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Utility Rural Broadband Playbook

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Utility Rural Broadband Playbook

Playbook: *a business playbook contains all the pieces and parts that make up your company's 'go-to' approach for getting things done.[1] This Utility Rural Broadband Playbook will identify the key opportunities and challenges around utility broadband deployment and the components of a strategy that maximizes community benefits while supporting the business needs of the utility.*

Disclaimer: *As with any general playbook, this is not intended to replace any needed legal advice nor to presume an understanding of the different aspects of your business, operational and otherwise, that you will need to take into account to determine what's best for your particular circumstances, and each utility is different, but it does provide some 'learnings' that we've identified that could be helpful if you are planning to conduct business in this space.*

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[1] "The Importance of Having a Business Playbook," Sterling Woods, Sterlingwoods.com. May 29, 2018.

Utility Rural Broadband Playbook

Executive Summary

This document provides a high-level overview of the options for utility support of broadband internet service deployment to underserved customers. While electric utilities of all types are considering or making investments in their own private wired and wireless broadband communications infrastructure primarily to enhance the reliability, security and modernization of the grid, this document is primarily focused on the options for investor-owned utilities (IOUs) to augment and use that infrastructure to also support broadband internet service deployment to underserved consumers, a practice referred to as "middle-mile leveraging." This playbook is a result of insights shared from IOUs that are already playing a part in rural broadband enablement, along with those that have taken initial steps to develop their strategies. Additional insights are provided by Internet Service Providers (ISPs), regulators, and associations, and rural cooperative leaders, as coordination is essential to the successful adoption of models for rural broadband enablement by utilities.

Municipal electric companies and electric cooperatives have advanced broadband deployment projects more frequently and more quickly than most IOUs because these entities face less regulation of investments and may more readily access state and federal programs for broadband deployment if they are willing to serve as the ISP. In contrast, IOUs generally face a more restrictive regulatory model that generally allows for rate recovery of infrastructure investments only in the context of a regulator-approved plan with rigorous cost-benefit analysis. The IOUs interviewed for this playbook do not want to provide the end-to-end broadband internet service and are generally not eligible to access public funds geared toward ISPs. This document thus is focused on use of IOU infrastructure to merely support, rather than provide, broadband to end users.

Many utilities are investing in private communications networks (including both wired and wireless technologies) for their own operational needs.[2] With these increasing network investments, opportunities arise to leverage this common communications infrastructure for the mutual benefit of the grid and the community by supporting both grid modernization and broadband deployment.

As utilities consider options for supporting broadband deployment, they may be venturing into activities that are outside of their core competency of providing utility service, and hence in less familiar territory. This document therefore seeks to establish a common language and shared models around IOU deployment of communications infrastructure to help facilitate broadband deployment and to help optimize use of that infrastructure to benefit both the grid through partnerships with telecom solutions entities, and the community through partnerships with ISPs. ISPs may include rural co-ops and municipalities that already provide telecom or cable services to their community or have an interest in doing so to bolster the economic development).

This document is framed as a playbook for utilities, offering a practical approach and actionable models for supporting broadband deployment as a regulated utility. It may also be useful for co-ops, municipalities, regulators, and ISPs that will play a role in delivering last mile service to their respective communities by leveraging the utility's middle mile investment.

[2] See, e.g., "Utility Network Baseline – April 2019 Update" at 10. *Utilities Technology Council.* April 2019. *UTC.org* ("Large utilities have massive data bandwidth requirements and therefore may need to deploy fiber even to remote substations."); Dano, Mike. "Utilities shift from tests to deployments with private LTE." *Light Reading.* January 13, 2021. LightReading.com.

Key Takeaways

- ***IOUs do not want to be ISPs.*** IOUs interviewed and referenced are interested in providing infrastructure elements in support of third-party provision of broadband internet service to underserved and unserved customers, but not in providing end-to-end internet service to customers. Accordingly, such retail service could be provided by an ISP that uses utility infrastructure as an input.

- ***Both wired and wireless utility networks contain "middle mile" infrastructure.*** Broadband deployment can be supported by leveraging utility "middle mile" wired and wireless communications assets: the connectivity between the ISP's facilities and the "last mile" connection that extends to the end-user.

- ***Fiber is desirable.*** Utilities have deployed and continue to deploy fiber for some fixed use cases that require ultra-high bandwidth and low latency speeds, such as for substation control. Additional fiber capacity can be used for middle mile access to provide connectivity to an ISP to deliver broadband to the home via an extension of fiber or wireless to the home or premise.

- ***Fiber is also a key component in many wireless network architectures.*** Utilities that run fiber to their substations for SCADA application would generally extend the connectivity to their distribution assets via a myriad of wireless technologies. Wireless is used often to provide last mile service due to the versatility of a wireless network and supports fixed and mobile applications for utilities.

- ***A growing number of utilities are investing in private wireless networks, private LTE specifically.*** There are a number of utilities who have deployed or are piloting private LTE. This is seen in public announcements in investing in licensed or shared spectrum, and in the many experimental licenses for use of spectrum issued by the FCC.

- ***Wireless network infrastructure can also be considered "middle-mile."*** These private LTE networks include a significant fiber component, as well as communication towers, cabinets, and electrical service that can be leveraged by cellular carriers to improve cellular coverage and provide wireless access to broadband. This infrastructure can be used to help provide part of the middle mile.

- ***Utility operations come first.*** IOU investments in infrastructure are first and foremost to meet utility needs, not primarily to support broadband deployment. Utilities are ramping up investments in telecommunication infrastructure to support their own needs, including AMI deployments, substation interconnection, distribution automation, wildfire mitigation, and other grid modernization initiatives. Electrification, decarbonization, and energy equity concerns are further driving such investments.

- ***Utility "make-ready" processes facilitate ISP access to infrastructure.*** Many utilities have worked hard to facilitate access to utility-owned poles for ISPs. As the number of entities seeking access to poles has increased, many utilities are facing exponential increases in the number of pole attachments they must process, often without adequate additional compensation or necessary increases in staffing. Failure of other third-party attachers to timely execute make-ready activities can delay new attachments and impede new deployments of broadband networks. However, utilities generally lack tools to force non-compliant third parties to complete make-ready activities. It is important to revisit and improve the "make-ready" process as part of major communications infrastructure deployment initiatives to ensure the process: (1) fairly compensates utilities for the increased workload they are facing, (2) ensures adequate consideration of utility safety standards and concerns, and (3) creates enforcement actions for non-compliant third-party activities that do not fall on utilities for implementation. Such actions will help ensure that new infrastructure to extend broadband internet service to unserved communities is deployed efficiently without compromising utility operations.

- ***Leveraging common infrastructure can increase value.*** When the capacity of an asset is augmented (like deploying additional strands in a dark fiber cable or providing space for third-party antennae on a radio tower) and leased to an ISP, the value of that overall asset to the utility will be increased by the value of the augmented portion as reflected in the lease

revenue. But beyond that, this dual use of a fiber cable or a tower increases the public benefit associated with the utility investment and could strengthen the case made to regulators for recovery of that investment as reasonable and prudent.

- ***Community support is critical for projects leveraging middle mile infrastructure.*** Leveraging middle-mile communications infrastructure touches many constituencies, all of which must be educated and brought on board to help ensure project success. Many utilities will likely seek permission to recover their investments in electric rates, folding that request into a rate case before the state PUC. State consumer advocates will weigh in on the relative benefits of the proposal for consumers, focusing not only on the flow of dollars but also the broader economic and societal benefits that will accrue to the community when it finally enjoys affordable broadband internet service. State and local policymakers may be asked to update policies related to IOU authority to lease telecommunications facilities and to site and construct towers and other infrastructure. Working with the ISP, the utility should engage community leaders and consumers about the benefits of broadband internet service, identifying and supporting champions for broadband equity in the community.

This playbook identifies the key opportunities and challenges implicated in pursuing a "leveraging" strategy. It describes the common wired and wireless network infrastructure that utilities may leverage for grid modernization and broadband deployment, the models utilities are using to facilitate broadband deployment without compromising the security and reliability of the electric grid, and the challenges and benefits associated with such projects. With this information, utility executives, regulators, advocates, and other stakeholders can make more informed decisions and address key concerns their customers, investors, and regulators raise in connection with leveraging private utility broadband infrastructure to facilitate broadband internet service for unserved consumers.

Table of Contents

1. Defining the Challenge

The global COVID-19 pandemic has exposed just how many Americans do not have access to a reliable, affordable home broadband connection. The gap between those with broadband access and those without – often referred to as the "digital divide" – is much wider and more pervasive than many policymakers realized.

Utilities responded quickly to the global pandemic. While their services are an essential services, with essential workers, where possible, utilities also allowed a majority of their workforce to work remotely. The strength of a digital grid, where operators of the grid can monitor, manage, and repair the grid safely and reliably, was demonstrated by the utilities that have some level of smart grid solutions in place.

Some of the challenges with building broadband infrastructure to close the digital divide include:

- The economics to build out broadband in the rural markets are not attractive enough for the major carriers to justify.
- Utilities (particularly IOUs) that have proven the need to develop a private telecommunications strategy for their service territory, and deploy wired and wireless infrastructure, cannot readily leverage a common set of infrastructure to help close the digital divide without building partnerships and having legislative support for such initiatives.
- The economics of smart grid implementations usually are more difficult to justify in rural markets where assets and homes are more widely spread out.

The news coverage throughout 2020 and 2021 is replete with stories of school children struggling to connect online for classes, remote workers unable to find reliable service to link up with their employers, small businesses unable to interact online with customers, and isolated seniors who cannot access medical care because they lack the necessary bandwidth for telehealth appointments. The shutdowns that started in March 2020 highlighted the millions of Americans across the country who do not have reliable broadband internet access service in their homes.

In June 2020, the National Telecommunications and Information Administration (NTIA) released an interactive map to help the public visualize the digital divide.

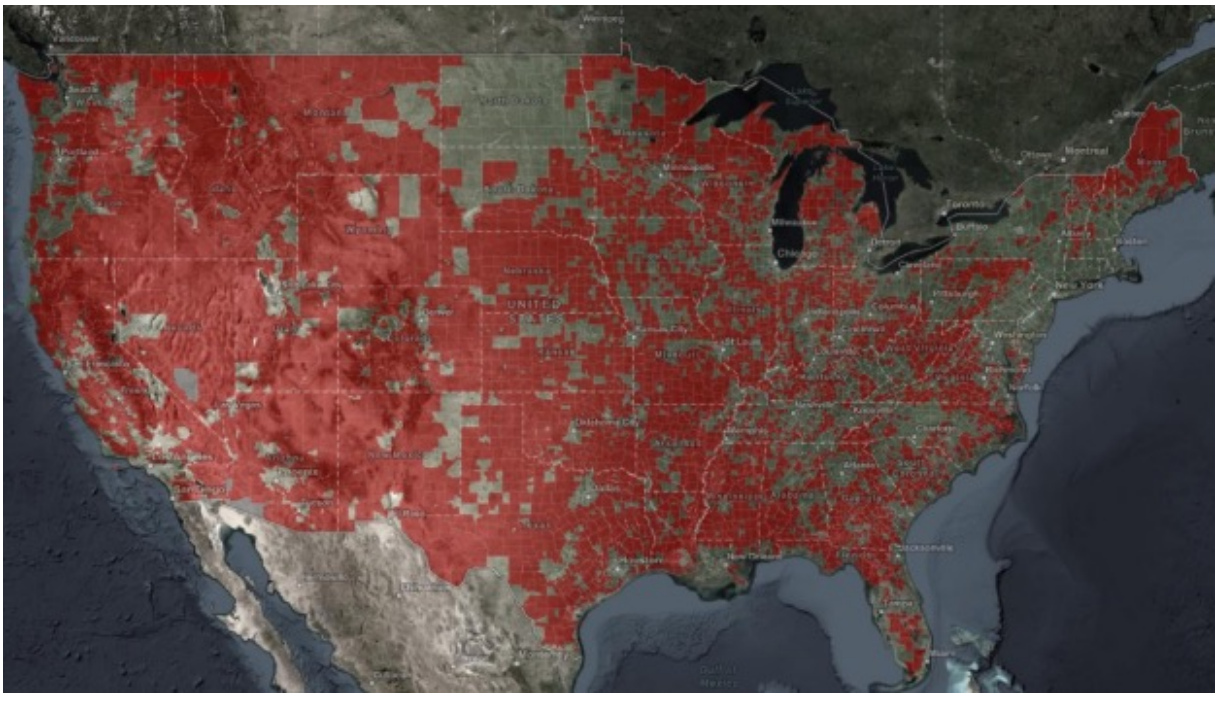

Figure 1 *- "Indicators of Broadband Need," National Telecommunications and Information Administration. Broadbandusa.maps.arcgis.com.*

Users can search by county to view county-level statistics for every state on various metrics, including percentage of households without internet access or without a computer, smartphone, or tablet. The map shows both the pervasiveness of the digital divide, as well as the disparities in access from the country's wealthiest county (Loudoun County, Virginia – percentage of households without internet access: 3.5%) to its poorest (Wheeler County, Georgia – percentage of households without internet access: 58.7%). These inequities in internet access often correlate to community income levels in much the same way as utilities see disparate access to advanced utility services among customer income levels. These findings are echoed in the National Association of Regulatory Utility Commissioners (NARUC) Broadband Expansion Task Force's June 25, 2021 Report:

> ***Broadband access is more widely available and adoption more universal in higher income areas, leaving low income areas on the wrong side of the digital divide***[3]

With the increased awareness of the digital divide and its impacts, policymakers are coalescing around the need to speed broadband deployment to every customer and premise, and to do so with a sense of urgency. Utilities are increasingly being asked – and are seeking – to be part of the solution. As discussed below, this momentum provides an opportunity to support broadband deployment while also driving needed utility investments for AMI, grid modernization, clean energy applications, smart city investments, and other utility initiatives that depend upon telecommunications infrastructure.

