Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Connect America Fund	)	WC Docket No. 10-90
	)	
ETC Annual Reports and Certifications	)	WC Docket No. 14-58
	)	
Establishing Just and Reasonable Rates for Local Exchange Carriers	))	WC Docket No. 07-135
	)	
Developing a Unified Intercarrier Compensation Regime	))	CC Docket No. 01-92

COMMENTS OF
NTCA–THE RURAL BROADBAND ASSOCIATION

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EXECUTIVE SUMMARY

Section 254 of the Communications Act of 1934, as amended (the "Act"), contains several important provisions with respect to the advancement of universal service, including principles that: (a) quality services shall be available at affordable rates; (b) services shall be reasonably comparable in price and quality as between urban and rural areas; and (c) universal service fund ("USF") support shall be sufficient and predictable.

When combined with the community commitment and the entrepreneurial spirit of small rural local exchange carriers ("RLECs"), the USF programs that enable deployment and ongoing operation of broadband-capable communications networks in rural America have had a largely successful – even if not perfect, and still incomplete – track record of making progress toward these statutory objectives. But the programs are now at risk of failure, putting rural America at risk of being left behind. Specifically, the current high-cost USF budget is insufficient to achieve the objectives listed above or to advance broader public policy objectives with respect to universal broadband access. Indeed, even as consumer demands for data-consuming applications and services increase at a remarkable pace, and even as policymakers have identified rural broadband as a critical component of a national infrastructure strategy, the USF programs most critical to ensure that underlying rural networks keep pace with such demands are funded at levels reflective of a time when supporting plain old telephone service was the primary objective. Because of their community commitment and predominantly rural focus, RLECs have tried to keep pace themselves as best they can, but the lack of sufficient and predictable support undermines the ability to obtain financing and efforts to plan and invest in broadband, leaving rural consumers with lower speeds and higher prices than those in urban areas. Put another way, a system that has been built first and foremost to ratchet and cram high-cost USF support down to arbitrary levels set nearly a decade ago is all but doomed to leave rural Americans with services that are

"unreasonably incomparable" in price and quality to those that urban consumers experience and enjoy.

Fortunately, the Federal Communications Commission (the "Commission") has recognized these shortcomings in recent months and has already taken several important near-term and/or partial steps to address them. Specifically, the Commission has provided additional support to ensure that rural areas served by RLECs receiving model-based support can at the very least receive the same level of per-location support as those in areas served by larger providers. Moreover, the Commission will be providing resources sufficient to mitigate the past twelve months of USF budget cuts for those RLECs receiving cost-based support – shortfalls that caused numerous firms to ratchet back their own broadband infrastructure investments and denied many rural consumers the affordable standalone broadband rates that had been the very impetus for reform in the first instance.

As welcome as these steps are, however, they are only near-term or partial in nature. The model continues to be "underfunded" as compared to its initial design for per-location support, while those RLECs receiving cost-based support are staring down the prospect of even deeper cuts in support – approximately $230 million – starting July 1 for investments they have already made in furtherance of universal service. Although the Commission has latitude to determine what may constitute "sufficient" support under the law, there is no reasonable case to be made that the current budgets are sufficient when the RLEC USF mechanisms fail to provide support at the levels specifically designed and approved by the Commission but for the arbitrary budget caps.

To address these shortfalls and to comply ultimately with the relevant statutory mandates, the Commission should establish a high-cost USF budget that: (1) reflects reasonable expectations as to demands over time based upon the approved design of the components of the USF programs; (2) is sized sufficiently to promote "true universal service" of the kind of necessary to drive the

availability of scalable, forward-looking networks that can evolve and keep pace with consumer demand, or at the very least, is sized sufficiently to correspond to the set of buildout and other performance tasks designed by the Commission; (3) is sized sufficiently as well to ensure "reasonable comparability" in terms of services and pricing; (4) provides greater predictability to the extent that any projected budget nonetheless turns out to be insufficient in a future period; and (5) includes an appropriate inflationary factor just as other USF programs do today. Using such principles to identify an overall budget based upon the existing components of USF support in areas served by RLECs, as explained herein, NTCA estimates that approximately $2.55 billion in total support will be needed in 2018 – roughly a five percent recalibrating increase over the current "run-rate" of support – and that budget demands will increase to approximately $2.8 billion in total support by 2026.

As a separate but related matter, the Commission should further adopt a carrier-specific threshold, or "floor," to provide greater predictability (another statutory mandate) based upon an average of several prior years of support. Finally, these budget demands and similar needs for resources resident within other high-cost USF programs (such as the Remote Areas Fund, the Mobility Fund, and disaster relief initiatives) could and should be satisfied by the application of an appropriate inflationary factor to the overall high-cost budget, just as is the case in other USF programs today – or, at the very least, by applying such a factor even just to the RLEC USF budget as suggested by the Commission dating back to 2011 and then carrying that forward.

Looking beyond the budgetary questions that are rightly front and center in the Commission's inquiries, other potential reforms should be viewed through the prism of whether they are needed to advance important public policy goals or "fix something that is broken." Even just the threat of tinkering with USF mechanisms can be as unsettling and disruptive to investment certainty as actual reform. For example, with respect to proposals such as lowering of the $250

cap or the 100 percent study area competitive overlap standard, there is no good reason articulated to reopen and revise these provisions, and the Commission should reject these proposals altogether. Indeed, the former could have a significant negative impact on consumers in some of the most rural parts of the country, while the latter has already been to some degree superseded by a process adopted more recently that would attempt to assess and verify competitive presence on a more granular basis. Experimental concepts such as vouchers and favoring certain states over others in support based upon the presence or absence of their own funding programs likewise risk upsetting the kinds of predictability and regulatory certainty necessary to justify investments in network assets in deeply rural areas where returns are measured in decades rather than years. Finally, however, NTCA believes that certain other potential changes teed up by the Commission as described further herein – including the notion of surgical modifications to the current distribution mechanisms to make them more stable and less complex – are worthy of further examination and consideration, provided that they are carefully vetted to ensure that they do not introduce new complications or unintended consequences, and do not mask the fact that insufficient USF support will always fall ultimately on the backs of rural consumers, no matter how rearranged.

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COMMENTS OF NTCA–THE RURAL BROADBAND ASSOCIATION

NTCA–The Rural Broadband Association ("NTCA") hereby submits these Comments in response to the Notice of Proposed Rulemaking[1] in the above-captioned proceeding. In the NRPM, the Federal Communications Commission (the "Commission") builds upon significant steps taken in an accompanying Order to address sufficiency concerns and seeks comment on how to make its high-cost universal service fund ("USF") programs even more effective and efficient. In particular, the NPRM raises much-needed questions regarding the longer-term sufficiency of USF support budgets for small rural local exchange carriers ("RLECs"), including but not limited to those receiving support based upon actual costs of rural investments and operations through Connect America Fund-Broadband Loop Support ("CAF-BLS") and High-Cost Loop Support ("HCLS") (collectively, "Cost-Based Support") or distributions via the Alternative Connect America Cost Model ("A-CAM"), as well as questions about several potential additional revisions to the USF programs beyond those adopted in many prior orders and orders on reconsideration.

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1 *Connect America Fund*, *et al.*, WC Docket No. 10-90, *et al.*, Report and Order, Third Order on Reconsideration, and Notice of Proposed Rulemaking (rel. March 23, 2018) ("Order" or "NPRM," as applicable).

I. THE CURRENT HIGH COST BUDGET IS INSUFFICIENT TO ACHIEVE THE MANDATES AND GOALS OF UNIVERSAL SERVICE IN RURAL AMERICA.

A. Support Levels Must Keep Pace with Consumer Demand and the Costs of Deploying and Maintaining Broadband-Capable Networks in Rural Areas.

1. "Reasonable Comparability" Requires Keeping Pace with Evolving Technology and Consumer Demands.

Broadband service is considered an essential service for consumers, just as telephone service was in the 20th century. Broadband has been called "a basic human need not just for learning, entertainment and social purposes but also for managing small business, emergency services, access to government, health care, and daily life."[2] But, unlike the relatively static nature of "plain old telephone service," demand for higher-quality, higher-capability broadband has increased at paces unimaginable even a decade ago. In mid-2000, "less than one household in thirty could access the Internet at a download speed of 200 kbps or greater."[3] In 2010, the Commission updated the benchmark for broadband Internet speeds from 200 kbps in both directions to 4 Mbps downstream and 1 Mbps upstream.[4] By 2014, NTCA member companies reported that nearly 83 percent of subscribers had access to broadband speeds at or above 10 Mbps,

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2 *2018 Wireless Broadband Predictions and Trends*, Atul Bhatnagar (Dec. 14, 2017), available at https://www.cambiumnetworks.com/blog/2018-wireless-broadband-predictions-trends/.

3 *The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data*, Robert Crandall et al, Issues in Economic Policy, The Brookings Institution, No. 6 (July 2007), available at https://www.brookings.edu/wp-content/uploads/2016/06/06labor_crandall.pdf.

4 *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act; A National Broadband Plan for our Future,* GN Docket Nos. 09-137, 09-51, Sixth Broadband Deployment Report, 25 FCC Rcd 9556 (2010).

with such speeds also representing the most popular Internet service tier among subscribers.[5] Just in the past year alone, fiber subscriptions in the U.S. grew by approximately 14.91 percent between June 2016 and June 2017, and constituted 11.8 percent of all broadband subscriptions in the U.S. during the same time period.[6] Over that same time frame, the average Internet speed in the U.S. increased by 22 percent, to 18.7 Mbps,[7] while Internet speeds globally increased an average of 15 percent in 2017.[8]

Adoption offers a convincing counterpart to observing growth in network capabilities – the network marketplace responds first and foremost to current and anticipated increases in consumer demand. In its most recent Section 706 report, the Commission found "year-to-year increases across the vast majority of areas, including Tribal lands, for adoption of 10 Mbps/1 Mbps, 25 Mbps/3 Mbps, and 50 Mbps/5 Mbps fixed terrestrial services."[9] Indeed, the Commission has observed that "adoption of service at 25 Mbps/3 Mbps, our current speed benchmark for fixed advanced telecommunications capability, grew from just under 10 percent in 2011 to just over 50 percent in 2016, an increase of approximately 40 percentage points in just five years."[10] Perhaps even more telling, adoption of services at 50 Mbps/5 Mbps leapt from just over 25 percent in 2014

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5 *NTCA 2014 Broadband/Internet Availability Survey Report* (June 2015), available at https://www.ntca.org/sites/default/files/documents/2018-01/2014ntcabroadbandsurveyreport.pdf.

6 Organisation for Economic Co-operation and Development, Penetration and data usage (June 2017), available at http://www.oecd.org/sti/broadband/broadband-statistics/.

7 *Akamai's [state of the internet] Q1 2017 report*, at 12, available at https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf.

8 *Id*.

9 *Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion,* GN Docket No. 17-199, 2018 Broadband Deployment Report, 33 FCC Rcd. 1660, 1698 (2018), at ¶ 73 (internal citation omitted).

10 *Id*. at ¶ 77.

to nearly 45 percent only two years later.[11] NTCA members report seeing reasonably comparable spikes in demand within their very rural customer bases. According to the 2017 NTCA Broadband Survey Report, "[w]hile the overall broadband take rate is generally the same (72 percent this year versus 73 percent last year), subscribers are moving up to higher speeds." In fact, NTCA member customers subscribing to broadband service in excess of 25 Mbps *doubled* from 2016 to 2017, while subscriptions to services of 4 Mbps of greater also increased. In contrast, subscriptions to service between 1 and 4 Mbps *decreased*.[12]

Moreover, we are only on the precipice of substantial demands to come based upon use cases, and keeping pace with demands for higher speeds will determine American competitiveness in a global economy and rural America's ability to remain a critical component of (and even help drive) such success. In North America alone, Cisco predicts 20 percent growth in demand for consumer IP traffic from 2016-2021 (CAGR).[13] Mobile-driven data demands in particular are expected (and hoped) to increase dramatically, in turn creating the need for more robust fiber facilities to "densify" wireless networks and support numerous devices operating simultaneously.[14] It is also predicted that "streaming video and new forms of immersive media

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11 *Id*. at Chart 1.

12 *NTCA 2016 Broadband/Internet Availability Survey Report* (July 2017), at 14, available at https://www.ntca.org/sites/default/files/documents/2018-01/2016ntcabroadbandsurveyreport.pdf.

13 *Cisco Visual Networking Index: Forecast and Methodology, 2016–2021*, https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/complete-white-paper-c11-481360.html.

