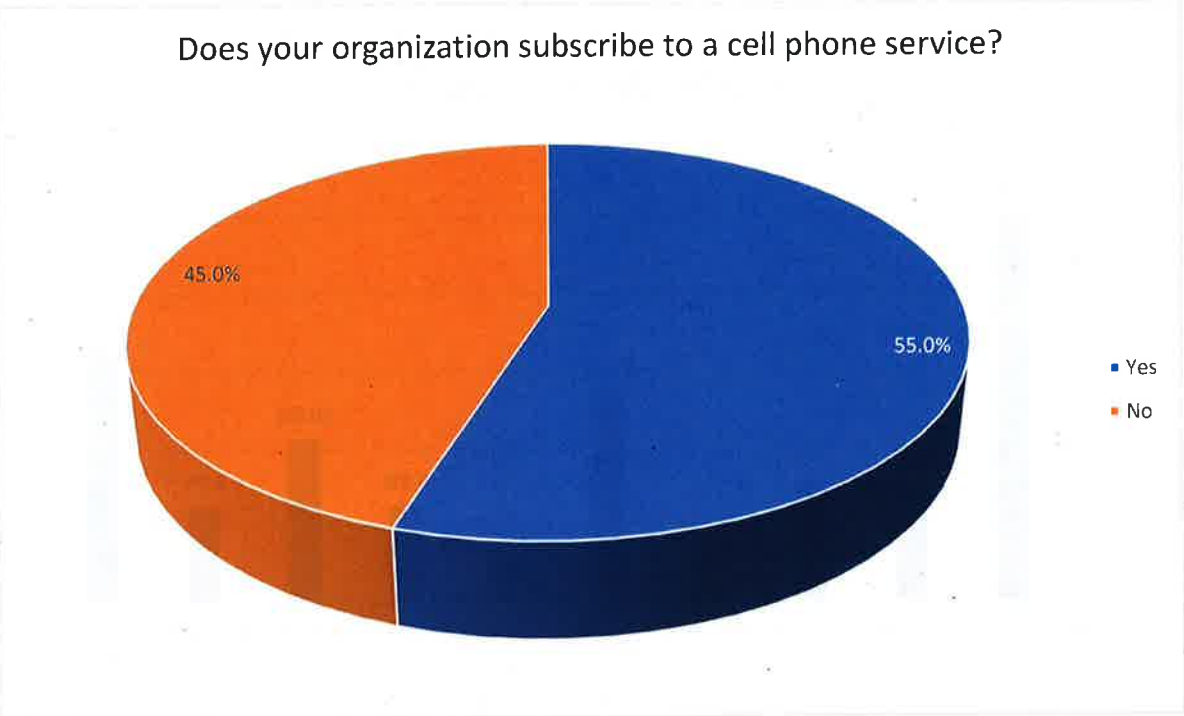


However, business respondents were mixed on how the high cost rural service should be funded with 41% said to increase the cost for all Vermonters, 39% said to increase the cost for rural areas to offset the need for raising the price for all of Vermonters, and 21% stating that they don't know or are not sure.

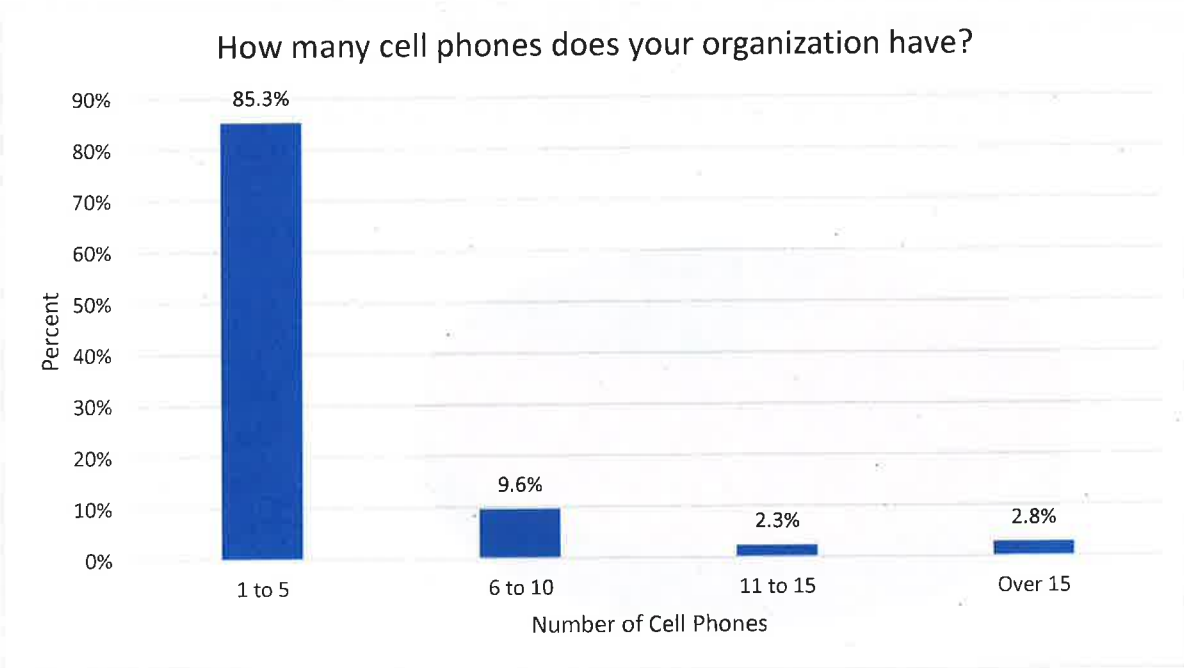


Cellular/Wireless/Mobile Telephone

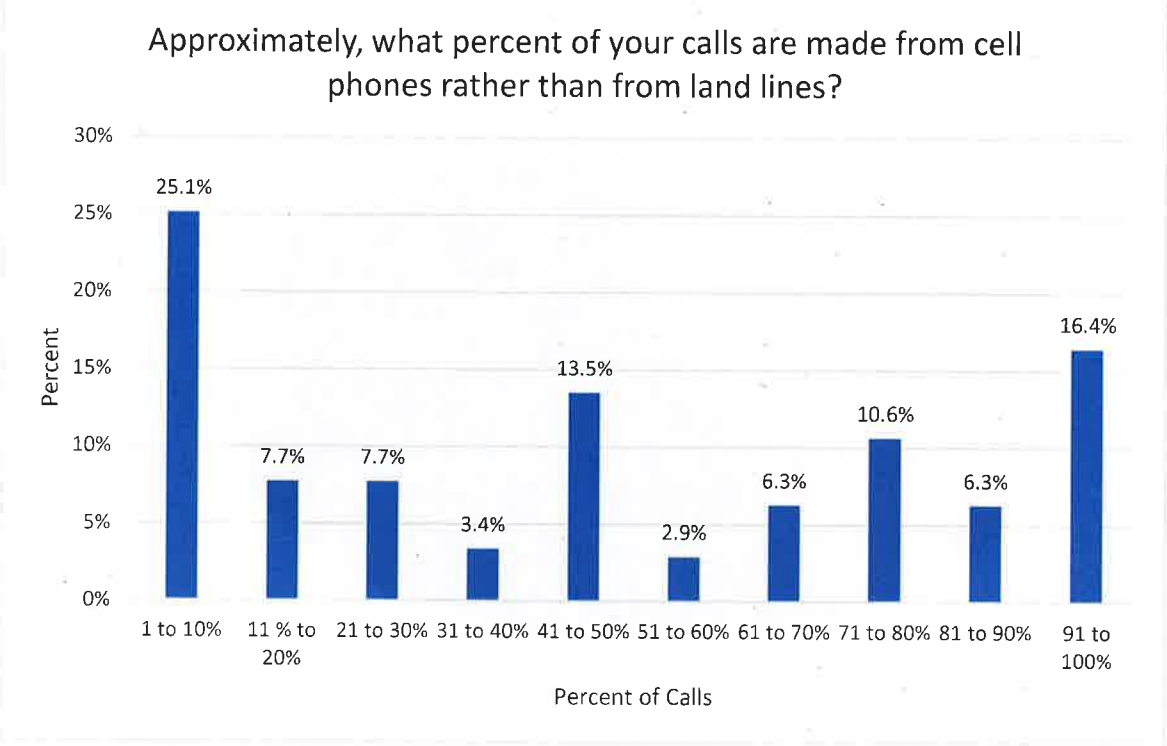
Over 50% of Vermont businesses subscribe to a cell phone service. Cell phone service usage has not changed significantly since the 2014 or 2012 studies.



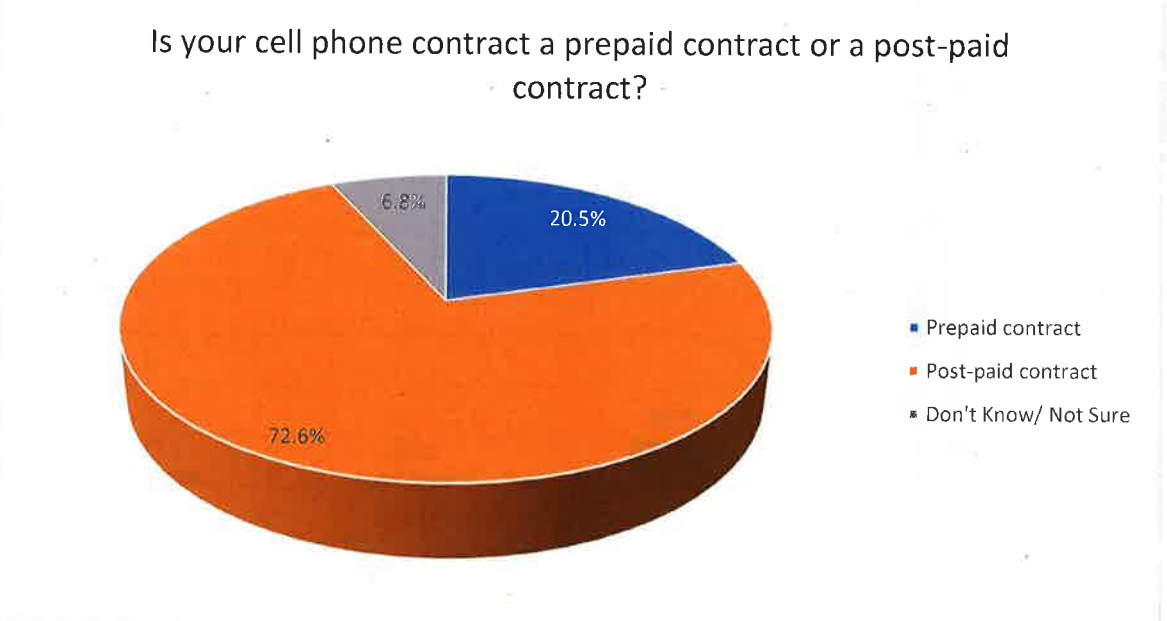
An overwhelming majority of non-residential respondents have an average of 4 cell phones for their organization. This is down from 2014 where organizations had an average of 8.7 cell phones.



