Statewide Telecommunications Assessment Report

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LICENSING AND REGULATORY AFFAIRS

Contents

Executive Summary

Beginning in the 1970s and 1980s, changes with telecommunications technology and policies began taking shape and have continued to evolve since that time. The accelerated changes, especially during the latter part of the 20th Century and the early part of the 21st Century, have increased the availability of a variety of different types of services, reshaped the competition landscape of these types of services, and resulted in different regulatory oversight models for these different services. As a result, there are vulnerabilities and gaps that may exist today within the telecommunications environment that have merged over time.

As telecommunications technology has evolved throughout the 20th century and continued to rapidly change during the early part of the 21st century, the Commission considered it important at this time to provide an assessment of telecommunications services in Michigan. Pursuant to Strategy 2-1 of the Commission's 2021-2025 Strategic Plan, the Commission will issue a Statewide Telecommunications Assessment Report to identify recommendations and improvements related to telecommunications services in Michigan. This report is intended to identify the gaps and make recommendations about ways to address those issues. This is especially important during a time of increased extreme weather due to climate change, including more frequent and more intense storm activity that leads to significant flooding, forest fires, tornadoes, hurricanes, and blizzards, all of which can impact telecommunications service. Additionally, it is imperative to identify these gaps and make recommendations to address systemic forms of discrimination and inequality that effect the affordability, adoption, access, and reliability of telecommunications services. Lastly, the ongoing COVID-19 global pandemic has not only demonstrated the importance of relying on telecommunications and broadband service for daily life, but it has also highlighted existing gaps and disparities with these services among different populations throughout not only Michigan, but the country.

This State Telecommunications Assessment Report provides background information on telecommunications service as it has evolved over the 20th century, and the laws that have shaped telecommunications regulation and policy in Michigan. This report also provides information regarding sections within the Michigan Telecommunications Act (MTA) that have been deregulated and examines some responsibilities of the Michigan Public Service Commission (MPSC) that go beyond the MTA and the Federal Telecommunications Act (FTA). However, more specifically, the focus of this report is specific to the ever-evolving telecommunications services and technologies such as wireless, broadband, and Voice-over-Internet-Protocol (VoIP).

The report outlines advantages and disadvantages to these new technologies and highlights the increasing interconnectedness that new telecommunications technologies have with other utilities and industries, including energy, water, and transportation. Lastly, while broadband service is not classified as a telecommunications service, individuals are becoming increasingly more reliant on broadband service as their primary means of communication. As such, the report also provides an overview regarding concerns with broadband accessibility and adoption.

This report is limited in scope, focused on an assessment regarding telecommunications service and does not seek to provide a complete analysis of the many functions or regulatory requirements of the MPSC applicable to the telecommunications industry. While deregulation of some telecommunications services has occurred and is discussed within this report, the telecommunications industry is not fully deregulated in Michigan. In addition, this report provides a limited overview of the new and advancing forms of telecommunications technology. The report does not provide in-depth technical detail regarding the different types of new and advanced telecommunications services. While all efforts were made to ensure the accuracy of the information in this report, as previously stated, the telecommunications industry can change rapidly. As such, the information contained in this report is accurate as of the date it was written but may no longer be current depending on when it is being read.

Lastly, this report provides recommendations regarding the MPSC's role related to telecommunications and broadband services and provides recommendations for how to improve customer protections related to telecommunications service, while also advocating for maintaining current regulatory policy pursuant to the MTA. In addition, the report is forward-looking, and as broadband service is evolving from a luxury to a necessity, this report provides recommendations regarding potential oversight roles for the Commission, and how the Commission can best serve the citizens of Michigan.

Introduction

As telecommunications technology has evolved and continues to rapidly change, the availability of a variety of different types of services has increased, the competitive landscape of these services has been reshaped, and different regulatory oversight models have been developed. As a result, there are vulnerabilities and gaps that may exist today within the telecommunications environment that have evolved over time. Due to these changes, it is important to perform a state assessment regarding telecommunications services in Michigan. This report is intended to identify those gaps and make recommendations about ways to address those issues. This is especially important during a time of increased extreme weather due to climate change, which can impact telecommunications service. Additionally, it is important to identify these gaps and make recommendations as there is an increased effort to confront systematic forms of discrimination and inequality, especially as it relates to affordability, adoption, access, and reliability of telecommunications services. Lastly, the ongoing COVID-19 global pandemic has not only demonstrated the importance of relying on telecommunications and broadband service for daily life, but it has also highlighted the gaps and disparities with these services among different populations throughout not only Michigan, but the country.

This report will provide an overview of the history of the Michigan Public Service Commission, as well as an overview of the different laws that provide the Commission with telecommunications regulatory authority. This report will also examine different areas of deregulation of telecommunications service, telecommunications competition, and Commission authority beyond the Michigan Telecommunications Act and the Federal Telecommunications Act. The report will then review and assess current telecommunications technology and examine the advantages and disadvantages of these evolving technologies.

Lastly, the report provides recommendations regarding the role of the Michigan Public Service Commission as it relates to telecommunications and broadband service. The recommendations will also focus on consumer protections, and how the Commission can best serve the citizens of Michigan.

Telecommunications in Michigan

Before reviewing and discussing the current state of the telecommunications industry in Michigan and how that industry is evolving, it is important to first understand the history of telecommunications in Michigan. In this section, we will give a brief history of the Michigan Public Service Commission and explain the Commission's role with telecommunications. In addition, we will also provide a brief overview of the statutes that provide the Commission with regulatory authority, and changes to those statutes throughout the years.

History of the Michigan Public Service Commission

In 1873, the Michigan Legislature established the Michigan Railroad Commission (MRC) with a single commissioner to regulate railroad rates and conditions of service. The Legislature expanded the Railroad Commission to a three-member body in 1909 and expanded its responsibilities to include regulation of electric rates and conditions of service. The MRC's authority was further expanded to include telephone service in 1911.

In 1919, the Michigan Railroad Commission was abolished and replaced by the Michigan Public Utilities Commission (MPUC), comprised of five members, each serving a four-year term. Public Act 419 of 1919 gave the MPUC authority to regulate steam and natural gas, expanding to water carriers (ferry services) in 1921, natural gas pipelines through Public Act 9 of 1929, petroleum pipelines through Public Act 16 of 1929, and motor carriers (i.e., trucking and freight) through Public Act 254 of 1933.[1]

The MPUC was abolished in 1939 and the Michigan Public Service Commission (MPSC / Commission) was established in its place as a five-member panel with each member serving a five-year term.[2] The Legislature reduced the body to a three-member panel in 1947, with members serving staggered six-year terms. At that time, the Legislature also imposed the first political restrictions on Commission members since the Railroad Commission had been abolished. MPSC members were prohibited from serving as officers or committee members of any political party organization. In 1951, the Legislature passed Public Act 275, which required that not more than two Commissioners may represent a single political party, which is still in effect today.[3]

History of Telecommunications Regulation

For most of the 20th century, telephone service was considered a natural monopoly, with one carrier in a given area and rates and service regulated by state public service commissions and the Federal Communications Commission (FCC), similar to how some utilities are still regulated today. While there were smaller companies operating as local providers in some areas, particularly rural locations, AT&T was the dominant telecommunications service and equipment provider in both local and long-distance service. Technological changes and an interest in bringing competitive forces to bear in regulated industries led the U. S. Justice Department to file antitrust lawsuits against AT&T, eventually resulting in the 1982 settlement under conditions

[1] Public Act 419 of 1919, Public Act 9 of 1929, Public Act 16 of 1929, and Public Act 254 of 1933.
[2] See Public Act 3 of 1939 for the creation of the Michigan Public Service Commission.
[3] Public Act 275 of 1951

granted by U.S. District Court Judge Harold Greene[4]. This led to the break-up of AT&T (known as the break-up of the Bell System in 1982), with AT&T retaining the long-distance portion of its business as well as equipment manufacturer Western Electric, and the local telephone business spun off into seven regional Bell operating companies (RBOCs), also sometimes known as the "Baby Bells". The breakup of AT&T spurred competition in long-distance telephone service but did not immediately facilitate competition in local telecommunications markets as these were still largely dominated by the RBOCs. However, this decision ultimately led to the rise of the important distinction between the Incumbent Local Exchange Carriers (ILECs), which are the local exchange providers offering service before the break-up of the Bell System, and the Competitive Local Exchange Carriers (CLECs), which compete with other providers including the ILECs. CLECs often provide services to their end users through their own network and switching, by reselling service from an incumbent local exchange carrier, or by utilizing certain parts of an ILEC's network. There are currently 37 ILECs and 139 CLECs licensed to provide local service in Michigan, although some ILECs also provide service outside of their original territory and could be considered a CLEC in those areas.

Michigan Telecommunications Act – Public Acts Over the Years

Michigan policy makers were among the first in the U.S. to recognize that consumers could be better served by a more competitive telecommunications industry. To facilitate this, in 1991 the Michigan Legislature passed the Michigan Telecommunications Act (MTA) in an effort to improve opportunities for economic development and promote customer choice in telecommunications. The MTA, as amended, has reshaped the Commission's role in telecommunications regulation to promote competition in the marketplace.

Below is a listing of the major telecommunications laws affecting telecommunications in Michigan since the break-up of the Bell System in 1982:

PA 305 of 1986 – Sought to facilitate technological innovations like fiber-optic cable and wireless communication services.

PA 179 of 1991 – A major underpinning that introduced competition, the Consumer Price Index rate regulation, and authorized the End User Common Line Charge (EUCL).[5]

PA 216 of 1995 – Required rate balancing and unbundling and set terms for interconnection between providers.

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[4] This settlement agreement was later defined as the AT&T Consent Decree in the Telecommunications Act of 1996. It is also known as the Modification of Final Judgment.
https://www.justice.gov/atr/page/file/1429156/download

[5] PA 179 of 1991

Federal Telecommunications Act of 1996 (FTA) – Sought to establish competition in local telephone service. Many observers say the FTA was patterned after Michigan's telecommunications legislation.

PA 295 of 2000 – Eliminated EUCL and imposed price freeze, increased slamming penalties, and expanded local calling.[6]

PA 235 of 2005 – Shifted the paradigm away from "facilitated" competition between companies to a system that facilitates competition between technologies.[7]

PA 182 of 2009 – Provided for the restructuring of intrastate switched toll access service rates.[8]

PA 58 of 2011 – Removed the last remnants of retail rate regulation and several consumer-focused service quality protections. Removed the requirement of the MPSC to submit an annual status of competition report to the Governor and Legislature. Allowed providers to opt out of filing Basic Local Exchange Service (BLES) tariffs.[9]

PA 52 of 2014 – Updated the conditions under which a provider of basic local exchange service or toll service can discontinue service in Michigan.[10]

PA 237 of 2016 – Updated language in the deaf/hard of hearing section to add deaf/blind.[11]

PA 34 of 2020 – Aligned Michigan's Lifeline eligibility requirements to that of the Federal Lifeline program., Allows providers to opt-out of the Michigan Lifeline program beginning Aug. 30, 2022. If a provider of basic local exchange service provides 90 days' written notice to the Commission and to all individuals receiving the reduced Lifeline rate under this section, the provider may, beginning Nov. 30, 2022, opt out of offering the reduced rate described under this section.[12]

PA 69 of 2021 – Eliminated the requirement for telecommunications providers to provide a telephone directory to customers.[13]