14 *Communications Infrastructure Upgrade: The Need for Deep Fiber*, Deloitte Development LLC (2017), at 10 (internal citation omitted) ("Deloitte Report"), available at (https://www2.deloitte.com/content/dam/Deloitte/us/Documents/technology-media-telecommunications/us-tmt-5GReady-the-need-for-deep-fiber-pov.pdf); *see also Evaluating 5G Wireless Technology as a Complement or Substitute for Wireline Broadband*, Larry Thompson, Vantage Point Solutions (Feb. 2017), at 14 (noting that the range of many 5G small cell deployments will be measured in "hundreds of feet, not in miles"), available at https://www.ntca.org/sites/default/files/legacy/images/stories/Documents/Press_Center/2017_Rel

such as Augmented and Virtual Reality (AR/VR) will contribute to traffic growth estimated at 181 percent CAGR through 2020."[15] Cisco, meanwhile, predicts Internet video surveillance traffic, which already increased by 9 percent between 2015 and 2016, will "increase sevenfold between 2016 and 2021."[16] Online shopping, already one of the most popular uses of the Internet, is expected to grow to 195 million people in the U.S. alone by 2019.[17] And a good portion of this online activity is being driven by better broadband access in rural America – a recent survey found, for example, that rural consumers account for 15 percent of all Internet-driven transactions, which are expected to reach $14 trillion annually by 2022.[18] Telehealth services, a valuable treatment option especially in rural communities, is predicted to grow by nearly 30 percent by 2021.[19] Higher-capacity broadband connections – both at home (to overcome the "homework gap") and in the schoolhouse – are also essential to the ongoing demand for distance learning, which has a

eases/02.13.17%20fcc%20ex%20parte-ntca%20letter%20submitting%202017%20technical%20paper%20wc%2010-90.pdf.

15 Deloitte Report at 10.

16 *Cisco Visual Networking Index: Forecast and Methodology, 2016-2021* (Sep. 15, 2017), available at https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/complete-white-paper-c11-481360.html.

17 *Internet Usage in the United States – Facts and Statistics*, Statista, available at https://www.statista.com/topics/2237/internet-usage-in-the-united-states/.

18 *A Cyber Economy: The Transactional Value of the Internet in Rural America*, White Paper (2018), at 1, available at https://www.frs.org/sites/default/files/documents/2018-03/A-Cyber-Economy_The-Transactional-Value-of-the-Internet-in-Rural-America.pdf.

19 *Growth Opportunities in the US Telehealth Market*, Forecast to 2021, Frost & Sullivan, (April 2017), available at http://www.frost.com/sublib/display-report.do?id=K122-01-00-00-00; *see also Anticipating Economic Returns of Rural Telehealth*, Schadelbauer, Rick, Smart Rural Community (2017), available at https://www.ntca.org/sites/default/files/documents/2017-12/SRC_whitepaper_anticipatingeconomicreturns.pdf.

projected global market size of $65.41 billion by 2023.[20] The Consumer Technology Association ("CTA") predicts that in 2018, 4K ultra HD TV demand will increase to 22 million units in 2018 (27 percent growth).[21] This new "standard" in televisions – 4K resolution – requires at least 15 Mbps to 25 Mbps of Internet connectivity per device,[22] a speed unavailable in many rural communities. During 2018, CTA forecasts increased demand for overall capacity will be fed by increased consumer demand for smart speakers (60 percent projected increase, units); smart home products (41 percent projected increase, units); virtual reality (25 percent projected increase, units). And, demand for streaming video is expected to drive a 35 percent increase in revenues for services such as Netflix and Pandora, growing to $19.5 billion.

Unfortunately, largely because of insufficient and artificially constrained budgets, universal service speed targets that often come to define the basic terms of broadband access in much of rural America have struggled to keep pace with such dynamic growth and innovation in this marketplace – despite statutory mandates that the USF program ensure quality services are available at affordable rates and that services in rural and urban areas are reasonably comparable

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[20] *Global E-learning Market 2018-2023* (Feb. 1, 2018), available at https://www.prnewswire.com/news-releases/global-e-learning-market-2018-2023-market-is-expected-to-reach-6541-billion-300591856.html; *see also* Cejda, Brent D., *Connecting to the Larger World: Distance Education in Rural Community Colleges*, Wiley InterScience (Spring 2007), available at http://www.accbd.org/articles/index.php/attachments/single/107; *The Impact of Broadband on Education*, U.S. Chamber of Commerce (Dec. 2010), available at https://www.uschamber.com/sites/default/files/legacy/about/US_Chamber_Paper_on_Broadband_and_Education.pdf.

[21] 2018 CTA Consumer Tech Industry Forecast, Consumer Technology Association, Arlington, VA, available at https://cta.tech/Research-Standards/Reports-Studies/Studies/2018/Technology-Sales-Forecasts-2013-2018-January-2018.aspx.

[22] *See, e.g.*, *You're buying a 4K TV. How much Internet bandwidth do you need?* Rob Pegoraro, USA Today (Dec. 11, 2017), available at https://www.usatoday.com/story/tech/columnist/2017/12/10/youre-buying-4-k-tv-how-much-internet-bandwidth-do-you-need/933989001/.

in price and quality.[23] In 2010, the National Broadband Plan first suggested a rural universal service goal of 4 Mbps download and 1 Mbps upload speeds, even as it touted a goal of providing 100 million households with 100 Mbps services by 2020.[24] This 4/1 Mbps USF speed target was largely sustained through the Commission's USF reforms, becoming the initial speed benchmark for Connect America Fund ("CAF") buildout.[25] In 2014, based in large part upon findings that 99 percent of Americans at the time had access to 10 Mbps broadband and that 25 Mbps broadband was available to the "vast majority of urban users," the Commission revised the CAF Phase II buildout requirement to 10 Mbps downstream and 1 Mbps upstream.[26] Now, in the wake of the 2016 reforms, some CAF recipients must offer 25 Mbps downstream and 3 Mbps upstream to a portion of their customer base, although due to USF budget limitations, most rural customers in supported areas remain subject to 10/1 Mbps targets that are lower than the kinds of speeds most Americans expect and demand.[27]

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[23] 47 U.S.C. § 254(b)(1) and (3).

[24] *Connecting America: The National Broadband Plan* (2010), available at https://www.fcc.gov/general/national-broadband-plan.

[25] *Connect America Fund; A National Broadband Plan for Our Future; Establishing Just and Reasonable Rates for Local Exchange Carriers; High-Cost Universal Service Support; Developing an Unified Intercarrier Compensation Regime; Federal-State Joint Board on Universal Service; Lifeline and Link-Up; Universal Service Reform – Mobility Fund*, WC Docket Nos. 10-90, 07-135, 05-337, 03-109; GN Docket No. 09-51; CC Docket Nos. 01-92 and 96-45; WT Docket No. 10-208, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663, 17726 (2011) ("2011 Order"), at ¶ 161. The Commission also indicated in 2011 that "we expect that consumer usage of applications, including those for health and education, may evolve over the next five years to require speeds higher than 4 Mbps downstream/1 Mbps upstream." *Id*. at 17726, ¶ 162.

[26] *Connect America Fund*, *et al*., WC Docket No. 10-90, *et al*., Report and Order, 29 FCC Rcd 15644, 15649 (2014), at ¶¶ 15-16.

[27] *Connect America Fund*, *et al*., WC Docket No. 10-90, *et al*., Report and Order, Order and Order on Reconsideration, and Further Notice of Proposed Rulemaking, 31 FCC Rcd 3087, 3098-99 and 3148-49 (2016) ("2016 Order"), at ¶¶ 24-26 and 161. The Rural Utilities Service has also recognized the importance of faster Internet speeds through programs such as its Community

Yet, over the course of all these changes – with higher speeds becoming the norm for most Americans, and with "somewhat-lesser-but-still-higher-than-before" speeds becoming the targets within some parts of the high-cost USF program – the high-cost USF budget has remained fixed under the same budget cap without even a mere inflationary adjustment for nearly seven years. As a reminder, the Commission in 2011 set a six-year budget for high-cost USF support at $4.5 billion per year, based upon no greater analysis than the observation that this was the level of support anticipated for receipt by carriers that year.[28] However, this amount was based upon resources that had been allocated to support telephone service, rather than broadband. To be sure, impressive broadband deployment in rural areas had been achieved by RLECs due to the Commission's prescient "dual-use" or "no barriers" policies that, in the absence of explicit high-cost support for broadband, enabled carriers to deploy telecommunications networks capable of providing voice and broadband supported by universal service funds.[29] And, even in the absence of specific deployment obligations, rural providers registered recurring and growing achievements in both telephone *and* broadband deployment prior to that time.[30]

Connect Grant Program, which requires recipients to offer at least 25/3 Mbps broadband to every customer in the proposed funded service area. *See* Rural Utilities Service, Announcement of Grant Application Deadlines and Funding Levels, 83 Fed. Reg. 51, 11494, March 15, 2018.

[28] 2011 Order, 26 FCC Rcd at 17711, ¶ 125.

[29] *See Federal-State Joint Board on Universal Service, Multi-Association Group (MAG) Plan for Regulation of Interstate Services of Non-Price Cap Incumbent Local Exchange Carriers and Interexchange Carriers*, CC Docket No. 96-45, CC Docket No. 00-256, Fourteenth Report and Order, Twenty-Second Order on Reconsideration, and Further Notice of Proposed Rulemaking, and Report and Order. 16 FCC Rcd 11244, 11322 (2000), at ¶ 200.

[30] *See* 2011 Order, 26 FCC Rcd at 17740, ¶ 205; *see also High-Cost Universal Service Support, Federal-State Joint Board on Universal Service*, Recommended Decision of the Federal-State Joint Board on Universal Service, WC Docket No. 05-337, CC Docket No. 96-45, 22 FCC Rcd 20477, 20488 (2007) ("2007 Recommended Decision"), at ¶ 39. ("Under existing support mechanisms, RLECs have done a commendable job of providing voice and broadband services to their subscribers.")

But, as the Commission affirms (and as all the indicators described above confirm), "since 2011, consumers' expectations and the Commission's requirements regarding broadband speed have continued to increase."[31] The Commission has further rightly noted that "[a] budget designed to speed the deployment of 4 Mbps/1 Mbps broadband to rural America may be insufficient to encourage the deployment of the high-speed broadband networks that residents of rural America need."[32] These observations echo the remarks of one Commissioner more than a decade ago in the face of suggestions at that time that national broadband objectives might be advanced simply by redeploying then-current levels of support, likening such ideas to "fighting a bear with a fly swatter":

> Bringing broadband to the far corners of the nation is the central infrastructure challenge to our country confronts right now. It is no different than the challenges previous generations of Americans faced to build the essential infrastructure of *their* times - the roads, turnpikes, bridges, canals, railroads and highways of centuries past. . . . [I]n the mid-1950 Congress looked to complete the interstate highway system in 10 years at a cost of $27 billion, which in 2005 dollars amounts to $196 billion. While no one is suggesting that such a level of government support be invested here . . . recommending a cap of the fund at current levels . . . cripples the ability of USF to support broadband in a credible manner.[33]

Thus, even as our nation has witnessed broadband technologies exploding and innovative new applications driving demand for deployment of even more robust fiber and 5G technologies – and even as other USF programs have seen budget increases and inflationary factors during the intervening years for the purpose of enhancing access for Americans of all kinds to more robust

[31] NPRM, at ¶ 108.

[32] *Id.*

[33] 2007 Recommended Decision, 22 FCC Rcd at 20500 (Statement of Commissioner Michael J. Copps) (emphasis in original).

and affordable evolving broadband services[34] – the high-cost USF program budget that is mission-critical for millions of rural Americans (and foundational for the success of all four critical universal service initiatives in rural America) has remained locked at levels largely reflective of plain old telephone service. It is essential for all universal service programs to evolve and to keep pace with such changes and for each to be sufficiently sized for the tasks they are assigned by statute, and it is time in particular to ensure that the high-cost USF program is sufficient to fulfill the objective of providing reasonably comparable services at reasonably comparable and affordable rates in rural and urban areas.[35]

This last point is particularly important, highlighting that the high-cost USF program is just as much about affordability as it is about availability and ongoing operation of networks. High-cost universal service support promotes broadband deployment in some of the nation's costliest-to-serve rural areas, where lack of density, difficult terrain, and weather-shortened construction seasons are among the many significant barriers to the provision of high-quality, reasonably

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[34] *See Schools and Libraries Universal Service Support Mechanism*, CC Docket No. 02-6; *A National Broadband Plan for our Future*, GN Docket No. 09-51, Sixth Report and Order, 25 FCC Rcd 18762, 18781-84 (2010), at ¶¶ 35-40 (increasing the E-Rate budget by the "same index the Commission uses to inflation-adjust revenue thresholds used for classifying carrier categories for various accounting and reporting purposes and to calculate adjustments to the annual funding cap for the high-cost loop support mechanism," but ironically not for purposes of increasing the high-cost USF budget itself); *Modernizing the E-rate Program for Schools and Libraries*, WC Docket No. 13-184, Order and Further Notice of Proposed Rulemaking, 29 FCC Rcd 8870 (2014); *Modernizing the E-rate Program for Schools and Libraries, Connect America Fund*, WC Docket Nos. 13-184, 10-90, Second Report and Order and Order on Reconsideration, 29 FCC Rcd 15538 (2014) (increasing the authorized E-rate budget by $1.5 billion annually); *Lifeline and Link Up Reform and Modernization et al.*, WC Docket No. 11-42 et al., Third Report and Order, Further Report and Order, and Order on Reconsideration, 31 FCC Rcd 3962, 4111 (2016), at ¶¶ 400-403 (increasing the target Lifeline budget to $2.25 billion annually and attaching an inflationary factor to that budget target).

