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BROADBAND UNIVERSAL SERVICE

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EXECUTIVE SUMMARY

For over seventy years, our nation's telecommunications policy has been based upon the concept of "universal service." Though in recent years technology has radically changed the landscape of the telecommunications industry, its spread has been dramatically inconsistent. Though revolutionary, broadband internet has skipped over a vast segment of American citizens. Rural Americans have been left with expensive, obsolete technologies unable to provide the services essential to participation in American economic and social life. Carrying on the ideal of universal service despite technological change is essential to ensuring that all Americans have access to communications, education, jobs, and healthcare.

However, investing in new broadband infrastructure in rural areas is a challenge. Though the Federal Communications Commission has taken many steps to enhance the availability of broadband, technology has not changed the fundamental economic challenges of running a wire to every home. States must explore innovative new policy options to support broadband deployment despite their jurisdictional limitations. Though primarily a Federal program, achieving broadband universal service will require the close supervision and local expertise of state commissions.

1. DEFINING UNIVERSAL SERVICE

Over the past two decades, the telecommunications industry has seen dramatic technological change. The services demanded by consumers today bear almost no resemblance to the dial-up internet and fax machines that characterized the 1990s. Fixed telephone service is almost anachronistic, replaced by smartphones more capable than anything we could have imagined two decades ago. Unfortunately the regulatory framework for providing telecommunications services has seen no similar revolution. While the Federal Communications Commission and the State Public Utility Commissions have worked diligently to implement new rules and regulations enabling new wireline and wireless services to reach more households than ever before, the legal framework under which the commissions operate has stayed roughly stagnant since its last major reworking in 1996.

While smartphones and high-speed broadband has exploded across the United States, many households have been left out. Despite being a truly transformative technological innovation, broadband is limited by its reach and cost. In an industry historically defined by capital costs and regulatory scrutiny, wireline broadband is characterized by the high cost per mile of rolling out service in sparsely populated areas. As a result, rural American households have lagged behind the rest of the country in obtaining access to broadband. While urban customers are using services capable of video conferencing and high definition television, rural Americans remain stuck in the 1990s at near dial-up speeds.[1] To bring the benefits of broadband to rural Americans will require a concerted effort by both the state and federal governments. Fortunately, we have a relatively successful set of public policy initiatives on which to build.

1.1 A Tradition of Universal Service

When plain old telephone service was introduced, it faced many of the same challenges as broadband. Each house in America, regardless of distance from the nearest town, had to be connected to the public telephone network. By the early 1900s, telephone service in the U.S. was provided almost exclusively by AT&T. With their nationwide monopoly, AT&T was able to subsidize their expensive local telephone network with long distance revenues. At the time, policymakers viewed this as a "natural monopoly," theorizing that the only way every house could receive service at a reasonable price was for a single company to provide service everywhere.[2] This nationwide monopoly was formalized by the federal government in the Kingsbury Commitment in 1913. The concept of universal service was born here at the lips of Theodore Vail, AT&T's CEO, who began advertising "One System, One Policy, Universal Service."[3] Though AT&T's monopoly on local telephone service was dissolved in 1982, our national telecommunication's policy is still based upon the theory of "Universal Service."

[1] (Federal Communications Commission, 2010, pp. 4-5.)
[2] (Thierer, 1994)
[3] ("One Policy, One System, Universal Service," 2013)

Central to universal service is bringing telecommunications services to every American. The Communications Act of 1934, which established the Federal Communications Commission, charged the newly created commission "to make available, so far as possible, to all the people of the United States, without discrimination on the basis of race, color, religion, national origin, or sex, a rapid, efficient, Nationwide, and world-wide wire and radio communication service."[4] The goals of such a nationwide network were recognized as national defense, safety of life and property, education, and healthcare.[5] Without access to the nation's telecommunications network, rural Americans are isolated from the economic, social, and political fabric of our nation. Despite the advantages of ensuring all Americans have access, achieving universal service is fraught with difficulty. Without a national monopoly, there is no natural business case for serving rural Americans where capital costs are too high to justify building a network.