A little less than 60% of businesses who subscribe to a cell phone service, make half or less than half of their organization's calls on cell phones. This number is down from 2014 where 73% of organizations make half or less than half of their organization's calls on cell phones.



When asked about the type of contract organizations have for their cell phone service, 72.6% of non-residential customers said they have a post-paid contract. In 2017, 20.5% of organizations have a pre-paid contract; this is a substantial increase compared to the 6% from 2014.



Similar to the 2014 study, the two most common cell phone service providers for non-residential customers are Verizon (46.2%) and AT&T (41.5%). U.S. Cellular or 21st Century Cellular make up about 3% of the market share.

What companies currently provide your cell phone service?

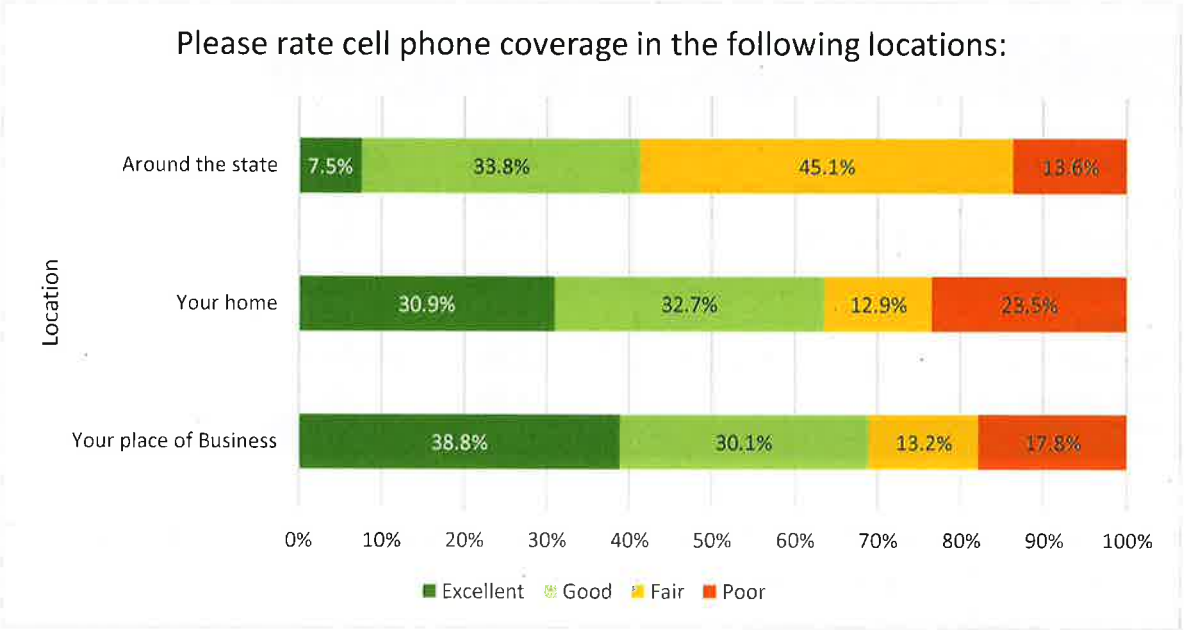
	Frequency	% of Total	% of Respondents
AT&T	88	40.2%	41.5%
Verizon Wireless	98	44.7%	46.2%
Sprint PCS	3	1.4%	1.4%
U.S. Cellular or 21st Century Cellular	7	3.2%	3.3%
Virgin Mobile	2	0.9%	0.9%
T Mobile	1	0.5%	0.5%
TracPhone	5	2.3%	2.4%
Other (please specify):	15	6.8%	7.1%
Total	212	100.0%	103.3%

Almost all of the non-residential purchase a plan that includes voice, over 95% include text messaging, and over 90% include data. Organizations are purchasing text messaging services about 5% more than 2014 and data service about 10% more than 2014.

What services are included in your organization´s cell phone plan?

	Frequency	% of Total	% of Respondents
Voice	214	34.4%	99.5%
Text messaging	207	33.3%	96.3%
Data	201	32.3%	93.5%
Total	215	100.0%	289.3%

Non-residential customers perceive cell phone coverage to be better around the place of business and home than around the state in general. Overall perception of coverage around the state is not very high, with over 50% of respondents said coverage is either fair (45.1%) or poor (13.6%). There has been about a 10% increase in the number of people who think coverage is fair compared to 2014.

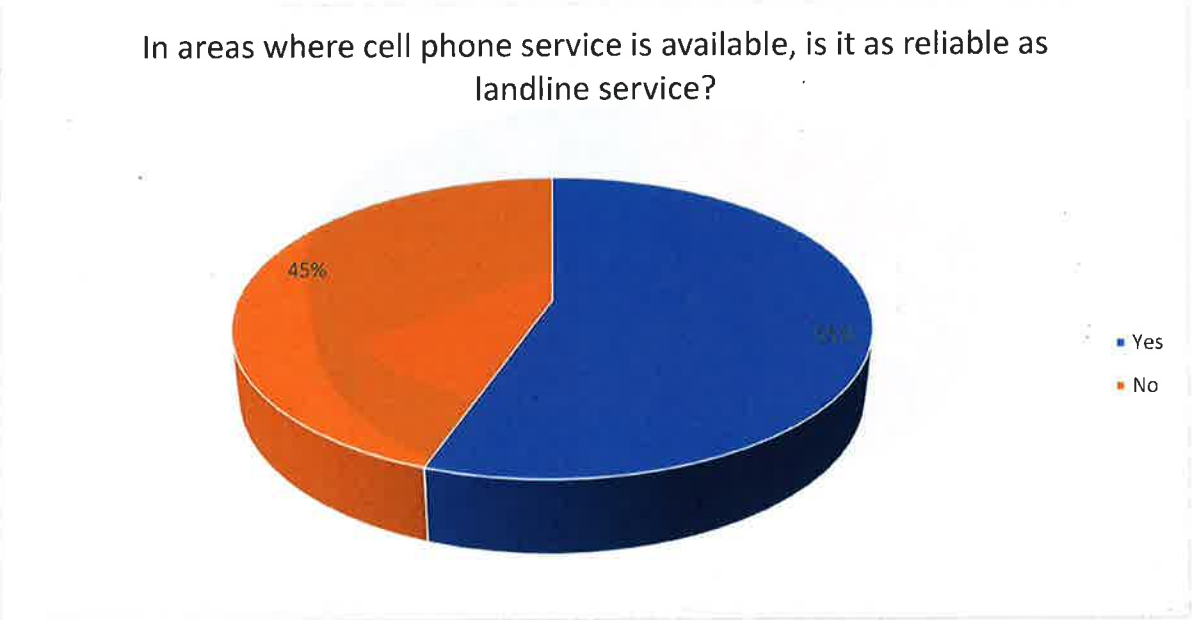


The leading factors that would cause non-residential customers to switch cell phone providers are Price (73.8%) and Service Quality (72.0%).

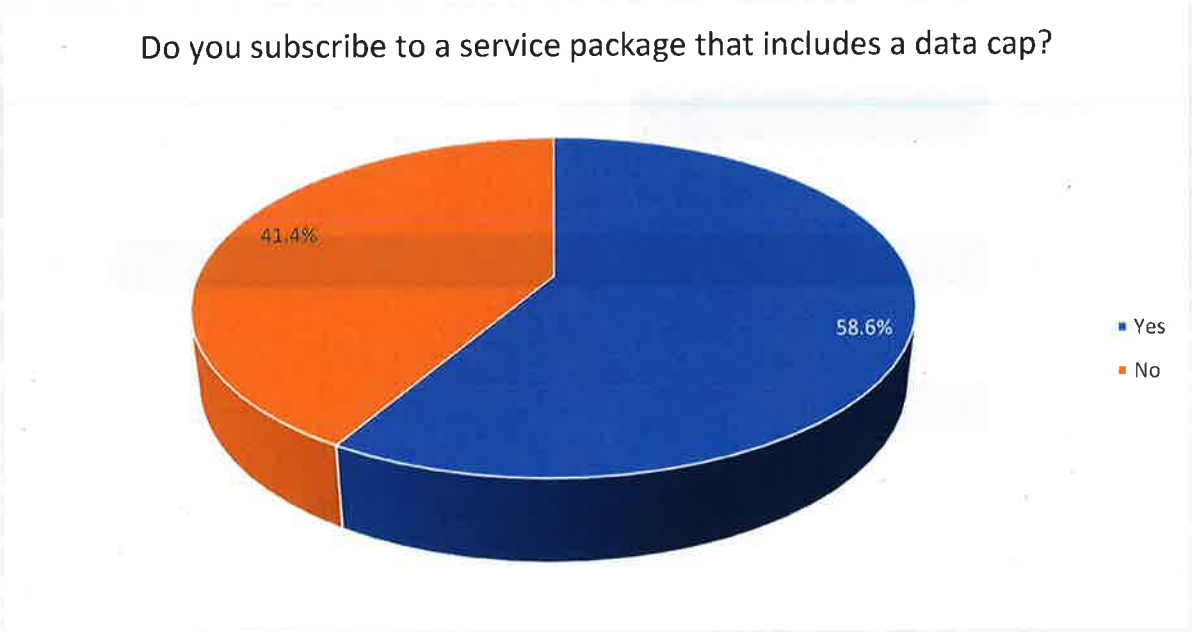
Would any of the following factors lead you to change your service to another cell phone provider?