[35] 47 U.S.C. § 254(b)(1) and (3); *see also id*. at § 254(c)(1).

comparable broadband service.[36] Indeed, deployment stimulated through high-cost support is foundational to all of the Commission's broadband public policy and statutory universal service goals, providing the networks for rural consumers of all income levels and types, including businesses, schools, libraries, and health care facilities, to participate in an increasingly online world. But "reasonable comparability" is a goal both as to availability and affordability under the statute – *both* the services *and* the rates must be reasonably comparable by law. Thus, while many often conceive of the high-cost USF program as merely stimulating network deployment, the high-cost program in fact "wears two hats." It provides the business case for network deployment and ongoing operations *precisely because* it helps to ensure that consumers in rural America can adopt services and pay rates that are "reasonably comparable" to those paid by urban consumers.

It can be clearly seen, however, that insufficient high-cost USF support undermines this goal of affordability, and thus ultimately hurts the business case for investment in infrastructure and the ability to sustain ongoing operations. The investment-related impacts of the budget control mechanism are described further below in Section I.B, but with respect to the *affordability* of broadband, NTCA members responding to a survey conducted in June 2017[37] anticipated the following *monthly* increases in rural subscriber rates for broadband service due specifically to the Cost-Based USF budget control cuts announced in May 2017:

$0.01 to $5.00	18.5%
$5.01 to $10.00	33.8%
$10.01 to $25.00	33.8%
$25.01 to $50.00	7.7%
More than $50.00	6.2%

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36 *See, e.g., NECA Trends, A report on rural telecom technology* (December 2015), at 3 ("Based on U.S. Census and [Commission] serving territory boundary area, TS Pool members serve areas with an average of only 5.4 households per square mile.").

37 *Ex Parte* Letter from Michael R. Romano, Sr. Vice President, NTCA, to Marlene H. Dortch, Secretary, Commission, WC Docket No. 10-90 (filed Aug. 15, 2017) (attaching results of NTCA member survey with respect to effects of USF budget shortfalls).

Moreover, many NTCA members reported in the same 2017 survey that they did not offer standalone broadband access at all, because to do so in the face of the Cost-Based USF support cuts would lead to average end user prices of $126 per month.

Unfortunately, the picture looks just as bleak for rural consumers in the face of the new, even larger budget cuts that were announced on May 1 and are scheduled to take effect on July 1.[38] Due to the persistent insufficiency of support based upon 2011 levels, this newest iteration of the budget cut will wipe out nearly $230 million in USF support that would otherwise have been provided under the Commission's own rules for investments already made in broadband-capable networks. This leaves RLECs no choice but to seek to recover these costs from small rural customer bases instead – and the data indicate just how badly this will harm consumers by undermining access to affordable broadband. Although NTCA members are still evaluating the impacts of the new, even larger budget cut announced only a few weeks ago, preliminary estimates indicate that once again members will have to raise rates (or keep rates higher than they would otherwise be) due to the loss of support – 37 percent of members in a recent survey responded that their broadband rates will need to be $5.01 to $10.00 per month higher to recover costs that will go unrecovered as a result of the new budget control figure, with another 32 percent reporting higher monthly broadband rates of $10.01 to $25.00 due to the support cuts.

Such rural end user rates fly in the face of any notion of "reasonable comparability" when the Commission's benchmark for 10/1 Mbps broadband is approximately $88 per month, while the 25/3 benchmark is approximately $94.[39] Such figures also fly in the face of the intended

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[38] *See Budget Control Mechanism for Rate of Return Carriers*, available at https://www.usac.org/hc/program-requirements/budget-control-rate-of-return.aspx.

[39] *Wireline Competition Bureau Announces Results of 2018 Urban Rate Survey for Fixed Voice and Broadband Services, Posting of Survey Data and Explanatory Notes, and Required Minimum Usage Allowance for ETCs Subject to Broadband Public Interest Obligations for All*

purpose of the 2016 reforms[40] and the many calls from Congress in recent years to ensure that rural Americans can obtain affordable access to standalone broadband services.[41] In the absence of more sufficient support – a high-cost USF budget built for the broadband marketplace of 2018 (and beyond) – many rural consumers will continue to be denied access to broadband that is reasonably comparable in price and quality to that enjoyed by millions of urban Americans today.

Finally, notwithstanding artificial and insufficient budgetary limits that, as described herein, have resulted in fewer locations reached, lesser speeds of broadband to locations reached, and higher rates for rural consumers, some may contend that the high-cost USF program budget is already sufficient because the program somehow can be made even more "efficient" in its

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United States Carriers, Including Carriers in Alaska, Public Notice DA 17-1093, WC Docket No. 10-90 (rel. Nov. 8, 2017). It should also be noted that these "reasonable comparability benchmarks" are set two standard deviations above the actual, much lower rates paid by the average urban user. *See* Urban Rate Survey Data and Resources, available at https://www.fcc.gov/general/urban-rate-survey-data-resources. By way of example, the average urban rate for 10/1 Mbps broadband appears to be approximately $54.

40 *See* 2016 Order, 31 FCC Rcd at 3121 and 3123, ¶¶ 87 and 92 (asserting that the 2016 reforms would promote affordable rates and consumer adoption of broadband services by providing support for broadband connections).

41 *See, e.g., Letter from Senators Deb Fischer, Amy Klobuchar and 61 Senators to Chairman Ajit Pai* (dated May 15, 2018), available at: https://www.ntca.org/sites/default/files/documents/2018-05/2018-%20Senate.pdf; *Letter from Reps. Kevin Cramer, Collin Peterson and 128 Representatives to Chairman Ajit Pai* (dated May 15, 2018), available at: https://www.ntca.org/sites/default/files/documents/2018-05/2018HouseUSFLetterFCC.pdf; *Letter from Senators Jerry Moran, Pat Roberts, Amy Klobuchar, and 36 Senators to Chairman Ajit Pai and Commissioners Michael O'Rielly, Mignon Clyburn, Jessica Rosenworcel, and Brendan Carr* (dated Oct. 31, 2017), available at: https://www.ntca.org/images/stories/Documents/Advocacy/2017Oct-Senate.pdf; *Letter from Reps. Collin Peterson, Kevin Cramer and 35 Representatives to Chairman Ajit Pai* (dated Oct. 2, 2017), available at: https://www.ntca.org/images/stories/Documents/Advocacy/2017Oct-House.pdf; *Letter from Rep. Cramer and 101 Representatives to Chairman Ajit Pai, and Commissioners Michael O'Rielly Mignon Clyburn* (dated May 2, 2017), available at: https://www.ntca.org/images/stories/Documents/Advocacy/2017May-House.pdf; *Letter from Senators Deb Fischer, Amy Klobuchar and 54 Senators to Chairman Ajit Pai, Commissioner Michael O'Rielly and Commissioner Mignon Clyburn* (dated April 11, 2017), available at: https://www.ntca.org/images/stories/Documents/Advocacy/2017April-Senate.pdf.

operations. Such a contention, however, would overlook and disregard the many steps already taken and the many measures already put into place to ensure that funding is disbursed efficiently and targeted to where it is needed most to support the deployment of networks and provision of supported services. Indeed, over the past seven years while the high-cost USF budget has been frozen, the Commission has adopted a comprehensive series of overlapping controls, caps, and constraints aimed at ferreting out any possible "waste, fraud, and abuse" in the system. In addition to many RLECs moving to model-based support which as designed by the Commission is intended to reflect an "efficient" level of distributions, the Cost-Based Support mechanisms are subject to: (1) operating expense limits adopted in 2016; (2) corporate operations expense limits expanded in 2011; (3) capital investment limits adopted in 2016; (4) cost benchmarks below which support is not available; (5) competitive overlap measures adopted in 2011 and enhanced in 2016; (6) a per-line cap on support adopted in 2011; (7) an overall budget control mechanism adopted in 2016; (8) a rate floor adopted in 2011; (9) geocoded buildout obligations adopted in 2016; and (10) much greater direction and constraints with respect to what kinds of expenses are now recoverable via USF.[42] When combined with detailed cost study filings, various performance reports, periodic certifications, substantial audits, and investigations,[43] these many measures provide a level of transparency and accountability with respect to high-cost USF that is unparalleled in any other broadband-focused program, and helps to ensure the most effective possible use of the USF budget

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[42] *See* 2016 Order, 31 FCC Rcd at 3331-32 (Statement of Commissioner Ajit Pai Concurring in Part and Dissenting in Part).

[43] In a recent NTCA survey to which 118 member companies responded, more than 30 percent reported having been the subject of a USAC audit in the past 24 months, and 30 percent indicated they had been subject to a Payment Quality Assurance examination during that period. Of those still under audit, nearly 70 percent reported the audit had been open for more than one year.

in dedicated, well-directed furtherance of the statutory mission of universal service.[44] In the wake of the many reforms over the past decade, what is missing is not accountability, but sufficiency.

2. The Budget Adopted in 2011 Has Failed to Keep Pace with the Practical Challenges of Deploying and Operating Rural Networks.

The current high-cost budget is insufficient to achieve the statutory mandates and public policy goals of universal service for rural America. The budget adopted in 2011 was predicated on the costs of deploying telephone service, an undertaking that even at the outset of the Nation's conversion to broadband did not contemplate a complete rebuild of the Nation's networks. Moreover, although newer telecommunications networks are substantially more capable and resilient than the ones that they replace (thereby potentially reducing ongoing operating costs over time), labor costs continue to represent the largest cost input to deployment and operational efforts – especially in rural areas where the simplest "truck roll" to build or maintain a network can consume hours at a time. As such, and as described more fully below,[45] potential productivity offsets relating to network capability do not necessarily translate to lower network deployment costs since those costs are grounded mainly in the very act of deploying facilities rather than the capability of the facilities being deployed. Finally, as discussed further below in Section II.D, labor costs are increasing at a rate equal to or greater than the cost of consumer goods such as those measured in indices like Gross Domestic Product Chain-type Price Index ("GDP-CPI"), meaning that the costs of building networks are outpacing even the standard measure of inflation used by the Commission in other, related contexts.

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44 *Cf.* NPRM at ¶ 111 (asking how the Commission can establish proper signals and incentives for efficient investment and operations, and ensure that resources shared by multiple carriers under a fixed budget are used in a manner that maximizes their value).

45 *See* footnote 129, *infra.*

For purposes of this discussion, a greater understanding of the construction process for rural broadband providers is useful. As an initial matter, the very process of preparing for and then undertaking construction involves multiple steps and "hoops" – many of which are simply unavoidable aspects of the physical act of planning for and undertaking deployment of a network and some of which are attributable to the kinds of factors that many policymakers are now reviewing to see if streamlining can be achieved.[46] But looking more specifically at efforts toward deployment in rural areas, a smaller communications provider will typically "bid-out" new deployments. This approach is necessary because most small providers do not enjoy a business scale large enough to employ directly the teams of engineers and construction personnel necessary to design and install the network. Accordingly, to address this issue of labor costs, NTCA consulted with several rural service providers, but relied principally upon engineers and construction contractors whose data would represent numerous builds from disparate geographic regions over a period of years; these included other associations representing the trades. NTCA also compared the responses from the providers, engineers, and construction contractors with information gleaned from the Bureau of Labor Statistics ("BLS") and other sources as described below.

As an overall matter, labor costs[47] for telecommunications deployment over the past decade indicated growth at a rate either equal to or greater than the rate of inflation measured by a consumer goods-focused index like the GDP-CPI. Accordingly, at the outset, the labor inputs to

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46 *See* Attachment 1 hereto (outlining procedures associated with deployment and upkeep of broadband-capable networks).

47 "Labor costs" refers to the collective costs of labor inputs. This is to be distinguished from "labor rates," which are ordinarily used to describe hourly rates. Engineering firms and telecom providers confront labor *costs* in bids and project considerations, while contractors generally address labor *rates* as an input to bid proposals.

telecommunications network deployment fuel higher costs when compared to other employee-dependent industries. In addition to inherent high labor costs, industry disruptions can cause costs to spike periodically. Notably, labor rates spiked following implementation of the American Recovery and Reinvestment Act ("ARRA"),[48] a period in which some respondents to the NTCA inquires observed that ARRA-created programs increased demand on contractors. Although those spikes eventually subsided, the collective impression of those surveyed was that prices never returned fully to pre-spike levels, and that as matter of course, spikes generally leave an upward impact on costs even after correction.[49] Moreover, compliance with the Davis-Bacon Act,[50] which sets wage limits for Federal contracting actions, layered additional higher costs atop the general increase that was occasioned by market demand following ARRA implementation. These experiences should serve to inform the proposition that spikes in labor costs are likely to occur in response to increased Federal actions aimed at increasing network deployment.

In addition to the impact of periodic surges in deployment activities, increased labor costs are also informed by pressures from outside of the telecom industry. Labor wages must respond to pressures from other underground industries. Accordingly, contractors for the communications industry must match wages for gas or electrical workers or risk losing those employees to the other markets. According to the Department of Energy, for example, the natural gas and extraction

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48 *American Recovery and Reinvestment Act of 2009*, Pub. L. No. 111-5, 123 Stat. 115 (Feb. 19, 2009).

49 Of course, as new broadband deployment programs have been adopted or remain under consideration – including not only this Commission's CAF initiatives, but also the RUS "pilot project" adopted in the recent Omnibus appropriations act and the prospect of additional broadband deployment initiatives in the Farm Bill and broader infrastructure and appropriations legislation – it is quite possible, if not likely, that such pricing pressures for contract labor could arise again.