1.2 The Universal Service Fund

To create a business case for serving rural Americans, the 1996 Telecommunications Act established the Universal Service Program. Just as AT&T's "natural monopoly" did, the Universal Service Program places a fee on every telephone bill in the country to build the Universal Service Fund (USF). This separate fund is the source of the vast majority of funds to support the deployment of telecommunications services in needy areas. While the FCC oversees the program, it is administered by the Universal Service Administrative Company. Contributions come into the fund via a small fee added to each telephone bill. The funds are then redistributed through a variety of different programs. Of those programs, the High Cost Loop Support program is perhaps the most important for ensuring access to telecommunications services in expensive-to-serve, rural areas of the nation.

The High Cost Loop Support Program (HCLS) incentivizes telecommunications companies to build out telephone networks in rural areas by covering portions of their costs based upon the number of "loops" they build. These "loops" of copper telephone cable provide service to an individual household. By reimbursing companies for their costs, the program ensures that even households in remote towns and villages have access to phone service. Though for telephone service the goal of universal service has been nearly achieved, technology has quickly passed us by.[6] Ensuring access to high-speed internet represents a new challenge for universal service.

[4] (*COMMUNICATIONS ACT OF 1934*, 1934.)
[5] (Federal Communications Commission, n.d.)
[6] (Blumberg & Luke, 2012; Rebecca J. Rosen, 2012)

2. DEFINING BROADBAND SERVICE

At first glance, providing broadband internet access seems to be the natural technological progression of the nation's universal service mandate for telephones. However, supporting broadband internet access through the Federal USF and HCLS programs is a challenge from a number of perspectives. First, while broadband internet access technologies have developed in leaps and bounds in the past several decades, there is no clear definition of what should qualify as "broadband service" qualified for state support. Second, while a multitude of technologies have developed for delivering high speed internet access, they are not all equivalent in the speed, upgradability, and flexibility that they provide. Finally, while broadband service is available in many areas, competition and reasonable pricing is not easy to ensure.

2.1 Capabilities-Based Definition

While traditional telephone service has benefitted from decades of technological refinement and regulatory redefinition, broadband internet access remains relatively undefined. Complicating the issue is that at some levels of service, broadband internet can carry VOIP services that are functionally identical to telephone service. Put plainly, before we can hope to fund broadband access to those in need, we first have to identify exactly what service we want to provide. Perhaps the best way to do so is to focus on a certain set of capabilities or services we want citizens to be able to utilize.

High speed internet access can be used to access a myriad of web services, video providers, and educational resources. However, the customer's experience will vary significantly based upon the speed and quality of the connection. For the past three years, the Federal Communications Commission has used a benchmark of 4 Mbps download and 1 Mbps upload to define broadband.[7] An internet connection meeting those specifications is adequate for the vast majority of web-based services.

For example, Skype, a very prominent videoconferencing software company owned by Microsoft, requires speeds of at least 1.2 Mbps for high quality conferences.[8] Netflix, another prominent company which has a wide array of movie and video content available for streaming, recommends speeds of at least 3Mbps for DVD-quality video.[9] While these two companies are certainly not the only services individuals may want to purchase, but they give a good sense of the types of applications a standard of 4 Mbps/1 Mbps allows. Educational software and working remotely both utilize similar services that have equivalent bandwidth requirements. Adopting a 4 Mbps /1 Mbps standard will

[7] (Federal Communications Commission, 2012)
[8] (Microsoft Corporation, n.d.)
[9] (Netflix, n.d.)

ensure that those living in rural areas have access to almost all of the internet services available to consumers.

Though adequate today, the 4 Mbps/1 Mbps standard almost certainly will not keep up with new services and technological advances. Both Netflix and Skype, for example, now provide high-definition video products that require over 10 Mbps to operate. As websites and services are optimized for the ever faster connections being deployed in urban areas, rural broadband connections must keep up.

2.2 The Last Mile Problem

In addition to a definitional challenge, providing broadband in rural locations is expensive and technologically challenging. In most areas of network construction, the company deploying wires can spread the immense cost of digging ditches or raising utility poles over a number of paying customers. In rural areas, providing service to multiple customers provides no such advantage.[10] This "last mile problem," named for the last mile from the center of a town to a home, makes it increasingly expensive to provide service in rural areas. Rather than running a cable down the center of a street and serving tens of houses, internet providers are forced to pull cable many miles to serve just one customer. While there are several different technologies used to provide broadband service, they all suffer from some variant of this problem.