2. The Opportunity: Leverage Utility Investments in Wired and Wireless Telecommunications to Help Close the Digital Divide

Utilities are ramping up investments in telecommunications infrastructure to support their own needs, including AMI deployments, substation interconnection, distribution automation, wildfire mitigation, distributed energy resource connections, and other grid modernization initiatives. Investments in connectivity are also needed to facilitate clean energy development and ensure energy equity, i.e., making certain customers have equal access to utility programs.

Utilities are making investments in both wired and wireless telecommunications networks, which have overlapping as well as disparate components. Often these investments have been on an ad hoc basis, with a single network serving just a single application, resulting in multiple wireless networks that may be a mix of narrowband for voice, some SCADA applications, and public cellular to enterprise use. Over the past ten years, AMI networks that were primarily mesh network using unlicensed spectrum may depend upon a separate fiber network or public cellular to connect substations.

Wired fiber networks are often deployed where high capacity is required, such as for connecting data centers, while wireless technology is frequently most efficient where end-points are highly distributed, such as for AMI, distribution automation, and connections to remote areas of a utility's territory. Wireless networks often operate on a variety of spectrum bands as well, depending on utility security needs and available spectrum options within a service territory.

With planning and coordination, a utility can leverage its investments in wired and wireless technology to support broadband deployment to enable internet access for unserved consumers. By taking a holistic view that considers utility needs for private broadband connectivity as well as the enablement of broadband deployment initiatives, utilities can create a unified network of both wired and wireless technologies with fiber and other broadband infrastructure that can be leveraged for middle mile use by ISPs.[4]

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[3] "2.0 Key Findings," Report of the NARUC Broadband Expansion Task Force, *"Report"* at 3. NARUC. June 25, 2021. *NARUC.org.*

[4] See, e.g., Gold, H. B. and Jackson, K. "Expediting Broadband Deployment: Creating Incentives for Investor-Owned Utilities." *Skinny Wire*, Volume XI, Issue 1. Jan, 19, 2021. Page 50. Walkerfirst.com/skinny-wire:

States should prioritize (funding, policy, strategy) the development of an open access, IOU centric, 5G ready, competitive statewide middle-mile fiber network to:
- Reduce cost of monopoly middle-mile,
- Provide broadband where it is needed most,
- Empower a new generation of "smart" applications (energy, healthcare, autonomous systems, IoT),
- Serve as a platform for private "LTE" networks for utility industry transformation.

There are significant public dollars available to support such utility efforts. For example, utilities are eligible to participate in the Federal Communications Commission's (FCC) $20.4 billion Rural Digital Opportunity Fund (RDOF).[5] The Phase I auction, conducted in the fall of 2020, awarded $9.2 billion dollars to various winners, including many rural electric cooperatives, to provide broadband to over 5.2 million unserved homes.[6] The FCC will conduct a second auction in the near future to award additional funds, and utilities remain eligible to participate as the bidding rules have not changed.[7] The Infrastructure Bill and Broadband Funding Summary (INVEST in America Act), which passed the Senate in August and is currently awaiting action by the House of Representatives, includes billions of dollars in broadband infrastructure funding that will flow to the states.[8] It includes a specific provision, Title IV – Enabling Middle Mile Broadband Infrastructure, that funds competitive grants for middle mile infrastructure for which utilities are eligible.[9] These dollars are part of a trend towards supporting utility efforts to facilitate broadband deployment.

A utility with dark fiber on either its wired or wireless networks has up to three resources it could leverage for broadband – middle mile dark fiber between substations and other locations, the deeper distribution last mile fiber, and shared use of the LTE network infrastructure. The cost of the additional incremental investment needed to provide that foundational infrastructure can be small or de minimis. One recent estimate of the cost of a 48-count fiber cable was $0.28 per foot, compared to a 96-count fiber cable at $0.50 per foot.[10] Thus, for an additional $0.22 per foot, a utility could double the capacity of its fiber deployment, creating dark fiber resources it could make available for broadband initiatives (installation costs would be essentially the same for the two types of cable). The low cost relative to increased value and revenue opportunity often makes it a prudent investment.

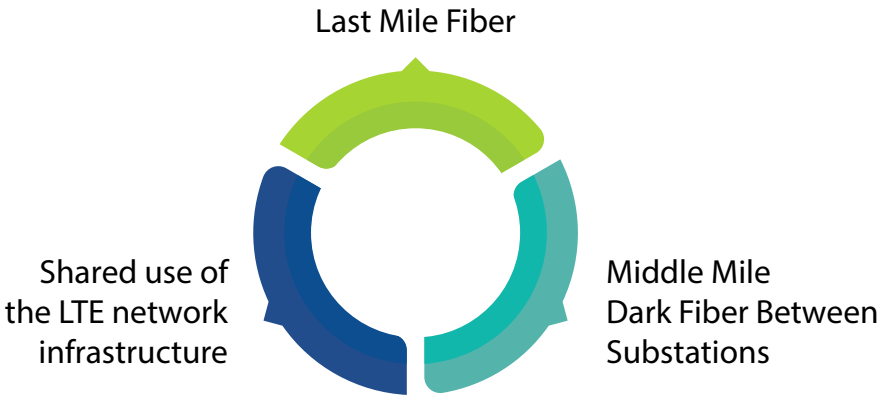

Figure 2 *- Opportunities to leverage common telecommunications infrastructure Including wired and wireless asset*

3. Models for Utility Support of Broadband Deployment

There are four basic models through which utilities can help facilitate broadband deployment to unserved and underserved areas:

Model	*Participants*
Collocation	IOUs, co-ops, and municipals
Lessor of Infrastructure Elements	IOUs, co-ops, and municipals
Wholesale Provider	IOUs, co-ops, and municipals partnerships with ISPs
Retail Provider	Co-op, and municipal partnerships with ISPs

Figure 3 *- Typical utility participation in broadband deployment models.*

[5] "Fact Sheet," Auction 904: Rural Digital Opportunity Fund. *Federal Communications Commission.* Fcc.gov/auction/904/factsheet.; Wilkins,Jon. "Top 10 Things to Know About the Rural Digital Opportunity Fund (RDOF)." RDOF.com. May 2020. rdof.com/news/rdof_top_10

[6] "Rural Digital Opportunity Fund Phase I Results, Data as of 12/07/20." *Federal Communications Commission*. Fcc.gov/reports-research/maps/rdof-phase-i-dec-2020.

[7] "Fact Sheet."

[8] https://www.congress.gov/bill/117th-congress/house-bill/3684 *United States Senate, 117th Cong., 1st Sess.* Epw.senate.gov.

[9] *Id.* at Sec. 60401.

[10] Estimate provided by Tilson analyst Andrew Freme.

These basic models carry varying degrees of risk and return for a utility and are not mutually exclusive. An IOU could, for example, focus on collocation and infrastructure leasing. As discussed further below, IOUs are also leveraging their expertise and industry knowledge to partner with ISPs and to support electric cooperatives and municipalities that are deploying broadband, in addition to leveraging their assets. These creative partnerships can be a powerful force to broadband expansion to unserved customers.

BROADBAND DEPLOYMENT FACILITATION MODELS

	RISK	RETURN	NEW UTILITY INFRASTRUCTURE
COLLOCATION	LOW	LOW	NONE
DARK FIBER LESSOR	MODERATE	MODERATE	NONE
WHOLESALE PROVIDER	MODERATE	MODERATE	NONE
RETAIL PROVIDER	HIGH	HIGH	----

Figure 4 *- Relative risk-return profiles for broadband deployment models.*

a. Collocation

Collocation involves the siting of third-party telecommunications equipment on utility infrastructure. This typically involves placement of fiber or wireless equipment on utility poles or transmission structures, or in substations, but collocation can also refer to laying fiber into utility ducts, underground conduit, or rights-of-way ("ROW"). Since most electric utilities own poles, ducts, and conduit, and easements in the ROW,[11] enabling collocation is not only a familiar exercise, but a required one. Applicable federal and state laws require utilities to provide telecommunications providers with nondiscriminatory access to utility poles, ducts, conduits, and rights-of-way. In other cases, like transmission structures and substations, utilities have more discretion. Vertical assets for wireless networks such as communication towers are also used for collocation (of wireless antennae, for example). Utility activities that enable collocation are an essential building block of broadband networks. Given their crucial role in broadband deployment, it is critical that the FCC, the state PUCs, and other governing authorities work with utilities to ensure adequate compensation and staffing for utilities, as well as enforcement of regulatory terms that supports the utility and does not place undue burdens on the utility to ensure third-party compliance with regulatory requirements. Because of the utilities' essential role as pole owners and managers of attachments, regulatory authorities should work closely with the industry to ensure their financial, logistical, and safety concerns are addressed.

For a broadband network deployment, delays in construction means delays in providing broadband to potential customers, as construction crews idle while waiting for approval and consumers face delays in hook-ups. One way that a utility can support deployment of new broadband networks is working with regulators to ensure that pole attachment processes are efficient and fair while maintaining safety standards, with appropriate rates, and has a scalable resource pool to do the work, at the attacher's cost. For many utilities, this means supporting pole attachment process reform, prioritizing fast, efficient pole attachment processes, and increasing resources for the process. Because large investments in pole attachment resources can be costly, many commissions are appropriately supporting or even promoting recovery for revamped, speedier pole attachments, and in many cases, those costs can be recouped from the attachers on a transactional fee basis. Some utilities are outsourcing part of the process to private third parties to increase efficiencies and offload what can be an enormous workload of applications.

[11] Limitations on utility easements and other communications uses are discussed further in Section 8, Potential Roadblocks to Utility Broadband Deployment Activities.

Although sharp increases in pole attachment licenses are undoubtedly more burdensome to the pole owners, the enhanced make-ready process can provide significant benefits to both owners and attachers. Make-ready activities are largely part of proper pole maintenance, replacement, and code enforcement. These activities benefit the attacher, as it will have safe and compliant poles for its infrastructure, as well as the pole owner, which will see improved safety and reliability for its attachments. New or additional strand and guying on poles from a new use also improves the resiliency of the infrastructure for both the utility's and the ISP's networks.

Collocation of third-party equipment also carries a cost to the network developer, as it must pay for "make-ready," the process of preparing utility poles or related infrastructure upon which the fiber or other equipment will be placed, in a condition suitable to support the new attachment. Make-ready costs can be a significant part of a network build. In unserved rural areas, for example, poles and supporting architecture may be too short or too old to accommodate additional attachments. Long stretches that require many pole replacements, combined with a low density of potential users for a new internet service to be enabled by the new attachments, can make the economics of a rural deployment quite challenging. Even in these situations, the utility can play a role in reducing the collocation costs by recognizing where existing code violations or pole deterioration need to be cured anyway for the safe and reliable operation of the system, thus reducing make-ready costs to the network developer.

Utility investments in their communications networks can also create new collocation opportunities. As utilities expand their own networks more deeply into rural areas and deploy infrastructure such as new or upgraded poles, conduit, or communications towers, they generate more opportunities for collocation. This new or upgraded infrastructure can then be used by ISPs to collocate their own equipment, spurring more broadband network development. The ISPs themselves may even become new and not insignificant electrical customers.

b. Lessor of Infrastructure Elements

With many utilities investing in their own networks, there are opportunities to lease elements of those networks, including dark fiber, microwave links, and electric power connections. Dark fiber or microwave links can provide an ISP with the middle mile connectivity needed for backhaul to enable retail broadband internet service. Revenue from infrastructure leases can return some or all of the investment to the utility and its customers, creating more return for the utility. However, this increased investment requires resources and leasing revenue is unlikely to offset the entire investment, and there is no guarantee of leasing revenue, hence there is increased risk as well.