50 *Davis-Bacon Act*, Pub L. No. 71-798, 46 Stat. 1494 (Mar. 3, 1931).

industry added 80.000 jobs from 2004 to 2014.[51] In addition to inter-industry pressure, contracting representatives reported to NTCA that labor shortages are endemic to all construction trades. Although wage increases for telecommunications line installers and repairers appear to be tracking with inflation (4.61 percent increase 2013-2017, as set against a cumulative inflation rate of 4.8 percent from 2013-2017), forecasts for the communications sector augur higher potentially higher future labor costs. Whereas the employment growth for line installers and repairers generally (*i.e.,* including electrical power line and telecommunications) is forecast at 8 percent for 2016-2026, the forecast for telecommunications line installers and repairers is just 1 percent employment growth during the same period.[52] That relatively meager growth in telecom installers and repairers is also outpaced by forecasts of 7 percent growth for all occupations, thus translating to what would appear to be a relative labor shortage in the telecom portion of the sector specifically.[53] Moreover, the national unemployment rate in March 2018 was at its lowest point in nearly 18 years, leading to greater demand for workers, generally.[54] Other sources indicate similar outcomes: PayScale Index ("PSI") identifies wage growth for the construction industry at a 13.6 percent increase since

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51 *The Electricity Workforce: Changing Needs, New Opportunities*, at 5-19, available at https://www.energy.gov/sites/prod/files/2017/01/f34/Chapter%20V%20The%20Electricity%20Workforce--Changing%20Needs%2C%20New%20Opportunities.pdf.

52 See, BLS, May 2017 National Occupational Employment and Wage Estimates, 49-9052, available at https://www.bls.gov/oes/current/oes_nat.htm#49-0000), compare to Occupational Employment Statistics, OES Data (May 2013), available at https://www.bls.gov/oes/tables.htm; *see also,* Bureau of Labor Statistics CPI, average 1.25 percent inflation 2013-2017, cumulative inflation 4.8 percent over four years.

53 BLS, U.S. Department of Labor, *Occupational Outlook Handbook*, Line Installers and Repairers, available at https://www.bls.gov/ooh/installation-maintenance-and-repair/line-installers-and-repairers.htm#tab-6).

54 *Table of Civilian Unemployment Rate, Seasonally Adjusted, April 1998-April 2018*, Bureau of Labor Statistics, available at https://www.bls.gov/charts/employment-situation/civilian-unemployment-rate.htm.

2006 and, and a 3.3 percent increase year-over-year;[55] the Associated General Contractors of America ("AGC") identified staff wage increases of 3.6 percent in 2016 and forecasted 3.4 percent growth in 2017.[56] It should be noted that PSI and AGC take a general view of the construction industry, which includes the subset of construction and contracting dedicated to utility and telecommunications infrastructure deployment. However, BLS data and inquires made by NTCA (as described herein) to engineers and construction professionals paint a consistent picture of potential labor shortages and labor costs increasing at a rate equal to or greater than the rate of inflation. For these reasons, NTCA submits that the impact of labor costs, which represent a significant portion of deployment activity, are feeding deployment costs that are not mitigated by productivity offsets and which in turn have a regressive impact when measured against the lack of any growth factor or increase in the high-cost budget. Regional characteristics also implicate costs. Geography and terrain can affect costs as an input to equipment and labor-hour needs, while geography can also inform prevailing local labor rates that may be based on cost of living indices or competition from other industries.[57]

The Commission further asks whether "increased costs, if any, have not been offset by savings related to increased labor productivity or the lower cost of network equipment."[58] NTCA

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55 *Trends in Compensation: Construction Industry Pay Trends, PayScale Index* (Apr. 10, 2018), available at www.payscale.com/payscale-index/industries/compensation-trends-construction-industry.

56 *Construction Staff Wages Expected to Rise by 3.4% This Year*, Associated General Contractors of America (Jun. 8, 2017), available at www.agc.org/news/2017/06/08/construction-staff-wages-expected-rise-34-year.

57 *See* Occupational Employment Statistics, Occupational Employment and Wages, May 2017, 49-9052 Telecommunications Line Installers and Repairers, available at www.bls.gov/oes/current/oes499052.html.

58 NPRM at ¶ 109.

submits that, since the lion's share of deployment is embedded in labor costs, overall increasing costs of deployment have not been offset meaningfully by increased labor productivity or lower network equipment costs. In the first instance, it is estimated, based upon a review of several sources, that labor costs constitute approximately 60-to-70 percent of deployment costs for "rural" plowed projects, and approximately 70-to-80 percent for "town" buried projects.[59] Although labor costs are understood to represent the proportion of build costs as noted above, NTCA also found that total project costs may represent varying proportions of labor and material costs over time, making precise comparisons of anything other than total build price difficult. However, as a general matter, review of projects over approximately five years indicates that the ratio of labor to material has increased, partly due to some stability in material costs as compared to higher increases in labor costs. And, the type of build will also inform the labor cost: a fiber-to-the-premises ("FTTP") build typical of a provider's service territory upgrade plan has a higher per-unit labor cost input than backbone construction.

The Commission also asks whether "other costs, such as fiber or electronics, have increased since 2011 due to inflation."[60] In its review, NTCA expanded this question to include whether the type of facility that is to be installed bears upon labor costs. Responses to this inquiry revealed that while the capacity of a facility does not implicate costs, the *type* of facility, and its manner of deployment, will inform costs. Labor rates are not tied to the differences between a 48 fiber or a

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[59] These data are based upon information gathered from engineering firms and data representing numerous builds over a five-year period. Many projects include both a town (even if small town) component as well as a rural component. The rural component may enjoy a lower per-mile build cost due to the absence of obstacles, boring, rights-of-way management, and negotiation with existing utilities, but the rural component is likely composed of many more miles of facility than the town component. And, while the town component may offer a more compact deployment, it is subject to the cost inputs such as boring, rights-of-way, and coordination with existing utilities.

[60] NPRM at ¶ 109.

288 fiber, or three conduits instead of two. One engineer observed, "The difference between a 3-inch back ream and a 5-inch back ream for boring is minimal; the real cost is in getting the machine and personnel out there in the first place." This is of particular consideration as providers install fiber more deeply into their networks. At the outset of the Nation's entry to broadband, many firms introduced broadband via Digital Subscriber Line, which permitted existing plant to be reused, largely untouched. As consumer demands for higher-speed services increase, however, significant amounts of plant (including drops) must be replaced. These shifts can be discerned in trends among NTCA members. In 2011, 80 percent of NTCA members used copper loops for the provision of broadband; by 2016, that number dropped to 36 percent.[61] Therefore, while fundamentally the cost of a network mile is no different for a higher or lower capacity network, the overall costs of meeting current broadband expansion efforts will reflect the conversion of old technology to new technology over many miles, thereby leading to high labor and deployment costs.[62]

And, while changes in construction practices may include efficiencies, those same actions may also implicate newly-realized costs. Plowing and drops are "mature" processes with any productivity gains (such as directional drilling or ribbon fiber technology) already incorporated within the past 10 to 15 years, so there is little room for expected additional new productivity offsets that would be occasioned by improved process (especially in very rural areas). As is the case with plowing, there have been few advances in technology that have provided efficiencies in

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61 *Compare NTCA 2011 Broadband/Internet Availability Survey Report* (March 2012), at 3, *with NTCA 2016 Broadband/Internet Availability Survey Report* (July 2017), at 3.

62 Additionally, forecasts must account for the fact that while aerial construction is generally less expensive than buried construction, factors such as the age and condition of existing poles and the frequency of severe ice or wind storms can make constructing and operating aerial plant costlier over the long run.

drop placement to offset costs in rural areas, and even with increased daily production, some engineers report the cost of drops doubling in the past 10 years.[63] This may reflect the location of the predominant number of drops: in greenfield developments, drops do not confront landscaping or existing facilities. In contrast, drops in existing populated areas, particularly those that are implicated in legacy network conversions, may be decades old. Programs aimed at increasing speeds through plant replacement require a drop to every establishment, which in turn introduces costs of mitigating any damage to landscaping and other property, as well as coordinating with existing facilities. Increased input costs that are met with static or declining levels of support yield a regressive impact that inflicts further damage on the ability of rural carriers to deploy critical broadband infrastructure.

These data demonstrate that various inputs contribute to increases in rural broadband network deployment costs. Although the costs of raw materials occupy one column of those expenses, labor costs are generally estimated to fuel approximately 70 percent of all new-build costs. Additionally, labor costs for rural broadband deployment are subject to inflationary pressures both from within (*i.e.,* labor shortages caused by greater demand for deployment to respond to Federal policy initiatives) and from without (*i.e.,* competitive pressures from other industries that look toward the same labor pool for deploying energy or utility infrastructure).

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[63] These data correlate to results developed from sources that examined build costs ranging from 2011 to 2017. As a general proposition, labor costs drawn from builds from different states and of different sizes were found to represent approximately 70 percent of outside plant costs. Other data revealed that discrete components of build costs fluctuated over time. In one set representing a series of rural-only builds over four years, drops were found to increase 110 percent. The cost of splicing labor and buried fiber cable increased 21 percent and 12 percent, respectively. Miscellaneous costs increased 9 percent, though the costs of splice case and buried handholes tended to decrease. When compared to data for "town only" deployments, costs increases were also found. However, to the extent that certain per-unit costs may be lower in rural settings than urban areas, the reduced population density and longer distance between users in rural deployments will account for high actual costs. To place this into context, NTCA members serve approximately 35 percent of the U.S. landmass, but less than five percent of the U.S. population.

Accordingly, any perceived potential "savings" from increased network capacities or advances in construction methodologies do not outpace input costs that increase at a rate equal to or greater than certain measures of inflation, which in turn implicates a regressive adverse impact upon providers whose cost recovery is obtained from funding mechanisms that do not reflect such effects.

B. The Current Budget is Insufficient to Meet Support Demands, and it is Harming Rural Broadband Investment – and, More Importantly, Rural Consumers.

The Commission has long recognized the substantial undertakings necessary to deploy and maintain broadband in rural areas. The Commission recognized, for example, that the significant demand for A-CAM support alone warranted a supplemental injection of $50 million per year in CAF reserves (beyond the initial infusion of $150 million per year leveraging such reserves).[64] And, yet, even that amount was insufficient to meet demand, and the final model offer and concomitant deployment obligations were therefore reduced when compared to initial design and offer. To be sure, such diminished deployment obligations were necessary to avoid an unfunded mandate, but they are nonetheless regrettable since they evidence the hard reality that a now-increased number of rural consumers will lack access to advanced broadband services. The Commission has since directed the Bureau to offer still more support to A-CAM providers, bringing the per-location support for those providers back to $146.10. The Commission estimates that this measure will result in "approximately $36.5 million more support per-year for the 10-year A-CAM term."[65] The Commission estimates that if this offer is accepted by all A-CAM carriers, then 17,700 additional locations would receive 25/3 Mbps over the next decade, while 14,000

64 *Connect America Fund*, Report and Order and Further Notice of Proposed Rulemaking, WC Docket No. 10-90, 31 FCC Rcd 13775 (2016).

65 NPRM at ¶ 68.

additional locations would receive 10/1 Mbps over the same term.[66] Additionally, the Commission took much-needed steps recently to override a 12.3 percent average reduction in support that recipients of Cost-Based Support had endured due to the persistent 2011-era budget. Toward this end, the Commission directed the Universal Service Administrative Company ("USAC") to "fully fund" support claims denied as a result of the approximately $180 million 2017-2018 budget shortfall.[67]

These steps were necessary and are appreciated. More importantly, along with the inquiries set forth in the NPRM, these actions evidence a recognition that the current budget is insufficient to advance the statutory mission of universal service in rural America. However, the Commission's own explanation reveals that these recent steps, when held against the parameters established by the A-CAM design as approved by the Commission in extending initial model offers, still leave that program underfunded by $66.6 million per year[68] – with 17,700 locations still lacking access to broadband at 25/3 Mbps, and nearly 22,000 potential subscribers awaiting broadband at 10/1 Mbps as compared to the initial model offer.

Moreover, even as the injection of $180 million is a one-time "shot in the arm" intended to correct a budget shortfall for one year (June 2017-June 2018) in Cost-Based Support,[69] recipients of such "stop gap" support are already staring down the barrel of even greater insufficiency in just over one month, when cuts approaching $230 million – roughly 15.5 percent of all Cost-Based Support – will once again start undermining recovery of costs already incurred in furtherance of

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[66] *Id*. at ¶ 67.

[67] *Id*. at ¶¶ 78-81.

[68] *Id*. at ¶ 143.