2.3 Wireline Technologies

When discussing broadband, two technologies invariably come to the fore: cable and DSL. These two wireline technologies are widely deployed across the country and provide fast and reliable service. Cable broadband internet is provided via the installed cable television networks of companies like Time Warner and Comcast. While expensive these legacy networks are capable of speeds of over 100 Mbps, though often at great cost. While very efficient at providing service over developed areas, cable is often only available in large towns and cities.[11] DSL, on the other hand, is available more broadly and is run via the telephone network. Though easier to deploy and retrofit to existing telephone networks, DSL is much slower, with most networks topping out around 10 Mbps.[12] In rural areas, DSL is often the only viable wireline technology available.[13] However, in some high-density areas, DSL providers have begun deploying truly next generation fiber-optic networks.

Fiber optic last-mile networks include a variety of different technologies, including Fiber-to-the-Home (FTTH), Fiber-to-the-Neighborhood (FTTN), and Fiber-to-the-Desk (FTTD), all of which provide incredibly high speeds, ranging from 100 Mbps to over 1

[10] (Wagter, 2010)
[11] (Wagter, 2010)
[12] DSL Speeds and Availability from National Broadband Map.
[13] ("National Broadband Map: Technology Availability," 2012; University of New Hampshire, 2012)

Gps depending on the network architecture.[14] Though incredibly powerful, fiber connections are also incredibly expensive as they require deploying an entirely new network, a costly expense for any internet service provider.[15] Though very powerful, fiber connections are difficult to deploy in rural areas given the expense of stringing fiber to individual homes.[16] Though the capacity and reliability of wireline technologies make them ideal for providing broadband service, the high cost of cable deployment makes wireless technologies very attractive for service in rural areas.

2.4 Wireless Broadband

Recognizing the obsolescence of their fixed telephone networks, many large telephone companies have invested in cellular phone networks. Though initially only capable of dial-up data speeds, these networks have rapidly become capable of high data rates. Fourth generation Long-Term Evolution (LTE) networks in particular are beginning to provide speeds in excess of 5 Mbps.[17] As a high-speed data link, these cellular networks provide an alternative path for broadband.

Though capable, several challenges remain for widespread use of cellular technologies to provide broadband internet service in rural areas. First, though LTE networks can function at a distance, each tower still requires a high-speed, low-latency fiber or microwave link for backhaul to the rest of the network.[18] In extremely rural areas, those backhaul links are scarce and as difficult to deploy as cable or fiber networks. Second, cellular networks are often capacity constrained, as only a certain amount of spectrum bandwidth is available for data.[19] While this capacity is often sufficient for mobile users, rural consumers with cellular broadband as their only choice may be faced with high costs for bandwidth usage.

Finally, satellite broadband technologies provide a last-ditch way to provide service in rural areas. Plagued by high latency and high costs, satellite systems are expensive and cumbersome, though they do provide speeds in excess of 10 Mbps.[20] Though capable of providing high speeds, satellite networks are useless for real-time voice or video communications like videoconferencing.[21] Both cellular and satellite wireless technologies should be considered long after all wireline options are considered. Though technological advances have expanded the variety of services deliverable via cables and wires, delivering high-speed broadband services will still requires investment in expensive last mile infrastructure.

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[14] (Wagter, 2010)
[15] (Wagter, 2010)
[16] (Taylor, 2006; Wagter, 2010)
[17] (Federal Communications Commission, 2010, p. 22)
[18] (Federal Communications Commission, 2010, pp. 78, 93–94)
[19] (Bennett, 2012; Federal Communications Commission, 2010, pp. 22, 41–42)
[20] (Federal Communications Commission, 2010, p. 37,38)
[21] (Brodkin, 2013)

3. RECENT FCC REFORM

Over the past few years, the FCC has worked diligently to bring its regulations into coherence with the technological realities of the industry. As more and more individuals abandon their landlines for mobile phones, the telephone's central place in regulatory policy becomes increasingly indefensible. However, without a reformulation of the 1996 Telecommunications Act, the FCC's ability to radically change directions is limited. Nonetheless, the FCC's reform efforts have included some innovative thinking and rewriting of its existing programs. At the center of those efforts lies the USF/ICC Transformation Order.

The USF/ICC Transformation Order focuses on two aspects of federal support for telephone networks in high cost areas. First, it reforms the High Cost Loop Support Program to reduce waste and require broadband service. Second, it reduces the implicit subsidies given using inter-carrier compensation fees. While the USF/ICC Transformation Order does not completely reformulate federal policy towards rural telecommunications, it is a massive change to the existing regulatory structure.