	Frequency	% of Total	% of Respondents
Service quality (dropped calls, voice clarity, latency, etc.	121	32.7%	72.0%
Price	124	33.5%	73.8%
Customer Service	70	18.9%	41.7%
Convenience of billing or account management (bundled services)	55	14.9%	32.7%
Total	**168**	**100.0%**	**220.2%**

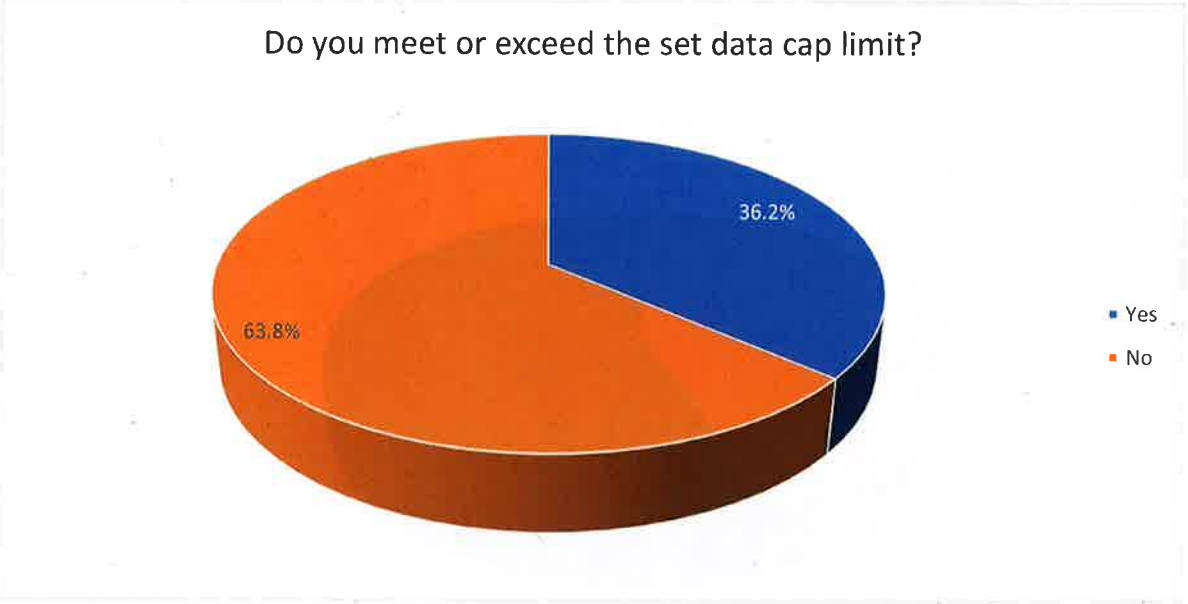
Similar to 2014, a little over half of non-residential respondents perceived cell phone service to be as reliable as landline service where available.



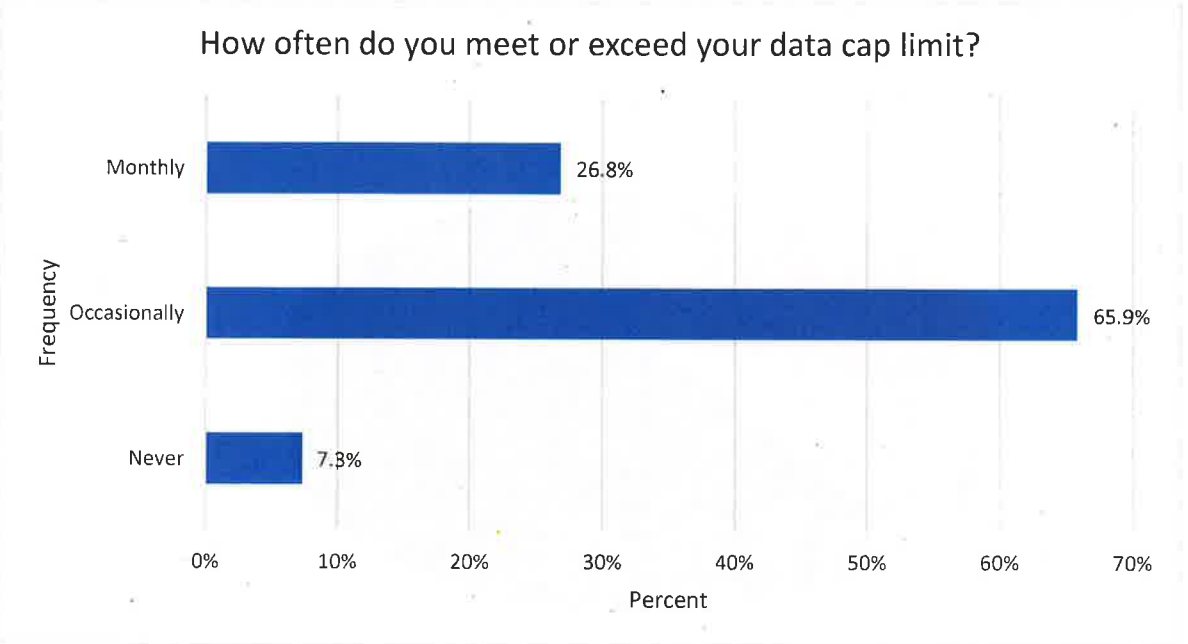
A little under 60% of non-residential customers subscribe to a service with a data cap.



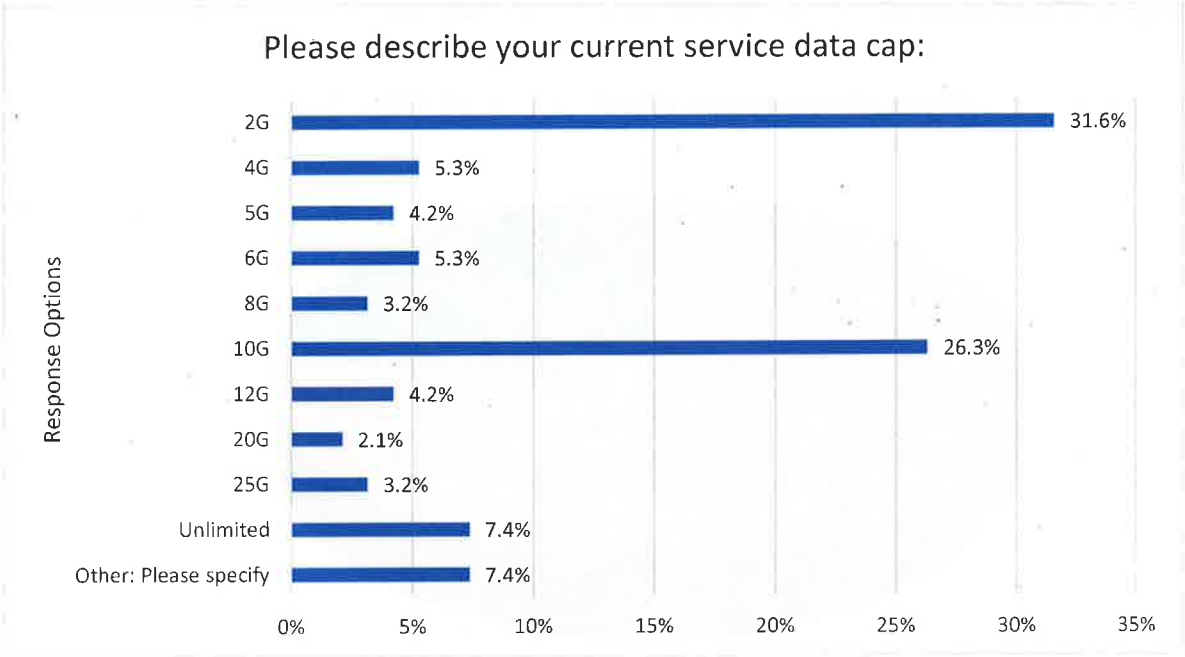
Of those who subscribe to a data cap, only about 36% exceed the data cap limit.



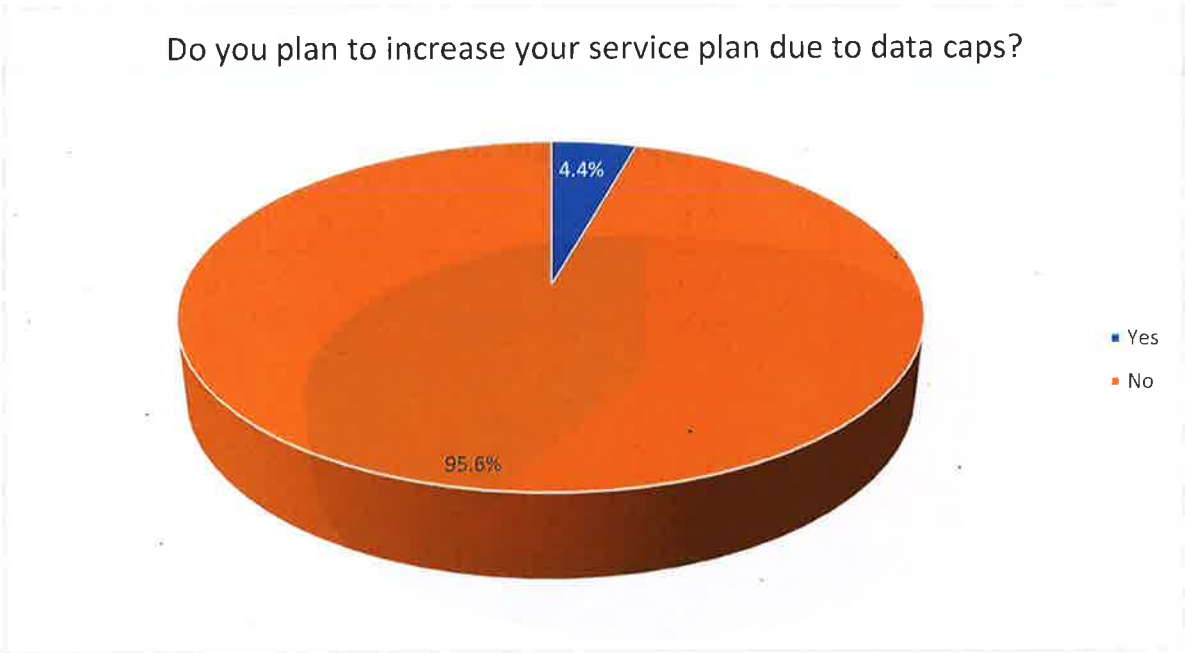
Of those who exceed their data cap limit, 66.9% exceed it occasionally, and 26.8% exceed the limit monthly.



When asked about their data cap, the most popular data cap limit was 2G (31.6%), followed by 10G (26.3%).