Utility investments in wireless infrastructure components such as fiber backhaul, electric power, equipment shelters, and radio towers can also be leased to an ISP to support the provision of broadband service to unserved customers. Poles and conduit that are part of the network may also be available for collocation. Although "leveraging" projects tend to focus on wired rather than wireless technology for the last mile connection due to concerns about speed of service, private LTE and 5G speeds have evolved to the point that they can meet speed requirements without the cost of fiber deployment. A wireless last mile opens a range of use cases for rural communities, particularly where there is extremely low density or difficult terrain that places fiber costs out of reach. In any event, elements of the infrastructure that could support a utility wireless network (like fiber backhaul from a tower) may nonetheless be leased to an ISP even if the last mile is wired.

c. Wholesale Provider

Utilities can also provide wholesale broadband service over any unused fiber. Wholesale broadband service is a high bandwidth connection that ISPs use to connect their retail networks. In the analogy to the electric grid, this would be the electrical transmission service. Some electrical cooperatives provide wholesale service in addition to retail service. There are many wholesale providers in the telecommunications market, so utilities that enter this space can face stiff competition, making it a riskier investment.

There are also significant legal and regulatory hurdles that an IOU faces if it seeks to provide either wholesale or retail broadband service. They must become a licensed telecommunication provider under applicable state law, and comply with FCC regulatory obligations, including state and federal Universal Service Fund payments and E911 requirements. Most utilities form a separate legal entity to provide wholesale or retail broadband for these reasons. Southern Company, for example, has an affiliate, Southern Linc, which provides wholesale, commercial, and retail broadband services, as discussed further in Section 5. These regulatory challenges, combined with the need to develop or add technical expertise on broadband deployment, deter most IOUs from becoming a wholesale or retail ISP.

d. Retail Provider

To date, the vast majority of IOUs have indicated that they do not want to serve as an ISP but prefer to stay oriented on their core mission of providing safe, reliable utility services. Their broadband focus is rather on laying the groundwork for ISPs, making it more cost-effective for them to provide broadband to rural communities. IOUs—and their commissions—are therefore more likely to embrace models with less risk and less potential return allowing them to focus on provision of electric service (*see* Figure 1).

4. How ISPs Typically Provide Broadband to Consumers' Homes

There are generally two architectures ISPs use to connect to consumers' homes to provide broadband internet service: wired and wireless. Wired connections typically depend upon fiber optic cable to each home for the last mile as well as fiber connections all the way to the internet. Wireless architectures (exclusive of satellite) depend upon radio wave communications to connect the home with equipment mounted on a radio tower; from there the connection to the internet is typically fiber, perhaps with a high-capacity microwave link on the way.

a. Typical Wired Fiber Networks Used by ISPs to Provide Home Broadband

While the terminology for communication networks differs from that of the electric grid, there are rough parallels to the basic elements of a fiber network and the grid: the middle mile is similar to transmission infrastructure and the last mile is similar to the distribution system. Both middle mile and last mile infrastructure deployed by a utility can support an ISP providing home broadband connections to unserved customers.

Wired utility networks are generally fiber networks. Fiber is different from – and can transmit much more information much more quickly – than the coaxial cable used in commercial cable networks that have traditionally served homes and businesses.

In the telecommunications world, fiber networks are often referred to as "Fiber to the Home" (FTTH) or "Fiber to the Premise" (FTTP) to be more inclusive to business, education, government, and other locations. The overall architecture of an FTTP network is often referred to as a Passive Optical Network or "PON." The PON is connected to the internet through an ISP's central office hub known as the head end. The PON is connected by a middle mile multifiber cable out into the network's service distribution area. An optical splitter near the service area then divides the signal into smaller distribution fiber strands that serve as the "last mile" connecting to the individual homes and businesses served by the ISP. The last piece of the "last mile"—the actual connection to the individual premises—is known as the "drop." The traffic from a group of "last mile" connections is aggregated onto "middle mile" fiber (the aggregated data is known as "backhaul") and carried to/from the head end. Sometimes an ISP will own and use its own fiber infrastructure for last mile and backhaul connectivity, but in many cases fiber network operators separate from the ISP lease to the ISP fiber strands the network operator does not need for other purposes, known as "dark fiber." Where this dark fiber is available, ISPs can use it as part of the "middle mile" connection needed to provide end-to-end broadband internet service.

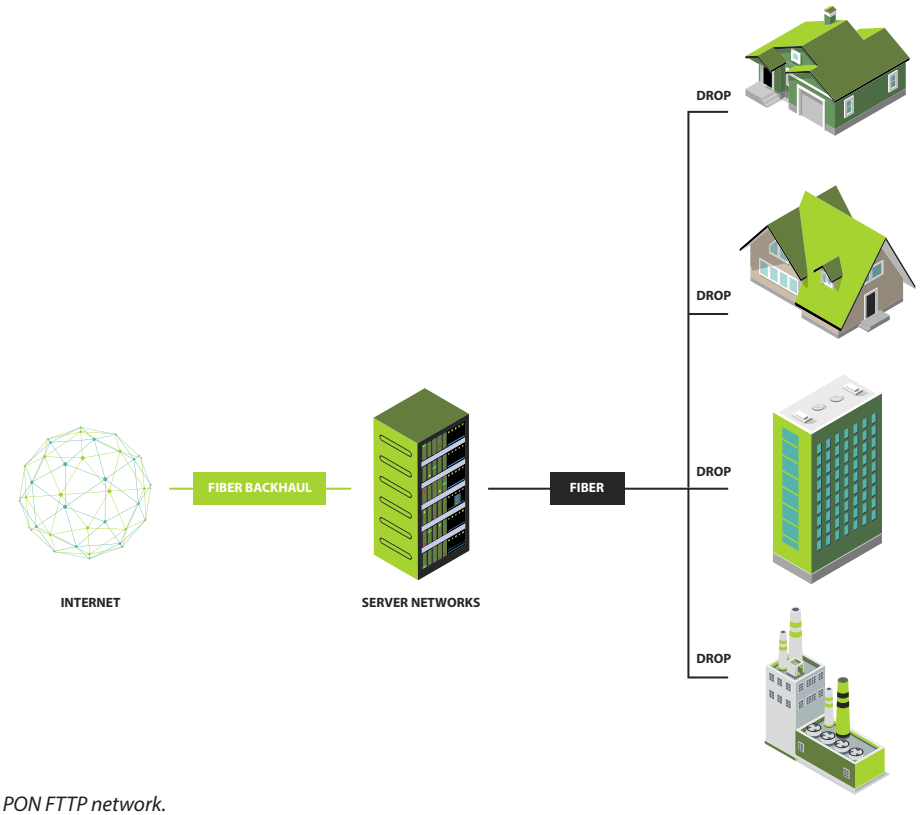

Figure 5 *- Diagram of generic PON FTTP network.*

b. Typical Wireless Networks for Connecting Subscribers to Their ISPs

Wireless networks use fiber or wireless microwave connections for backhaul (the middle mile) and wireless technology for distribution into the service area (the last mile). This wireless distribution is called a radio access network or RAN. Traffic from the RAN is aggregated and backhauled to the wireless network core and the head end using a fiber network or combined fiber/microwave network. As with wired networks, there may be dark fiber or extra microwave links alongside backhaul links as well as other common wired and wireless infrastructure such as utility poles, radio towers, conduit, electric power, and equipment shelters. Utilities with deployed AMI and distribution automation equipment usually rely on wireless networks for the last mile to communicate with devices in the field. This architecture can also be used for private LTE and 5G to serve homes and businesses.

For all mobile and some non-mobile residential broadband internet access, ISPs will opt for wireless broadband in use cases where wireless is more versatile or cost-effective, such as in low density rural areas. An analysis by The Brattle Group discussed the usefulness of wireless for rural broadband where the cost to provide service per premise via wireless is lower than it would be with a wired network:

> ***The key difference between providing broadband services to urban versus rural areas is the population density of customers…. Upstream of the distribution network, costs would be expected to be similar between a wired and wireless network—the required switches, routers, interconnections, etc., are not significantly affected by the choice of wireless versus wireline distribution networks. Downstream of the distribution networks (i.e., at the customer's home or business), the cost of connecting the customer to the distribution network varies significantly but not consistently by the choice of wireline or wireless networks. For example, a wireless network could have relatively expensive customer premise equipment (CPE) such as an exterior antenna or relatively inexpensive CPE such as a lap-top card. Similarly, a wired network could have a relatively inexpensive cable modem or relatively more expensive fiber network interface device. The wired network's connection to the residence could be a low-cost above-ground drop or a more expensive buried connection.***[12]

[12] Bazelon, Coleman. "The Benefits of Wireless Broadband For Rural Deployments" at 5- 6. *The Brattle Group.* March 16, 2010.

The analysis then provides a comparison of the costs for deployment of wired versus wireless networks and predicts that wireless broadband has fixed capital costs savings per household served of up to $7,500 as compared to wireline costs in large sections of rural America.[13] Although deployment costs may well vary from the costs used in The Brattle Group's 2010 analysis, the conclusion remains the same: wireless networks may well be more cost-effective than FTTP for providing broadband to many rural areas.

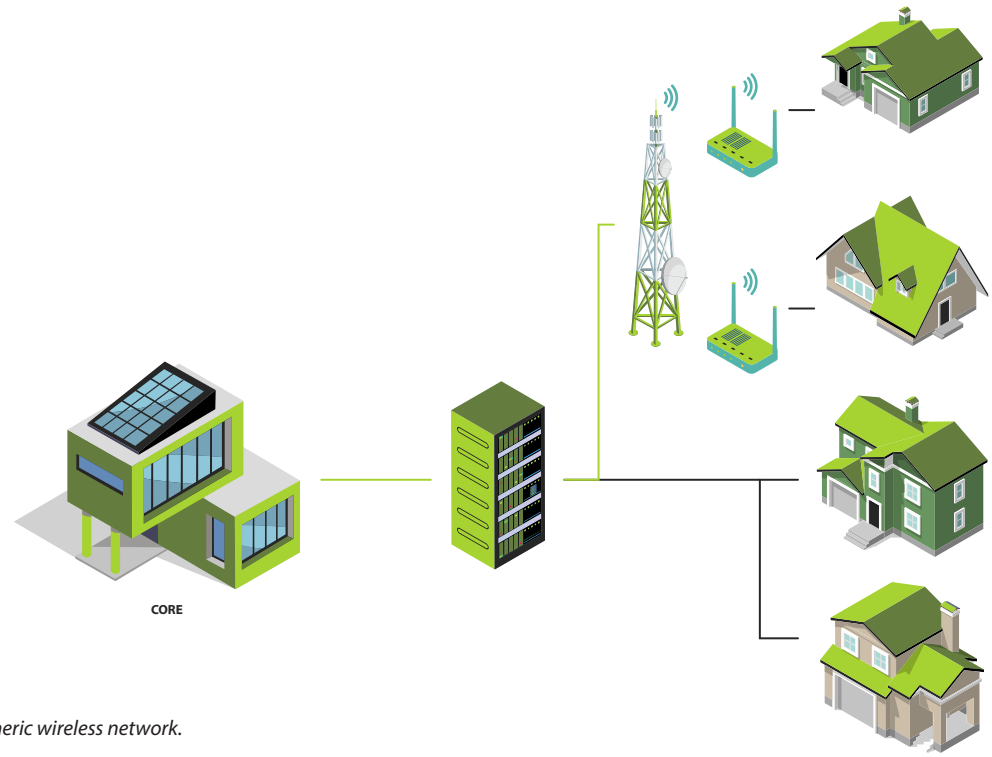

Figure 6 *- Diagram of generic wireless network.*

i. Wireless Technologies

There is a variety of technologies that can provide wireless last mile connectivity to the end user or device. For critical utility functions that require the highest level of security and reliability, many utilities are turning to private Long-Term Evolution or "LTE" networks, which are non-public cellular networks available only to authorized users, such as utility personnel. LTE networks are desired since it is a standards-based technology, which results in a large ecosystem, and provide scalability rather than being limited to a single vendor and impacted by obsolescence. The private LTE network transmits and receives its signal using frequencies on the electromagnetic radio spectrum. The architecture of a private LTE network can also be upgraded to provide 5G service. Private LTE networks rely on licensed spectrum, unlicensed spectrum, or shared spectrum such as Citizens Band Radio Service, or "CBRS." The signal is distributed via antennae on towers and in small cells to end-use devices like phones and machine-to-machine modems. Private LTE networks are designed based on specific use cases and can be customized to meet the requirement of connectivity to 100% of a utility service territory, vs a public carrier that may not cover some areas due to the low density of homes.

ii. Spectrum

For critical operations that require the highest level of security and reliability, utilities should consider licensed spectrum.

Licensed spectrum: Private LTE networks with licensed spectrum is particularly useful for utility applications that require high levels communications availability and data protection. Networks based on licensed spectrum operate within specific radio frequencies licensed by the Federal Communications Commission ("FCC") for exclusive use by the licensee. The users of licensed spectrum operate within that spectrum band and have recourse to the FCC to prevent and mitigate any interference with their usage.

[13] *Id.* at 13-15.