3.1 Connect America Fund

Rather than continue funding telephone service alone, the Order replaces the High Cost Loop Support Fund with a Connect America Fund. This fund continues to provide compensation for companies operating telephone networks in rural areas and implements a broadband service requirement.[22] In addition to telephone service, rural telecommunications carriers must meet the fund's 4 Mbps / 1 Mbps broadband requirement to be eligible for funds. To ensure that companies have a chance to invest in new infrastructure before losing funding entirely, the Order established a transition timeline from 2012 to 2017.[23] In addition, the Order made available additional funds to eligible telecommunications carriers to upgrade their voice networks to become broadband capable.[24]

The Connect America Fund established by the Order is the largest source of funding for rural broadband initiatives.[25] While individual grants and loans may provide carriers with the incentive to invest in new infrastructure, ultimately almost all rural telecommunications providers will rely upon the Connect America Fund to support their operations. As the transition from existing high cost loop support continues, rural providers may face challenges developing the broadband infrastructure required for funding.[26] In conjunction with the changes to inter-carrier compensation, rural carriers will face significant challenges.

[22] (Federal Communications Commission, 2010, 2012; Horrigan, 2010)
[23] (Federal Communications Commission, 2011; Geppert, 2012)
[24] (Federal Communications Commission, 2011)
[25] (Federal Communications Commission, 2010, 2011)
[26] (Federal Communications Commission, 2010, 2011; Geppert, 2012)

3.2 Bill-and-Keep Framework

In addition to reforming the High Cost Loop Support program to fund broadband, the Order begins lowering inter-carrier compensation fees as part of a transition to a "bill-and-keep" framework. Inter-carrier compensation fees are paid from one carrier to another in exchange for terminating a phone call that originated outside the company's network. While wireless carriers have long participated in a "bill-and-keep" system, the transition for wireline raises issues for small rural carriers.[27] Historically, rural carriers have benefitted from high inter-carrier compensation fees, as locating call centers and other businesses with high numbers of incoming calls helps subsidize the rural carriers operations, as other companies must pay to terminate each incoming call. However, lowering inter-carrier compensation to zero helps remove the implicit subsidy and makes it clear exactly how rural networks are being publicly supported.[28]

Though the transition period for both inter-carrier compensation and the Connect America Fund may be challenging for rural carriers, these two regulatory changes encourage rural carriers to invest in their networks. Without new broadband networks, carriers will be unable to benefit from either CAF support or the lucrative new businesses enabled by broadband. Though the Order may create incentives for carriers to enter new broadband markets, it is unlikely that all areas will receive service. Achieving broadband universal service will require additional action on the state level.

4. STATE COMMISSIONS AND UNIVERSAL SERVICE

State commissions have a unique role within the Universal Service Program, one that remains largely unchanged by the USF/ICC Transformation Order. However, because the FCC's statutory authority for telecommunications regulation is still based upon telephone service, the state commissions have a limited role in encouraging new broadband deployment. While encouraging telecommunications providers to invest in new networks to support broadband internet access is almost certain to be a goal for many state commissioners, jurisdictional issues prevent them from power efficiently.

4.1 Jurisdictional Issues

While you may note that the definition for broadband service given above is completely independent of the technical means by which the service is delivered, the regulatory framework is not. Under the 1996 Telecommunications Act, the FCC has classified cable and wireless services as "information services."[29] These services are exempt from the public interest requirements implemented by state commissions including carrier of last resort (COLR) obligations. While State commissions have a role in designating cable

[27] (Federal Communications Commission, 2010; Geppert, 2012)
[28] (Federal Communications Commission, 2011)
[29] (Sicker, 2004)

and wireless companies as eligible telecommunications carriers, they are not able to regulate rates or intrastate connection fees for those companies.[30] These jurisdictional issues make it challenging for states to pursue broadband initiatives from any angle other than infrastructure construction incentives. However, there are a few methods of incentivizing network investment that are worth further discussion.

4.2 Community Broadband Initiatives

One method of encouraging new broadband deployment that is decidedly non-traditional is community broadband initiatives. Some communities have begun investing in their own broadband networks, knowing that internet connectivity is an essential piece of public infrastructure. Rather than waiting for a telecommunications company to decide that their community is easy to serve, these towns and cities have simply invested their own funds. State policymakers can do much to help these grassroots efforts take off.