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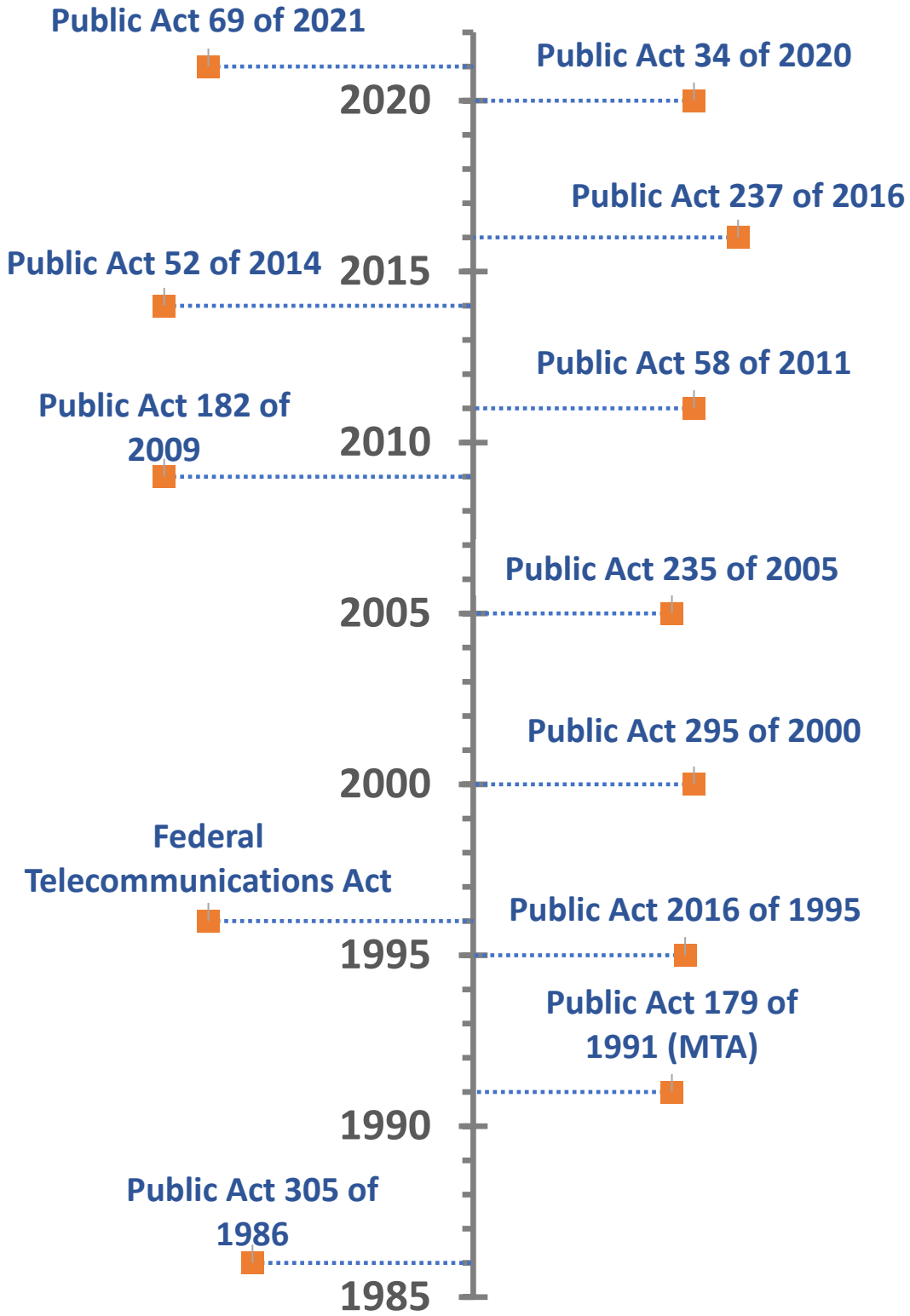
6 PA 295 of 2000
7 PA 235 of 2005
8 PA 182 of 2009
9 PA 58 of 2011
10 PA 52 of 2014
11 PA 237 of 2016
12 PA 34 2020
13 PA 69 of 2021

The last significant rewrite of the MTA was in 2011 through Public Act 58. While there have been some changes made to the MTA since that time, none have been as significant as the changes in 2011. Figure 1 provides a timeline of the significant telecommunications laws impacting Michigan.

Figure 1

Significant Telecommunications Laws



The Federal Telecommunications Act

As noted, the FTA, otherwise known as the Telecommunications Act of 1996, was enacted to help set the parameters for competition. However, in addition to setting those parameters, it also delegated regulatory authority to the states. In Section 201(1) of the MTA, it states, "Except as otherwise provided by this act or federal law, the commission has the jurisdiction and authority to administer this act and all federal telecommunications laws, rules, orders, and regulations that are delegated to the state, including, but not limited to, the authority to arbitrate and enforce interconnection agreements and to establish rates in accordance with the standards set forth by applicable law." In addition, Section 201(2) of the MTA states, "The commission shall exercise its jurisdiction and authority consistent with this act and all federal telecommunications laws, rules, orders, and regulations." Pursuant to the MTA, the Commission has additional regulatory authority over telecommunications issues not specifically included in the MTA but delegated to the states by federal law. Examples of this delegated authority include authority regarding interconnection agreements and eligible telecommunications carrier issues.

Reduced Regulation

As the telecommunications industry has evolved, and new service offerings using different platforms (cellular service, Voice-over-Internet-Protocol, etc.) have emerged, the regulatory role of the Commission over traditional landline service has been curtailed. Similar regulatory frameworks for emerging technologies have not been established, which could leave gaps in oversight in consumer protection, accessibility, reliability, and safety. During the past 30 years there have been changes made to the MTA, including some changes that reduced regulation. However, the telecommunications industry is not completely deregulated, and the Commission continues to have a number of regulatory responsibilities delegated to it by federal laws, rules, orders, and regulations as well as responsibilities that remain in the MTA and other state statutes, such as the METRO Act, 911 Act, and the Uniform Video Services Local Franchise Act.

Next, we will highlight the most significant changes in the MTA that have reduced regulation.

Elimination of Retail Rate Regulation

Prior to 2005 the Commission was responsible for setting retail rates for basic local exchange service.[14] In addition, providers were required to price their services above cost, as determined by a Total Service Long Run Incremental Cost (TSLRIC) study. These cost studies were used both to set price floors for retail rates as well as to set wholesale rates that incumbent providers are required to offer to competitive providers. This was done to create an even playing field for competitive providers and encourage them to enter the market. In 2005, with the passage of Public Act 235, this retail rate regulation was reduced to a single residential rate. This was known as Primary Basic Local Exchange Service (PBLES) and guaranteed a minimum number of local calls and minutes per month to residential customers. In 2011, Public Act 58 was passed which eliminated the last remnants of retail rate regulation by removing the requirement to provide PBLES as well removing the requirement that retail rates may not be set below cost.

Elimination of Quality of Service Rules

Public Act 58 of 2011 also included a provision that rescinded the MPSC's quality of service rules for telecommunications providers. Prior to this, the Commission had put in place administrative rules that set minimum standards for certain aspects of the services provided by local exchange carriers. These rules included requirements related to addressing customer complaints, reporting service disruptions, the quality of customer voice calls, and network capacity, among others. Due to the rescission of these rules, the MPSC's authority to regulate the quality of service provided to Michigan's telecommunications subscribers was reduced, although some issues can still be addressed through the customer complaint process.

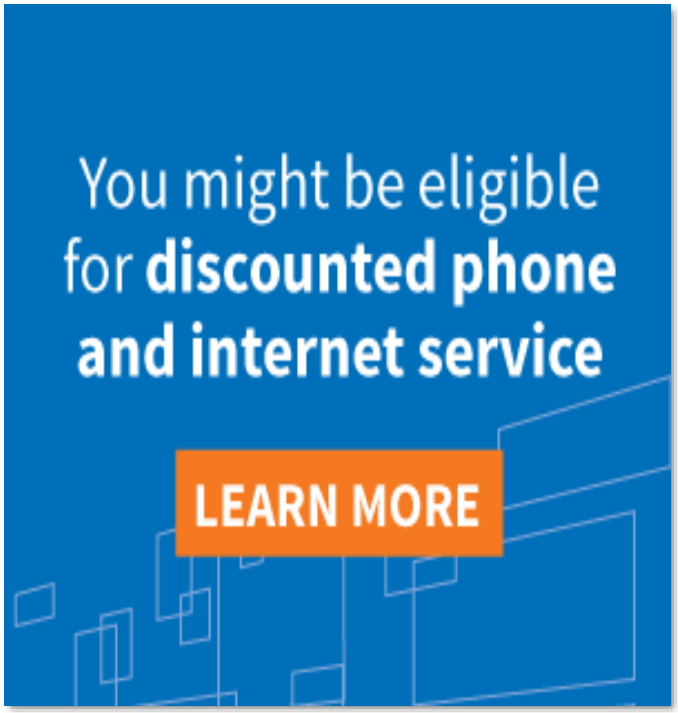
Elimination of Billing Rules

The 2011 amendments to the MTA also rescinded rules the MPSC had previously promulgated to set billing standards for local exchange providers. These rules set minimum standards for providers such as the number of days a customer was given to pay their bill, required information that must be included in customer bills, how billing disputes would be handled, and other associated items. The recission of these rules means that telecommunications billing is now much less regulated, as providers are no longer required to meet a minimum standard set by the Commission. The MPSC continues assisting customers that have billing disputes with providers and in many cases can still help resolve the dispute. Customers continue to have the option to file a formal complaint against their provider with the Commission, but there are fewer options of enforcement available now than there were when the billing rules were in effect.

[14] As defined by the MTA, basic local exchange service is: "the provision of an access line and usage within a local calling area for the transmission of high-quality 2-way interactive switched voice or data communication."

Changes to the Lifeline Program

Lifeline is both a federal and state program to help reduce the cost of telecommunications services for income-eligible customers. The program originated at the federal level in 1985 following the breakup of AT&T and came about in Michigan with the 1991 passage of the MTA. Originally the program was designed to reduce the cost of voice landline telephone service and provided a monthly discount to eligible customers. Over the years many changes have been made to this program at the federal level including the addition of a wireless lifeline program in 2005, the addition of broadband as a supported service in 2016, and the shift to a national lifeline eligibility verifier in 2019.



While the addition of broadband service changed the federal Lifeline program, the Michigan Lifeline program, as defined in the MTA, continued to only support landline voice services along with having a slightly different set of consumer eligibility requirements compared to the federal Lifeline program. This changed in 2020, when Public Act 34 of 2020 amended the MTA to adopt the federal Lifeline consumer eligibility requirements for the state program. It also allows providers to opt-out of the state program completely beginning November 30, 2022. Until that time, the state Lifeline program will continue to operate providing additional discounts on voice service for Michigan consumers and will remain in place after 2022 for providers that do not choose to opt-out. At the end of December 2021, there were approximately 2,690 voice-only landline Lifeline customers in Michigan.

Telecommunications Competition and Interconnection Agreements

While the broadband market has expanded and the decisions of the FCC have reduced access to elements of the ILECs' networks offered to CLECs on a wholesale basis, the CLECs' reliance on interconnection to the ILEC network to provide competitive services for customers continues to remain. The Commission still provides oversight of AT&T Michigan's (it was known as Ameritech Michigan at the time of the initial submission of performance measurements, benchmarks, and reporting in U-11830) performance measures and remedy plan, with its obligation to provide nondiscriminatory access to its facilities and services. This proceeding is derived out of AT&T Michigan's desire to offer long distance service, which had been prohibited after the break-up of the RBOCs, until the RBOCs demonstrated that they had opened up their networks to competition.

The performance measures and remedy plan are currently reviewed every two years in MPSC Docket No. U-11830 by a collaborative body of participating CLECs, AT&T, and the Midwest state Commissions of Michigan, Illinois, Indiana, Ohio and Wisconsin.[15] The CLECs and AT&T Michigan have agreed to extend the performance measures and remedy plan that were established in the 2008 collaborative for the 2010, 2012, 2014, 2018 and 2020 plan renewal periods, for which the Commission has issued orders each of those years approving the plans. Changes to these plans require filing interconnection agreement amendments on behalf of AT&T Michigan and the CLECs.