Unlicensed spectrum: The FCC makes some bands available for use without a license. This allows for crowding and interference in the band by multiple users without any limit or recourse. It is basically the "wild west" because any user can access it, and there is enormous potential for interference from other users. It is generally not suited for critical utility functions, but can be suitable for broadband, where there is a higher tolerance for interference. In general, unlicensed uses that interfere with critical utility operations should be curtailed.

Shared spectrum: Spectrum sharing is another option for wireless operations, allowing multiple categories of users to share the same frequency bands. Utility industry spectrum sharing focused primarily in the 3.5 GHz band, known as the Citizens Broadband Radio Service ("CBRS"). This band was historically reserved for military applications, mostly naval radar. The FCC created a Priority Access License or "PAL" to coordinate sharing among licensed users, reducing the risk of them interfering with each other. In 2020, the FCC auctioned off PAL licenses, and a number of utilities won licenses in the auction. Other parts of CBRS are available to all users without a license. CBRS may be subject to military use preemption, which means that the military has priority over other uses when it is operating in the area. CBRS can be a viable option for utility private LTE networks as a complement to dedicated, licensed spectrum. Since the potential for interference from other licensed or unlicensed users in CBRS remains a concern, critical utility operations which require the highest level of security and reliability are best supported with licensed spectrum.

As technologies mature and PUCs approve large scale grid modernization programs, utilities are increasingly moving towards common telecommunications frameworks for network infrastructure that integrates the various utility applications. For example, a fiber backbone can connect substations and other major nodes even as it also supports a private LTE network. That private LTE network, in turn, could provide secure access for a multitude of applications, including AMI, distribution automation, and smart lighting. As discussed further below, such a unified network architecture drives fiber deeper into the electric distribution network and provides three resources that a utility could leverage to support broadband – middle mile dark fiber between substations, the deeper distribution last mile fiber, and shared use of the LTE network infrastructure.

The NARUC Broadband Task Force reached a similar conclusion:

> ***Middle mile networks constructed by investor owned electric utilities (IOUs) may provide still another means for increasing broadband availability in unserved and underserved areas. These networks provide a broadband backbone that can be used by ISPs that contract with the utility to provide broadband service.***
>
> ***As with cooperatives, emerging technologies for network control and optimization are driving [investor-owned] utilities to install wired and wireless broadband service as part of their internal control and communications systems to enhance their operations and increase service reliability. Development of a broadband backbone for electric distribution operations allows utilities to optimize current and emerging technologies to improve operations and create a more secure and smarter grid.***[15]

This unified network approach presents a powerful utility platform for supporting broadband deployment.

5. Industry Perspectives

Many of the nation's IOUs are engaged in or planning actions to support broadband deployment. This section provides information and perspectives from some of the nation's utility leaders in this area, as well as from ISPs and other companies that work with utilities on telecommunications projects.

[14] "NIST Helps Facilitate First-Ever Spectrum Sharing Between Military and Commercial Wireless Carriers." *NIST.* March 22, 2018. NIST.gov.

[15] "Investor Owned Utilities." *Report* at 12.

Company	Representative/Source	Title
Alabama Power/Southern Company	John Smola	Director of Marketing and Business Development
Alliant Energy	James Gallegos	Senior Vice President, General Counsel & Corporate Secretary
Ameren	Joseph Millard	Director of Transmission Portfolio Management, Planning and Project Controls
Anterix	Rob Schwartz	President and CEO
Appalachian Power Company/ American Electric Power	Brad Hall	Vice President of External Affairs
C Spire	Ben Moncrief	Senior Vice-President of Strategic Relations
Dominion Energy	Ed Diggs	Manager, Electric Distribution Grid Solutions - Rural Broadband Program, Dominion Energy Virginia
	Matt Heartwell	Manager, Electric Distribution Grid Solutions - Rural Broadband Program, Dominion Energy Virginia
Geoverse	Paul Zuccaro	Vice-President of Business Development
Vermont Electric Cooperative	Rebecca Towne	CEO
Tilson	Joshua Broder	CEO
UScellular	Grant Spellmeyer	Vice President of Government Affairs
Xcel Energy	Ronald "Griff" Griffith	IT Manager – OT Connectivity

Figure 7 *- Summary of perspectives from utility companies and providers of telecommunications solutions partners.*

John Smola, Director of Marketing and Business Development, Alabama Power

Alabama Power, a subsidiary of Southern Company, is another leader in utility broadband. While the company has used fiber on its network for decades to support utility operations, it entered its first fiber lease with the Montgomery Chamber of Commerce in 2018, making it one of the first IOUs to use its infrastructure to support broadband deployment.

According to John Smola, Director of Marketing and Business Development for Alabama Power, the company sees its core mission as providing electricity to its 1.5 million customers in Alabama. It strives to better serve its customers by investing in technology that improves the reliability, resiliency, and security of its electric grid. It therefore makes strategic investments in the connectivity space – through both wired and wireless networks – to make the grid smarter and more reliable. Alabama Power sees these investments as also working to "future-proof" the grid by ensuring its ability to adapt to new technologies.

They approach these wired and wireless investments so that they can support Alabama Power's core regulated investments, and if they partner with an ISP, also to further connect unserved customers. The company only partners with ISPs to support broadband deployment and does not provide any direct broadband service to customers.

They work with ISPs primarily through fiber leasing. These fiber leases are not traditional Indefeasible Right of Use (IRU) arrangements typically seen in the telecommunications industry, which grant unconditional and exclusive use of the network's capacity for a long period of time. Rather, Alabama Power approaches each partnership differently and maintains control over its network, performing maintenance and outage restoration.

Mr. Smola notes that the lessors of the dark fiber on the utility's network have generally recognized that Alabama Power is great at restoration and that their network architecture has a high degree of redundancy. Because the utility's communications networks are so reliable, the ISP's service also shares that same reliability.

The Alabama PSC has been supportive and very engaged in the effort to support broadband deployment. According to Mr. Smola, this is because the Commission understand the benefits to the core network, and also appreciates that the need for broadband in the state is so desperate. Under Alabama Power's approved grid modernization plan, the company included enough fiber to meet its anticipated needs through 2040. Mr. Smola estimates that adding this additional fiber was an incremental cost of 1-2% of the total cost. In the meantime, the company maximizes the value of unused dark fiber by leasing it to ISPs and providing the revenue back to its ratepayers.

The PSC requires a regular regulatory check-in on Alabama Power's fiber utilization. They weigh the amount of fiber in use by the utility and the amount of dark fiber used or available for use by an ISP to ensure there is a balance between current and future use of the fiber by the utility, and to ensure there is not an excessive amount of dark fiber built into the system.

Alabama Power also has extensive wireless networks and spectrum leases. It is open to leasing the elements of the wireless networks, including the towers, land space, racks, cabinets, and poles, although it has not yet done so. It is also studying potential partnerships for sharing of its spectrum. It does share wireless assets with Southern Linc, a Southern Company affiliate that provides wholesale, commercial, and retail wireless services.

Mr. Smola noted the importance of the state legislature to IOU support of broadband deployment. Alabama passed a bill [the "Broadband Using Electric Easements Accessibility Act"[16]] to allow use of utility easements to support broadband deployment and allow IOUs to deploy infrastructure for communications services and to support broadband. This type of legislation is key in reducing the financial risk associated with these networks, and also allows for much speedier deployment, as the IOU does not need to clear path for deployment easement by easement.

This leveraging strategy is beginning to bear fruit. For example, Alabama Power is working with Tombigbee Electric Cooperative and its subsidiary ISP freedom FIBER to provide broadband in northwest Alabama. Alabama Power is enabling use of its existing electric and fiber infrastructure for the ISP's fiber backbone.[17]

The public reaction and feedback to Alabama Power's efforts has been very positive. "There's a lot of excitement in the rural areas," Mr. Smola said.

James (Jim) Gallegos, Executive Vice President, General Counsel & Corporate Secretary, Alliant Energy

Alliant Energy, which serves approximately a million customers in Iowa and Wisconsin, views supporting broadband deployment as a way for the company to support its customers and communities, according to Jim Gallegos, Alliant Energy's Executive Vice President, General Counsel & Corporate Secretary.

> ***"The digital divide has turned out to be an issue that is having a great impact on our customers and the communities we serve," Mr. Gallegos said. "Consumers are struggling with telecommuting, education, and health." He noted that***

[16] Ala.Code 1975 § 37-16-4 (2019).

[17] Patchen, Tyler. "Alabama Power, Tombigbee team up for rural internet project." *Birmingham Business Journal*, June 21, 2021. *Bizjournal.com*.

Alliant Energy is looking to make life better for its customers through better access to reliable broadband service within its' service territories in Iowa and Wisconsin.

As the country emerges from the pandemic, Alliant Energy sees an opportunity for the company to help build stronger communities by helping with broadband deployment.

"Some municipalities are reaching out to us, looking for help," Mr. Gallegos said. "But there is no one-size-fits-all solution. Alliant Energy is not looking to compete with or become an ISP, and we are agnostic on which reputable ISPs or telecommunications providers whom we work with. We just want to help, and we already have the infrastructure in place to do so."

He noted that one goal both Alliant Energy and the communities share is retaining customers and creating an environment that sustains growth. Without adequate broadband, consumers may have no choice but to relocate.

"One story that stuck with me is about a family farm in northwest Iowa. One of the family members had to work remotely during the pandemic and without adequate connectivity, the family had to move in order to telecommute. We don't know when they are coming back. No one wants people to move because they lack broadband; access to broadband is a quality of life issue," he said.

Many of the communities Alliant Energy serves in both Iowa and Wisconsin are rural, and Mr. Gallegos noted there's a great need for reliable broadband service.

"Precision agriculture is an important part of the economy, and we also have – and would like to attract more – heavy manufacturing," he said. Wisconsin has a significant steel industry, for example. Alliant Energy is looking to support its communities more directly as well.

"Is there a community with no ISP? Could we set up an internet café there to support telemedicine, tele-education, and other essential activities? The problem is bigger than just broadband infrastructure; it also digital literacy and providing access to hardware and software.," Mr. Gallegos said. "There's just not enough being done to deal with this issue holistically."

Alliant Energy has already deployed significant fiber to serve its grid needs, including a fiber ring from Madison to Cedar Rapids. The company has dark fiber that it is interested in leasing, and it has already received positive feedback from ISPs. It is looking at a more distributed energy model, which will necessitate fiber throughout its system to automate operations and support other smart grid investments. It will be looking at potential ISP or telecommunications partners for pilot projects in the fourth quarter of 2021.

Alliant Energy also sees leveraging its telecommunications assets to support broadband deployment as a way to help make customers whole for its infrastructure investments. All revenues from leases will flow back to customers.

Mr. Gallegos noted that there was a need to educate legislators, regulators, and other stakeholders on the role that utilities can play to support broadband deployment.

"It's not intuitive," he said, "but once people understand the value of utility infrastructure to provide that middle mile need, the support has been overwhelming." He noted that Alliant Energy worked closely with industry associations and elected officials including key U.S. Senators to develop support for the utility infrastructure funding in the infrastructure bill passed by the Senate in August.

He sees increasing interest and excitement in the utility industry around broadband deployment but notes that more dialogue and collaboration is needed.

"Alliant Energy's goal is to make broadband more accessible for everyone. We need to look at the issues holistically: networks, hardware, software, digital literacy, ISP partnerships, working with non-profits and businesses on adoption. All the elements need to come together."

Joseph Millard, Director of Transmission Portfolio Management, Planning and Project Controls, Ameren

Ameren serves six million electric customers in Missouri and Illinois and has one of the most comprehensive leasing strategies in the industry. The company is currently deploying dark fiber on its transmission and distribution system to support operations and is building more to enable grid modernization efforts. According to Joseph Millard, Ameren's Director of Transmission Portfolio Management, Planning and Project Controls, Ameren is investing over $1 billion dollars in communication networks to support operations and enable grid modernization. There are three components to Ameren's communication investments:

- Fiber networks
- Private LTE
- AMI wireless mesh network

The business case for each of these investments could stand alone on the cost-benefit analysis for Ameren's grid modernization efforts. Ameren has a very detailed utility use case for its investments to support full recovery. However, to maximize the value of the investment and help bring broadband to communities in and around its service territories, the company seeks to lease dark fiber on its existing system and additional deployments, including on its private LTE network. It already allows collocation of wireless carriers on its transmission infrastructure and Ameren-owned communication towers.

Ameren is being careful not to pick winners and losers for its leasing and collocation efforts, but rather seeks to offer access to any interested party. Like most IOUs, Ameren is not interested in being an ISP. It hopes its efforts will create more competition among ISPs and provide more choices for its customers. The company also sees the synergies between grid and communications network operations: it has the trucks, the people, the field assets that can be used to support broadband deployment.

There are challenges to Ameren's efforts, as there are challenges with respect to utility easements and property rights.[18] The company is working to overcome these issues and is planning ahead with its deployments with designs that increase the flexibility, reliability and resiliency of the infrastructure and enable secure third-party access to support broadband, such as being strategic about splice points and redundancies.