[69] *Id*. at ¶¶ 78-81.

universal service.[70] NTCA's June 2017 survey of its members[71] found that those affected by the USF budget cuts to Cost-Based Support would endure an average support reduction of $536,084 during the relevant annual period. This inability to recover costs already incurred in furtherance of broadband deployment and operation logically discourages future network investment in at least two ways – first, it creates a new need to conserve cash to pay for investments already made, and second, such reductions have a substantial chilling effect on going-forward investment given the uncertainty of likely larger budget cuts to come. Thus, it was not surprising that NTCA's 2017 survey found that 64 percent of respondents planned to reduce future network investments over the next 12 months. These reductions in planned investment, on average, were $943,418, and they translated to denied or deferred buildouts that would have yielded greater speeds for customers as follows:

10 to 25 Mbps down	average reduction of 34% in customers reached
26 to 50 Mbps down	average reduction of 31% in customers reached
51 to 100 Mbps down	average reduction of 30% in customers reached

Although companies are still assessing the precise impacts of the new $230 million USF support cut announced just a few weeks ago on their investment plans for the next twelve months, preliminary indications based upon a recent NTCA member survey paint an even worse picture in

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[70] *See Budget Control Mechanism for Rate of Return Carriers*, available at https://www.usac.org/hc/program-requirements/budget-control-rate-of-return.aspx; *see also Statement of Chairman Ajit Pai on Projected USF Budget Cuts for Small, Rural Carriers* (May 1, 2018) ("The prior Administration's budget control mechanism has created constant uncertainty for small, rural carriers, endangering their ability to make long-term investment decisions to bring high-speed broadband to the millions of Americans who still lack it. That's why earlier this year we allocated $180 million to such carriers as a stop-gap measure to avert budget cuts for the current funding year. But now small carriers are facing even more severe cuts in the coming year, which will only exacerbate the digital divide in rural America. That highlights the importance of the Notice of Proposed Rulemaking we advanced earlier this year.")

[71] *See Ex Parte* Letter from Michael R. Romano, Sr. Vice President, NTCA, to Marlene H. Dortch, Secretary, Commission, WC Docket No. 10-90 (filed Aug. 15, 2017) (attaching results of NTCA member survey with respect to effects of USF budget shortfalls).

terms of investment impacts than the $180 million shortfall in 2017. In particular, in response to the 2018 survey just completed, the average reported reduction in support for the next 12 months equals nearly $665,000, which translates into a per-company average of more than $1,650,000 in deferred or declined investment in rural broadband infrastructure – which itself translates into the following reductions in terms of the percentage of NTCA members' customers that would have been expected to receive higher-speed services but for such postponement or cancellation of deployment:

10 to 25 Mbps down	average reduction of 52% in customers reached
26 to 50 Mbps down	average reduction of 50% in customers reached
51 to 100 Mbps down	average reduction of 50% in customers reached

These data, and the information presented further above, portray a regulatory and marketplace catastrophe that threatens at once to overwhelm and undermine efforts to promote rural broadband deployment and achieve universal service: deployment costs that are increasing while high-cost support mechanisms lack an inflationary factor, and USF budgets set in the first instance at levels based upon no greater analysis than what they were nearly a decade ago, leading to suppressed broadband investment and higher rates for rural consumers.

II. GIVEN THE FOREGOING EVIDENCE OF INSUFFICIENCY, AND IN ORDER TO ACHIEVE BOTH THE MANDATES OF FEDERAL LAW AND ESSENTIAL BROADBAND POLICY GOALS, THE COMMISSION SHOULD SET A SUFFICIENT AND PREDICTABLE BUDGET FOR RLEC HIGH-COST USF SUPPORT THROUGH 2026.

A. The High-Cost USF Budget Must Satisfy Statutory Principles and be Sufficient to Achieve the Goals and Objectives of the Mechanisms as Designed by the Commission.

Any decisions with respect to universal service policy must follow from the plain language of the law. Section 254(b)(5) of the Communications Act, as amended (the "Act"), requires that USF mechanisms be "specific, predictable and sufficient."[72] Although the Commission has latitude to determine what constitutes "sufficient" support,[73] it represents a patent case of insufficiency when USF mechanisms fail to provide support specifically *as designed and approved* by the Commission simply and solely because funds to fulfill those designs are not then made available. Put another way, it is one thing for the Commission to define an acceptable level of universal service for consumer availability and affordability and then identify what support is deemed necessary and sufficient to achieve that, but it is another thing altogether for the Commission to define universal service, identify the support levels needed to achieve that – and *then* apply cuts to USF support notwithstanding what the Commission's own rules otherwise deem necessary to achieve universal service.

This concern affects model-based and cost-based support alike. As discussed above, due to insufficient funding, the Commission's model has not been "fully funded" even at the capped level of support originally offered by the Commission. Instead of operating within designed limits (*i.e.*, with a $200 per location cap), the per-location limit for model support has been ratcheted

72 47 U.S.C. § 254(b)(5).

73 *In Re: FCC 11-161*, 753 F.3d 1015, 1055-60 (10th Cir. 2014).

down to wedge A-CAM support within the funds then-available.[74] Similarly, RLECs receiving Cost-Based Support must submit their costs of constructing and operating networks so that they can be run through a detailed set of formulas and multiple caps under Commission rules that ultimately generate an approved level of such support.[75] These are not "made-up" costs, but rather actual costs demonstrably incurred in deploying networks and delivering services to consumers in rural America that are then submitted to the Commission for review consistent with the agency's established rules and processes prior to support being distributed. And yet, despite actually incurring these costs in support of voice and broadband, and despite submitting them for review, and despite running them through the formulas and many caps that define ultimately what support should be received, the support deemed otherwise permissible and appropriate is then crammed down after the fact to fit Cost-Based Support within an amount of funds then-available – resulting in the actual loss of hundreds of millions of dollars of support to compensate for work *already done* toward the mission of universal service.[76]

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[74] *See Wireline Competition Bureau Announces Support Amounts Offered to Rate-Of-Return Carriers to Expand Rural Broadband*, WC Docket No. 10-90, Public Notice (rel. Aug. 3, 2016), at 1-2 (extending offers based upon $200/location but noting revised offers may be necessary depending upon available budget); *Connect America Fund,* WC Docket No. 10-90, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 13775, 13779 (2016), at ¶ 8 (providing additional A-CAM support but establishing per-location limits on support based upon carrier-specific deployment status); Order at ¶¶ 62-69 (providing yet further A-CAM support to bring support up to $146.10/location). It is true that deployment obligations "ratchet down" with reductions in support under the operation of the A-CAM – but it is then unclear if the reduced buildout obligations result in universal service as intended by the model, since such reductions translate into fewer customers receiving broadband and many of those that are still lucky enough to receive broadband at all obtain such service at lower speeds than they otherwise would if the model operated as designed.

[75] *See* footnote 42, *supra*, and accompanying text.

[76] Moreover, support cannot be considered sufficient if consumers cannot obtain the supported services at "reasonably comparable" rates. As described in Section I.A.1, *supra*, the budget shortfall generates support cuts that yield rates materially higher than those in urban areas for standalone broadband services, leaving many rural consumers in the affected areas with rates that are best characterized as "unreasonably incomparable."

As a matter of law and good public policy, measures that involve "ratcheting down" and "cramming down" cannot reasonably translate to "sufficient" support. To the contrary, such measures are superimposed upon the USF programs simply to suppress support within arbitrary budgets set years ago in lieu of a more holistic and informed perspective on what budget is in fact "sufficient" to achieve universal service as articulated by the Commission, as established by design of the Commission's own mechanisms, and as required by statute. Although the United States Court of Appeals for the Tenth Circuit upheld the Commission's six-year 2011 budget when challenged, the Commission's successful defense of its RLEC USF budget in that case rested upon several theories, including: (a) sufficiency could be achieved through "a number of reforms to eliminate waste and inefficiency;" (b) the rather ironic ability of carriers to decline to deliver broadband where USF support was insufficient (which would appear to turn the very notion of "universal" service on its head); and (c) the prospect of a budgetary review before the end of 2017.[77] Yet, as the dissent in the Tenth Circuit case pointed out – the only dissent registered among the multitude of issues appealed in the wake of the 2011 order – the Commission failed at the time to attempt to ascertain the costs of advancing universal service in setting the high-cost USF budget.[78] And, as time has revealed, as all the evidence above shows, and as the acknowledged shortfalls in funding confirm, the many cuts, caps, and constraints put into place "to eliminate waste and inefficiency" in 2011 and 2016 may have helped to eliminate waste and ensure that funding is directed to the right places, but they nonetheless cannot overcome the plain and simple

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77 *In Re: FCC 11-161*, 753 F.3d at 1055-60.

78 *Id.*, 753 F.3d at 1107 (Acharach, J., concurring in part and dissenting in part) ("Instead, the FCC states that it regards the $4.5 billion budget as 'sufficient' without any information, estimate, or even guess about the cost of what it is requiring.").

fact that more resources are needed to deliver supported services in rural America that are reasonably comparable in price and quality to those available in urban areas.

Fortunately, this Commission has already recognized and taken prudent, much-needed steps in the Order to mitigate these budgetary concerns on a partial and/or near-term basis, and the NPRM now offers an important opportunity to take further steps to remedy these long-standing shortcomings through a more strategic, evidentiary-based review of what high-cost USF budgets must be going forward.[79] The evidence described above indicates that the current budget is insufficient on its face for both A-CAM and Cost-Based Support – these programs, as designed and defined by Commission rules, are simply not being funded to the levels designed and defined by those rules as necessary to achieve universal service. To address these concerns and to comport with the law, the Commission should set sufficient long-term budgets that will also provide reasonable predictability – another statutory requirement – to those undertaking to fulfill universal service by deploying and operating networks that are intended to last for many years and even decades.

With these statutory principles and lessons learned from relatively recent history as backdrops, there are several discrete and specific goals for which the Commission should aim in establishing a high-cost USF budget for a series of years to follow. In particular, the budget going forward must: (1) reflect reasonable expectations as to demands for program support over time; (2) be sized to achieve "true universal service" in the form of scalable networks that can evolve to meet consumer demand, or be sized sufficiently at the very least to correspond to the set of buildout and other performance tasks designed by the Commission; (3) be sized sufficiently as well to ensure "reasonable comparability" in terms of services and pricing; (4) provide greater

79 NPRM at ¶¶ 108-109.

predictability to the extent that any projected budget nonetheless turns out to be insufficient in a future period; and (5) include an appropriate inflationary factor just as other USF programs do today.[80] These five factors must guide any effort to build a budget from the "bottoms-up" – they represent necessary prerequisites to providing predictable and sufficient support for the constituent parts of the high-cost USF program as they have been designed and adopted by the Commission, and there is substantial, consistent support in Congress for taking such steps.[81]

Looking first at the A-CAM budget, the Commission should at a minimum provide "full funding" of the A-CAM offers as initially extended – that is, support at $200 per location for each offer previously accepted by A-CAM electors.[82] As the Commission notes, such a step "would accelerate broadband deployment in those areas for which [RLECs] accepted the first A-CAM offer."[83] Indeed, NTCA estimates that "fully funding" just to the level of these initial offers, which the Commission has identified as necessitating up to $66.6 million in additional USF support per year, would result in nearly 18,000 more rural locations receiving 25/3 Mbps broadband and an additional 22,000 locations receiving 10/1 Mbps broadband than would otherwise be the case. Although the additional $36.5 million per year already made available by the Commission in the recent Order for A-CAM electors is much-welcomed and will itself yield further broadband buildout,[84] there is now a meaningful opportunity to "finish the job" and achieve the objectives of the model as originally designed and adopted, thereby achieving the goals of universal service as

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80 *See* footnote 34, *supra.*

81 *See* footnote 41, *supra.*

82 NPRM at ¶¶ 142-143

83 *Id*. at ¶ 143.

84 *Id*. at ¶¶ 66-69.

articulated and anticipated by the Commission in first extending model offers. In sum, the Commission should provide the $66.6 million in additional resources it has identified as needed to reach a support level of $200 per location, and thereby establish the A-CAM annual budget at a total average annual support level of approximately **$631.5 million** (taking into account the effect of "transition payments" [85]) through 2026.

Turning next to the Cost-Based Support mechanisms, the Commission must tackle insufficiency challenges that result not just in failing to meet designed increases in future support, but which punitively and arbitrarily reduce otherwise approved USF support for investments already made in furtherance of universal service. To overcome these concerns of Cost-Based Support being slashed due to insufficiency with respect to costs that otherwise would be supported under the Commission's own formulas, and to enable investment in higher-capacity broadband networks capable of meeting the speeds expected now as compared to years ago when the budget was established,[86] the Commission should reasonably and responsibly project what levels of CAF-BLS and HCLS support, at a minimum, will be required through 2026 (*i.e.*, the remaining term of the current A-CAM offers, which will otherwise be referred to herein as the "Budget Term"). To do so, the Commission can rely upon the projection methodology it adopted in Appendix E of the 2016 Rate-of-Return Reform Order, which has been used previously to establish Cost-Based Support buildout obligations.[87] As shown in Attachment 2 hereto, NTCA anticipates the need for

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85 The exact level of model support will differ per year based upon the effects of transition payments, but an annual average is provided for purpose of simplification. The actual disbursements of transition payments should be factored into any final decisions made by the Commission with respect to annual budgets to avoid needless shortfalls in earlier years and surpluses in later years. *See also* footnote 112, *infra* (describing the composition of the $631 million estimate in greater detail).

86 *See* Section I.A.1, *supra*.

87 2016 Order, 31 FCC Rcd at 3316-17 (Appendix E).

Cost-Based Support will equal approximately **<u>$1.43 billion</u>** in calendar year 2018, and relying upon the Appendix E methodology, demand for Cost-Based Support can be expected to increase to approximately **<u>$1.75 billion</u>** by calendar year 2026.