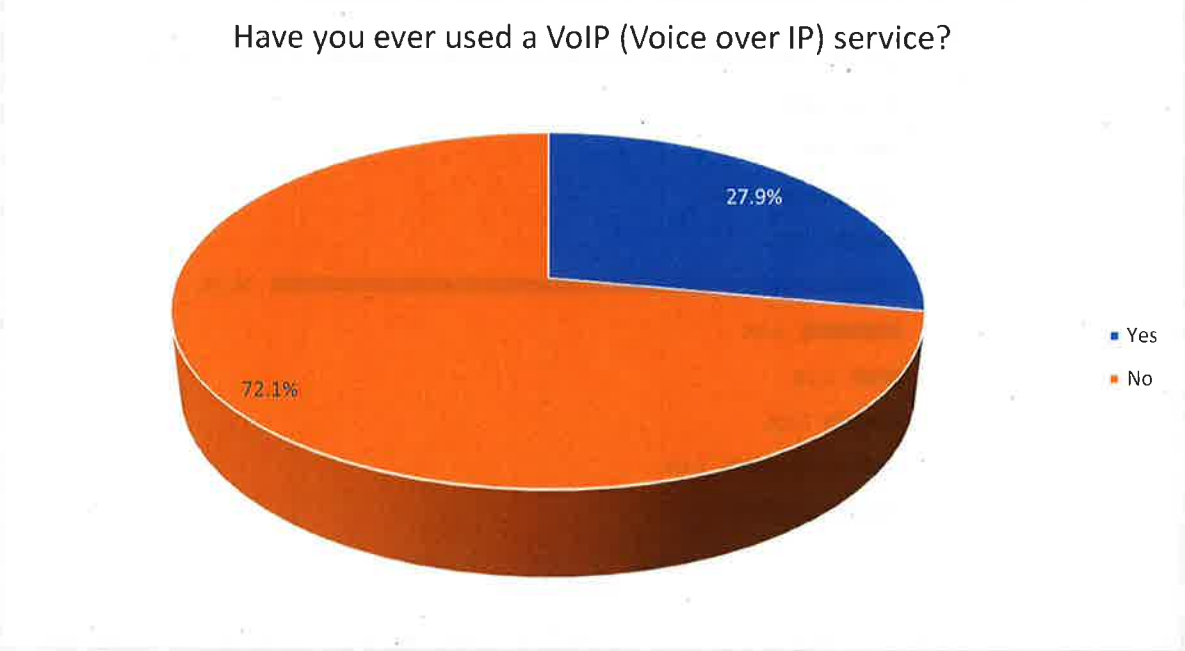


Even though some respondents exceed their data cap limits, an overwhelming majority of non-residential customers (95.3%) do not plan to increase their service plans due the data caps.

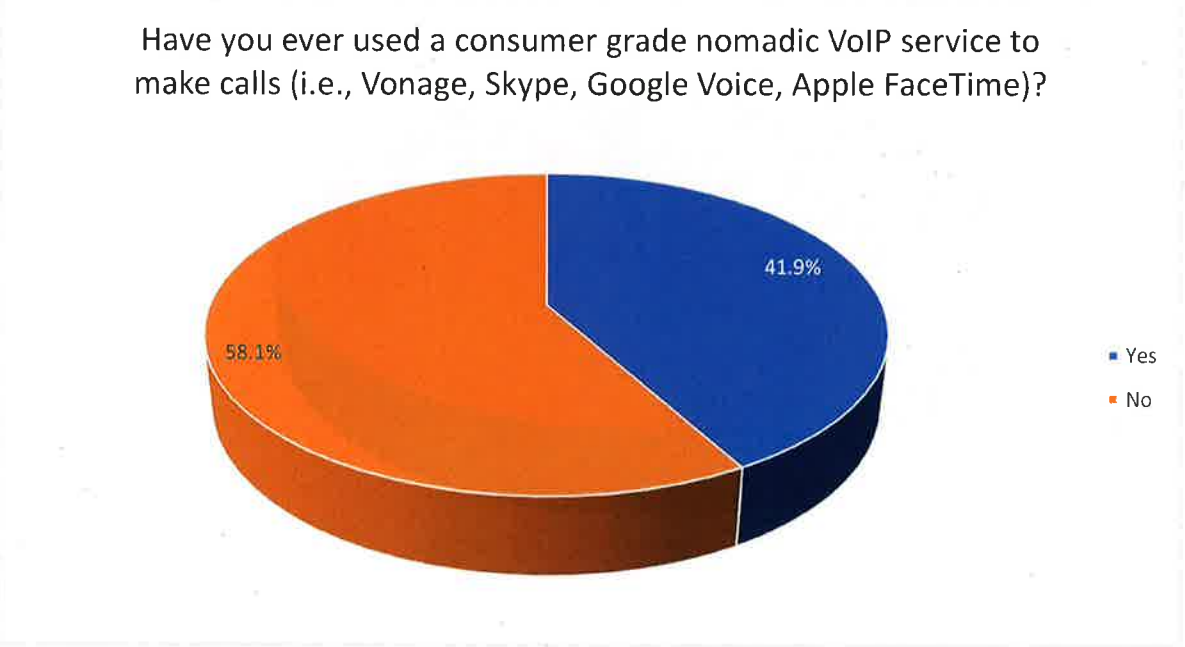


Nomadic VoIP

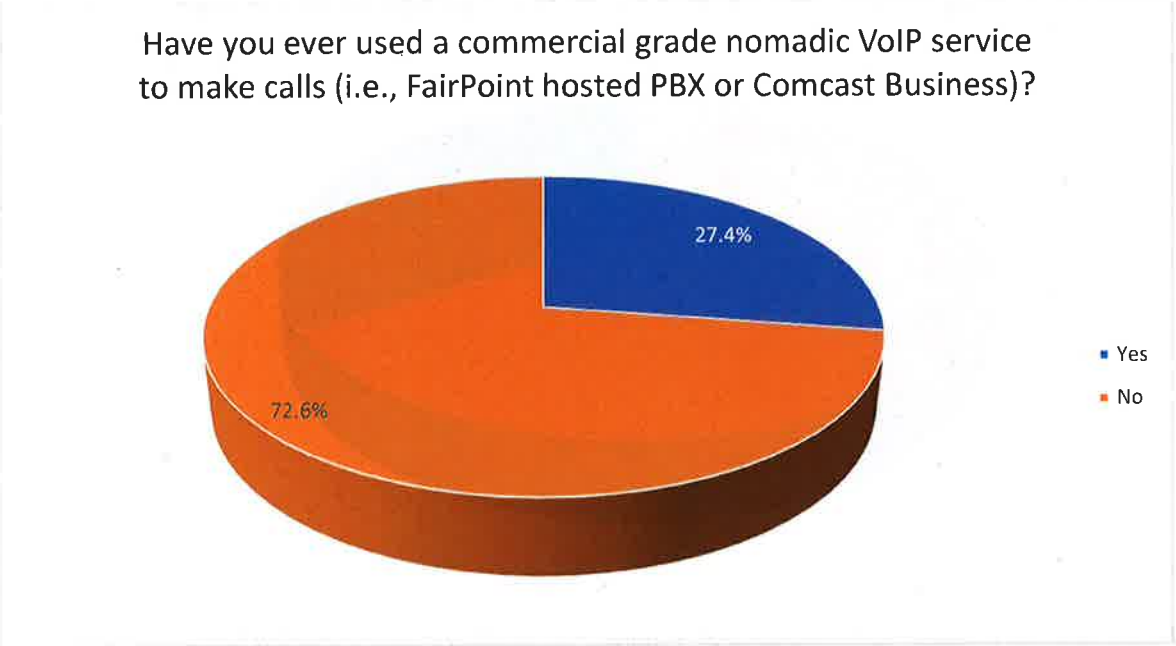
A majority of non-residential customers (72.2%) have not used a VoIP service.



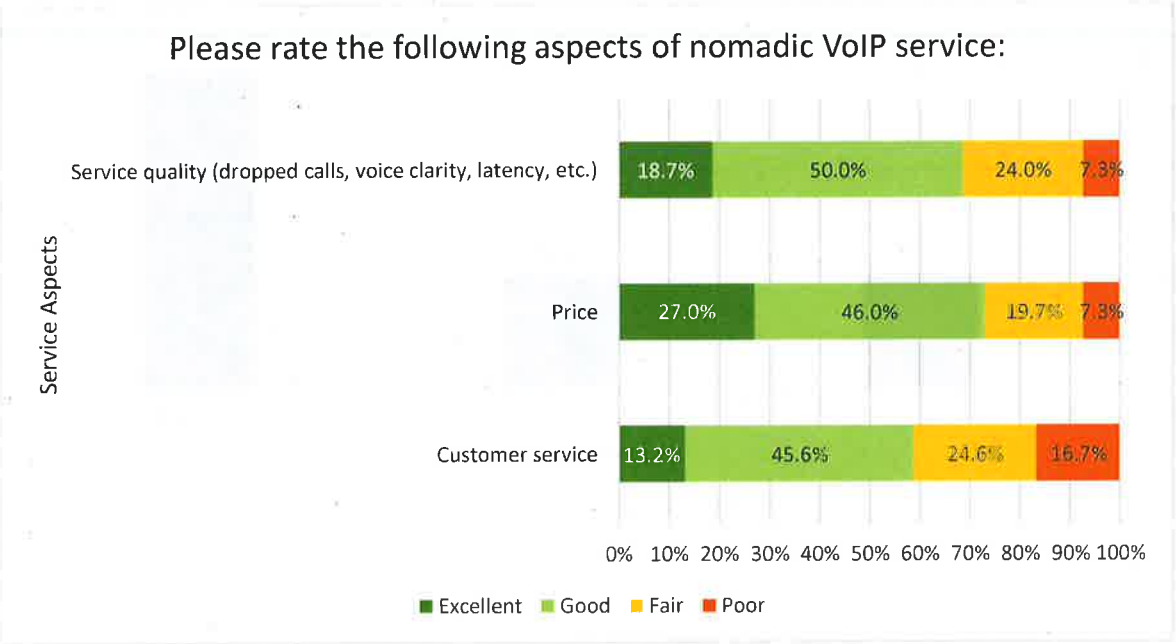
A little over 40% of business respondents said that they have used consumer grade nomadic VoIP services to make calls.