The numerous interconnection agreements and amendments that are filed each year with the Commission continue to demonstrate a reliance on the wholesale interconnection services provided by the ILECs for competition, particularly in the business sector, to remain robust. The MPSC approved approximately 74 new interconnection agreements and amendments last year.

9-1-1 Responsibilities

While the previous section provided historical background regarding the Commission's statutory authority regarding telecommunications and some areas of deregulation, this next section focuses on the Commission's statutory responsibilities and oversight of telecommunications which are not limited to those provided under the MTA or FTA, specifically regarding 9-1-1. The MPSC also has responsibilities under the Emergency 9-1-1 Service Enabling Act (PA 32 of 1986 or the 9-1-1 Act[16]) as discussed below.

Section 413 of the 9-1-1 Act allows the Commission to promulgate administrative rules as specifically authorized under that section of the 9-1-1 Act. In doing so, the Commission must consult with and consider the recommendations of the State 9-1-1 Committee (SNC) when promulgating these rules. Under this section, the Commission has promulgated rules for public safety answering point (PSAP) telecommunicator training standards

[15] MPSC Docket No. U-11830
[16] mcl-act-32-of-1986.pdf

as well as for multiline telephone systems (MLTS) standards.[17]

Pursuant to section 713 of the 9-1-1 Act, the Commission also has a designee assigned to the 21-person SNC. This committee, created within the Department of State Police, works to develop standards and model system considerations and makes other recommendations for emergency telephone services. The SNC's authority is limited to what is prescribed under the 9-1-1 Act.

Section 403 of the 9-1-1 Act also allows the SNC, counties, or 9-1-1 service districts that are having problems with providers not submitting appropriate fees to notify the Commission for its investigation and recommendation as to whether the Attorney General should pursue further action. Section 602 of the 9-1-1 Act allows disputes between or among service suppliers, counties, public agencies, public service agencies or any combination of those entities to be brought to the Commission as a contested case for resolution through an administrative hearing.

One of the Commission's more significant roles pertaining to 9-1-1 is its responsibilities in approving cost studies submitted by providers for the transport, routing, and delivery of wireless and IP-based 9-1-1 service. Once the cost studies are approved, providers can submit monthly invoices of their costs to the Commission for reimbursement.[18] Staff reviews these invoices and the Commission issues a minute action for the amount approved in the invoice. Providers of 9-1-1 service then seek reimbursement through the Michigan Department of Treasury.

On December 1, 2020, as required under the 9-1-1 Act, the Commission issued a report to the Legislature and Governor detailing incurred and ongoing costs and estimates related to the transition of counties and 9-1-1 service districts in Michigan to an IP-based 9-1-1 service provider. That report can be located on the Commission's website.[19]

New Technology

The telecommunications industry is one that is largely driven by technology and its advancement. During the 20th century many innovations in telecommunications were realized, including the landline telephone network itself, cellular telephones, and the start of the internet. Technological innovation continued into the 21st century with developments like broadband to replace dial-up internet, and advancements in cellular technology including wireless internet. Customers started

[17] The 9-1-1 telecommunicator training standards were promulgated in 2012. While the MLTS requirements were initially crafted as administrative rules in 2011, they have since been rescinded and MLTS requirements were incorporated as statutory requirements in section 413 of the 9-1-1 Act, although these requirements in the 9-1-1 Act were recently replaced by the federal MLTS requirements as a result of PA 126 of 2021, which became effective on December 17, 2021.

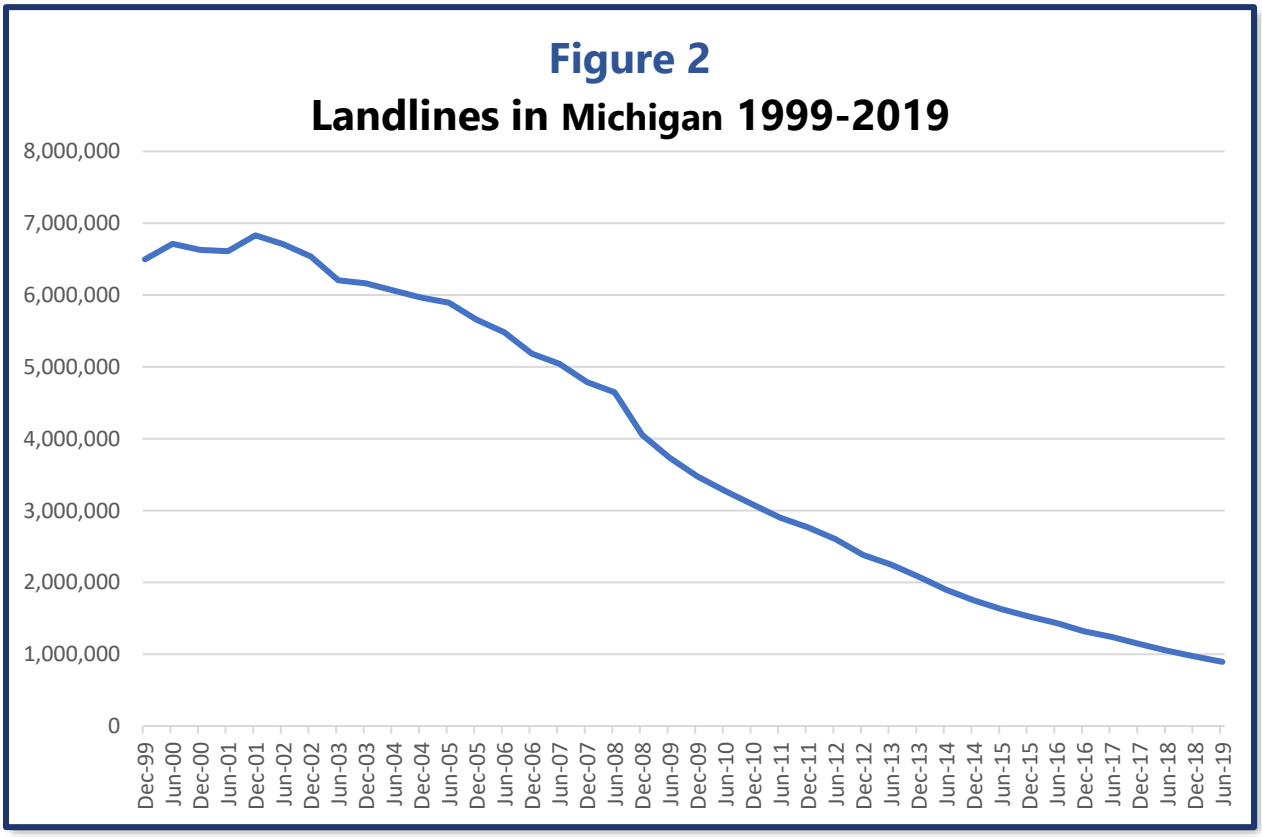
[18] Prior to enactment of PA 126, providers were allowed to submit invoices on a quarterly basis.

[19] Status of Cost Information Related to IP-Based 9-1-1 Services in Michigan

using alternatives to traditional landline telephone service that became available due to this new technology.

Beginning in the year 2000, the FCC required telecommunications providers to submit data twice a year with their subscriber counts for various services using FCC Form 477[20]. This data shows the impact of new technology on telecommunications within the state of Michigan. According to this data, in December of 1999 telecommunications providers operating in Michigan reported just over 6.4 million landlines in service. This number peaked in December of 2001, at the height of the dial-up internet era, at approximately 6.8 million lines, and then started to decline. In June of 2019 (the most recent period Form 477 voice services data is available, as of the date of this report), the number of landlines reported by providers in Michigan was down to 894,000.

Figure 2 shows the changes in the trend for landline in service in Michigan since 1999.



Source: FCC Form 477 Data

This decline is largely attributable to the advancement of new technology. As broadband internet service became more commonly available throughout Michigan, dial-up internet service was no

[20] https://www.fcc.gov/economics-analytics/industry-analysis-division/form-477-resources

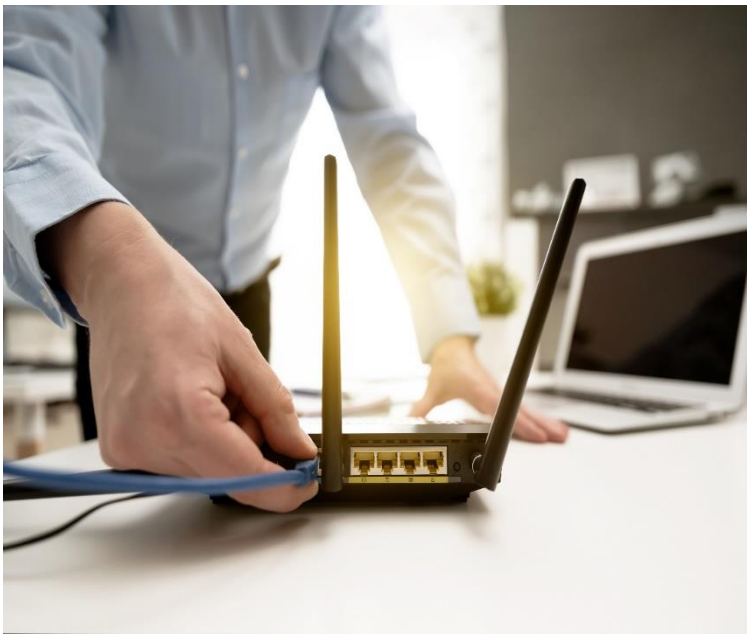
longer as widely used and as a result, customers could cancel additional landlines they had subscribed to as dedicated modem lines. Telecommunications providers also began using broadband lines to offer voice services through Voice over Internet Protocol, or VoIP. Cellular technology advanced during this time and exploded in popularity leading to many choosing to forgo landline service and replace it with cellular telecommunications. However, due to this shift towards newer technology, there are gaps in the regulatory regime when compared to traditional landline service that policymakers need to be aware of. These gaps may need to be addressed through legislation to make sure Michigan's citizens continue to have access to reliable and affordable telecommunications services.

Technology continues to advance and as of the date of this report, some of the most impactful technologies in the telecommunications industry include broadband internet, fifth generation cellular networks (5G), and VoIP.

Broadband Internet

Broadband internet access has become an important tool in most people's lives and is now considered essential by many. It has changed how people work, go to school, shop, connect with their community, and receive healthcare. Michigan's citizens relied even more on their broadband service in 2020 due to the COVID-19 pandemic, especially due to the need for many to work or attend school from home.

The definition of broadband can vary depending on the context, according to Newton's Telecom Dictionary: "Today's common definition of broadband is any circuit significantly faster than a dial-up phone line."[21] While this definition is what most will likely think of as being broadband, it encompasses a wide variety of technologies and services, some of which would be considered insufficient for today's internet-based applications. Therefore, the FCC has defined broadband for certain regulatory purposes based on the speeds the connection is capable of delivering. This is particularly relevant to any internet service provider receiving federal funding for broadband deployment,



[21] Newton's Telecom Dictionary, 31st Edition.