Ameren views its leasing and collocation efforts as maximizing the value of its investments for its customers, because both the potential leasing revenue to offset costs borne by customers and the potential of improved broadband access for its customers. The revenue can offset ratepayer investment and enhance the value of its network because of the multiple benefits. Better broadband will enable economic development, which in turn can drive load growth. Sharing, rather than duplication, of infrastructure also reduces environmental impact associated with construction and operations. And if Ameren's efforts reduce costs for ISPs as well, they can stretch the value of the public dollars currently being directed broadband deployment.

"We want to squeeze every dime from our assets for our customers," Mr. Millard said, "and provide as many benefits as possible to the communities we serve. At the end of the day, we are a service company."[19]

[18] These limitations are discussed *infra* in Section 8, Potential Roadblocks to Utility Broadband Deployment Activities.

[19] For further information, see "Leveraging Utility Infrastructure to Bridge the Digital Divide," Ameren presentation before the NARUC Broadband Expansion Taskforce, Nov. 5, 2020.

Rob Schwartz, President & CEO, Anterix

As the largest holder of licensed spectrum in the 900 MHz band (896-901/935-940) throughout the contiguous United States, plus Hawaii, Alaska and Puerto Rico, Anterix is uniquely positioned to support the utility sector. Our mission is to enable the private wireless broadband capability that supports the modernization of the electric utility grid, including the integration of distributed and renewable energy resources. We are now in the process of executing on that mission. To date, the FCC has granted 14 experimental licenses at 900 MHz, empowering numerous utilities, including the National Renewable Energy Lab, to test dozens of use cases including monitoring, sensing and control of mission critical applications. Three utilities, Ameren, SDG&E and Evergy, have entered into contracts with Anterix and intend to deploy private LTE within their service territory.

> ***"As utilities architect and deploy private LTE networks for their own internal needs, there also is an exciting opportunity to support rural broadband deployment," Mr. Schwartz said. ""There has been a growing interest in identifying how these private LTE networks could play a role in a utility's efforts to support rural broadband. The assets that they are deploying to enhance the reliability, security and resiliency of the grid are a combination of wired and wireless networks. Elements of these internal-facing networks, namely the 'middle-mile' components that do not connect to the utility, are fungible, and could be utilized by an ISP. Those elements of a wireless network include communication towers, cabinets, electricity, or extra microwave links, alongside backhaul links and other common wireless infrastructure such as utility poles, radio towers, conduit, electric power, and equipment shelters may be leased to an ISP. Sharing access to these assets can not only lower the cost that an ISP would incur if it were to deploy broadband service on its own but may also stimulate an ISP into providing broadband coverage in an area that would otherwise not be economical. We look forward to partnering with utilities and other stakeholders to help optimize how they can leverage common infrastructure to support the grid, and also help close the digital divide."***
>
> ***"As a founder of the Utilities Broadband Alliance (UBBA), we believe that partnerships between utilities and providers of services and technology are instrumental to the success of grid modernization programs. Anterix is committed to ensuring that utilities have access to 900MHz spectrum as a nationwide de-facto standard for private LTE, enabling their grid modernization strategies. However, our commitment expands beyond spectrum to driving innovation and solutions to enhance utilities' private telecommunications investments," said Mr. Schwartz.***

He further explained that Anterix continues to build partnerships to create a strong ecosystem that will help to improve value and scale in support of utility private network deployments. The recently-launched Anterix Active Ecosystem Program brings more than 50 leading technology companies together to support 900 MHz Private LTE (PLTE) networks and shape the future of private wireless broadband for utilities. This, in turn, may accelerate deployments and perhaps open additional opportunities to provide middle mile assets to rural ISPs.

> ***"It's essential that we find ways to provide broadband to every premise in America, including in the most rural, most remote, most geographically challenging regions of our country. Wireless networks are definitely part of the solution and leveraging utility investment in private LTE networks can be a gamechanger for wireless ISPs seeking to reach these most difficult, and most expensive, locations."***

Brad Hall, Vice President of External Affairs, Appalachian Power Company

American Electric Power Company and its subsidiaries (AEP) are also deeply invested in projects to support broadband deployment. Like most other IOUs, AEP is focused on "its core competency" of building and managing infrastructure, and not on being an ISP, according to Brad Hall, Vice President of External Affairs for AEP subsidiary Appalachian Power Company. It leases fiber and other middle mile infrastructure to ISPs to support broadband deployments. AEP has over 20,000 miles of fiber and is adding thousands more miles. While it has traditionally leased any dark fibers if approached by a potential customer, it is now actively marketing its dark fiber to ISPs.

There are several reasons for AEP's focus on supporting broadband deployment. AEP has one of the largest portfolios of infrastructure in the utility market, with fiber and other communications infrastructure across eleven states.

First, Mr. Hall has spent much of his career in economic development and sees that broadband is now part of any economic development discussion. It is a primary driver to attract and retain industry. And strong economies are good for the utilities that serve them. Broadband also provides direct benefits to consumers in the form of access to education, health care, the digital economy, and other essential services.

Second, AEP is investing in grid modernization projects and needs connectivity to interconnect with smart grid devices. Although most of these projects involve wireless broadband, AEP is pushing fiber further into unserved territories to support connectivity. This brings fiber backhaul closer to consumers and improves the opportunity for fiber to the home and coverage from fixed wireless towers.

The cost-benefit analysis for these projects varies depending upon topography and population size. For more urban or densely populated areas, grid modernization is the primary driver, as grid mod technologies are more frequently deployed in those areas. In more rural markets, the impetus is more focused on the direct benefits of broadband deployment to consumers, such as education, health care, emergency services, and so forth.

All of the revenue from leasing of infrastructure will go back to consumers under AEP's model. As Mr. Hall said, there will never be enough leasing revenue to cover the cost of deploying broadband infrastructure, but the revenue can help defray those costs. AEP's communications infrastructure is approximately 60% fiber to the premise and 40% fixed wireless. Maximizing the "dual purpose" of this infrastructure helps the business model, and their goal when they support broadband deployment is to ensure every unserved customer in the area has access to broadband. In Virginia and West Virginia, Appalachian Power was empowered by statute to work with ISPs and deploy middle mile infrastructure, and those statutes provided guidance on the company's recovery and returning revenue to ratepayers.[20]

AEP is also working with ISPs to enhance collocation opportunities by improving the make-ready process. Any process improvements will be implemented throughout the company to the extent possible, to improve the process for all attachers. AEP also places its fiber in the electric supply space instead of in the communications space. This helps speed deployment as well, because the company does not have to wait for other attachers to move their attachments, as it would if it deployed in the communications space. AEP then works with ISPs to drop access points to AEP fiber into the communications space.

AEP worked with different organizations and leaders to educate them on the models for utility broadband deployment. The company also met with ISPs to explain their model and to assure them that AEP is not looking to compete with ISPs. Mr. Hall noted that the conversation around utility broadband has changed over the last two years.

"It used to be 'how can we do this?'" Mr. Hall said. "Now that we better understand the need, it's 'how can we not do this?'"

Ben Moncrief, Senior Vice-President of Strategic Relations, C Spire

C Spire is a telecommunications-based technology company that provides high-speed wired and wireless broadband service. C Spire was a key part of a Mississippi PUC initiative to deploy broadband in rural parts of the state. According to Mr. Moncrief, Entergy, one of Mississippi's two investor-owned utilities, sought PUC approval of capital investments in grid modernization. At the urging of the PUC, especially Mississippi Commissioner Brandon Presley, Entergy sought to partner with an existing ISP to build a middle mile fiber network where Entergy would serve as the anchor tenant. C Spire then partnered with Entergy on the project.

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[20] *See* "Provision of broadband capacity to unserved areas of the Commonwealth," Va. Code Ann. § 56-585 et seq.
"Electric power utilities; feasibility study for providing broadband services; Public Service Commission to assist; proposed legislation to be developed; report ;" W. Va. Code § 31G-4-5 et seq.

"The utility secured a portion of the fiber strands C Spire built along several segments across Entergy's footprint," Mr. Moncrief said. "Entergy was the anchor tenant, so they got great connectivity for their programs, and consumers got better access to high-capacity, low-latency broadband service as a result of a more robust middle mile fiber network." C Spire and other ISPs can now leverage these fiber routes to provide service to end customers.

"We are seeing some brand-new networks being built as a result of this effort," he added, "as well as deepening the footprint of existing networks. People who weren't connected now are."

Having Entergy as an anchor tenant made all the difference in the business model, according to Mr. Moncrief, enabling them to build more fiber in more rural areas of Mississippi. C Spire also has a different partnership with Alabama Power, under which C Spire leases excess dark fiber capacity, including some long-haul fiber, from the company.

"Alabama Power built substantial fiber to improve the resiliency and reliability of their grid ," Mr. Moncrief reported. "We are now able to leverage some of their current excess capacity fiber to accelerate broadband deployment; this allows C Spire to reach new markets with our fiber broadband services much more quickly."

Like others, Mr. Moncrief reported that franchise agreements and permitting of infrastructure are two of the biggest challenges. The incumbent telecommunications providers also do not like the competition from smaller ISPs that are using the network to deploy broadband. Easements can also be a problem, but he noted that Mississippi and Alabama both passed laws enabling utility easements to be used for broadband deployment.

C Spire is seeing increasing interest in these utility middle mile networks. The public benefits and economic savings of leveraging utility infrastructure for middle mile "seems so obvious to us," he said.

Ed Diggs, Manager, Electric Distribution Grid Solutions - Rural Broadband Program, Dominion Energy Virginia
Matt Heartwell, Manager, Electric Distribution Grid Solutions - Rural Broadband Program, Dominion Energy Virginia

In Virginia, **Dominion Energy** submitted its first grid transformation project in 2018, seeking to improve resiliency through grid automation and AMI deployment. As part of that project, they received approval to deploy fiber between substations. They conducted a feasibility study around how the company could use excess fiber on its routes. They found that in areas with little or no existing fiber, the Dominion Energy middle mile fiber can help create a sustainable business model for the ISP, as it buys down the cost of transport for the ISP.

As it moves forward with efforts to modernize Virginia's energy grid, Dominion Energy Virginia is working to provide "middle-mile" fiber optic cable infrastructure that can also be used to bridge the digital gap and reduce broadband deployment obstacles for ISPs. Leasing the fiber also makes Dominion Energy's investment more cost-effective, as leasing revenue is used to offset the fiber investment.

In Virginia, a pilot program enacted by legislation in 2019 and made permanent during the 2021 General Assembly session allows IOUs to invest in middle mile infrastructure to support broadband deployment, provided that the company works with an ISP to provide the service to the customer.[21] It allows for the IOU to seek cost recovery through a rider with an annual true up.

Limitations on utility easements are a significant barrier to Dominion's efforts. While a 2020 statute expanded utility use of middle mile infrastructure to support broadband deployment, it also stated that IOUs are responsible for obtaining all necessary easements to permit the lease of dark fiber by 3rd party ISPs.[22]

[21] Va. Code. Ann. § 56-585. 1:8 (2019).

[22] Va. Stat. Ann. §56-585.1:9 (2020).

Another challenge for Dominion is standing up and managing the capacity needed to support the fiber deployments. This includes increasing its capacity around make-ready, splicing, and testing of the fiber, skills sets that the utility does not necessarily have. The Company also has to establish dark fiber lease rates that take into consideration that ISPs are targeting a limited number of customers within unserved areas.

Mr. Diggs noted that the cooperation among stakeholders at the federal, state, and local level has been paramount to the success thus far. Legislators and regulators have worked together to secure necessary approvals for the Rural Broadband Program. Local, state, federal and electric utility partnerships have been paramount in closing the digital divide in Rural Virginia.

> ***"A holistic approach that considers all of the stakeholders involved is important," Mr. Diggs said. "That's essential to success."***

A number of fiber leasing projects are underway, and the Company is seeing the creation of additional partnerships that will have a significant positive impact on broadband deployment to unserved consumers in Virginia. For example, Dominion Energy is teaming up with Central Virginia Electric Cooperative and the Cooperative's wholly owned subsidiary, Firefly Fiber Broadband and Rappahannock Electric Cooperative to bring broadband service to unserved customers in rural Central Virginia. The fiber will be used for the utility's operational needs as well as for broadband deployment, reducing broadband deployment costs for ISPs and the jurisdiction they will serve.[23] This reduces the overall deployment costs for the ISP.

> ***"It's a once in a lifetime opportunity for Virginia residents and the communities where they live," Mr. Diggs said.***

Paul Zuccaro, Vice-President of Business Development, Geoverse

Geoverse is a Private 4G LTE/5G mobile network operator that builds and operates carrier grade broadband and cellular networks. Their end-to-end solutions support mission-critical applications using CBRS and licensed spectrum.

Mr. Zuccaro, Vice-President of Business Development, sees the potential for utility Private LTE/5G networks to support wireless broadband networks as well as improving cellular coverage.