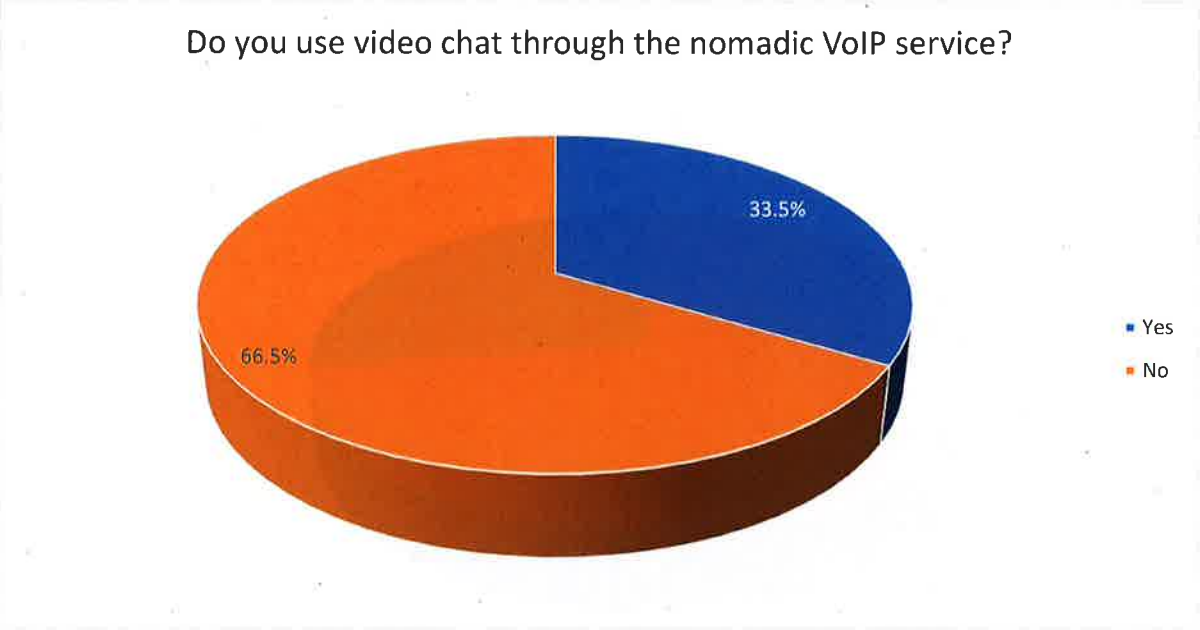
Less than 30% of non-residential consumers have used commercial grade nomadic VoIP services to make calls.



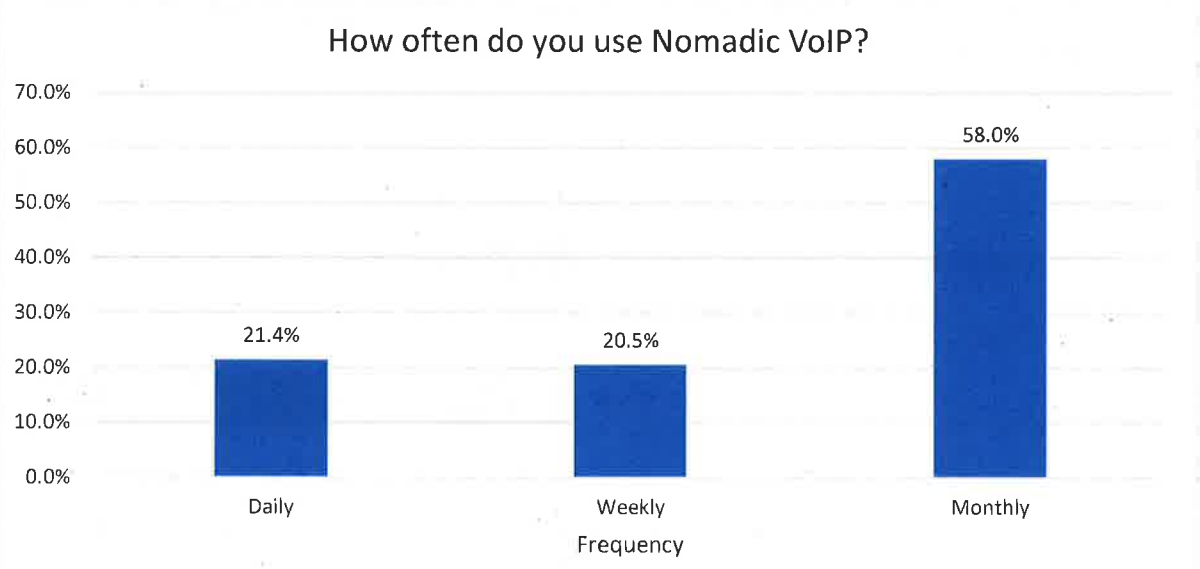
Of those who have used nomadic VoIP services, overall perception of VoIP is relatively high with over 50% responding with either excellent or good.



About a third of non-residential respondents said they have used VoIP services for video chat.

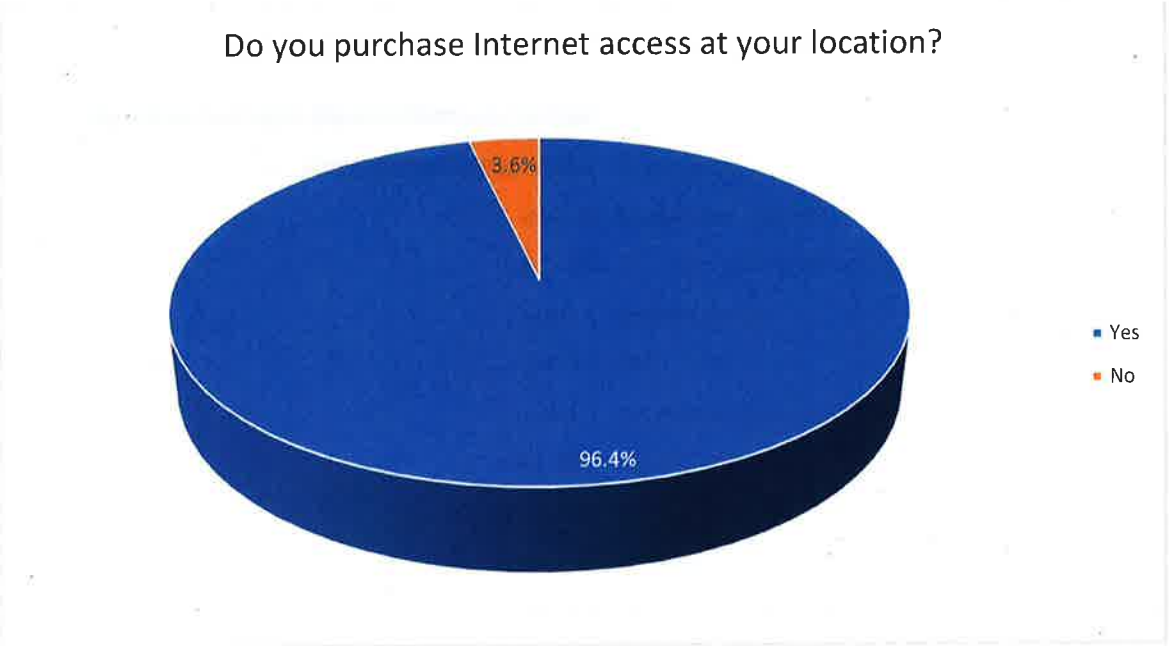


Of those who use nomadic VoIP, a majority of respondents (58.0%) use it on a monthly basis.