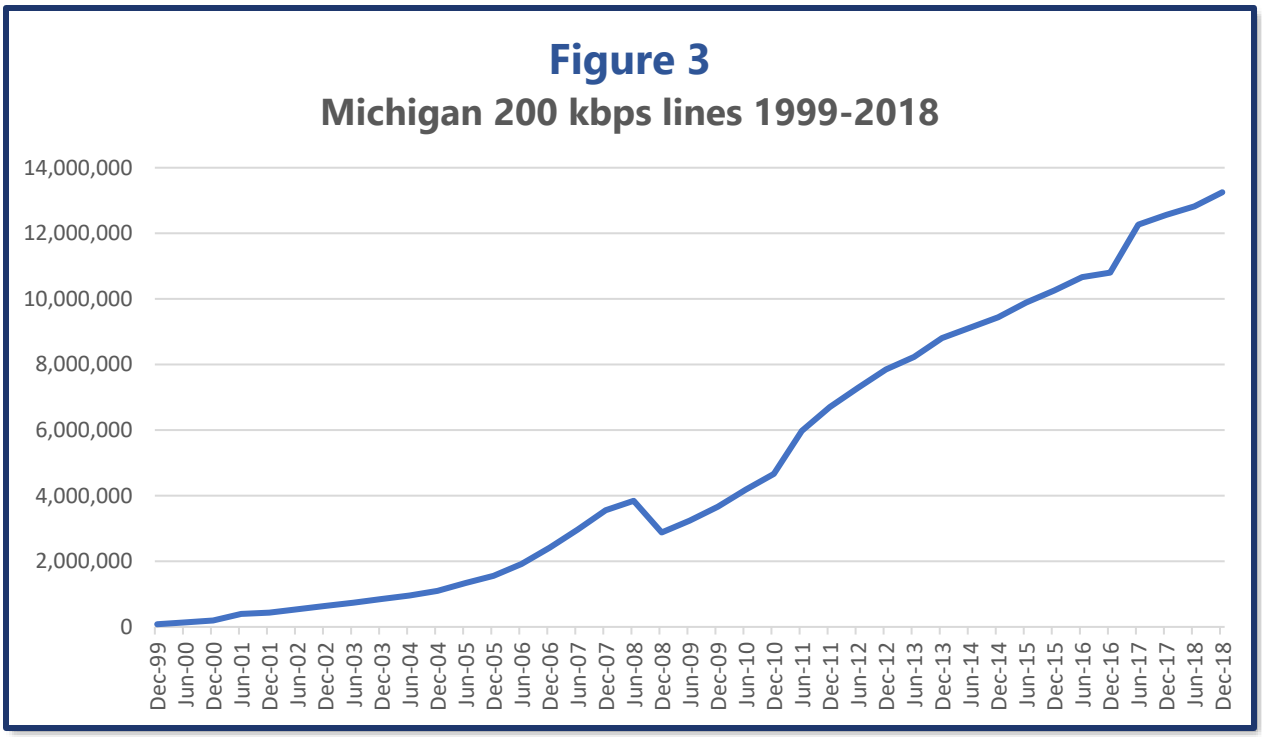
such as through the Universal Service Fund, because broadband supported by federal funds must meet or exceed the FCC's standard. As of the date of this report, the FCC's definition of broadband is a connection capable of 25 Mbps downloads and 3 Mbps uploads[22]. This definition has evolved over time and has been updated as technology advances. It was most recently changed in 2015 and reaffirmed in 2020 in the FCC's annual Broadband Deployment Report. This definition only applies to "fixed" services such as cable internet, Digital Subscriber Line (commonly known as DSL), fiber to the home, and fixed wireless service. For mobile wireless (cellular) the FCC has not established a fixed benchmark, stating that it would be unreliable due to variability in performance of mobile wireless service. The FCC has also continued to maintain the position that mobile and fixed broadband services are not yet functional substitutes for each other in all use cases[23]. Mobile broadband technology continues to advance (see below for information on recent advances) but it has limitations and is not yet at the point where it can fully replace fixed broadband service for all uses.

According to data available from the FCC, broadband internet in Michigan has grown from approximately 81,000 connections capable of 200 kbps in December of 1999 to over 13.2 million in December of 2018, the most recent time period for which data is available.[24] While 200 kbps is no longer considered to be broadband by the standard set by the FCC, and most would consider it to be too slow for modern uses, it was the standard used for data collection in the early days of Form 477 and it is useful in tracking the growth of broadband over time. Figure 3 shows this growth from 1999-2018. The small drop in 2008 was most likely due to changes in reporting criteria by the FCC and not an actual drop in subscriber counts.

[22] Fourteenth Broadband Deployment Report. ¶ 12. https://docs.fcc.gov/public/attachments/FCC-21-18A1.pdf

[23] *Id* ¶ 11.

[24] Internet Access Services Reports: https://www.fcc.gov/internet-access-services-reports



Source: FCC Internet Access Services Reports

5G Wireless

Cellular technology has had a tremendous impact on telecommunications in Michigan and nationwide. What started as a method for analog mobile voice calls has evolved into digital voice and high-speed internet and has transformed many aspects of peoples' lives. Most cellular devices

in use now rely on what the industry calls the fourth generation of cellular technology, or 4G. This technology launched during the 2009-2011 timeframe and supported faster mobile broadband than prior third generation networks, as well as other technical changes to improve service. The cellular generations leading up to 4G were as follows:

- ***1G***: Developed in the late 1970s, this technology was the original analog voice cellular system that was used by cellular devices until the 1990s.
- ***2G***: This second-generation technology launched in the 1990s which replaced analog voice with digital voice, introduced SMS text messaging, and eventually included some mobile internet capabilities.
- ***3G***: Launching shortly after the turn of the century, 3G technology brought faster internet speeds. The technology continued to improve and eventually was fast enough to support early streaming video and other internet applications.

Typically, there has been a new wireless generation approximately every 10 years and that trend continues today. Technology has advanced and cellular providers are currently deploying fifth generation cellular networks, or 5G.

What is 5G?

Fifth generation cellular technology offers several improvements over the current 4G technology. 5G allows for faster mobile data speeds, lower latency, as well as other service improvements. 5G also supports a greater number of devices per tower or base station compared to 4G, which is important considering the growing number of connected devices in use and future uses such as connected vehicles. While the technical details of 5G are beyond the scope of this report, one aspect worth understanding is the wider range of radio frequencies used by 5G. Due to the physics of radio waves, lower frequencies travel further from the base station and have better penetration through walls and other obstacles but are slower than higher frequencies, which offer faster data speeds but will not travel as far. 5G is commonly broken down into three bands of frequencies:

- *Low band frequencies* have the lowest speeds but have the widest coverage and are more capable of working through obstructions such as terrain and buildings.
- *Mid band frequencies* are balanced between speed and coverage and are similar to the frequencies used by 4G, however the technological improvements of 5G will make them faster.
- *High band frequencies*, sometimes referred to as millimeter wave or ultra wideband, can offer incredibly fast access speeds but are very limited in range.

One of the common misconceptions about 5G is that it requires what has come to be known as "small cells", which are small versions of the equipment typically located on a cellular tower. While small cells are used for high band 5G they are not used by mid and low band. They do provide very fast broadband, however due to the short distances they can serve, it's likely they will mostly be limited to densely populated urban areas. In addition, these small cells have caused some issues related to pole attachments and rights-of-way since wireless providers frequently seek to place them on existing utility poles. This will be discussed in more detail later in this report.

5G in Michigan

The three major wireless carriers (AT&T Mobility, Verizon Wireless, and T-Mobile, which includes the former Sprint) all report 5G availability in Michigan, including some high band service available

in larger cities such as Detroit and Ann Arbor. This varies by provider since they are each following a different 5G rollout plan based on radio spectrum access and individual business plans.[25]

While the 5G rollout is underway, it is likely 4G will remain in use for many years. There are many devices still using 4G and it will take some time before wireless carriers deploy 5G to all areas currently covered by 4G. If 4G follows the same pattern as 3G, it may be 10 years or more before 4G is retired, as 3G is only now being retired from service by wireless providers.[26] As with previous generations, new 5G devices will fall back on 4G in areas where 5G is unavailable.

Michigan consumers considering upgrading to a 5G device are encouraged to check their provider's service map and speak to them about 5G coverage before deciding if having 5G access is important to them.

Voice Over Internet Protocol

One of the newer technologies in the telecommunications industry is Voice over Internet Protocol, more commonly known as VoIP. This technology allows voice communication over an internet connection, as compared to traditional landline phone service, which is routed over a circuit switched network. While VoIP as a protocol is not new, aside from early internet voice chat, it did not become a useful telecommunications technology to most consumers until there was widespread broadband adoption.

There are important definitions that apply to VoIP but not to traditional landline voice service:

[25] Maps of 5G availability for each of the three major wireless providers can be found on their respective websites:
AT&T Mobility: https://www.att.com/maps/wireless-coverage.html
T-Mobile USA: https://www.t-mobile.com/coverage/coverage-map
Verizon Wireless: https://www.att.com/maps/wireless-coverage.html

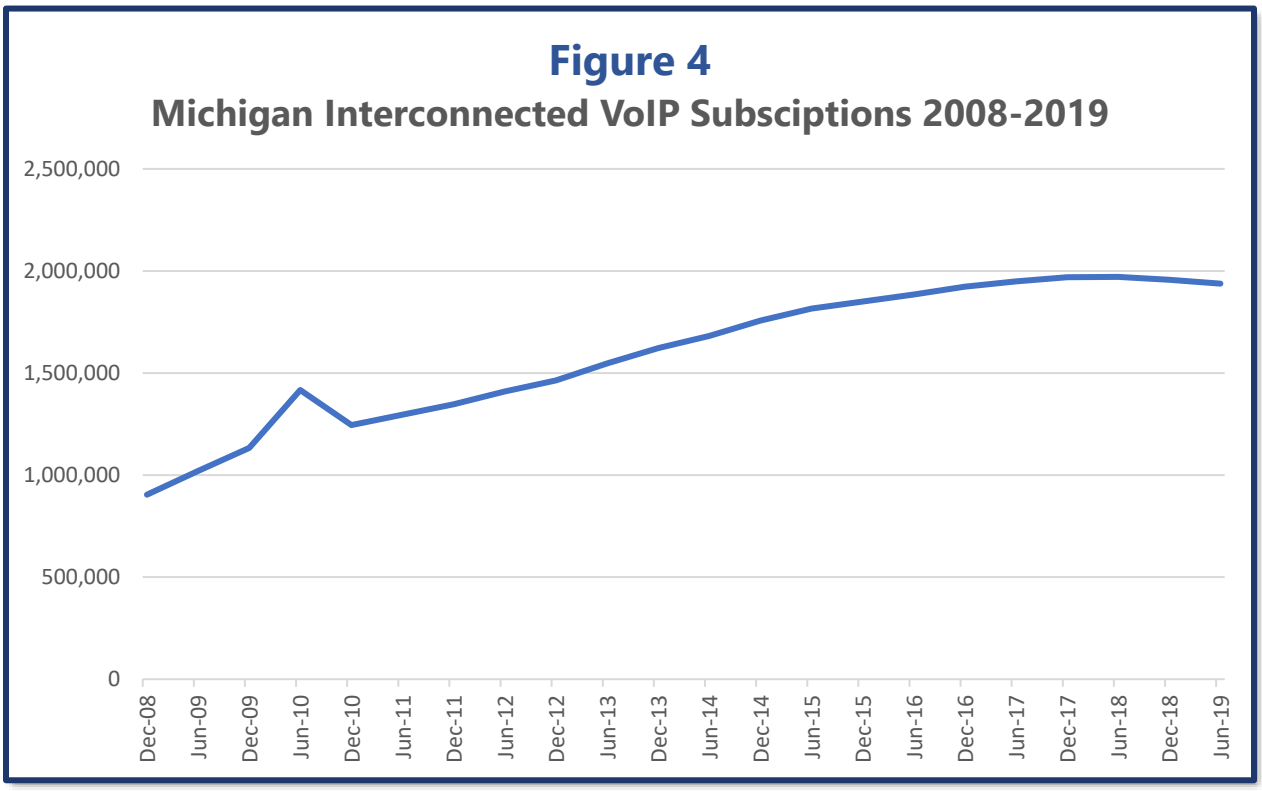
[26] As of this report the three major wireless carriers all have plans to retire 3G services in 2022. More information can be found in this consumer guide from the FCC:
https://www.fcc.gov/consumers/guides/plan-ahead-phase-out-3g-cellular-networks-and-service

- ***Static vs Nomadic VoIP***: Static VoIP is similar to landline phone service in that it is tied to a specific customer's premises. Typically, this is the case when VoIP service is provided by a cable company or other broadband provider as part of a package. The VoIP service is attached to that customer's internet equipment, such as a cable modem, and will only work when connected to the broadband provider's network from the customer's specific premises. On the other hand, nomadic VoIP is subscribed to separately from broadband service and will function when connected to any suitable internet connection. Nomadic VoIP can take several forms, including software on a computer, a specialized VoIP phone, and VoIP adapters that allow a landline phone to be connected to it and to make and receive calls using VoIP.
- ***Interconnected VoIP vs Non-Interconnected***: Interconnected VoIP can be either static or nomadic and refers to a VoIP provider being interconnected with the public switched telephone network (PSTN). This interconnection allows a customer of a VoIP provider to make and receive calls to and from any phone number, including cellular, landline, and other interconnected VoIP customers. Non-Interconnected VoIP is not connected to the PSTN and users can only communicate with other users of that particular VoIP system. This includes many internet messaging applications that have voice features, as users are only able to communicate with other users of that application.
- ***Over the Top VoIP***: Over the top (OTT) VoIP is a term used by the FCC to refer to interconnected VoIP service that is provided independently from broadband service. For example, VoIP service provided by a cable company for use on its network would not be considered OTT, while VoIP service purchased independently of the cable company by one of its broadband customers would be. This type of VoIP service is typically considered to be nomadic as well since it is not tied to a particular service location while non-OTT VoIP will typically be static, but this can vary based on the services and providers.