First, in some states, the incumbent telecommunications companies have successfully lobbied the state legislature to pass legislation making it difficult or impossible for towns and communities to fund their own telecommunications infrastructure.[31] These states, including Texas, Pennsylvania, and Nebraska have seen significantly fewer community broadband initiatives as a result.[32] State policymakers should first ensure that if a community chooses to build a broadband network, it has the freedom to do so.

Second, though community broadband initiatives can certainly benefit from state funding support, non-fiscal assistance may be even more important. While small towns can often partner with network construction firms to get the job done, it takes significant expertise to build out networks. State-level public utility commissions and policymakers can encourage access to this expertise by providing a centralized place for information on successful community broadband projects, public and private funding sources, and service availability mapping.[33] Local communities can use these resources to develop their own broadband initiatives.

Finally, an expanded state role in promoting community broadband deployment can encourage communities to work together in their local geographic area. By encouraging cooperative development, state policymakers have the opportunity to coordinate and advise community initiatives such that they meet state level broadband deployment goals and standards. State policymakers should support community broadband deployment as perhaps the most effective solution that requires little state funding.

[30] (Sicker, 2004, p. 157,158)
[31] (Settles, 2010)
[32] (Institute for Local Self-Reliance & Community Broadband Networks.org, 2013; Taylor, 2006)
[33] (New Hampshire FastRoads, n.d.)

4.3 Infrastructure Incentives

In addition to encouraging community broadband initiatives, state policymakers can engage a variety of initiatives to make broadband rollouts cheaper and easier. First, to avoid digging new trenches to lay new fiber, states can require new public projects to incorporate telecommunications conduit. Adding conduit to public roads and infrastructure construction allows high-speed broadband projects to deploy new wires simply by pulling them through the conduit, avoiding the need to dig another trench.[34] Similarly, state policymakers can encourage communities to grant or require access to utility poles for the purpose of broadband deployment. While simple on the surface, expanding access to utility poles and public facilities for broadband deployment helps reduce the costs of broadband deployment. One prominent example of this strategy is Google's fiber deployment in Kansas. While fiber is often not suitable for rural broadband initiatives, expanding access to public utility poles may still help inspire broadband deployment.

State policymakers can also encourage broadband deployment by incorporating super-high speed internet connections into plans for new public buildings. Providing super-high speed access to anchor institutions like town halls and schools helps ensure that at the very least, rural citizens are able to access broadband internet from public facilities. However, super-high speed broadband to anchor institutions also helps encourage broadband deployment by establishing the high speed fiber backhaul necessary to connect towns to the rest of the internet. Establishing high-speed access in anchor institutions was a key goal of the 2010 National Broadband plan.[35] State policymakers can further that goal in their state as well.

Finally, state governments can help support broadband deployments by providing state-level mapping and measurements. While the FCC has done some mapping culminating in the National Broadband Map, continual updating and monitoring is necessary. New Hampshire's Broadband Mapping and Planning program provides a good example of an ongoing effort to identify where new broadband deployments are needed.[36] Expanding that effort to evaluate pricing and appropriate service levels could provide policymakers with an annual look at the state of broadband within New Hampshire.

5. CONCLUSION

Pursing universal service for broadband is a challenge. Technological, economic, and regulatory barriers make it difficult for policymakers to push telecommunications companies to invest in new network deployments to rural areas. While the FCC has

[34] (Eshoo, Boucher, Waxman, and Markey, 2009; Federal Communications Commission, 2010, chap. 6; Google Inc., Lampert, O'Connor, Georgatsos, & Whitt, 2009)
[35] (Federal Communications Commission, 2010, chap. 2)
[36] (University of New Hampshire, 2012)

encouraged new broadband deployment with its new Connect America Fund, it has also limited the options available to state commissions regarding broadband. In order to incentivize rural broadband deployments, states will have to focus on non-regulatory policy tools like grants, community broadband initiatives, and infrastructure requirements. Perhaps the best place to begin is for states to define their broadband deployment goals and engage in rigorous testing and mapping to ensure that they know where they stand in relation to their goals. Ultimately broadband universal service will require the cooperation of both state and federal commissions through the Universal Service Program.

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