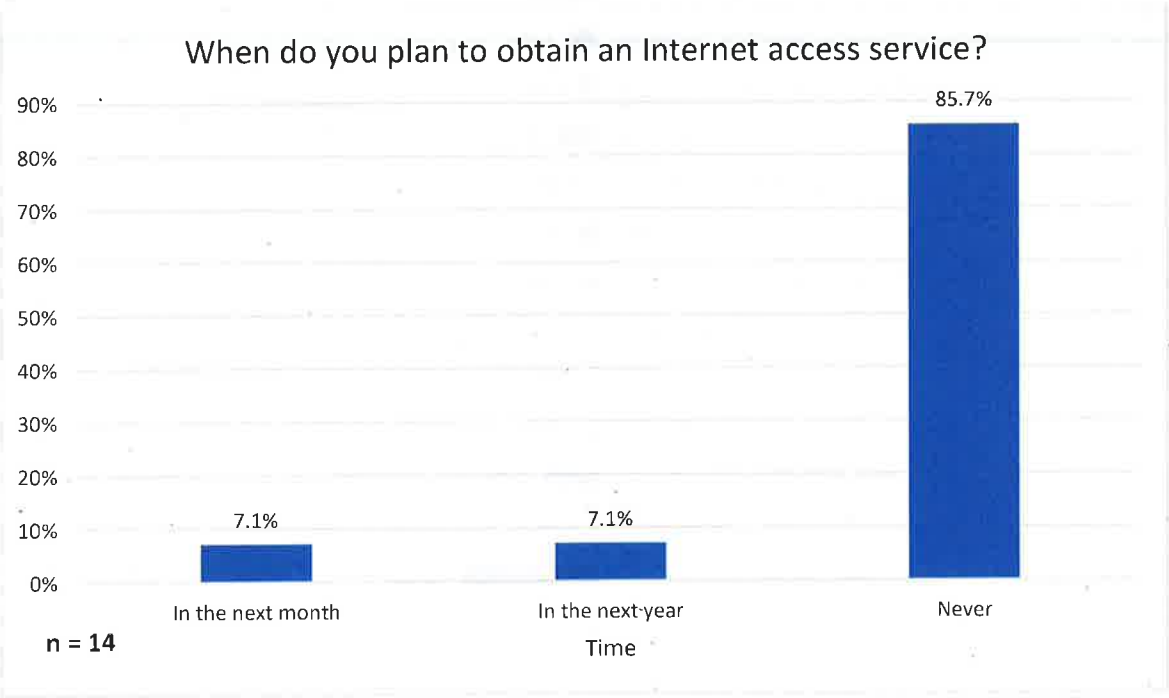


Internet

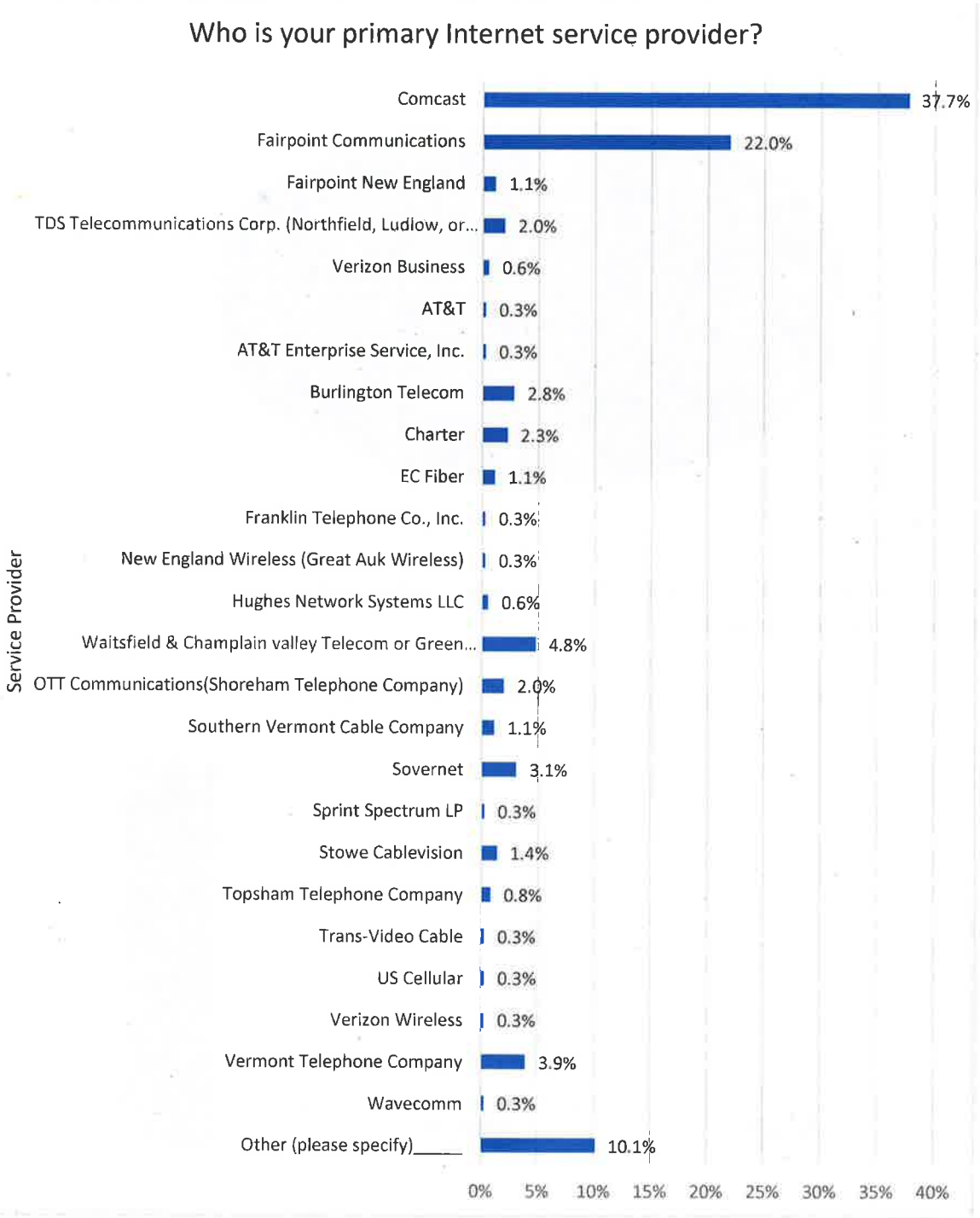
Similar to 2014, over 95% of business respondents purchase internet access for their location.



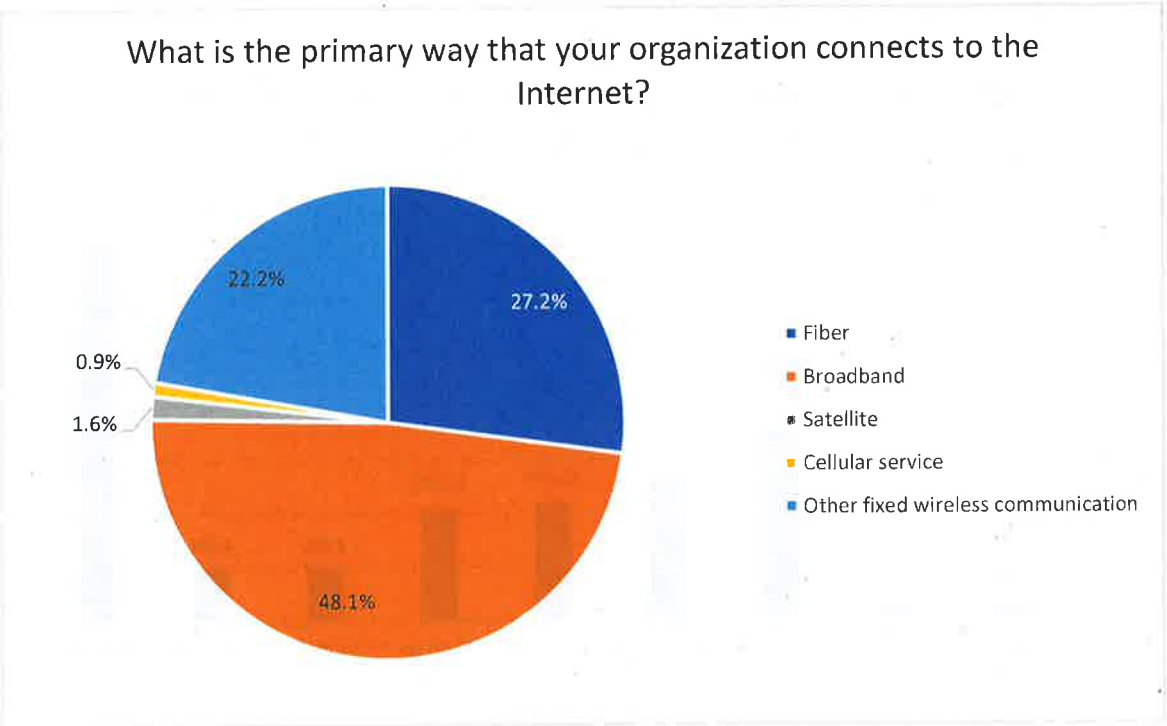
Of those who do not currently have internet access service at their location, over 85% (n=12) do not ever plan to purchase internet services.



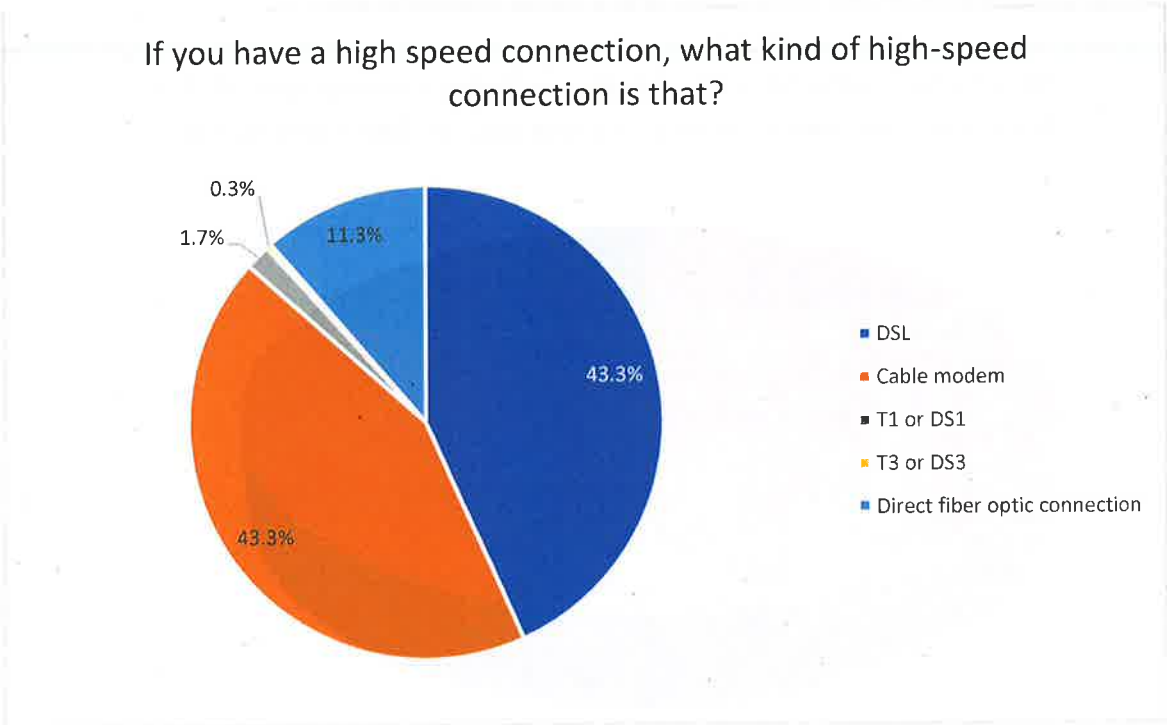
Similar to the 2014 results, Comcast (37.7%) and FairPoint Communications (22.0%) hold the largest market share for providing Internet services.



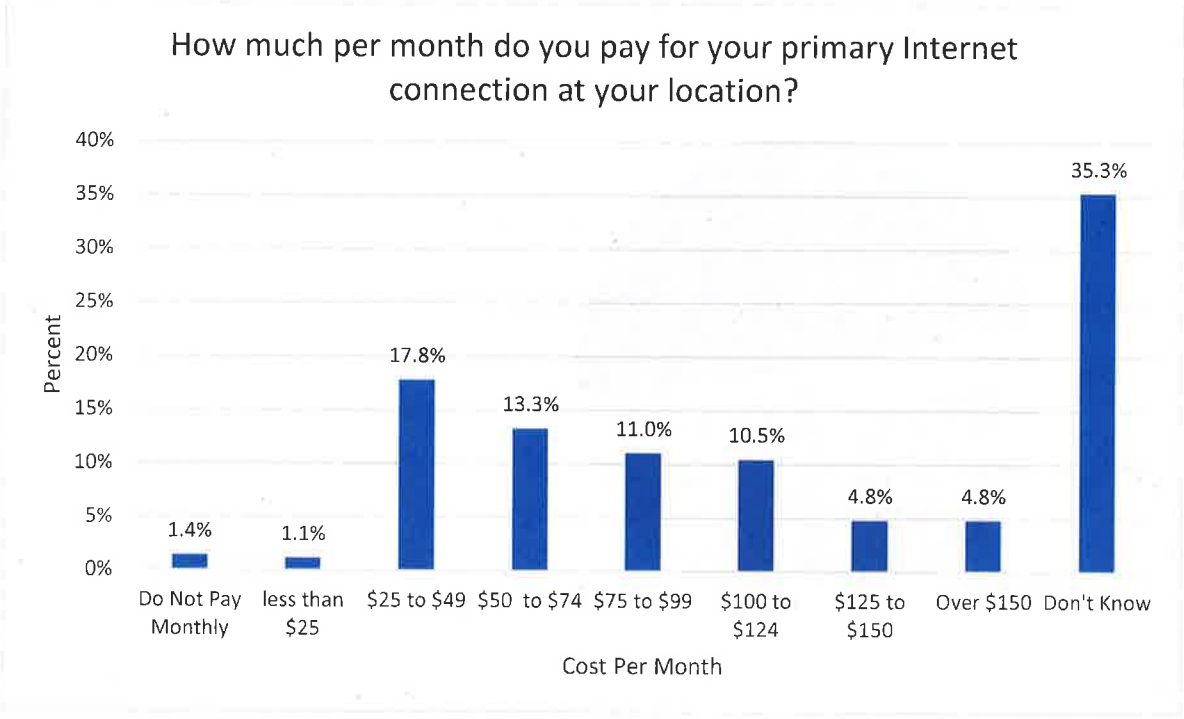
Most businesses use either Fiber (27.2%) or Broadband (48.1%) services to connect to the Internet.