The FCC began collecting information on interconnected VoIP subscriptions from telecommunications providers in 2008. In December 2008, there were 904,000 interconnected VoIP subscriptions reported in Michigan, and that number has since grown to over 1.9 million VoIP subscriptions as of June 2019[27]. Until 2014, the FCC had not broken down this data by whether the subscription was OTT or not, so no long-term trend of that distinction can be viewed. However, in June 2019, 262,000 of the subscriptions reported in Michigan were OTT, while the majority 1,676,000 were provided by the same company providing the broadband connection. Many broadband providers, particularly cable internet providers, market their VoIP products as an alternative to landline phone service and offer these products as part of a service bundle. This also aligns with the majority of wireline broadband connections in

[27] Voice Telephone Services Reports: https://www.fcc.gov/voice-telephone-services-report

Michigan being served via a cable modem. Figure 4 shows the growth of interconnected VoIP in Michigan.



Source: FCC Voice Telephone Services Reports

VoIP Advantages and Disadvantages

While VoIP is frequently marketed as being equivalent to landline voice phone service, the MPSC does not consider it to be a complete substitute and has previously advised customers in Michigan to be aware of the differences when choosing telecommunications services. VoIP has distinct advantages and disadvantages when compared to traditional wireline phone service and it is important consumers are aware of these when evaluating which service is appropriate for them.

Some of the advantages of VoIP can include:

- ***Price***: VoIP may cost less than comparable landline service depending on the provider. It also typically has lower cost long distance and international rates.
- ***Features***: Since VoIP is internet based, it can offer features that may not necessarily be available to landline customers. Some of these features may include access to voicemail and other phone features via the internet or a smartphone app, advanced call screening and detail logging, and other internet-based features. These can vary based on the VoIP provider.
- ***Portability***: While this can also be a disadvantage, specifically with regards to emergency services (this is discussed further below), nomadic VoIP's portability can be an advantage as

well. Nomadic VoIP can easily be moved to any location with a broadband internet connection by simply moving the customer equipment and connecting it to the internet.

While VoIP does offer advantages compared to landline voice service, it has some disadvantages as well. These include:

- ***Reliance on Broadband***: VoIP only works if a broadband internet connection is available. Therefore, anything that results in the disruption to broadband service will also disrupt voice service. In addition, if there are service quality issues and the speed of the broadband connection becomes too low or latency becomes too high, audio disruptions or other quality issues can occur. A reliable broadband connection is an important factor in deciding to rely on VoIP.
- ***Power Requirements***: For VoIP service to work, the customer's device that connects a phone to the internet must have electrical power. If this device is separate from the device providing broadband such as a DSL or cable modem, then that device will need power as well (if VoIP is sold as part of a broadband package these devices are frequently integrated). In the event of a power outage, a backup battery is necessary to retain VoIP service. Some providers furnish these batteries; however, it is important to be aware that in the event of a long-term power outage the battery will eventually run out unless a generator or other means to recharge it is available. This contrasts with landline service that obtains its power from the provider's central office. Those providers are required to have backup power so even during long-term outages, landline service typically continues to operate.
- ***Access to Emergency Services***: While all interconnected VoIP is required to provide access to emergency services via dialing 9-1-1, there may be additional steps to make sure the phone number is associated with the correct address. Since landline service is tied to a fixed address, the provider must associate the phone number with the address so if 9-1-1 is called the location is automatically given to emergency operators. Static VoIP offered by a telecommunications or cable company is frequently set up this way as well since it is tied to customer equipment at a particular address. However, in the case of nomadic VoIP, it may be the customer's responsibility to update their address as needed to make sure 9-1-1 calls are properly routed and contain the correct location information. Customers with VoIP service should confirm with their provider what, if any, steps need to be done to set up 9-1-1 location data.[28]
- ***Compatibility with Older Technology***: Some older technology that relies on a phone connection, such as fax machines and alarm systems, may not be compatible with a VoIP line. There may be upgrades available to address compatibility for additional cost. VoIP has advantages and disadvantages when compared to a traditional landline and it is important

[28] More information can be found in the following FCC consumer guide: https://www.fcc.gov/consumers/guides/voip-and-911-service

that potential subscribers be aware of these differences so they can make an informed decision about what telecommunications services will best meet their needs. The MPSC recommends anyone considering VoIP as an alternative to a landline to carefully review and evaluate the service being considered.

Blending Old and New Technology

The original landline telephone network relied exclusively on copper wiring to carry voice calls. As technology advanced and fiber optics became available, telecommunications providers started incorporating them into their networks due to their ability to carry more traffic at faster speeds and over longer distances. This resulted in what is typically known as a hybrid fiber/copper network, where fiber and copper are used together to provide telecommunications services. As we've moved into the 21st century the limitations of copper have become more apparent, particularly when it comes to high-speed internet, and some providers are moving to an all-fiber network while others are finding new ways to utilize copper to offer higher speeds. There remains a large amount of copper telecommunications cable and associated support equipment that is still in service and being utilized with new technologies to offer 21st century services. This blending of old and new technologies has created some issues that are discussed in further detail below.

Pole Attachments

Pole attachments refer to leasing space on a utility or telecommunications pole for cable or other equipment. A common example of this is when telephone and cable tv cables are attached to the same pole that electrical wires are on. Pole attachments are generally regulated by the FCC unless a state notifies the FCC that it chooses to do so itself. Michigan provided notice to the FCC on January 19, 1981, certifying "that it regulates the terms, rates and conditions for pole attachments and that, in so regulating, it considers the interests of cable television subscribers, the customers of other attaching parties and the customers of utilities." Michigan filed a follow up letter with the FCC on May 24, 1985, certifying that "a specific methodology exists in Michigan for the establishment of rates, terms and conditions of pole attachment and that such is publicly available." The FCC accepted those certifications and Michigan is considered a "reverse

preemption" state regarding the FCC's pole attachment regulations, pursuant to the FCC's Rules, 47 C.F.R §1.1401-1.1415[29].

Furthermore, MCL 460.6g provides the Commission with jurisdiction to regulate the rates, terms, and conditions of pole attachments by attaching parties. Subsection (2) of MCL 460.6g states, in relevant part, that "[t]he commission shall ensure that the rates, terms, and conditions are just and reasonable and shall consider the interests of the attaching parties' customers as well as the utility and its customers."[30]

Section 361 of the MTA additionally provides conditions and requirements for telecommunications pole attachments.[31]

Pole attachments have become an issue with new technology, particularly with electric utility pole attachments, as more providers seek to attach to existing poles for wireline high speed internet and for small cell 5G equipment. As previously mentioned, high band 5G has very fast service, but can only serve a limited distance from the base station, so more of these small cells are required to effectively serve an area when compared to low and mid band 5G. Many providers see utility poles as an ideal place to install this equipment due to their locations in densely populated areas. Public Act 365 of 2018 (the Small Cell Act of 2018) granted wireless service providers and wireless infrastructure providers access to the public rights-of-way and the ability to attach to poles and structures in the public rights-of-way. It also standardized the fees for collocations.[32] The Commission does not have any oversight of this Act.

Rights-of-Way Issues

Public Act 48 of 2002, the Metropolitan Extension Telecommunication Rights-of-Way Oversight (METRO) Act, provides the Commission with authority concerning municipal rights-of-way issues.[33] The purpose of the METRO Act is to:

- Encourage competition in the availability, cost, terms, and other conditions of providing telecommunication services.
- Encourage the introduction of new services, the entry of new providers, the development of new technologies, and increase investment in the telecommunication infrastructure in this state.

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[29] https://www.ecfr.gov/cgi-bin/text-idx?SID=8dfc4bffe8114292d14547ed1cb45532&mc=true&node=sp47.1.1.j

[30] http://legislature.mi.gov/doc.aspx?mcl-460-6g

[31] http://legislature.mi.gov/doc.aspx?mcl-484-2361

[32] Public Act 365 of 2018 – Small Cell Act. The Small Cell Act does not apply to all entities that own poles, including investor-owned utilities whose rates are regulated by the Commission.

[33] Public Act 48 of 2002 – Metropolitan Extension Telecommunications Rights-of-Way Oversight Act.

- Improve the opportunities for economic development and the delivery of telecommunication services.
- Streamline the process for authorizing access to and use of public rights-of-way by telecommunication providers.
- Ensure the reasonable control and management of public rights-of-way by municipalities within this state.
- Provide for a common public rights-of-way maintenance fee applicable to telecommunication providers.
- Ensure effective review and disposition of disputes under this act.
- Allow for a tax credit as the sole means by which providers can recover the costs under this act and to ensure that the providers do not pass these costs on to the end-users of this state through rates and charges for telecommunication services.
- Promote the public health, safety, welfare, convenience, and prosperity of this state.

Under the authority of the METRO Act, the Commission prescribed the application process and permit forms used by telecommunications providers for rights-of-way access. Prior to the METRO Act, municipalities created their own permit forms and determined their own permitting fees, which made the permitting process more difficult to navigate for providers. As more providers sought to deploy high speed internet access, rights-of-way issues and disputes increased and the METRO Act was created to help resolve these issues and create uniformity.

The MPSC Staff assists providers and municipalities with questions and informal disputes that arise during the permitting process. The METRO Act also provides for a formal dispute resolution process through mediation provided by the Commission.

Municipalities are required to provide the Commission a notice of each permit they approve or deny, and those permits are tracked and posted on the Commission's website.[34] Municipalities are required to take action on a permit request within 45 days of the application date and Commission Staff verifies that they are following the METRO Act.

Providers pay an annual rate of $0.05 per linear foot for their telecommunications facilities located in the public rights-of-way. These fees are paid to the Local Community Stabilization Authority (LSCA), which replaced the METRO Authority as a result of Public Act 88 of 2014, amending the original METRO Act.[35] The LCSA then disburses those fees to municipalities.

Providers are allowed tax credits based on their annual linear footage fees paid under the Act. This is meant as an incentive for deploying broadband and telecommunications service and it

[34] https://www.michigan.gov/mpsc/0,9535,7-395-93309_93439_93464_94128_94129_94325-503418--,00.html

[35] http://www.legislature.mi.gov/documents/2013-2014/publicact/pdf/2014-PA-0088.pdf

ensures that providers do not pass rights-of-way access costs on to end-users through rates and charges. Providers submit tax credit applications to the Commission on an annual basis and Commission Staff reviews the applications and verifies the costs paid to the LCSA pursuant to the METRO Act before granting the tax credits. In 2022, the Commission granted tax credits for over 78 providers totaling more than $29 million dollars.