> ***"Being a mobile network operator is in our DNA," he said. "We can build and operate highly secured, resilient private cellular networks that support critical utility operations, like private LTE networks that use Anterix spectrum, which have broad propagation to cover a broad AMI deployment, for example. We can use that same infrastructure to provide wireless coverage for wholesale and consumer use on CBRS and other spectrum assets."***

He noted that Geoverse has operated a cellular roaming network for 15+ years, operating 1,200+ multi-technology sites across 500+ physical locations, serving approximately 1.2m unique retail and wholesale subscribers.

> ***"If a utility is installing a communications tower as part of its private LTE network, it's highly cost efficient to deploy additional radio access network capacity on the tower and stand up a CBRS network on the same architecture," Mr. Zuccaro said. "We can operate the private and wholesale mobile network, meet the regulatory requirements to be an ETC[24] and so forth, partner with a local wireless ISP to provide that last mile service, and be the trusted, competent network operator for the utility."***

He says the biggest obstacles to a wireless deployment is not having existing fiber assets or tower infrastructure, so leveraging utility telecommunications assets provides a great opportunity for Geoverse.

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[23] "More than 25,000 Central Virginians Could Get Broadband Access through Regional Broadband Partnership." *Dominion Energy.* June 24, 2021. *DominionEnergy.com*. Press release

[24] Eligible Telecommunications Carrier as designated by their respective state regulatory commission or, in some cases, by the FCC. "Join Lifeline as an ETC." USAC.org.

"We're really interested in helping utilities commercialize their assets to support rural wireless deployments and help out with cellular roaming services as well," he added. "We provide carrier-grade service to support core business functions in addition to expertise in rural deployments."

Rebecca Towne, CEO, Vermont Electric Cooperative

In Vermont, the state's two largest electric distribution utilities, **Green Mountain Power** (GMP), an IOU, and **Vermont Electric Cooperative** (VEC), a cooperative (both are regulated by the Vermont PUC), have teamed up to reduce make-ready fees, hoping to lower collation costs and speed deployment of broadband to unserved customers. As detailed in filing before the Vermont PUC, GMP and VEC recognized that high make-ready costs presented a barrier to new network deployments to unserved customers in some of their most rural territories.[25]

Since neither company wanted to build new infrastructure as part of a rural broadband initiative, and neither wanted to serve as an ISP, they focused on reducing make-ready costs.

"We can plainly see that our communities need help accessing improved broadband services," said VEC CEO Rebecca Towne. "We decided that we could most effectively help speed network deployment by focusing on infrastructure, which is our business. If we can reduce the cost of putting up fiber, we can provide a key part of the solution."

They came up with a temporary make-ready subsidy, termed a Temporary Unserved Location Broadband Rider, that covers the cost of make-ready for up to $2,000 per unserved premise. So for every unserved premise that a network passes, the utility will provide a discount of $2,000 in make-ready costs.[26] The subsidy is only applicable to consumers without access to internet speeds of 4 Mbps downstream and 1 Mbps upstream or greater, which are considered the most unserved consumers in Vermont. The incentive is only available for three years and on a first-come basis: only the first ISP whose network passes an unserved customer receives the subsidy. The time limitation of three years also serves as an incentive for speedy network deployment. The utilities justified their requests to recover program costs from ratepayers on multiple grounds, but most notably, that GMP and VEC intend to use the improved broadband connectivity to provide customers with equal access to innovative products and services such as dynamic electric rates, residential battery storage such as Telsa PowerWalls, and incentives for controllable loads for electric vehicle chargers, heat pumps or other household devices. They termed this equal access to their services "energy equity."[27]

"It's a priority for us and GMP to ensure that we are providing our services on a fair and equitable basis to all of our customers," Ms. Towne said. "Improved broadband service in our territory supports that energy equity goal and provides an additional benefit to our customers of better internet access that they can use for remote learning, remote work, telemedicine, and other essential functions. It's a win-win for us and our customers."

The PUC agreed and approved the proposals without a hearing and without any objection.[28]

Joshua Broder, CEO, Tilson

Tilson is on a mission to build America's information infrastructure. The company's clients include major telecommunications carriers as well as utilities that are investing in both wired and wireless infrastructure to support utility grid modernization needs.

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[25] Vermont Public Utility Commission Cases 21-0544-TF and 21-0546-PET (Green Mountain Power); and Docket 21-0807-TF (Vermont Electric Cooperative, Inc.); "Tilson Helps Vermont Utilities Develop Ground-Breaking Broadband Strategy to Bridge Digital Divide," *TilsonTech.com.*

[26] *Id.*

[27] *See* "Prefiled Direct Testimony of Brian Otley on Behalf of Green Mountain Power," at 6 (Jan. 29, 2021) in VT PUC Cases 21-0544-TF and 21-0546-PET

[28] "Order Authorizing treatment under the Strategic Opportunities Exception," VT PUC Case No. 21-0645-PET (March 12, 2021) for GMP; and "Order Approving Tariff Filing," VT PUC Case No. 21-0807-TF (March 12, 20231) for VEC.

Increasingly, Tilson's utility clients are also looking to leverage that same infrastructure to support broadband deployment to unserved customers.

> ***"The pandemic has driven digitization of our society ahead by ten years or more and we're not going back," Mr. Broder said. "Now that we've been forced to work, talk to our doctors, and attend school online, many of us see the benefits and want to maintain the flexibility these virtual platforms offer. So consumers are demanding universal broadband access and utilities are responding."***

He noted the multiplier effect on public benefits when utilities are able to offer their infrastructure to ISPs for broadband deployment.

> ***"It's a win-win-win for utilities, ISPs, and consumers," he said. "Utilities are able to provide another tangible benefit to their customers by facilitating broadband deployment and also creating some revenue to offset the cost of the network investment; ISPs are able to reduce their costs by using utility assets as middle mile infrastructure, which allows them to invest more deeply into unserved parts of the country; and most importantly, the utility's consumers get a state-of-the-art modern electric grid and better broadband service."***

There is still a great deal of education and dialogue needed in the utility sector, according to Mr. Broder. Utilities are skilled at deploying and maintaining infrastructure, but there's often some discomfort and reticence around incorporating non-utility uses cases into grid operations, and even more concern about the security and regulatory implications of sharing of infrastructure.

> ***"We need to assure our electric utilities that they can safely embrace both wired and wireless options like fiber and private LTE to support their own needs and also create pathways for ISPs to deploy broadband without compromising security, resiliency, or reliability," he said. "It also makes a lot of sense – and in the end saves resources – to take a holistic approach to designing and building a utility's communication platform, rather than doing it piecemeal and building one system for AMI, another to serve substations, and yet another one for radio communications."***

Mr. Broder is seeing a sharp increase in utility investments in telecommunication infrastructure and a corresponding need for sharing of information across both industries.

> ***"We live at the intersection of utilities and telecommunications," he said, "so we see down both streets, so to speak. It's clear to us that developing a common language and understanding around the needs of both utilities and ISPs will speed up development of the broadband networks that everyone needs right now."***

Grant Spellmeyer, Vice President of Government Affairs, UScellular

UScellular is a mobile network operator headquartered in Chicago, Illinois and the fourth-largest wireless carrier in the United States. It has approximately 4.9 million customers. The company is looking for opportunities to partner with utilities, according to Mr. Spellmeyer, Vice President of Government Affairs.

> ***"We see what's happening with public funding of utility middle mile infrastructure, something like $500 million for five years," he said. "We think this will create a more reasonable pricing model for companies like us, and the leasing revenue can return money to the ratepayers."***

Access to utility fiber, towers, and other telecommunications infrastructure would be very useful for UScellular.

"There's many places that it can be very difficult to site a tower," he said. He noted that is a natural fit for a utility to place communications towers for their own use in their easements, and then partner with a wireless or cellular company like us use their towers to deploy wireless services.

""I can deploy a gigabit of service if I have the towers," Mr. Spellmeyer said. Having utility infrastructure available for leasing provides another tool in the toolbox.

"It lets us take advantage of the utility's network and universal service mandate. In rural areas the challenge is always getting the infrastructure, so we're definitely interested in those utility relationships," Mr. Spellmeyer added.

Ronald "Griff" Griffith, IT Manager – OT Connectivity, Xcel Energy

Xcel Energy serves more than 3.7 million electric customers and more than 2.1 million natural gas customers in Colorado, Michigan, Minnesota, New Mexico, North Dakota, South Dakota, Texas, and Wisconsin. It is broadening how the company supports its telecommunications networks, which include dark fiber, private LTE, and now a focus on rural broadband. According to Mr. Griffith, IT Manager for OT Connectivity, Xcel is working to ensure that its Operational Technology (OT) network, which is focused on grid operations, is separate and unaffected by its Information Technology (IT) network, which serves internal business functions.

"It's important that IT does not affect OT," Mr. Griffith said.

Mr. Griffith noted that Xcel's territory includes some very rural states. Because the company operates in many remote areas, it is investigating a shift its focus to private LTE, which is often more cost-effective than building long stretches of fiber to very rural communities.

"Private LTE could become the cornerstone of our strategy," he said. "It's so much more versatile than WiMAX," a wireless platform previously used by Xcel.

Xcel is investigating if ISP partners could provide connectivity to unserved customers by leveraging Xcel's wireless infrastructure, including communications towers and fiber backhaul. Mr. Griffith also sees significant potential with cellular companies, which can lease space on Xcel's towers to improve cellular coverage.

Xcel's strategy for supporting rural broadband deployment is focused primarily on providing dark fiber within Optical Ground Wire (OPGW) along its transmission system.[29]

It is a significant investment, as Xcel is building 200 to 300 miles of new transmission infrastructure. Xcel will then look for underserved communities along its transmission lines to partner with the company and local ISPs to provide broadband. Xcel is not as interested in sharing distribution fiber and other distribution assets because of security concerns.

Mr. Griffith noted Colorado as one example as a potential beneficiary of Xcel's transmission fiber.

"There are a lot of rural electric cooperatives in the state," Mr. Griffith said, "and we could make drops to the coops from the fiber in the OPGW, which could then provide broadband to their customers," with Xcel serving as the "big brother" providing fiber backhaul and technical support to the coop.

Like most IOUs, Xcel does not want to be an ISP. The company does want to have its own transport end to end.

"We want to own our OT network," said Mr. Griffith, "so that we can control it and not be reliant on carriers."

Mr. Griffith sees educating key decisionmakers within the company and at public utility commissions as one of the keys to success. Broadband is unfamiliar territory for many in the utility industry, and these projects are not generally about increasing revenue,

[29] OPGW is a cable used in the construction of electric power transmission and distribution lines that combines the functions of grounding and communications. An OPGW cable consists of a tubular structure with on or more optical fibers within it. "What is OPGW?" *Transmission Line Overview.* Tloverview.blogspot.com.

but rather about generating goodwill. The pace of change in the underlying technology also makes these decisionmakers wary of stranded costs if a chosen technology becomes obsolete. However, the increased availability of public funds to support broadband deployment is very helpful, as the funds ensure there is little or no incremental added cost for including dark fiber within the OPGW, for example.

> ***"As you keep adding use cases to our communications infrastructure investment," Mr. Griffith said, "it makes too good of a business case not to do it."***

He noted that developing an understanding of other IOUs' investments and activities supporting broadband deployment are particularly useful.

> ***"Southern Company is the tip of the spear," Mr. Griffith said, but noted the increased activity in other states around utility broadband, especially Virginia, is also influencing the industry. "We need information from other trusted partners."***

6. Regulator and Consumer Advocate Perspectives

Commissioners, former commissioners, and consumer advocates are taking increasingly interested in models for utility support of broadband deployment. While there is certainly a large diversity of perspectives, interviews with a sampling of these individuals show a rising focus on rural broadband.

Name	*Position*	*State*
Stefanie Brands	Former Rate Counsel and NASUCA Executive Committee Member	New Jersey/NASUCA
Rachelle Chong	Former FCC and former PUC Commissioner	California/Federal
Talina Mathews	Former Commissioner and NARUC Broadband Enhancement Task Force Member	Kentucky/NARUC
Chris Nelson	PUC Chair and Broadband Enhancement Task Force Chair	South Dakota/NARUC
Brandon Presley	PUC Commissioner and former NARUC President	Mississippi/NARUC

Figure 8 *- Summary of perspectives from utility regulators and consumer advocates.*

Former New Jersey Rate Counsel Director and National Association of State Utility Consumer Advocates (NASUCA) Executive Committee Member Stefanie Brands

Director Brand sees many issues in New Jersey with access to broadband, especially in low-income urban areas and more rural parts of the state. Many consumers in New Jersey have access only to DSL service, which generally does not come anywhere near broadband speeds of 25/3 Mbps. She acknowledges that the utilities have ubiquitous poles and other infrastructure that could be useful in providing broadband to unserved consumers. It is important that any such broadband infrastructure investments be cost-effective and maximize benefits to consumers, including the return of any revenue generated by the investments to ratepayers.