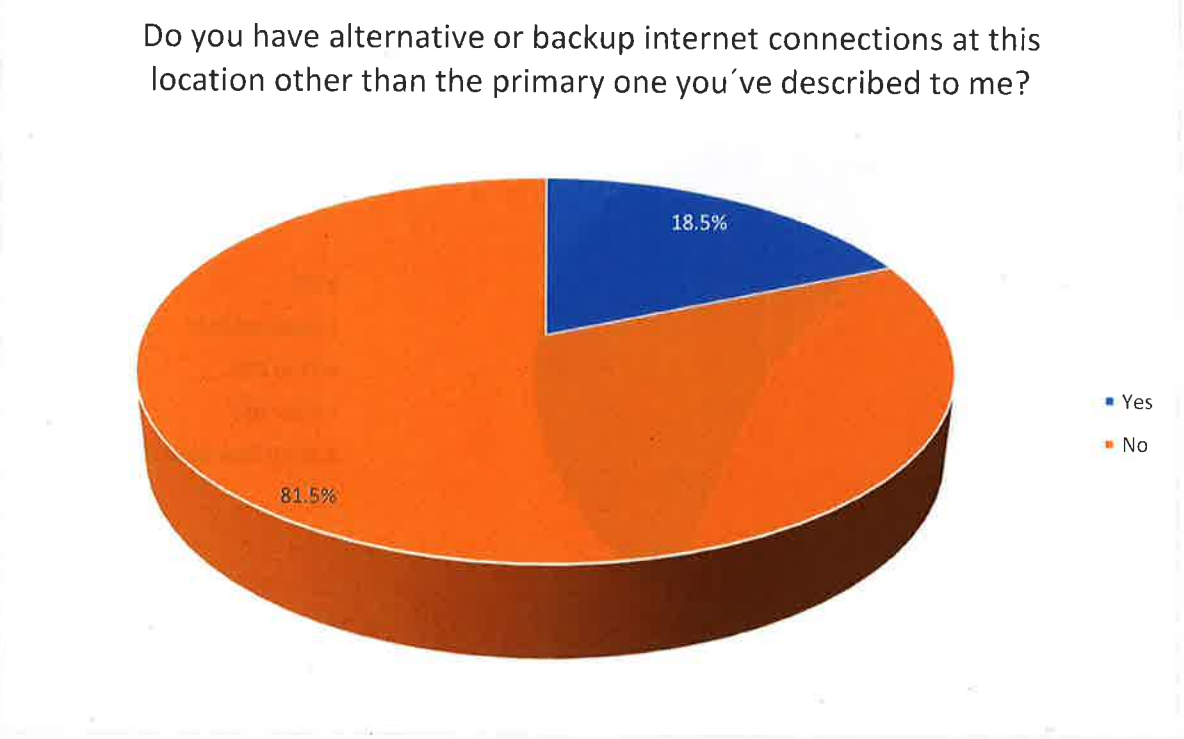
Of those who have a high-speed connection, most have a DSL (43.3%) or Cable modem connection.



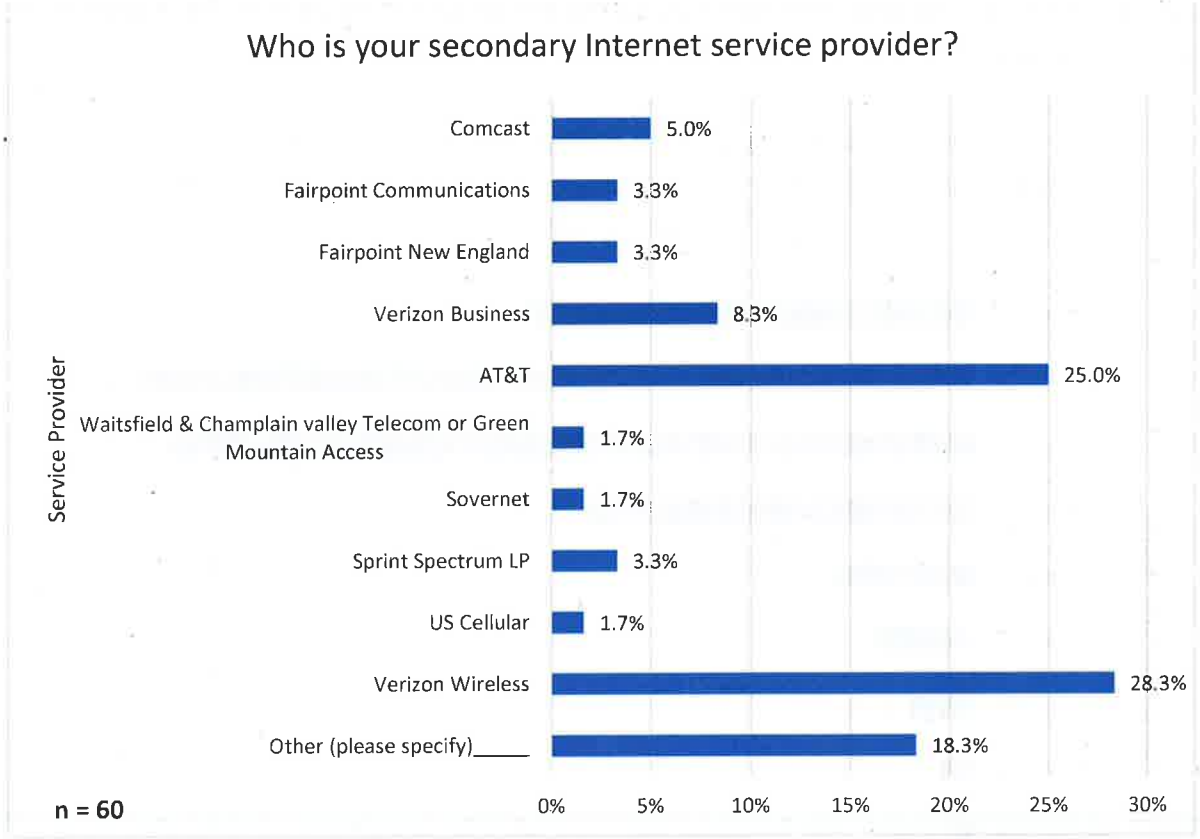
The median value that non-residential customers pay is about $70, which is about $10 higher than in 2014. The modal response ($100) is $60 higher than in 2014.



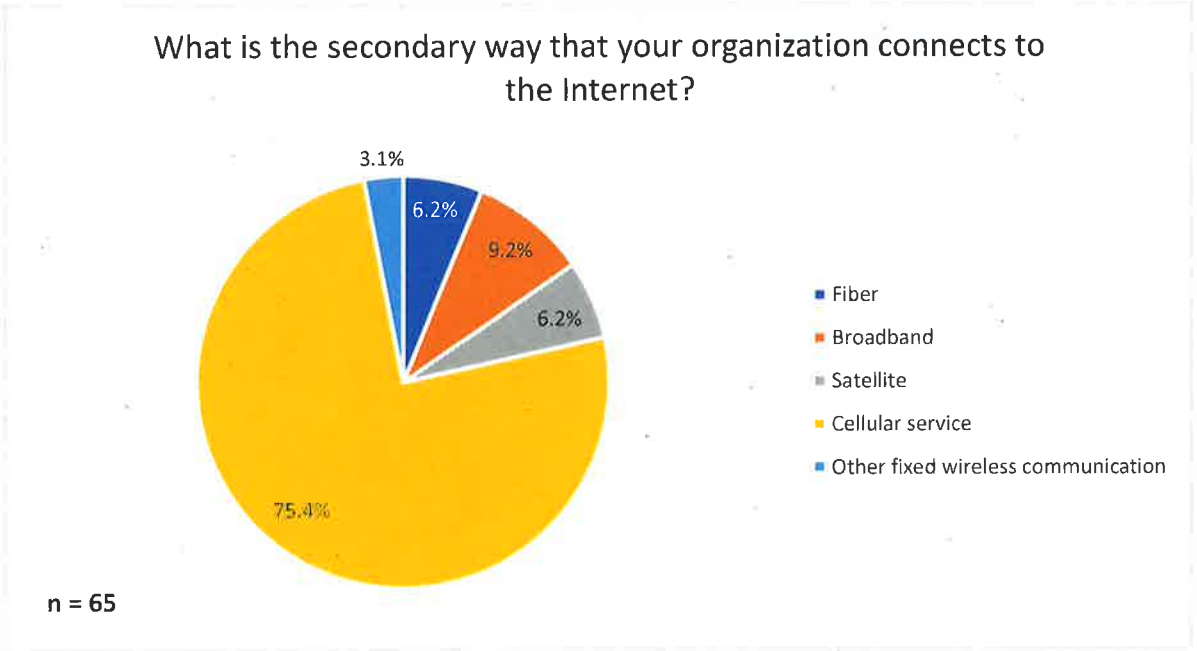
A majority of respondents (81.5%) do not subscribe to a backup internet service.



Of those who do subscribe to a secondary internet service provider, Verizon (28.3%) and AT&T (25.0%) have the largest market share.