Discontinuance of Service

As discussed above, technology has evolved rapidly in the telecommunications industry. As new and improved technologies become available, the reliance and regulation of basic local exchange service (landline service) has seen a decline. From 2001 to 2019 Michigan has seen a loss of almost 6 million landline customers as those customers rely on unregulated wireless and VoIP technologies to communicate. While broadband and wireless service expand their footprint in Michigan, there are still areas of this state where broadband is not available and wireless coverage is unreliable, and people continue to depend on a landline connection to communicate for their personal and business needs.

If a provider offering basic local exchange service in Michigan decides to discontinue providing the service, it must follow certain federal and state requirements to be allowed to do so. Section 313 of the MTA, as amended, provides for the state's carrier of last resort obligations for reliable voice telecommunications service. [36]Federal requirements are outlined in Section 214 of the FTA and the rules of the Code of Federal Regulations 47 CFR Sec. 63.71[37]. After a provider files notice of a discontinuance in an MPSC docket, Section 313 of the MTA allows a customer of that provider or any interconnecting telecommunication provider to request the Commission to investigate the availability of comparable voice service with reliable access to 9-1-1 and emergency services to that customer or a customer of an interconnecting telecommunication provider. A comparable voice service in this section is defined as any 2-way voice service offered through any form of technology, including VoIP services and wireless services, that is capable of placing calls to and receiving calls from a provider of basic local exchange service.

The Commission lacks jurisdiction over other forms of technology that are allowed to substitute as comparable voice service options for basic local exchange service. If a provider of basic local exchange service, particularly an incumbent local exchange carrier that was the only provider of basic local exchange service in an exchange, were to discontinue service because an unregulated comparable voice service with reliable access to 9-1-1 and emergency service was available, the Commission would not have regulatory authority to require that unregulated provider to follow Section 313 should they decide to then discontinue service. As a result, it could create a situation

[36] http://legislature.mi.gov/doc.aspx?mcl-484-2313
[37] Important information regarding Section 214 of the FTA and 47 CFR Sec. 63.71

where no other provider is available to offer voice service in an exchange, potentially leaving customers with less reliable options for voice service.

Risks Present in the Transition to New Technologies

The transition from the traditional public switched telephone network (PSTN) to advanced communications networks such as VoIP and cellular communications brings many new features and capabilities. However, this transition is not without risk. While landline phone technology lacks some of the capabilities of these advanced systems, it has been thoroughly tested over decades of use and has been proven to be quite reliable. Due to the characteristics of new technology, there are additional points of failure that need to be planned for to ensure reliability. Failure to mitigate or not properly account for these risks could leave subscribers without access to community resources, emergency services, and other critical resources.

Extreme Weather Events

When considering the risks that can threaten telecommunications infrastructure, regardless of technology, it is necessary to take extreme weather events into consideration. Since these events are increasing in frequency the risk presented by them is increasing as well. 2021 saw a large number of these events take place including deadly cold in Texas, wildfires in California, hurricanes, including Hurricane Ida which caused power outages, flooding, and tornadoes from the Gulf Coast to East Coast, and the December tornadoes in Arkansas, Illinois, Tennessee, Missouri, and Kentucky.[38]

As discussed in the 2019 Michigan Statewide Energy Assessment, the landscape of risks to Michigan's infrastructure is changing due to these extreme weather events. "Michigan's proximity to the Great Lakes provides a buffer from some high impact weather events. Even so, the state is not immune to experiencing climate extremes".[39] Recently there have been multiple extended

[38] https://www.washingtonpost.com/nation/interactive/2021/weather-disasters-2021/
[39] https://www.michigan.gov/documents/mpsc/2019-09-11_SEA_Final_Report_with_Appendices_665546_7.pdf, page 15.

power outages due to high winds.[40] It was also noted in the Statewide Energy Assessment that the National Oceanic and Atmospheric Administration's data shows the upper Midwest is experiencing greater climate extremes including increased winds.[41] Additionally, in 2020 the Midland County surrounding area experienced torrential rainfall that led to the catastrophic dam failure of the Sanford and Edenville dams.[42] The dam failures caused significant property damage including an impact on telecommunications infrastructure in the surrounding area. The increase in extreme weather and the potential disruptions to telecommunications services must be planned for and mitigated. During these events access to reliable communications is critical in allowing for affected residents to contact emergency services, access resources to help recover, and other necessary uses. To have resilient telecommunications infrastructure, several issues need to be addressed, especially power supply to telecommunications infrastructure. As these weather events will likely increase in frequency and severity, it is crucial that these risks be addressed to ensure that resilient and reliable telecommunications services are available when they are most needed.

Backup Power

A risk impacting both cellular and VoIP services is power outages. Like all telecommunications networks, the PSTN also requires electrical power to operate. However, electricity to the PSTN is supplied over the line from the telephone provider's central office or remote equipment. In Michigan, facilities based local exchange providers are required by the MTA to have emergency backup power. The MTA requires a minimum of 3 hours of battery power if a permanent generator is installed, and up to 8 hours for remote locations without a generator. The provider is also required to have a mobile power unit available that can be connected to central offices or remote equipment within 8 hours.[43] As a result, even if there is a long-term disruption to electrical service

[40] https://www.freep.com/story/news/local/michigan/2021/12/16/high-winds-michigan-power-outage-dte-energy-consumers-energy/8921805002/

[41] Statewide Energy Assessment, Page 15.

[42] https://www.washingtonpost.com/weather/2020/05/20/michigan-dams-fail-midland/

[43] http://legislature.mi.gov/doc.aspx?mcl-484-2305c

and a customer loses power to their home or business, the PSTN will continue to function normally and customers will be able to make and receive calls.

Voice over Internet Protocol

As previously stated in this report, VoIP does not receive power over the network, so it requires a power source at the customer's location to provide electricity to the VoIP equipment. In the event of a power outage at a subscriber's location, a backup source of electrical power is needed for service to continue to be available. This can be critical since power disruptions can be caused by natural disasters and other catastrophes when demand for emergency services may be at its highest. This is both a technical concern and an educational one, as many VoIP products are marketed as replacements for landline service and potential subscribers may not be aware of the limitations of VoIP with regards to power outages.

To attempt to address these concerns, the FCC adopted requirements in 2015 for all providers of fixed facilities-based residential voice services that are not line powered. While in some circumstances this can include wireless services if they are marketed as landline replacements, it mostly applies to fixed interconnected VoIP providers. Beginning with the adoption of these requirements, providers of a covered service must offer for sale a backup power source that will provide at least 8 hours of power to a customer's VoIP equipment. Starting in 2019, providers are now required to also offer a 24-hour backup power solution. They are also required to inform customers at the time of subscription and annually of certain information prescribed by the FCC including limitations of their service during a power outage, backup power options, and other related information. These requirements are currently set to expire in 2025, however the FCC has stated that if it finds they are still necessary, further action may be taken.[44]

While the FCC's requirements address some of the risks of VoIP by helping to make sure subscribers are informed of the limitations of their service and what backup power options are available, and by requiring providers to have backup power sources for sale to customers, it is still up to the subscriber to purchase and maintain a backup power source, whether from the provider or a source of their own choosing. Some providers do include a backup power source at no extra charge as part of the subscription, but that is not a requirement of the FCC. The MPSC recommends all current and prospective VoIP subscribers in Michigan carefully review provider information on backup power and consider their backup power needs in a potential emergency situation.

Wireless Network Risks

While mobile wireless devices such as cellular phones have their own built-in battery, there are still risks related to power outages. While the battery built into a cellular phone will typically last

[44] https://docs.fcc.gov/public/attachments/FCC-15-98A1.pdf

through a short power outage, in the event of a longer-term power outage, customers may need to find an additional power source to recharge their phones. However, due to the portable nature of these devices this is a more manageable concern compared to the need for backup power for VoIP. A greater risk for wireless networks is the loss of power to cellular towers. These towers need electricity to operate and if power is disrupted, large areas served by that tower could be left without wireless service. While many towers have some form of battery backup power for short term outages and may have standby generators, this has been entirely voluntary on the part of providers and has been shown to be insufficient at times. One of the more recent examples of this was during the 2019 California wildfires where power was shut down as a safety measure, leaving some towers inoperative. This resulted in residents losing access to emergency services or updated disaster information.[45] While Michigan is not prone to the expansive wildfires, there are other natural disasters that do affect our state, so it is important that this risk is managed.

In response to similar outages following Hurricane Katrina in 2007, the FCC planned to require providers to have at least 8 hours of backup power for their cellular towers. Ultimately, this was rejected on a procedural matter and the FCC chose not to pursue it further, leaving backup power for towers largely a voluntary issue. However, in July of 2020 the California Public Utilities Commission (CPUC), in response to the previously described wildfires, issued requirements that cell towers have 72 hours of backup power during emergency situations.[46] This requirement was challenged by providers and in October of 2021 the CPUC denied rehearing in that proceeding.[47] At the time of this report, it is unknown if the issue is settled or if there will be further litigation. Since California is the first state to enact such requirements, it may pave the way for other states to do the same in order to address this important issue.

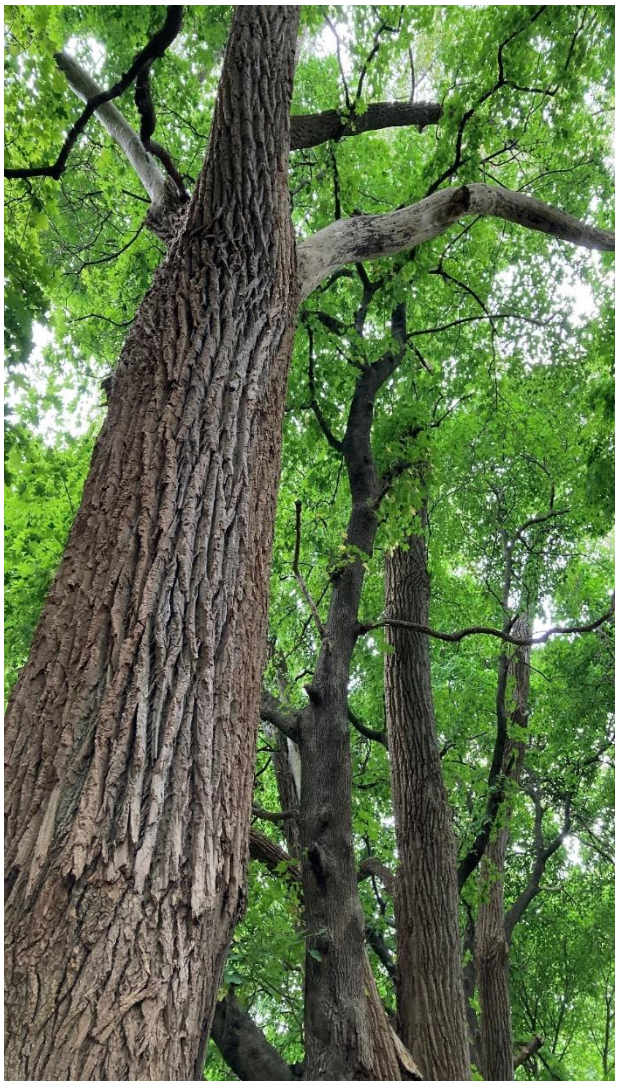
In the wake of Hurricane Ida and other natural disasters, the FCC once again proposed steps to improve the reliability and resiliency of wireless communications networks during emergencies. In 2021, the FCC released a Notice of Proposed Rulemaking seeking comment on its proposals, which include aspects of establishing the framework for network resiliency as mandatory rather than voluntary. The Commission filed reply comments on January 14, 2022 supporting CPUC's positions regarding these critical emergency situations.[48] On July 6, 2022, the FCC issued a Report and Order and Further Notice of Proposed Rulemaking.[49] In its Order, the FCC largely codified the voluntary framework's existing provisions as mandatory for all facilities-based mobile wireless providers, stating that it is taking prompt and decisive measures to improve the reliability and resiliency of mobile wireless networks that are a significant lifeline for those in need during

[45] https://www.nytimes.com/2019/10/28/business/energy-environment/california-cellular-blackout.html
[46] https://apnews.com/article/679f1066a90fb6bd1c4b1dee80059212
[47] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M413/K823/413823431.PDF
[48] FCC PS 21-346 Network Resiliency Reply Comments_final011322.pdf
[49] https://www.fcc.gov/document/fcc-acts-improve-network-resiliency-during-disasters

disasters and other emergencies. It also sought further comment on aspects of reporting requirements to the FCC detailing the implementation of the provisions of the order.