By contrast, should the budget levels for Cost-Based Support remain fixed under a 2011 vintage budget without any reasonable attempt to project and adjust for future demand, insufficiency will persist and budget controls will grow to investment-deterring, unsustainable levels that fly in the face of statutory mandates for sufficiency, predictability, or reasonable comparability. Specifically, as Attachment 2 shows, in the absence of any changes to the existing USF budget, RLECs receiving Cost-Based Support could face budget controls that ultimately cut on average a quarter (25 percent) of their support, resulting in <u>**more than $400 million year-after-year** in denied recovery of costs actually incurred in deploying broadband networks in rural America</u>.

Indeed, the trend is already headed with all due speed in this disconcerting direction – a troubling trend that has been recognized by the Chairman as inconsistent with statutory mandates for predictability and sufficiency.[88] Specifically, just a few weeks ago, USAC announced the latest budget control had climbed, on average, to 15.5 percent – cutting nearly $230 million in support starting as of July 1, 2018 for investments already made in furtherance of universal service and broadband public policy goals. If unaddressed, as described above, this shortfall portends substantial negative consequences on future broadband investments, the ability to repay loans for investments already made, and the ability of consumers in rural America to obtain access to reasonably comparable services at reasonably comparable rates.

88 *Statement of Chairman Ajit Pai on Projected USF Budget Cuts for Small, Rural Carriers* (May 1, 2018).

B. As a Separate Matter from the Need to Establish a Sufficient Overall Budget, the Commission Should Improve Predictability by Adopting Individual, RLEC-Specific Thresholds for Minimum Levels of Cost-Based Support.

It is important to consider as *a separate matter* from any attempt to set a long-term overall USF budget the concept of a threshold level (or "floor") for individual RLEC support through 2026 to the extent that that total demand for Cost-Based Support in a future year happens to exceed the available budget.[89] To be clear, such a carrier-specific "threshold-setting" exercise as suggested in the NPRM is separate and distinct from an overall "budget-setting" exercise as described in Section II.A above, and should come into play only as a contingency in the event that the efforts to set a proper budget as identified above nevertheless underestimate demand in some future period. Put another way, the "ceiling" (the overall budget) and the "floor" (the carrier-specific thresholds that apply when the budget is exceeded) are two different things developed via two different processes to comport with two different but equally important goals – the overall budget for RLEC USF support must be set over the proposed Budget Term to comport with the sufficiency mandate of the statute by anticipating demand over time. By contrast, carrier-specific threshold levels of support throughout the Budget Term would provide greater predictability should reasonable attempts to project future overall budget demand nonetheless fall short in future years.

As to what such a "floor" could be, the NPRM offers up several suggestions for a threshold RLEC-specific level of support that would not be subject to a future annual budget control: (1) 80 percent of an A-CAM offer to each carrier calculated at a $146.10 per location funding cap; (2) the specific "Appendix E" five-year projection for each carrier; (3) some fraction of each carrier's "unconstrained" 2016 or 2017 claims amount, perhaps adjusted for line loss; or (4) a limit on how

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89 NPRM at ¶¶ 148-154.

much a carrier's individual budget control could exceed the industrywide average impact (*i.e.*, no carrier could suffer a budget loss that is more than twice the percentage applied on average to other recipients of Cost-Based Support).[90]

NTCA appreciates the Commission's thoughtfulness in suggesting the creation of such a threshold and in identifying several options for consideration. NTCA proposes, however, a different metric for use as a carrier-specific "floor" of Cost-Based Support – one that resembles, but slightly modifies, the third "unconstrained support" baseline option identified by the Commission. Specifically, the Commission should set the annual "threshold of support" throughout the Budget Term for each RLEC receiving Cost-Based Support at an amount equal to the lesser of: (a) an average of that carrier's three prior years of calculated high-cost USF support on an "unconstrained" basis (*i.e.*, without reference to any effects specifically of the budget control mechanism during that period); or (b) the carrier's then-current level of "unconstrained" support.[91] Such a threshold, which would be calculated annually on a rolling basis throughout the Budget Term, ties to a reasonable measure of recent actual costs incurred in furtherance of universal service – thus providing some level of predictability – while at the same time: (1) recognizing that support levels for individual carriers will often vary over a series of years based upon investment

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[90] *Id*. at ¶ 153.

[91] As the Commission's own third option rightly recognizes, it is punitive to bake budget control effects from prior years into calculating the very "floor" that is supposed to insulate a threshold amount from such effects going forward. It is also critical to observe that this "floor" does not *guarantee* any RLEC a certain level of support; all that it offers is some assurance that the *budget control specifically* will not have the effect of reducing support below a certain level. On a similar note, the "lesser of" calculation is appropriate to ensure that a carrier's threshold will never exceed what its unconstrained level of support would have been for any given year. Finally, it will be necessary as part of this exercise to take account of RLECs that either obtain or lose access to HCLS support mid-way through any such rolling three-year period; an adjustment will need to be made to ensure that no carrier's "floor" is too high or too low due to qualifying newly for or no longer being eligible for HCLS.

cycles; and (2) ensuring that the prospect of carriers attempting to "raise their floor" will be limited by looking to average support levels over a series of several prior years and taking into account all caps and constraints in place other than the budget control itself.[92]

By contrast, none of the other potential measures identified for the floor achieve such objectives as well. For example, using A-CAM support as the basis for a carrier-specific threshold makes little sense in the context of carriers that did not elect A-CAM support due to concerns that the model can be wholly unreflective of the actual costs of serving granular geographies.[93] In fact, using A-CAM could yield rather odd practical results in this context, with some companies' thresholds being next to nothing, while other RLECs' "floors" could ironically turn out to be materially higher than current actual support levels.[94] Such wide variations in thresholds among

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[92] Designing the floor in such a fashion would also help to address any perverse incentives that may arise with respect to "over-investment" such as the Averch-Johnson effect, *see id*. at ¶ 154, especially when combined with all of the many other caps and limits that already apply to Cost-Based Support. *See* footnote 42, *supra*, and accompanying text.

[93] As the Commission is aware, the economic impacts of distance and density remain significant and, in certain rural regions, are exacerbated by the continuation of rural to urban migration and geophysical barriers that can present unique local challenges. Mention must also be made of the significant fees and requirements imposed by the federal government when use of federal lands is required. Thus, even if at a "macro" level, a model can help in estimating costs across wide geographies, no model can be all inclusive in the recognition of all such conditions at a granular level, and mandatory use of the model whether directly for support or indirectly as a floor flies in the face of such diversity. *See, e.g.*, NTCA Petition for Reconsideration and/or Clarification, WC Docket No. 10-90, *et al*. (filed May 25, 2016), at 25; Comments of CenturyLink, WC Docket No. 10-90 (filed Aug. 8, 2014) ("The Connect America Cost Model ('CAM') is a useful tool for determining, in the aggregate, where supported networks should be built so as to maximize deployment within a reasonable budget. But no model is perfect, and least of all at a disaggregated detail level— even if the CAM is very accurate overall, it is certain to be inaccurate frequently at the level of an individual household location, or even census block.").

[94] In the original A-CAM offer, RLECs with more than 90 percent 10/1 Mbps broadband deployment were deemed ineligible to elect such support. Some of these RLECs may have received significant increases in USF support in migrating from Cost-Based Support to A-CAM but for their ineligibility to make such an election. If these firms' A-CAM support thresholds were now to be used as a "floor" for support that would not be subject to the budget control, the "floor" may be substantially higher than the current support received by a given company based upon its own actual costs.

carriers, especially when compared to actual costs of investment and operations, make little sense. Moreover, to the extent that A-CAM was intended to be a voluntary measure precisely because it did not reflect actual operating conditions in many markets, the use now of A-CAM as a "floor" could become an effective "backdoor" mandatory conversion to model-based support – and even worse, at only 80 percent of such support.

The second option – using individual "Appendix E" projections as a carrier-specific threshold – is flawed for similar reasons. While, much like a model, such projections can provide value in identifying future *overall* budget demands as described in Section II.A above, the Appendix E assumptions are based upon industry-wide assumptions regarding investment and operations. Such one-size-fits-all assumptions are far more likely to miss the mark at a granular level in terms of in any given individual study area's own projections, and thus (like a model) are unlikely to provide an appropriate carrier-specific "floor" of support in all cases.

The third option articulated by the Commission – setting a floor for each carrier based upon a fraction of its unconstrained 2016 or 2017 support amounts – somewhat resembles NTCA's proposal. However, unlike the NTCA variation suggested above, it fails to account for variability in investment cycles. For example, a carrier that invested heavily in 2014 or 2015 will have higher claims in 2016 or 2017 than one that invested several years earlier, and thus a higher "floor" merely due to timing considerations. It is due to this need to capture variances in individual investment cycles that NTCA suggests modifying the third suggested option to reflect the support received by carriers over a period of several prior years.

The NPRM's final proposed option would be simply to limit the percentage reduction to an amount that is no more than twice the average budget control. While this may provide assurance as to recovery of *some* amount, this option fails to fulfill the goal of promoting greater predictability. Instead, a carrier will be unable to ascertain the amount of its floor until *after* the

overall budget controls are announced, rendering the value of the threshold concept largely moot for purposes of business planning. For these reasons, NTCA's proposed modification to the Commission's third option as described above represents the best means of addressing predictability concerns through the establishment of a carrier-specific annual threshold level of support throughout the Budget Term.

The Commission further asks whether it should revise deployment obligations if a threshold level of support is established for each carrier.[95] Specifically, the Commission suggests that, if it were to use the A-CAM in establishing such a threshold, it could then use A-CAM as well to implement new buildout requirements. As noted above, however, it is inappropriate to utilize the A-CAM to establish minimum levels of support for those operators that specifically declined to elect (or were even barred from electing) the model. Instead, the threshold should be based upon some rolling measure of actual costs as described above. Aside from this methodological question, NTCA does not object to the notion of revising the buildout requirements in some reasonable manner if RLECs are also given greater assurance of a minimum threshold level of support. Indeed, a fundamental tenet of universal service policy should be that buildout obligations correspond to the level of USF support that carriers can reasonably expect to receive over the buildout period. The Commission should therefore consider simply utilizing the Cost-Based Support buildout obligation formulas already adopted for RLECs,[96] but recalculate those formulas and apply them over the Budget Term based upon the "floor" of annual support that each RLEC can reasonably plan on receiving during that period.

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[95] NPRM at ¶ 155.

[96] 2016 Order, 31 FCC Rcd at 3149-3155, ¶¶ 162-180.

Finally, it is important to note that whatever annual overall budgets and potential carrier-specific minimum thresholds of support might be adopted – and notwithstanding the welcomed and much-needed budgetary reprieve provided in the Order – the budget control will start reducing Cost-Based Support again in just a matter of weeks. Thus, consistent with the Commission's own observation in the NPRM[97] and the comments of Chairman Pai upon USAC's publication of the new budget control,[98] any additional resources provided to address the insufficiency of this program's budget should be applied retroactively to July 1, 2018, so that RLECs and the rural consumers they serve will not be harmed by USF support cuts that will approach *$20 million per month* in just a few weeks.

C. The Means of Applying the Budget Control Mechanism for Cost-Based Support Should Not be Modified.

The NPRM next proposes to modify the budget control to use only a pro rata reduction in lieu of the current mechanism's use of a hybrid per line/percentage approach.[99] The rationale provided is that such a revised method would provide greater predictability, be more equitable, and be less complex than the current budget control mechanism. NTCA disagrees.

First, changing the budget control to apply only on a percentage basis provides no greater predictability than the current methodology. If the USF budget is insufficient to satisfy demand for support that would otherwise be permitted under the Commission's own rules, the precise level of cuts to come will, by definition, be unpredictable until the cuts are announced, no matter whether such cuts are calculated and applied exclusively on a per-line or a percentage basis. (Put another way, no one had any idea the new budget control would be 15.5 percent on average until USAC

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97 NPRM at n. 363.

98 *See* footnote 70, *supra.*

99 NPRM at ¶ 150.

announced it earlier this month.) Establishing a proper carrier-specific "floor" for support as noted above is a far more effective means of promoting predictability than tweaking the budget control calculation. In short, rather than tinkering with the formula for applying budget cuts that cannot be known until USAC announces them each May 1, the best means of providing more predictable Cost-Based Support is through careful efforts to project future overall demand as accurately as possible, paired with a properly-sized, carrier-specific baseline threshold of support.

The NPRM further contends that the per-line component of the budget control mechanism can lead to inequitable swings in support.[100] If one looks at the historical development of the budget control, however, the "hybrid" per-line/percentage cut was developed *precisely because* it would promote greater equity (or "shared pain") among all RLECs subject to the budget control.[101] Indeed, as Attachment 3 to these Comments demonstrates, the hybrid approach to applying the budget control results in relatively higher-cost carriers losing much more support on a per-line basis, even if their percentage of lost support is somewhat lower. By contrast, if the support cuts are applied strictly on a percentage basis, the percentages are the same for all carriers of course – but customers of higher-cost RLECs lose much more in terms of monthly support per line as a result. The current mechanism thus strikes a carefully designed balance intended to spread the negative effects of an insufficient USF budget as equitably as possible, whereas migration to a percentage-only reduction would disproportionately affect one class of carriers with no corresponding benefit in terms of predictability. For these reasons, the Commission should decline to reopen a mechanism that in the first instance reflected a carefully struck balance for equity based upon industry input.