For example, after Hurricane Sandy hit New Jersey in 2012, high winds and storm surge flooding disrupted wireless and internet service.[30] According to Director Brand, she opposed a proposal by some of the state's utilities to build an entirely new communications network throughout the state after Sandy because it would have overbuilt existing incumbent telecommunications networks that had already been paid for by the state's consumers through their cable bills. She supported more limited proposals, such as New Jersey utilities providing backup power to cell towers in the event of emergencies.

[30] *See*, e.g., Reardon, Marguerite. "Hurricane Sandy disrupts wireless and internet services." *CNET.com.* Oct. 30, 2021. *Cnet.com.*

Director Brand recognizes that difficult policy questions that must be addressed when utilities support broadband deployment with programs that arguably shift broadband costs to electric ratepayers. When the societal need is too great to be addressed without some level of utility support, she will consider supporting targeted proposals that may result in some cost-shifting.

For example, her office opposed a legislative proposal to use the public benefits charge on the electric bill to replace lead service lines to schools, but ultimately did not press the issue extensively due to the amount of money involved and the fact that it addressed a significant public health issue involving consumers across the state.

With broadband, Director Brand acknowledged that it is essentially a utility service that every consumer needs. She would be more open to programs that are targeted to unserved consumers, propose a dual use of utility infrastructure, and return benefits to ratepayers. It is also important that utilities pursue other available funds such as American Rescue Plan broadband dollars before turning to ratepayers.

> ***"Broadband brings other benefits to the utilities as well," Director Brand said, "such as resiliency and storm restoration. If utilities are looking at the benefits to customers, have revenue sharing, and can increase competition for broadband, then everybody wins."***

Former FCC and California PUC Commissioner Rachelle Chong

Ms. Chong serves as Special Counsel to the California Emerging Technology Fund (CETF), a non-profit corporation established by the California PUC with a mission of closing the digital divide throughout California through the use of emerging technologies. Ms. Chong noted that CETF advocated that all utilities should encourage all their customers to be online in order to: (1) receive educational information and billing information about utility low-income programs of interest; (2) save utilities the operational costs of communicating with their customers by using online methods instead of postal mail or home visits; (3) meet the goals of state energy efficiency and environmental protection programs that require or are facilitated by online connections; and (4) promote equity for disadvantaged communities.[31]

She noted that California Governor Gavin Newsom issued Executive Order N-73-20 on August 14, 2020, directing state agencies to bridge the digital divide, including actions by the California PUC to accelerate broadband deployment and "to leverage utility infrastructure to increase access to existing fiber and cost-effectively deploy new fiber."[32] This led to a rulemaking by the California PUC on how utilities can assist in bringing broadband to unserved rural areas, by allowing Internet service providers to lease utility dark fiber, or place broadband facilities on utility poles or other infrastructure in rural, remote or Tribal areas.[33] That rulemaking is currently underway, and the state's IOUs filed their pilot proposals in July and August 2021.

Former Kentucky Commissioner Talina Mathews

Commissioner Mathews is also a member of the NARUC Broadband Expansion Task Force. She said Commissioner Presley chose her for the Task Force because her hometown in Jackson County, Kentucky, has a fiber network to every premise because of an effort by the rural phone company, Peoples Rural Telephone Cooperative (P.R.T.C.). Using funds from the U.S. Department of Agriculture's Rural Utilities Service (RUS) and Obama-era stimulus dollars, P.R.T.C. built a thousand miles of cable to all seven thousand structures in the county. In the most rugged terrain, crews relied on a mule to haul the cable.[34]

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[31] "Reply of the California Emerging Technology Fund," *Application of Southern California Edison Company et al. for Approval of Energy Savings Assistance and California Alternate Rates for Energy Programs and Budgets for 2021-2026 Program Years,* Applications No. 19-11-004 and 19-11-006.

[32] "Ahead of New School Year, California Schools Receive Critical Funds to Support Distance Learning and Governor Newsom Signs Executive Order Directing State Agencies to Bridge Digital Divide." *Office of Governor Gavin Newsom,* August 14, 2020. Gov.ca.gov. Press release.

[33] *Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California*. September 18, 2020. Rulemaking 20-09-001 before the California PUC.

[34] Halpern, Sue. "The One-Traffic-Light Town with Some of the Fastest Internet in the U.S." *The New Yorker.* December 3, 2019. *NewYorker.com.*

Commissioner Mathews noted how access to world-class internet has totally changed the economics in Jackson County. It happened, she said, because of leadership at P.R.T.C. and local champions in economic development and the school system. She also noted the support of U.S. Congressman Hal Rogers, who helped obtain support from the RUS.

Commissioner Mathews sees the value of broadband to local communities. She feels one of the roles that PUCs and IOUs can play to broadband deployment is ensuring that there are pole attachment regulations that are clear and provide a level playing field for all attachers. They need to remove artificial hurdles such as unreasonable union rules and anti-competitive actions that block new attachers.

> ***"I had no idea how contentious pole attachments are until I got involved in the Task Force and these issues, " she said. She believes it would be very helpful to have organizations like NARUC develop model pole attachment rules or best practices for attachments to help educate commissioners.***

While she sees the value of utility support of broadband deployment, she notes that some states, including Kentucky, have made it difficult for regulated utilities to overbuild fiber to allow for leasing of the infrastructure for broadband deployment. The rules have been changed for electric cooperatives, but not for IOUs. Under Kentucky law, IOUs must demonstrate need and a lack of duplication in the investment, which makes building extra fiber very difficult. She finds that there is more openness to the conversation about broadband deployment at the PUC, but that the requirements of the certification of public need would need to change. There have been attempts to change the statutory requirements in the state legislature, but they have not succeeded to date.

In light of the potential difficulty obtaining regulatory approval for fiber investments beyond what is needed for utility needs, Commissioner Mathews agreed that utility investments in wireless networks such as private LTE to support grid modernization might be the most immediate way for Kentucky's IOUs to facilitate broadband deployment to unserved customers. As discussed supra, wireless companies such as US Cellular can add their equipment to utility communication towers to support cellular and fixed wireless broadband service. Since there is no additional incremental investment needed by the IOU, Kentucky's regulatory framework would probably not be a barrier to the leasing of such infrastructure by a wireless ISP.

Commissioner Mathews believes that the state's IOUs would have to come to the PUC and push for the ability to use their infrastructure to support broadband deployment. To date, that has not happened. She noted that there have been two major smart grid projects approved in Kentucky without any discussion of broadband.

There are also limitations on how utility easements can be used, which present another hurdle. Kentucky does not have laws such those recently passed in Mississippi and Alabama, for example, which authorize use of utility easements to support broadband deployment, and she is not aware of any proposals to do so.

She noted that there definitely some consumer outrage about the lack of broadband in rural parts of the state, but there is also concern about some really large, failed public projects like Kentucky Wired that makes the public wary of government action in this area.[35]

> ***The possibility of IOUs supporting broadband deployment "all comes down to the way the state's certificate of need state is written," Commissioner Mathews said, as well as the utilities' ability to link their investment to a utility use.***

South Dakota PUC Chair and NARUC Broadband Enhancement Task Force Chair Chris Nelson

Chairman Nelson believes that while traditional telecommunication providers will continue to provide broadband to the vast majority of consumers, it is time to welcome non-traditional market entrants in the broadband space. New entrants bring capital for and interest in deploying broadband to unserved customers. Much of South Dakota is served by rural telephone cooperatives

[35] Miller, Alfred. "Kentucky's $1.5 Billion Information Highway to Nowhere." *ProPublica in partnership with Louisville Courier-Journal.* May 8, 2019. *ProPublica.org.*

which have 100% fiber in their incumbent areas and are now edging out from their networks to unserved consumers in neighboring areas, so rural deployment is not as much of an issue there as in other states.

Commissioners are increasingly interested in utility broadband deployment, according to Chairman Nelson. However, many PUCs may not have jurisdiction over telecom or utility broadband efforts, especially since much of the utility broadband deployments are being done by largely unregulated electric cooperatives. A commission's ability to engage in utility broadband depends on state law and the commission's priorities. If there is no applicable law or guidance around utility broadband, then it is up to the judgment of the commissioners as to how much they want to guide, encourage, or adjudicate utility broadband issues.

Many incumbent telecommunication providers object to utilities supporting broadband deployment on the grounds that it is a cross-subsidization of broadband by electric ratepayers and provides an unfair advantage to ISPs working with utilities to serve rural America. Commissioner Nelson feels, however, that as long as utility efforts are focused on unserved customers and not supporting head-to-head competition with existing broadband providers, those efforts are appropriate. In fact, Chairman Nelson does not see how the incumbents can defend their position, given that there are so many unserved consumers in America.

Chairman Nelson believes that sharing infrastructure for grid modernization and broadband improves the overall business case for that infrastructure. He feels that ideally state legislation would address the potential barriers to utility broadband deployment. As a rancher, he is sensitive to landowners' rights and therefore concerned with any easement reforms which would negatively impact private property rights.

The goal of increasing broadband deployment to unserved customers, in Chairman Nelson's view, is sufficient justification to allow cost recovery for utility investments. He previously stated during a hearing of the NARUC Broadband Expansion Task Force that he is not overly concerned about cross-subsidization between electric customers and broadband providers.

> ***"It's the 21st century," he said. "Everyone ought to have the opportunity to access broadband, for healthcare, education, economic opportunities, all of the things that the internet enables."***[36]

Mississippi PUC Commissioner and former NARUC President Brandon Presley

Commissioner Presley has been a vocal advocate for including a rural broadband component in every utility grid modernization project.

> ***"We need to take a holistic look at the needs of the state," he said. "With a $90 million utility grid mod project, the utility better come up with a use for rural broadband."***

He sees this as maximizing the value of the investment for the ratepayers. He noted that he is elected to his position, and that when he goes to a town hall with 200 people, they want access to the internet. When they see utility fiber on the pole outside their house, but they cannot access it, they get very frustrated. Commissioner Presley said he could not explain to constituents why they couldn't access that ratepayer-funded fiber to provide broadband.

> ***"It's penny wise and pound foolish," he said, to spend all that money on grid modernization and not require it to support broadband deployment. He noted that having universal connectivity is important for unserved communities, but also for the utility. "If there's no broadband," Commissioner Presley said, "there's no energy efficiency or home of the future, with remote thermostats and other connected appliances and devices, and also all of the things that we haven't even thought of yet."***

[36] This sentiment was echoed in the findings of the NARUC Broadband Expansion Task Force: "Broadband is necessary for full participation in the life of the nation. The importance of connectivity has been demonstrated during the pandemic, as business, education, medicine, and social activities moved on line." "Key Findings," *Report at 3*.

To address this concern, Commissioner Presley led a PUC effort to have C Spire build 300 miles of fiber, with the Mississippi IOU Entergy serving as the anchor tenant. C Spire will provide retail service and wholesale backhaul to ISPs. The project is completed, and not one person has complained. In fact, he noted the success of the efforts in Mississippi. Mississippi was at the bottom of the whole country in terms of broadband access for consumers, and now it is rising steadily in the rankings.

They do not want to slow down the utility projects, so those projects lead, but allowing ISPs to access and lease the infrastructure also brings revenue back to the ratepayers. There is a similar project under discussion with Mississippi Power.

The Mississippi goal, according to Commissioner Presley, is to bring fiber to every home. He noted, however, that there is no doubt that there is a place for wireless when fiber is not practical or affordable. The common infrastructure for a wireless network can also support wireless broadband and cellular services.

The biggest challenge, according to Commissioner Presley, is overcoming the objections of the incumbent telecommunication providers. Some object to the IOUs providing backhaul service and refuse to support it. However, in his opinion, it is time for the country to break free from dependence solely on the incumbents. The incumbents have not fixed the issue despite decades of dominance, so it is time to look at new models like utility broadband.

> ***"Sometimes you need to have a steel stomach to overcome the incumbents," he said.***
>
> ***"We also need to change the mindset of the regulators," Commissioner Presley said. Regulators look at things in an old paradigm, which he acknowledged has stood the test of time. "There is a lot of momentum" for utility support of broadband, however, he said.***
>
> ***"Most important: don't be narrow-minded. Grid modernization and broadband deployment are joined at the hip. The cost of adding capacity to support broadband is incremental."***

Commissioner Presley also noted the support of the Mississippi legislature, which passed Senate Bill 2798 this year, authorizing electric utilities to permit ISPs to use utility assets and easements to provide broadband. The statute also provides that all revenues from such use will be credited back to ratepayers.