Gaps in Wireless Coverage

Another risk specific to wireless telecommunications is coverage gaps. Due to the physics of radio waves, it is possible for an area that is within the typical operational range of a wireless transceiver to have substandard or nonfunctional coverage. As explained by the FCC "like other radio transmissions, wireless phone calls can be affected by severe weather, topographical features, or large structures or other objects between your phone and the nearest cell site."[50] These so called "dead zones" can occur both indoors and outdoors and can be temporary, due to things like storms or electrical interference, or more persistent when caused by terrain or buildings. They can also be provider-specific since different cellular providers may be using different frequencies or have towers closer to a given location.



Customers that are considering replacing wired telecommunications services with wireless need to carefully evaluate available coverage at their locations. While most wireless providers have coverage maps, these maps should not be relied on as definitive proof of functional service. Evaluating carefully is especially important if cellular communications are to be relied upon as the sole means of communication in an emergency situation. If there are coverage problems in a given area, some providers offer tools to report the issue and may be able to fix it. It may also be worth evaluating the coverage of an alternative provider since, as previously noted, due to different frequencies and tower locations one provider may not be susceptible to the same gaps in coverage as another. There are also devices such as Wi-Fi calling, femtocells, and amplifiers that wireless users can install to boost coverage, but these are usually

[50] https://www.fcc.gov/consumers/guides/understanding-wireless-telephone-coverage-areas

at the customer's expense and require both electricity and an alternative broadband connection in the case of Wi-Fi calling or a femtocell. If coverage in an area is marginal, retaining wired telecommunications service may be a better choice to guarantee access to telecommunications services in an emergency.

While the transition from landline service to advanced telecommunications services and networks brings many new capabilities, it also brings additional risks such as those outlined throughout this report. Michigan citizens that rely on services such as cellular communications or VoIP as their only means of telecommunications should make sure they understand these risks, make an informed decision, and take what actions they can to reduce them.

Associated Regulatory Landscape

While much of this report focuses on telecommunications as a standalone sector, it is important to acknowledge the reliance upon telecommunications that exists in other regulated industries and the impact changes in one industry can have in another. Telecommunications technologies are frequently thought of as a separate entity when crafting regulatory policy, and this should not necessarily be the case. One recent example of this was in 2019 through 2020 when the FCC acted to open up the 6 ghz band for unlicensed use.[51] This raised many concerns from the energy industry, which relies on that band for both communications and for wireless access to some remote equipment.[52] The rollout of unlicensed devices that utilize the 6 ghz band is still in its early days so it is unknown at this time if there will be a problem for energy utilities, but this is an example where better consideration could have been given to the interdependency between the energy and telecommunications industries when enacting new regulations. As our infrastructure becomes more dependent on telecommunications technologies, it becomes even more critical to take this into consideration when deciding regulatory policy for these sectors. Below, this report discusses some of the associated regulatory landscape and the interdependency between telecommunications and other sectors. This is not meant to be an exhaustive overview of telecommunications use in these sectors.

Energy

Energy services, which include electricity and natural gas, have already been mentioned in this report when discussing the risks of new telecommunications technologies and their dependence on energy infrastructure. However, there is a reciprocal dependence on telecommunications infrastructure for some energy services as well. One example that many electric utility customers

[51] https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses-0
[52] One example of these concerns is this briefing from the Utilities Technology Counsel: https://utc.org/wp-content/uploads/2018/09/2018_9_IssueBrief_6.pdf

are familiar with is advanced metering infrastructure (AMI), otherwise known as "smart meters". These electric meters communicate wirelessly via cellular data services with the utility. This technology allows the utility to read the meter remotely, to be aware of outages in real time, as well as offer new capabilities such as time-of-use programs. Some natural gas utilities have implemented similar metering networks. Smart meters are reliant on cellular telecommunications networks and this interdependence must be considered when regulatory policy is created that affects one or the other.

Energy utilities are also reliant on telecommunications technologies at the grid level. Many remote facilities are connected using wired or wireless communications to allow the utility to monitor and control these facilities. Without this remote access, the energy grid would be far less capable than it is. As identified in the Statewide Energy Assessment report this smart operating technology has many advantages including:[53]

- Detect and respond more quickly to events such as electrical outages and pipeline leaks.
- Conduct smarter preventative maintenance of energy infrastructure.
- Foster energy efficiency by providing near real time energy consumption and pricing information.
- Further integrate distributed and renewable energy resources.
- Automate various operational functions to reduce costs and add resilience.
- Improve data collection and tracking to help meet regulatory requirements.

There are clear advantages to having telecommunications capabilities integrated into the energy grid. However, this reliance on telecommunications technologies also adds a potential weakness related to cybersecurity, which will be discussed further below.

[53] Statewide Energy Assessment: https://www.michigan.gov/documents/mpsc/2019-09-11_SEA_Final_Report_with_Appendices_665546_7.pdf, P 141

Water

In the 21st Century Infrastructure Commission Report it was stated that Michigan's drinking and wastewater management systems were largely constructed between 50 and 100 years ago and are reliant upon outdated technologies and approaches.[54] The report recommended that utilities embrace new technologies and laid out several recommendations for doing so. As with the energy industry, many of these new water infrastructure technologies would likely be dependent on telecommunications services and it is important that regulatory policies take this into account. One such technology mentioned in the report is smart metering, which similar to the electricity and natural gas systems, would allow more real time monitoring of the water distribution system. Many of the advantages for smart operating technology discussed in the Statewide Energy Assessment also apply to water infrastructure. As with the energy industry, adding remote access capabilities adds risk that must be managed.

Transportation

Transportation is also becoming more reliant on telecommunications technologies in the 21st century. This is particularly true for automobiles, as they become increasingly more connected and development of autonomous vehicles continues. In the 21st Century Infrastructure Commission Report it was stated that Michigan is a leader in the development of intelligent vehicle technology, with several research and test facilities within the state. The report also notes that because intelligent vehicle technology is so new and advancing

[54] 21st Century Infrastructure Commission Report: https://www.michigan.gov/documents/snyder/21st_Century_Infrastructure_Commission_Final_Report_1_544276_7.pdf, P. 112

rapidly, it is difficult to know all the infrastructure implications.[55]

While the full implications of these developing technologies are unknown, it is apparent that intelligent vehicle technology will rely on telecommunications infrastructure, particularly wireless communications. Cellular communications technologies are already being integrated into vehicles for information, entertainment, vehicle software updates, and other features that manufacturers integrate into new cars. Future intelligent vehicles are likely to rely on this type of communication for even more functions as autonomous vehicles make their way into the market. As with other industries such as energy, it will be important that regulatory policies that affect transportation consider the impact on telecommunications and vice versa.

Cybersecurity

The move to incorporate remote monitoring and control capabilities into more of our infrastructure has raised concerns in the area of cybersecurity. Anytime the ability to access something remotely via telecommunications is added, this opens a potential entry vector for hackers and other bad actors to take advantage. One recent example related to a water utility happened in early 2021 at a Florida water treatment plant. Hackers were able to gain access and attempted to increase the level of chemicals in the water. Remote access was enabled to allow workers to monitor and adjust equipment from home, and in this situation, it also allowed a malicious actor to gain access to the system. This could have been disastrous had it not been caught by employees as it was happening.[56] Another recent example was the May 2021 Colonial Pipeline Hack, which disrupted liquid fuel supplies to a large part of the southeastern United States. This hack was likely due to reliance on a single factor authentication system.[57]

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[55] 21stCentury Infrastructure Commission Report. P. 83: https://www.michigan.gov/documents/snyder/21st_Century_Infrastructure_Commission_Final_Report_1_544276_7.pdf

[56] https://www.nytimes.com/2021/02/08/us/oldsmar-florida-water-supply-hack.html

[57] https://www.reuters.com/business/colonial-pipeline-ceo-tells-senate-cyber-defenses-were-compromised-ahead-hack-2021-06-08/

As telecom networks increasingly rely on the internet, it also allows bad actors the capability to launch Denial of Service attacks against these networks, which can create major interruptions to telecom services if networks aren't fully protected against such threats.[58]

The 2019 Statewide Energy Assessment made several recommendations to the energy industry in Michigan to better secure against cyber-attacks. These include educating staff on phishing and other malware vectors, requiring 2-factor authentication for remote access, and conducting regular tests and simulations[59]. As more of our critical infrastructure becomes connected, these steps will become even more vital to ensure we enjoy the benefits this advanced technology can bring while guarding against the potential downside as much as possible.

Broadband Access, Adoption, Affordability

As discussed throughout this report, there have been many different advances in technology and service offerings, including broadband service. While much attention has been focused on the issue of broadband availability, it is also important to discuss broadband adoption concerns. Broadband adoption is a separate but related issue to that of broadband availability. While broadband availability refers to extending broadband service to unserved or underserved areas, broadband adoption is whether a person that has broadband available at their home or business chooses to subscribe to it. Broadband has become an essential service, and improving broadband adoption is an important part of working to close the internet access divide and ensuring that all Michigan residents have access to affordable and reliable high-speed internet. Broadband has increasingly become utilized in many everyday activities including education, work, hobbies, and essential services such as healthcare.

In 2018, the Michigan Consortium of Advanced Networks (MCAN) issued its Michigan Broadband Roadmap report (MCAN Report)[60]. Among the issues addressed in this report was the issue of broadband adoption. This report found that the majority that choose not to subscribe to broadband do so because of the cost of service. The MCAN Report noted that based on a 2015 study, 33% of people in the United States without broadband stated that the monthly cost was the major deterrent to subscribing. Other reasons related to costs were given as well, including the cost of a computer or other internet capable device.

As found in the MCAN Report, household income is a major factor in broadband adoption, with more lower income households not subscribing to the service. According to the US Census Bureau's American Communities Survey Public Use Microdata for 2019, approximately 27% of

[58] https://www.cisa.gov/uscert/ncas/tips/ST04-015
[59] Statewide Energy Assessment: https://www.michigan.gov/documents/mpsc/2019-09-11_SEA_Final_Report_with_Appendices_665546_7.pdf, P. 160
[60] https://connectednation.org/wp-content/uploads/sites/13/2019/01/Final-Roadmap-8-8-18.pdf

households in Michigan with annual incomes below $35,000 did not have high speed internet service such as cable, fiber, or DSL, while only approximately 12% of Michigan households that reported an annual income above $75,000 did not have high-speed internet[61]. While these percentages include both households that do not have broadband available and those that have it available but choose not to subscribe, it is clear that there is a correlation with lower income and lack of broadband in a household. The U.S. Department of Health and Human Services has found that older low-income people are also less likely to have access to home high speed internet. Their data shows that in 2018 across the U.S. 59% of those over 65 living in poverty had home internet access compared to 84% of those ages 18-64.[62]

Racial Disparities in Broadband Adoption

While household income is the largest factor when it comes to broadband adoption, racial disparities must also be considered. In 2016, Free Press released a report analyzing the impact of systemic racial discrimination on home internet adoption. In this report, it was found that when other factors are controlled, people of color had lower rates of broadband adoption than what would be predicted based on income alone.[63] Their analysis suggested that one of the factors that caused this disparity was the fact that home broadband providers frequently require credit checks, which have systemic racial biases, and do not typically offer low cost options, as opposed to the cellular industry which offers prepaid and other low-cost services.[64] Free Press also found that neighborhoods that are predominately non-white tend to have lower broadband deployment and competition which also leads to lower adoption.