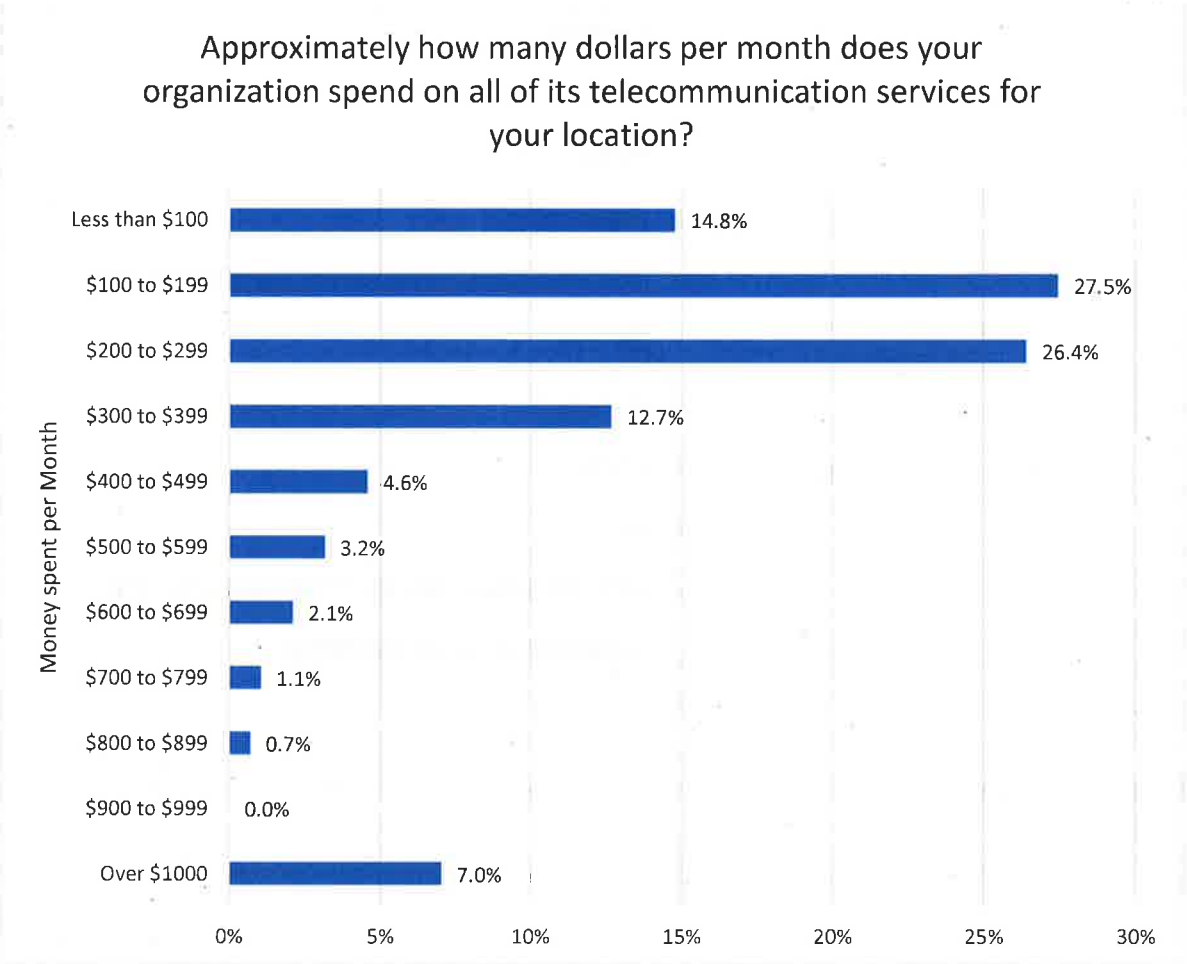


For those who have a secondary internet connection, the majority (75.4%) connect via a cellular service.

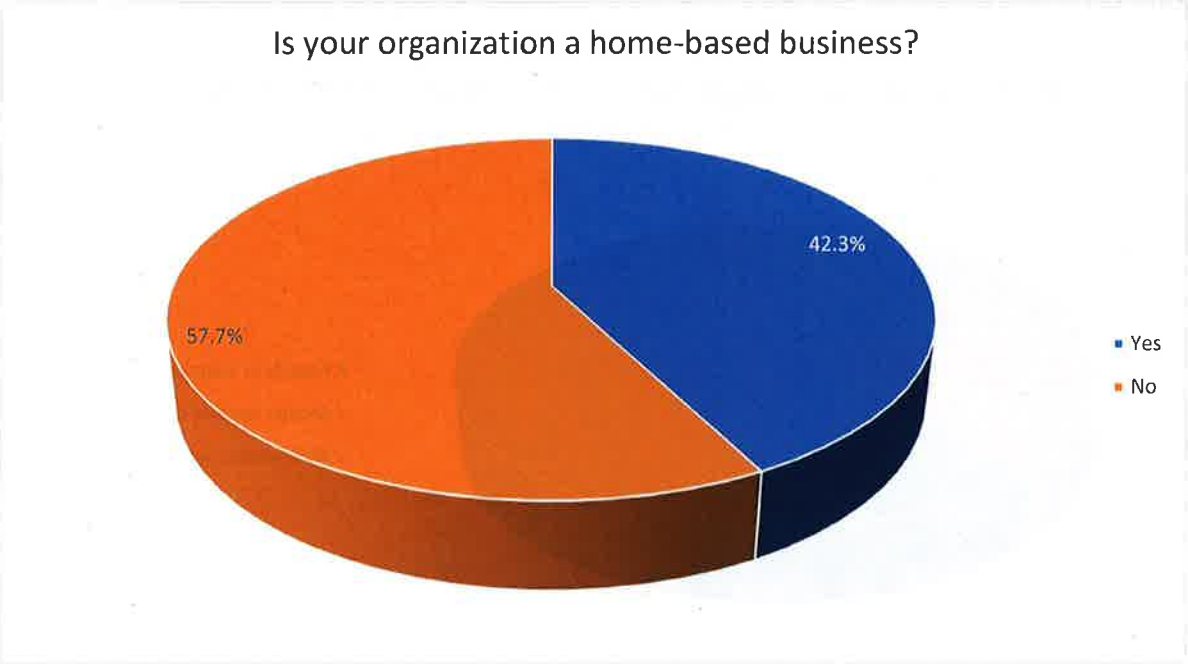


General questions about the company

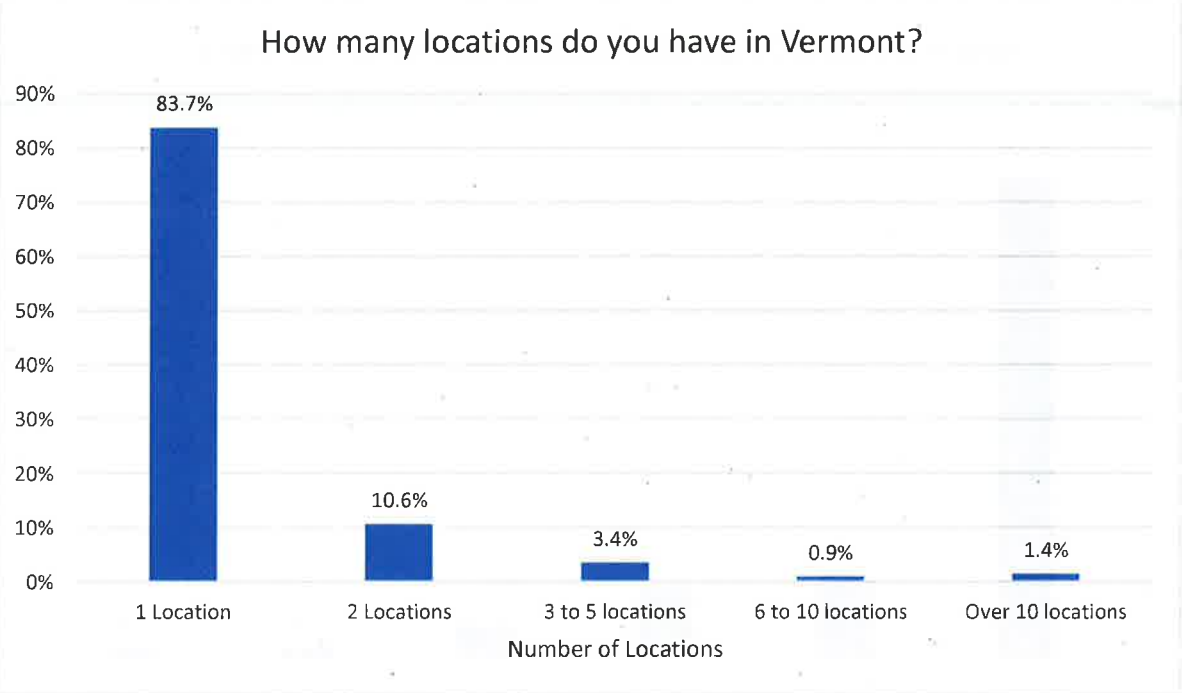
Though the average amount that Vermont businesses spend per month is $535.15, most companies spend less than $400 a month for telecommunication services for their location. The median amount that non-residential customers pay for telecommunication services is about $200.



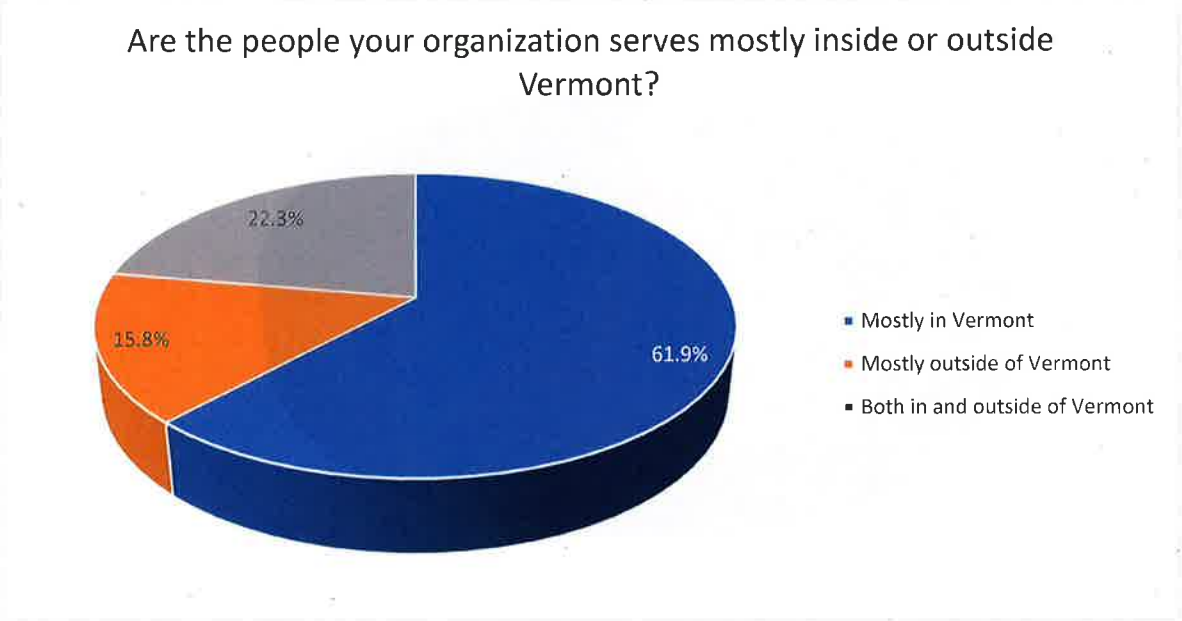
The majority of businesses survey were not home-based businesses.



Most businesses surveyed (83.7%) had 1 location in Vermont.



Most organizations surveyed (61.9%) serve customers inside Vermont, some (22.3%) served both customers inside and outside of Vermont, and about 15.8% served customers mostly outside of Vermont.



Most businesses (69.6%) surveyed had 5 employees or less.