> ***"Our goal is to have the best electric grid in the country," Commissioner Presley said, "and the best broadband."***

7. Benefits of Leveraging Utility Communications Infrastructure

When utilities use their own communications infrastructure to support consumer broadband deployment, both the utility and the customer win. Utilities are making substantial investments in communication networks to support grid modernization efforts, including AMI, distribution automation, smart lighting, and other initiatives. Ameren, for example, according to Mr. Millard, is investing $1 billion on communications infrastructure to support grid operations. Allowing this investment to also facilitate broadband deployment increases benefits to both consumers and utilities.

a. Consumer Benefits

- ***Maximizes value of customer investment.***

Allowing existing assets to be monetized to support broadband deployment brings revenue back to the company, reducing overall ratepayer costs. When future investments are designed with a secondary use for broadband in mind, incremental investments in larger fiber cables, enhanced tower capacity, and minor design modifications such as strategic splice points for last mile fiber can further increase the value of the assets as a platform for broadband deployment. Greater amounts of dark fiber and other communications infrastructure mean more opportunities for leasing and lease revenues.

- ***Reduces deployment costs for internet service providers, supporting broader deployment to the public.***

Making network infrastructure available to ISPs reduces the ISPs' cost of deployment, saving the ISP the need to build its own infrastructure, duplicating that of the utility. The cost reduction improves the business case for broadband deployment and increases the potential for deployment to unserved areas. This dual use of the utility infrastructure increases the public benefit: customers will have the improved resiliency, reliability, and other benefits of grid modernization even as they realize substantial economic, educational, and social benefits of expanded broadband service into unserved area.

- ***Stretches public dollars available for broadband.***

Federal, state, and local governments are pouring billions of dollars into improving broadband access in unserved areas. Utility actions that reduce deployments costs allow public funds otherwise earmarked to defray these costs to be put toward other aspects of broadband projects, thus extending service to more consumers without increasing the investment.

- ***Enhances opportunities for smart city and connected community applications.***

Smart city and connected community initiatives bring together telecommunications, energy, and transportation technologies. These technologies rely on broadband connections. Examples include lighting controls, parking and traffic management, automated vehicles, smart meter infrastructure, energy controls, and a myriad of other technologies.[37] Utility infrastructure used to enhance broadband supports and enables these initiatives. Healthy, safe, and resilient communities provide economic and societal benefits which in turn benefit the utilities that serve them

- ***Increases availability of utility programs and services for all customers.***

There is increasing interest and demand for energy equity: equal access to utility programs and services for all utility customers, and fair and even distribution of the costs and benefits of those programs and services. The major concern is that though low-income consumers pay for such programs and services through charges on their electric bill, they have less opportunity to access them because of cost or rural location. Supporting broadband deployment throughout a utility's territory helps provide every customer with access to any initiative that requires connectivity, such as dynamic charging for electric vehicles, power walls, and time-of-use rates. This was one of the major benefits cited by Vermont utilities in their applications for the broadband rider.[38]

- ***Enables precision agriculture applications.***

Connectivity has been an integral part of farming for at least 20 years, according to Nancy Post, director of the Intelligent Solutions Group at John Deere.[39] A single tractor may have 300 sensors and about 140 controllers on board to help ensure that seeds are planted at the right depth and receive the right amount of water, the correct amount of light, and just the right amount of herbicides and pesticides. However, these capabilities are hampered by connectivity limitations.[40] A USDA report estimated that the realization of the full potential of digital technologies for agriculture could bring economic benefits equivalent to nearly 18% of total production.[41]

b. Utility Benefits

Allowing wired and wireless assets to support broadband benefits utilities in many of the same in ways it benefits the utility's own customers.

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[37] "Creating Smart Communities I A Guide for Policy Makers." *National Conference of State Legislatures.* April 14, 2021. *NCSL.com*.

[38] *See fn. 22, supra.*

[39] Goovaerts, Diana. "John Deere thinks rural 5G could help feed the world." *Fierce Wireless*. June 25, 2021. *FierceWireless.com.*

[40] *Id.*

[41] *Id.*

- ***Maximizes public benefit and strengthens the business case for cost recovery in rates.***

This dual use of utility assets – both for the utility and for its consumers and communities -- maximizes the public benefit associated with the utility investment and strengthens the case before the PUC for recovery in rates of the cost of those assets as a reasonable and prudent investment.

- ***Offsets the cost of grid modernization initiatives.***

Grid modernization initiatives can be costly, and a private utility broadband network is a critical element of almost every grid modernization application—whether the network be wired, wireless, or both. Monetizing wired and wireless assets and creating a revenue stream for the benefit of the utility and its customers help offset the cost of grid modernization initiatives.

- ***Increases access to capital.***

Utilities benefit if they are permitted to make middle mile or other infrastructure available for the use of a third-party provider of broadband internet service, as this leveraging can improve the business case for the investment. That additional broadband use case can provide the utility with better access to capital, and possibly to funding sources focused on broadband middle mile infrastructure such as low interest loans, investment funds, or even state and federal money.

- ***Addresses state policy goals.***

State regulators and other policymakers may view rural broadband as a priority issue and may take note of it in considering approval of the utility's grid communications broadband network.

- ***Provides economic benefits to the utility.***

Improved broadband improves the local economy and helps reverse "youth drain" from rural unserved areas. Strong communities create strong utilities, and strong economies may increase load growth.

8. Potential Roadblocks to Utility Broadband Deployment Activities

Utilities are interested in maximizing the value of their wired and wireless network investments by supporting broadband deployment, but they need a framework for integrating the consumer and community use into their own plans in a way that does not compromise security or result in excess costs that may not be recoverable through a rate case or offset by leasing revenues. To mitigate these risks, utilities, regulators, and policymakers must address a few significant obstacles to utility deployment of infrastructure for use by ISPs and other third parties to support broadband internet service:

- ***Easement and ROW barriers.***

One of the greatest barriers to IOU broadband deployment is that utility easements for use of ROWs sometimes limit the utility's ability to deploy communications infrastructure there. Many utility easements are silent on communications infrastructure because they were acquired decades ago before broadband or the internet were developed. Other easements may only permit communications infrastructure to be used for utility operations.

Easement reform is needed in many to states to clarify that utilities may use their easements to support broadband deployment. As stated by industry experts Heather Burnett Gold and Karen Jackson in their published paper, "Expediting Broadband Deployment: Creating Incentives for Investor-Owned Utilities,"

We should be encouraging IOUs to build these essential middle mile networks by permitting them the following flexibility:

- ***Allow additional infrastructure placement in existing easements without the need to obtain rights-of-way owner approval and additional costs***[42]

Some states have passed such easement reforms, including Virginia, West Virginia, and Vermont.[43] Many other states have considered easement reform statutes in 2021 but did not ultimately pass legislation.[44] Until there is either clear federal guidance or nationwide state reforms, easement limitations will remain a challenge that IOUs will have to address on a project-by-project basis, perhaps requiring them to renegotiate existing easements for any broadband projects, a process Dominion, for example, is undertaking in Virginia.

Note, however, Brad Hall from AEP does not see easement negotiations as a major issue, but rather as part of the core competency of every utility that they perform in the regular course of business. AEP considered easement issues early in the process of developing a broadband program and did not consider them a major hurdle. AEP communicates with landowners as to the need for the easement to support broadband and often faces little or no opposition. In fact, Mr. Hall reported that some landowners even donated land for fixed wireless towers, because the need for broadband internet service is so great.

- ***Pole attachment challenges.***

As discussed in Section 2.a, the make-ready and pole attachment processes can present practical barriers to deployment if they cause delay or excessive expense. As pole owners, IOUs can promote broadband deployment by working with regulators and attachers to ensure fair, efficient, and reasonably priced make-ready processes that protect utility operations.

- ***Opposition from incumbent communications providers.***

Some major providers of consumer internet services – generally not the ones that are currently partnering with utilities on deployment projects -- have objected to utility efforts to support broadband deployment. Some testified at the NARUC Broadband Task Force, for example, and raised concerns about cross-subsidization and unfair competition, as discussed in Chairman Nelson's remarks. However, some of the objecting ISPs are the ones that have declined to serve rural America because the difficult business case. Utilities are seeking to support broadband deployment by leveraging their infrastructure to lower deployment costs for ISPs, not by competing with them. There should thus be opportunities for utility partnerships with these providers as well.

Conclusion

As America continues to emerge from the COVID-19 pandemic, the impact of the digital divide has been seen and felt like never before. The urgency of closing that divide is resonating through state houses, commissions, and the utility industry, as well as with consumers. By collaborating on a common framework for leveraging its own communications infrastructure to support third-party-provided broadband internet service to unserved consumers, the electric utility industry can increase the likelihood of full recovery of its infrastructure deployment costs, reduce the time and expense involved for ISPs to deploy broadband internet service to consumers, and increase the return on investment for utility wired and wireless infrastructure assets by using them for the dual purposes of enabling grid modernization and supporting broadband deployment. Perhaps most significantly, this collaborative approach can increase utility revenue and reduce ratepayer bill impact, bringing all of the public benefits associated with broadband access to the community and positioning utilities as catalysts for closing the digital divide.

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[42] *Skinny Wire,* Volume XI, Issue 1. Jan. 19.2021. Walkerfirst.com.

[43] VT. H. 360, 2021. See also fn. 18.

[44] *See, e.g.,* Missouri. 101st General Assembly. Senate Bill No. 184 (authorizing utility broadband activities).

Glossary

5G: The fifth-generation technology for broadband cellular networks, following after 1G, 2G, 3G, and 4G technologies. 5G greatly increases the speed and responsiveness of wireless networks.

AMI: Advanced metering infrastructure.

Backhaul: Large aggregations of data gathered from last mile fiber and carried by middle mile fiber to the head end and vice versa.

Broadband internet access service or Broadband: A mass-market retail internet service that provides subscribers with the capability to transmit data at download speeds of at least 25 Megabits per second (Mbps) and upload speeds of at least 3 Mbps, often referred to as "25/3 Mbps."

Clean energy: Zero-carbon energy sources, including renewable and green energy sources.

Dark fiber: Extra fiber strands deployed by network operators that are not in use for network operations.

Digital Divide: The gap between consumers who have access to affordable, reliable broadband internet access service in their homes and businesses, and those who do not.

Distributed energy resource or DER: A small-scale unit of power generation that typically located on the consumer's side of the electric meter and is connected to the power grid at the distribution level. Examples include rooftop solar panels, home battery storage, and residential geothermal units.

Distribution automation or DA: Technology employed by an electric utility that can perform distribution system functions automatically, such as sensors, switches, and automatic reclosers.

Drop: The ISP connection to the individual customer premises.

Utility Easement or Easement: The utility's right to use or control part of a property without using it, typically for installing, repairing, and maintaining utility lines, infrastructure, and equipment.

Energy equity: Ensuring that utility customers have equal ability across customer classes and income levels to access programs and services offered by its utility, such as AMI, battery storage, and dynamic rates for electric vehicle charging.

Fiber: Ultra-thin fiber optic glass cables that transmit information via a beam of light. Fiber cables contain individual fibers grouped in multiples of twelve: 12 count, 24 count, 48 count, 72 count, 96 count, etc.

Fiber backbone: Fiber trunk lines that carry data to and from smaller fiber lines or interconnection points.

Fire suppression: Automated fire detection and suppression equipment integrated into an electric grid, such as automated fire detectors and extinguishing agents.

Grid modernization: Improvements made to the electric grid to support integration of distributed energy resources, improved security, grid automation, and other initiatives to improve the flexibility, resiliency, and reliability of the grid.

Internet Service Provider or ISP: A company that provided customers with access to the internet.

Last mile: The final segment of a telecommunications network that connects customers to the network.

Make-ready: The process of preparing utility poles or duct where the fiber or other equipment will be placed to ensure it is in suitable condition to support the new attachment.

Middle mile: Broadband infrastructure project that does not predominantly provide broadband service to end users or to end-user devices, including physical assets of wired and wireless networks such as utility poles, conduit, and existing dark fiber, fiber backhaul, electric power, equipment shelters, and communication towers.

Passive Optical Network or PON: The overall architecture of a wired fiber network.

Pole attachment: Attachment by a cable television system or telecommunication provider to a pole, duct, conduit, or right-of-way owned or controlled by a utility.

Private Long-Term Evolution or Private LTE: Non-public wireless networks based on 4G technology available only to authorized users.

Radio Access Network or RAN: Access point that connects individual devices such as cellphones, computers, or other wireless equipment to a wireless network through radio connections.

Right-of-Way or ROW: Easement or other legal right that allows a utility to use or access a piece of property for utility purposes.

SCADA: Supervisory control and data acquisition (SCADA) is a system of software and hardware elements that allows industrial organizations to monitor, control, and interact with remote devices, applications, and data.

Small cell: Low-power cellular access nodes that communicate wirelessly over radio waves and provide network coverage to a limited area.

Smart grid technologies: Technologies enabled by two-way communication networks, such as advanced sensors, AMI, automated relays and feeder switches, and grid-connected battery storage.

Spectrum: The invisible radio frequencies over which wireless signals travel.

Unserved consumers: Although definitions vary by state, unserved or underserved consumers are generally considered to those without access to reliable internet access of at least 25/3 Mbps.