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100 *Id.*

101 *See* 2016 Order, 31 FCC Rcd at 3145, ¶ 150.

Finally, there is no apparent basis for claims that the current calculations are overly complex. The simple mathematical process is that if a total shortfall is identified, 50 percent of that is addressed through calculation of a per-line reduction and the remainder is applied on a percentage basis. There is nothing in this simple, two-step formula that makes it administratively difficult or unworkable such that complexity provides justification for the change.

D. In Addition to Setting Sufficient Budgets for A-CAM and Cost-Based Support, the Commission Must Factor the Alaska Plan, CAF-ICC Projections, and any New Initiatives that May be Adopted Pursuant to the NPRM into an Overall Multi-Year Budget for RLEC High-Cost USF Support.

The preceding sections of these Comments indicate that, at a minimum: (1) the annual budget for A-CAM should be set at approximately $631.5 million per year; and (2) the annual budget for Cost-Based Support should be fully funded at approximately $1.43 billion this calendar year and should be estimated to increase to approximately $1.75 billion by calendar year 2026 (*i.e.*, the end of the Budget Term) as shown further in Attachment 2 hereto. But the effort needed to set an overall budget using a "bottoms-up" approach does not end at A-CAM and Cost-Based Support, as these are not the only RLEC high-cost USF mechanisms that exist. A holistic attempt to set a right-sized budget throughout the Budget Term on a "bottoms-up" basis must also account for the Alaska Plan, the existing Connect America Fund-Intercarrier Compensation ("CAF-ICC") program, pending USF-related waivers or other requests for relief that may be granted, and any new initiatives that may be adopted in this proceeding.

As an initial matter, the Alaska Plan will require a fixed amount of approximately $44.7 million in support per year over the Budget Term.[102] Next, the existing CAF-ICC mechanism currently distributes nearly $400 million in support for RLECs, although this amount can and does

[102] *Connect America Fund*, *et al.*, WC 10-90, *et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 10139 (2016).

fluctuate by year. Indeed, it might reasonably be expected that CAF-ICC amounts will go down over time and mitigate necessary increases in Cost-Based USF support as articulated above – although there is no guarantee of such due to continuing uncertainties in the intercarrier compensation marketplace, including the potential for further reform, the prospect of future disputes, and potential effects associated with migrations to broadband. Thus, in attempting to estimate CAF-ICC demand through a Budget Term ending in 2026, the Commission should: (a) not make any alterations to the existing CAF-ICC program that would render forecasting budget demand any more difficult than it already is; (b) project $400 million in RLEC CAF-ICC support for 2018; and (c) reduce that 2018 budgeted amount by $10 million per year through 2026.[103]

This leaves then the question of any further USF reforms the Commission may address through this rulemaking. The first such reform that the Commission proposes is a new "glide path" or other type of transitional model offer to those RLECs that would take less in A-CAM support than they receive currently through the Cost-Based Support mechanisms.[104] Such an offer should not present any overall budgetary concerns; to the contrary, to the extent that RLECs accept such an offer and their support payments begin to transition downward over time, this should mitigate overall budgetary demand on Cost-Based Support as noted above – although the exact amounts of "savings" that might be realized through such an offer cannot be identified until the Commission makes the kinds of alterations noted in the NPRM and it becomes clear which carriers would be eligible for and elect such alternative support.[105] NTCA therefore supports the proposals of the Commission with respect to the parameters and requirements of such a new "glide path" offer

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103 *See* Attachment 1.

104 NPRM at ¶¶ 117 and 124-137.

105 *See id*. at ¶¶ 120-123.

(including the prospect of capping the loss of support[106]) and encourages the Commission to consider further and adopt these proposals. NTCA further contends that this offer should be extended to *any* RLEC currently receiving Cost-Based Support currently (regardless of relative buildout), provided specifically that the Commission then uses any "savings" generated through the future reductions in support for such electing RLECs to help fund and offset future anticipated increases over the Budget Term in Cost-Based Support as described above.[107]

In identifying anticipated levels of RLEC USF support and setting an overall budget through 2026, the Commission should also take into the prospect of pending waiver requests or other needs that could increase total support demand. For example, there are "orphaned" exchanges in areas served by a number of RLECs due to the effect of the parent trap rule.[108] These "orphaned" areas sit in limbo somewhere between RLEC and price cap treatment, in that they do not qualify for Cost-Based Support, but they also are ineligible for CAF Phase II funding.[109] This

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[106] *See id*. at ¶ 122 (suggesting the potential for a transition that caps reductions at a specified percentage of current support levels).

[107] This is important as a matter of budgetary equity because if highly-deployed carriers could "cash out" and take a glide path offer at the "high watermark" of their support levels, the depreciation (and resulting budgetary "headroom") that would have over time otherwise accrued to the benefit of peers receiving Cost-Based Support would dissipate. *See* 2016 Order, 31 FCC Rcd at 3104, ¶ 66 (discussing need to "prevent companies from electing model-based support merely to lock in existing support amounts") (citing Letter from Cheryl L. Parrino, Parrino Strategic Consulting, on behalf of the Nebraska Companies, to Marlene H. Dortch, Secretary, FCC, WC Docket No. 10-90, at 2 and Attachment at 3 (filed Jan. 14, 2016)). In 2016, this concern existed because any "headroom" in the budget resulting from the "glide path" offers accrued solely to the benefit of (and to fund) new model elections at that time, but if the amounts freed up this time revert instead this time to offset future demand in the Cost-Based Support budget, any such concern should be mitigated substantially, if not entirely – meaning that no restrictions on the ability of providers to elect such a "glide path" would be necessary.

[108] NPRM at ¶ 92.

[109] To be clear, some RLECs affected by the parent trap elected A-CAM support, but that is not an option for those still affected by the parent trap today – and for those that did not initially elect A-CAM, a new offer now likely remains equally unpalatable because of the effect on the remainder of their serving areas. See *id*. at n. 281.

leaves carriers with limited ability and incentive to invest in upgrading broadband-capable networks, leaving in turn the consumers in these rural areas with higher prices and reduced access to quality voice and broadband services. Addressing these "orphaned" exchanges by eliminating the parent trap through a sufficient award of support should be accounted in any attempt to set a "bottoms-up" high-cost USF budget through 2026. Similarly, there are petitions pending from a few carriers that were denied an A-CAM election (or had their model offers reduced) due to shortcomings in Form 477 data or other technical considerations.[110] The annual budgets to be set for the Budget Term should include the estimated amount of additional support it would take to resolve these pending petitions. Finally, as the Commission observes at several places through the NPRM, entities of all kinds face additional, unique challenges in serving tribal areas,[111] and the annual budgets that are set for the Budget Term must account for any additional support provided to these operators.

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[110] *See, e.g.*, Petition for Reconsideration of Grand River Mutual Telephone Corporation, WC Docket No. 10-90, *et al*. (filed May 2, 2018) (seeking at least $990,000 per year in additional A-CAM support associated with areas initially identified as served via FTTP technology); Petition for Reconsideration of Hamilton County Telephone Co-Op, WC Docket No. 10-90, *et al*. (filed May 8, 2018) (seeking at least $2.3 million per year in additional A-CAM support associated with areas initially identified as competitively served).

[111] NPRM at ¶¶ 120 and 122.

In summary, based upon this "bottoms-up" analysis of the budgetary demands of each initiative, NTCA estimates that the annual authorized budget for RLEC USF should be set for calendar year 2018 at approximately $2.55 billion, consisting of the following subparts:

- **$631.5 million to "fully fund" existing A-CAM offers at $200 per location[112]**
- **$1.43 billion to "fully fund" Cost-Based Support**
- **$45 million for the Alaska Plan**
- **$400 million for CAF-ICC support**
- **Approximately $50 million to accommodate "orphan" parent trap exchanges, additional Tribal Broadband support, and other potential support demands that may be approved by the Commission as a result of the NPRM[113]**

From a current "run-rate" perspective, this approximately $2.55 billion annual budget for calendar year 2018 would represent an increase of roughly five percent ($140 million) over today's funding levels (which include a $2 billion "baseline" budget, $236 million in incremental A-CAM

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112 This amount includes the support "brought over" by A-CAM electors, the initial use of $150 million in CAF reserves, the $50 million additional infusion of CAF reserves, the award of $36.5 million more in the most recent Order, and the estimated $66.6 million still needed to fund A-CAM support at $200 per location. *But see* footnote 85, *supra*, and accompanying text (noting the need to account properly for the effect of transition payments in "average" annual budgets over the Budget Term). It is worth highlighting that $200 million of the overall annual budget indicated here is in fact attributable to CAF reserves used for A-CAM support, meaning that the annual budget estimates might also rightly be viewed as $2.35 billion in 2018 and $2.6 billion in 2026.

113 NTCA believes that support for parent-trapped exchanges would equal approximately $12 million per year, and it may be worth the Commission considering other measures that would even enable or facilitate future transactions that realize benefits for the USF budget as a whole while also providing incentives to the operators undertaking them. Turning next to Tribal Broadband support, to NTCA's knowledge, there is no publicly available estimate of the amounts of support needed to address additional tribal support consistent with the proposals made by the Commission in the NPRM. Proponents of Tribal Broadband support, however, previously estimated the amount needed as "up to $25 million" annually. *See Ex Parte* Letter from Godfrey Enjady, President, National Tribal Telecommunications Association, to Marlene H. Dortch, Secretary, Federal Communications Commission, WC Docket No. 10-90, *et al*. (filed Sep. 16, 2016), at 5 (stating that the proposed Tribal Broadband Factor "would be capped at $25 million annually"). Thus, without knowing how the Commission's proposed variation on such support may "price out," NTCA has estimated the support demands for Tribal initiatives as requiring an additional $25 million annually. This is all to say, however, that this final "line item" may need some relatively minor revision (upward or downward) as further evidence is released by the Commission with respect to various proposals or otherwise brought forward to "price out" all of these items.

funding, and $180 million in a one-time infusion of Cost-Based Support). As noted above, however, budget demands are expected to change over time, with some constituent components of RLEC USF increasing and others decreasing. For this reason, the Commission should set a specific, discrete authorized budget target for each year of the Budget Term as indicated further in Attachment 2, culminating in an authorized budget of approximately $2.8 billion in calendar year 2026 that consists of:

- **$631.5 million to "fully fund" existing A-CAM offers at $200 per location**
- **$1.75 billion to "fully fund" Cost-Based Support**
- **$45 million for the Alaska Plan**
- **$320 million for CAF-ICC support**
- **Approximately $50 million to accommodate "orphan" parent trap exchanges, additional Tribal Broadband support, and other potential support demands that may be approved by the Commission as a result of the NPRM[114]**

This 2026 estimated budget is approximately 9 percent higher than the 2018 budget level recommended above – translating to a relatively small annual increase over that period. Of course, budget demand in 2026 (and in each year prior thereto during the Budget Term) may be mitigated further should the Commission offer, and should a number of RLECs accept, a "glide path" option for A-CAM support that can be used to offset projected increases in demand for Cost-Based Support.

The Commission should *not* at this time place further strains on already insufficient USF budgets, however, by enabling a new, revised offer of A-CAM support – unless it is prepared to provide additional support *atop the budgets indicated above*. To be clear, NTCA supports "optionality" for USF support. If sufficient resources can be made available, NTCA endorses new model offers for all RLECs without restriction (although, as of this time, NTCA is uncertain what the budgetary implications of such new model offers may be). As demonstrated above, however,

[114] *See* footnote 113, *supra*.

the USF budget is already insufficient even just to meet current obligations and demands, and the budget gap in the existing constituent parts of the program will only grow over time. Offering more funding for a new initiative out of an already-limited pool of resources would undermine efforts to "fully fund" existing A-CAM offers, and would pose the risk of generating even more significant cuts in future support for those receiving Cost-Based Support.[115] Thus, the Commission should first "finish the job" of providing sufficient funding for existing mechanisms – A-CAM and Cost-Based Support – before it tries to divvy up further an already too-small pool of funds. To the extent that more funds remain available to enable a second voluntary model offer after the insufficiency of the existing initiatives is addressed in full as required by law and good public policy, NTCA endorses such a second model offer.

Finally, it is worth noting that the budget levels recommended above through a "bottoms-up" approach unfortunately still do not reflect what it would likely take over a series of years to deliver to every rural location in the United States broadband that is reasonably comparable in price and quality to what is available to urban users. Hearkening back to the law, in addition to support being sufficient and predictable, true universal service must aim for "quality" services that are "affordable"[116] and for "reasonable comparability" between rural and urban areas.[117] From a broadband speed perspective in today's terms, this should translate to enabling networks capable

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115 To be clear, this reasoning applies only with respect to those that would receive more under a new offer of A-CAM support than they receive currently in Cost-Based Support; as noted *supra*, those RLECs wishing to take a "glide path" and receive reduced support via A-CAM present no such budgetary challenges and, to the contrary, can help to offset the future anticipated demand growth in Cost-Based Support as described above.

116 47 U.S.C. § 254(b)(1).