Current data indicates that this disparity is still a problem. According to a survey by the Pew Research Center in 2021, 80% of white adults in the United States have home broadband service, compared to 71% of black adults and 65% of Hispanic adults.[65] In Michigan, the US Census Bureau's data shows that in 2019, 17% of people that responded that they were "white alone" did not have home internet access, while 22% of those that identified themselves as "black or African American alone" reported not having home internet access.[66] As stated in the Free Press report, income disparities alone cannot explain the lower adoption rates and the impact of racial disparities should be considered in policies designed to increase broadband adoption in Michigan in order for them to be effective.

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[61] US Census Bureau Public Use Microdata: https://data.census.gov/
[62] https://aspe.hhs.gov/system/files/pdf/263601/Internet_Access_Among_Low_Income.pdf
[63] https://www.freepress.net/sites/default/files/legacy-policy/digital_denied_free_press_report_december_2016.pdf, p. 71
[64] *Id,* p. 82-83
[65] https://www.pewresearch.org/internet/fact-sheet/internet-broadband/
[66] US Census Bureau Public Use Microdata: https://data.census.gov/

Impact on Vulnerable Communities

Lack of home internet access has been shown to negatively impact households, and that impact is greater on already vulnerable populations such as the poor and elderly. This has been made exceptionally clear during the COVID-19 pandemic as many activities that were previously done in person, such as work, school, and healthcare, were moved online. The U.S. Department of Health and Human Services (DHHS) concluded that access to the internet may have been a factor in accessing critical benefits during the pandemic and that those without access to the internet tend to have more chronic health conditions and worse health outcomes.[67] While those that had reliable home internet were able to continue health care and other essential services online, those lacking internet access had to find other ways or go without access to these services. There is also the "homework gap". According to MCAN, one study found that approximately 50% of K-12 students were unable to complete their homework due to a lack of internet access.[68] As many vulnerable communities already face challenges to ensuring students receive a high-quality education, a lack of home internet access magnifies these challenges.

However, there are also opportunities to assist these vulnerable populations. Increasing broadband availability and adoption can make new economic, educational, and social opportunities available. Broadband access will allow these communities to access resources that previously may have been unavailable. MCAN concludes that households with broadband have an estimated annual economic benefit of $1,850, and this benefit may increase as more workplaces and businesses take advantage of remote services.[69] This will require addressing the issues outlined above, along with others that may be discovered as broadband adoption is improved. While there has been a large effort to increase broadband availability through programs such as the Connect America Fund and the Connecting Michigan Communities grants, improving broadband adoption has received less attention. There are programs to help reduce the cost of home internet service, such as the Federal Lifeline program, but challenges to increasing broadband adoption remain. The MCAN Report outlined several recommendations to increase broadband adoption, including eliminating cost barriers and increasing digital literacy, which the MPSC agrees are things that should be considered.

Governor Whitmer has made increasing broadband adoption a priority through several initiatives including creating the Connecting Michigan Task Force (CMIT) and the Michigan High-Speed Internet Office. The CMIT was created to advise and assist in improving coordination among stakeholders in addressing broadband and technology access and adoption issues in the state. One focus of the CMIT is to monitor federal broadband-related activities for policies and funding

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[67] https://aspe.hhs.gov/system/files/pdf/263601/Internet_Access_Among_Low_Income.pdf

[68] MCAN Report: https://connectednation.org/wp-content/uploads/sites/13/2019/01/Final-Roadmap-8-8-18.pdf, P. 38

[69] *Id,* P. 38.

opportunities that impact broadband in Michigan, such as the Rural Digital Opportunity Fund (RDOF), the Emergency Broadband Benefit Program as well as recently proposed federal legislation aimed at expanding broadband infrastructure. The MPSC continues to have a role in these taskforces and programs and will continue to work to increase broadband adoption throughout Michigan so all citizens can take advantage of the opportunities it provides.

The MPSC has partnered with Connected Nation Michigan (CNMI) for over 10 years to develop an interactive statewide broadband availability map and to promote increased residential and business broadband access and adoption throughout Michigan. CNMI has created several maps that illustrate the availability of broadband and telephone service, as well as identifying the providers that offer these services throughout Michigan.[70] CNMI also partnered with the MPSC in 2020 to create a statewide Wi-Fi hotspot map to assist residents who lack internet access at home.[71]

Pursuant to Public Act 618 of 2018, the Connecting Michigan Communities (CMIC) Grant Program was created to award grants to applicants for projects that extend broadband service into unserved areas in Michigan.[72] Staff at the MPSC has been involved with the CMIC Grant Program from the beginning and has had a role in reviewing grant applications and making grant award recommendations. On October 12, 2020, Governor Whitmer announced $12.7 million in the first round (CMIC 1.0) of CMIC Grant Awards for 10 projects to provide broadband access to over 10,900 households, businesses and community anchor institutions (CAI) in Michigan.[73] An additional $1 million in awards (CMIC 1.5) was announced on April 13, 2021.[74] The third round of CMIC (2.0) Grant awards of $15.3 million were announced on July 15, 2021.[75] CMIC (3.0) awards of $3.3 million were announced on June 14, 2022.[76]

Recommendations

While the MPSC does not advocate for any specific legislation, it is important for the MPSC to engage the appropriate parties to provide information and perspective on telecommunications and broadband issues. Commission Staff provides the following general recommendations to

[70] https://connectednation.org/michigan/mapping-analysis/
[71] http://cngis.maps.arcgis.com/apps/webappviewer/index.html?id=0d69accbb5ff422a82eccc2c9101b69d
[72] https://www.michigan.gov/dtmb/0,5552,7-358-82547_56345_91154_102790_102791---,00.html
[73] https://www.michigan.gov/minewswire/0,4629,7-136-3452-542115--,00.html
[74] https://www.michigan.gov/dtmb/0,5552,7-358-82546_96816-556811--,00.html
[75] https://www.michigan.gov/whitmer/news/press-releases/2021/07/15/lt--governor-gilchrist-announces-award-to-increase-high-speed-internet-access-across-michigan
[76] https://www.michigan.gov/whitmer/news/press-releases/2022/06/14/governor-whitmer-invests-to-expand-high-speed-internet-access-to-781-homes-and-businesses

consider concerning the MPSC's role related to telecommunications and broadband services, as well as potential ways to improve customer protections and oversight.

- **Revise and update basic consumer protections and service quality standards**
  In 2011, many service quality standards and consumer protections were removed from the MTA. These changes have had an impact on customers and the MPSC continues to receive around 1,000 telecommunications complaints each year. Customers are frustrated and upset when they are informed that these consumer protection provisions were removed from the MTA and that their only recourse for some complaints is to file a complaint with the FCC or continue to work with their provider to resolve their issue.

  Commission Staff suggest updating basic consumer protections and service quality standards for regulated services to ensure that customers' services are being restored in a timely manner, appropriate credits and billing issues are being addressed and resolved, service issues are being repaired timely, outages are being reported by providers, and that there is an established complaint process in place. In the recent past, Michigan customers have encountered significant service outages resulting from the May 2020 catastrophic dam failure and a cable line being damaged within a lake. It is important that telecommunications consumer protections are in place and maintained to ensure reliable telecommunications services in situations like this.

  Additionally, Commission staff recommends reviewing the possibility of expanding certain consumer protections to include new telecommunications services such as broadband, wireless, and VoIP. The differences in both the consumer protections available and the agency responsible for their enforcement can lead to confusion among consumers. Restoring basic consumer protections to regulated telecommunications services and adopting similar protections for consumers using new technologies would simplify the process of resolving issues with providers and would help to close some of the gaps in regulatory policy by making sure that all telecommunications services have appropriate consumer protections.

- **Adopt new standards for emergency situations**
  Consider the adoption of additional standards to include that providers report and have policies and plans in place to address emergency situations or outages. With the increase in cyber-attacks and extreme weather events that can lead to disruptions in telecommunications services of all types, uniform standards and requirements should be considered to keep vital telecommunications services operating during and after these events or to restore service as soon as possible. During an emergency, access to telecommunications allows for those affected to contact emergency services, find resources to assist with recovery, and to remain aware of conditions. With many of

Michigan's citizens relying on technologies such as cellular and VoIP, updated standards are needed to ensure these services remain available during an emergency.

- **Revise discontinuance of service requirements**
  Section 313 of the MTA only covers basic local exchange service providers. If an alternative unregulated provider, such as a VoIP or wireless provider is offering comparable voice service with reliable access to 911 in an area and is allowed to replace the landline provider and then the unregulated provider chooses to discontinue the service, the MTA has no requirements that the provider would have to continue to provide service or that an alternative provider be available, potentially leaving an area with no reliable provider of telecommunications service. Although the Commission would contact the FCC to attempt to address these issues, revisions to the requirements would benefit Michigan's citizens by ensuring that they are left with an option for vital telecommunications services should a provider, regardless of technology, choose to discontinue service. Other revisions to better streamline the process for discontinuance and to update outdated language could be considered as well.

- **Provide the Commission with broadband complaint handling authority**
  Even though broadband service is not regulated, the Commission still receives hundreds of broadband complaints filed by customers. The complaints that are received by the MPSC Staff vary and may include billing, service quality, service outage, lack of access, speed quality, and service restoration issues to list a few. The MPSC is in a unique position as it is one of the few agencies that receives complaints such as these. While MPSC Staff use the Video Franchise (PA 480 of 2006) complaint process as a guide for handling these broadband complaints informally, there are providers that refuse to respond to broadband complaints from the MPSC due to the unregulated nature of the service. In addition, if at any time a broadband provider fails to respond to the MPSC Staff, the Commission has no recourse other than to suggest that the customer file a complaint with the FCC or the Federal Trade Commission. Customers are not allowed to file formal broadband complaints with the MPSC. This separate treatment of complaints for a service that many consumers are using as a replacement for traditional landline service can be confusing for consumers having problems with their providers.

  It would be beneficial to customers if the Commission was empowered to officially handle broadband consumer complaints in a similar process that is outlined in Public Act 480 of 2006. This would reduce confusion among consumers and allow for faster resolution of complaints since they could be handled within the state instead of having to be filed with a federal agency.

- **Expand and continue the Commission's role of active participation with broadband related issues and policies**

As the pandemic has brought to light, broadband is no longer a luxury, but increasingly a necessity, similar to utilities such as water, electricity, and natural gas. However, due to the rapid changes in technology, gaps in regulatory treatment of broadband have developed. While Governor Whitmer created the Michigan High-Speed Internet Office, it would be expected that the role of this office would be more directed towards policy, rather than regulation. Any state or federal laws and policies regulating broadband would seem to be most appropriately placed under the authority and umbrella of the MPSC as the experienced body delegated to handle utility matters.

Additionally, efforts to improve both broadband availability and adoption should be continued and expanded. This may include studying areas of low availability or adoption to better understand how to address these issues in those specific areas within the state, designing programs to help improve access or adoption in those areas, and working collaboratively with broadband providers. Access to affordable and reliable broadband has become a necessity and should be available to all citizens of Michigan.

In conclusion, as this report has shown, the rapidly evolving telecommunications industry has left gaps and vulnerabilities in regulatory treatment of various services that should be addressed. Doing so ensures that Michigan's citizens will continue to have access to reliable and affordable telecommunications services, regardless of technology used. While this report is not advocating for any specific legislative changes, the Commission Staff recommendations are proposed to help facilitate thought and discussion between the appropriate parties so that progress can be made at addressing the potential gaps and vulnerabilities that may exist to better serve the residents of Michigan.