117 *Id*. at § 254(b)(3).

of providing consumers with access of *at least* 25/3 Mbps,[118] if not something greater still. Moreover, the Commission must take heed of the statutory mandate for an "evolving" standard of universal service.[119] To this end, the Commission and all stakeholders involved – providers, contributors, and consumers – will be better off to the extent that limited USF resources are used to support networks that will stand the test of time and keep pace with increasing consumer demands that define "reasonable comparability" in the future.[120] Put another way, achievement of "true universal service" should aim for scalability and sustainability of networks over the long term (in addition to ensuring the ability to continue delivering quality, reliable voice services), in lieu of promoting the deployment and operation of networks that within just a few years will seem antiquated and incapable of satisfying consumer demand. Indeed, if one considers that in some respects USF support is a "contract" in which the Commission induces buildout and operation by providers of broadband-capable networks over a span of years for the benefit of consumers in rural areas, the Commission's resources are most effectively utilized by "contracting for" a long-term asset that will fulfill the needs of those consumers over as much of the life of that asset as possible and by minimizing the needs for costly upgrades or even wholesale network replacements or rebuilds in later years to the detriment of future USF budgets and contributors. A goal of "true universal service" will necessarily call therefore for greater resources than the current budget provides, and even greater resources than those identified above.

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118 *See Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion,* GN Docket No. 17-199, 2018 Broadband Deployment Report, 33 FCC Rcd. 1660 (2018).

119 47 U.S.C. § 254 (c)(1); *see also* NPRM at ¶ 108 ("Consumer demand for higher speeds is also evident.").

120 *See* Section I.A.1, *supra*.

E. An Inflationary Factor Should Apply to the Overall High-Cost USF Budget – Just as it Does to Other USF Programs – to Ensure Long-Term Sufficiency and Achieve Important Programmatic Priorities, Including but Not Limited to RLEC USF Initiatives.

As a coordinated complement to the thorough budget-setting exercise described above – specifically, to help pay for any increased demand in future years – the Commission should attach an inflationary factor *to the overall high-cost USF program budget of $4.5 billion per year* to ensure collection of sufficient resources to satisfy the estimated demand. Such a step represents a prudent and necessary aspect of USF budgetary planning – and, as a matter of equity, simply puts the high-cost USF program on parity with other USF programs. [121]

As Attachment 2 to these Comments shows, setting a budget merely by attaching an inflationary factor as of 2018 *only to the current Cost-Based Support budget* would still yield denied recovery year after year of more than $200 million per year of costs that have actually been incurred in deploying broadband networks in rural America. In fact, NTCA estimates that if an inflationary factor were applied to the total baseline RLEC USF budget of $2 billion, this *still* would leave the budget underfunded by approximately $170 million annually on average when compared to projected support demand as shown in Attachment 2 (although the funding shortfall would start to narrow a bit at least in later years). Thus, budgets must be set in the first instance based upon thoughtful and detailed projections of anticipated future demand, and it is also essential that – consistent with how inflationary factors are applied in the context of other USF programs – an inflationary factor should be applied to the *entire high-cost budget*, and not just RLEC USF support alone.

The benefits of such a consistent approach to application of inflationary factors across all the USF programs are clear, and will accrue beyond the RLEC USF initiatives. Indeed, applying

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[121] *See* footnotes 34 and 80, *supra*, and accompanying text.

an inflationary factor to the entire high-cost USF budget would help not only address concerns about how to tackle and "pay for" insufficiency in RLEC USF programs as noted herein, but could also then provide much-needed resources to address *other important high-cost universal service priorities*. For example, the Mobility Fund is itself constrained under an artificial budget that would appear insufficient to achieve what is deemed reasonably comparable mobile access throughout rural America.[122] Meanwhile, the Remote Areas Fund remains somewhat of a budgetary apparition – an initiative that most know will be much-needed to address gaps in coverage left by other high-cost USF programs, but one lacking shape or exact scope today.[123] Any such additional resources could also be used to encourage deployment of more future-proof networks that offer scalability for higher speeds consistent with requirements to plan for an evolving level of universal service.[124] Finally, in the past year, the Commission has commenced use of high-cost USF resources to help address serious, service-affecting damage to communications networks resulting from natural disasters.[125] Using "budget headroom" generated

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122 *Connect America Fund*, WC Docket No. 10-90, *Universal Service Reform – Mobility Fund*, WT Docket No. 10-208, Report and Order and Further Notice of Proposed Rulemaking, FCC 17-11 (rel. Mar. 7, 2017), at ¶ 23 ("We adopt a budget of $4.53 billion for MF-II over ten years – the amount of legacy support mobile carriers outside Alaska would receive over the next decade less the funding needed to phase-down support in census blocks fully built with private capital.").

123 *See* 2011 Order, 26 FCC Rcd at 18092-99, ¶¶ 1223-1254 (proposing the creation of a Remote Areas Fund and seeking comment on its structure, budget, the definition of "remote areas" and other factors); *see also* Blog of Commissioner Michael O'Rielly, available at https://www.fcc.gov/newsevents/blog/2017/02/01/federal-broadband-infrastructure-spending-potential-pitfalls. ("Sadly, I have visited parts of America that are without any option for broadband service. Getting to work on the FCC's Remote Areas Fund, as I have called for over the past three years, would be a step in the right direction.").

124 47 U.S.C. § 254(c)(1).

125 *Connect America Fund*, WC Docket No. 10-90, Order, 32 FCC Rcd 7981 (2017) (granting eligible telecommunications carriers operating in Puerto Rico and the U.S. Virgin Islands to authority utilize high-cost universal service support to repair and maintain telecommunications infrastructure damaged by Hurricane Maria and making up to $76.9 million available for that purpose.); *Chairman Pai Unveils $954 Million Plan to Restore and Expand Networks in Puerto*

by application of an inflationary factor to the overall high-cost USF budget would thus help position the Commission to achieve multiple essential public policy goals and comport with statutory sufficiency mandates with respect not only to RLEC USF mechanisms, but also other essential high-cost USF initiatives such as those listed above.

At the very least, and as an alternative to applying an inflationary factor to the entire high-cost USF budget to promote programmatic objectives with respect to RLEC USF mechanisms and beyond, the Commission should apply an inflationary factor to the overall RLEC USF budget – but starting from the budget as it was first set and effectively capped in 2011 at $2 billion annually and then bringing that forward.[126] The Commission observes that had an inflationary factor applied to that budget from the start, the current $2 billion "baseline" would be $193 million higher as of 2018 – which happens to be an amount just slightly above the 2017-2018 shortfall in Cost-Based Support.[127] Applying an inflationary factor going forward in this manner would therefore at least help to mitigate, if not entirely overcome, the prospect in future years of support shortfalls, and thus help to protect rural consumers who would otherwise be compelled to pay significantly higher rates that urban consumers for broadband services in defiance of the mandates for universal service.

Finally, NTCA submits that it is important to use a proper measure of inflation in adjusting the high-cost USF budget moving forward. Although the GDP-CPI has been the traditional measure of inflation in other contexts within the high-cost program[128] and in adjusting other USF

Rico and U.S. Virgin Islands, Press Release, (rel. Mar. 16, 2018) https://apps.fcc.gov/edocs_public/attachmatch/DOC-349583A1.pdf.

[126] 2011 Order, 26 FCC Rcd at 17711, ¶ 126.

[127] NPRM, at ¶ 105.

[128] *See, e.g.*, 47 C.F.R. § 54.1303(a).

program budgets, it must not be overlooked that, unlike these other programs and as discussed at length in Section I.A.2 above, the primary cost associated with broadband network deployment and operation in high-cost rural areas is labor.[129] The GDP-CPI does not focus upon and is not driven significantly by labor costs generally or rural costs of labor in particular; instead, GDP-CPI "measures the average change over time in the prices paid by urban consumers in the United States for a market basket of goods and services."[130] Thus, while GDP-CPI is an often-used measure of inflation in the United States, because it is a measure of *price* inflation rather than inflation in *costs or inputs*, it is not as germane to the costs of paying for labor to build and maintain networks and deliver services in rural America as a measure of labor inflation. The Commission should therefore consider utilizing the Employment Cost Index ("ECI")[131] or another index more reflective of labor costs to adjust the high-cost USF budget going forward – although, at a minimum, the overall high-cost USF budget should be adjusted by a GDP-CPI inflationary factor consistent with its use in other USF programs.

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[129] While some may speculate generically that "productivity" improvements should offset inflation in some manner, *see* NPRM at ¶ 109, it is important to note that no such offsets are applied today when inflationary factors are incorporated into other USF program budgets. Moreover, in the specific context of labor costs that are likely much more prevalent in the high-cost program, any productivity gains should presumably be recognized – "already baked into" – any national inflationary factor used; as discussed *supra*, NTCA is not aware of any evidence of unique productivity gains in the broadband deployment context that would justify applying a "special productivity offset factor" only to telecom network construction- and operation-related inflation as compared to other measures of labor cost.

[130] *Comparing the Consumer Price Index with the gross domestic product price index and gross domestic product implicit price deflator*, Bureau of Labor Statistics, Monthly Labor Review, March 2016 (available at: https://www.bls.gov/opub/mlr/2016/article/comparing-the-cpi-with-the-gdp-price-index-and-gdp-implicit-price-deflator.htm).

[131] *See, e.g., Ex Parte* Letter from Larry D. Thompson, Vantage Point Solutions, to Marlene H. Dortch, Secretary, Commission, WC Docket No. 10-90, *et al*. (filed Jan. 28, 2016).

F. In Summary, a Thoughtful and Carefully Planned Exercise in Setting Overall Budgets and RLEC-Specific Support Thresholds Will Permit the Commission to Fulfill the Statutory Mandates Governing Universal Service – While at the Same Time Respecting the Valuable Nature of and Maximizing the Effective Use of Ratepayer Resources.

The approaches to "budget-setting" and "threshold-setting" as described in this Section II are reasonable and necessary to comport with the statutory mandates for sufficiency, predictability, and reasonable comparability – while also striking an appropriate balance that recognizes the need for fiscal accountability and maximizes effective use of the ratepayer resources that underpin universal service initiatives.

First, to comport with the statutory principles of universal service and the demands of the Commission's own programs as designed to achieve universal service, the RLEC high-cost USF budget should be set for funding in the amount of approximately $2.55 billion in calendar year 2018 and approximately $2.8 billion by calendar year 2026. A thoughtful, informed approach to budgeting by looking at the demands of each component of the program is necessary to put the high-cost USF program on a path toward longer-term success and sustainability in fulfilling statutory universal service mandates for sufficiency and reasonable comparability. Second, providing a threshold level of support for each RLEC as described in Section II.B, will promote predictability and enable reasonable business planning for broadband buildout. Third, application of an appropriate inflationary factor to the *overall* high-cost USF budget (based upon a $4.5 billion figure to start and increasing thereafter as discussed herein) will place this program on equal footing with other important initiatives under the USF umbrella, and help to ensure sufficient resources are available to meet program demands in future years – not just with respect to RLEC USF support mechanisms, but also other essential high-cost initiatives such as Mobility Fund, the Remote Areas Fund, and disaster relief. At the same time, the many caps and constraints in place within the RLEC USF programs will continue to promote and enhance fiscal accountability and,

in respect of contribution obligations, ensure that limited ratepayer resources are directed toward deployment and operation of advanced networks that offer quality voice and broadband services on a reasonably comparable basis in fulfillment of universal service.[132]

Finally, the Commission asks in the NPRM whether it should continue the direction to USAC to forecast total high-cost demand as no less than one quarter of the annual high-cost budget, regardless of actual quarterly demand, in order to minimize volatility in contributions.[133] This is a prudent measure that benefits all stakeholders (contributors and recipients of support alike), and the Commission should continue this directive to USAC – based, however, upon the current $4.5 billion level for high-cost USF as adjusted going forward subject to an appropriate inflationary factor as noted above in Section II.E.

III. ANY OTHER POTENTIAL REFORMS SHOULD BE VIEWED THROUGH A PRISM OF WHETHER THEY WOULD ADVANCE IMPORTANT PUBLIC POLICY GOALS, WHETHER THEY ARE NEEDED TO FIX CLEAR SHORTCOMINGS IN THE EXISTING MECHANISMS, AND WHETHER THEY WOULD PROMOTE – OR UNDERMINE – CERTAINTY THAT FOSTERS INVESTMENT AND DRIVES EFFICIENT OPERATIONS.

In addition to the series of important questions asked regarding how to ensure that the high-cost USF budget can fulfill statutory mandates for sufficiency, predictability, and reasonable comparability while balancing the need for fiscal accountability, the NPRM seeks comment on other potential changes to the RLEC USF mechanisms. Before delving into the specific questions presented with respect to each such potential reform, it is important to step back and consider the implications and marketplace effects arising out of the prospect of shifts in regulatory frameworks. Even if well-intentioned, constant tinkering with support mechanisms (or even just the unending overhang of potential reform) can itself create substantial regulatory uncertainty, suppress

132 *See* footnote 42, *supra*, and accompanying text.

133 NPRM at ¶ 138.

incentives for investment, and undermine reasonable efforts to plan for deployment of network assets that are intended to last and will require cost recovery over the course of years and even decades.[134]

At this stage, in the wake of a seemingly unending raft of potential and actual reforms since 2010, the goal should not be to remake yet again from whole cloth or even substantially revise the support mechanisms in place now. Rather, good public policy should drive careful consideration of how to stabilize and improve them through surgical changes – or, where needed, how to rectify any serious problems that have been identified and need resolution – without otherwise causing disruption or introducing new uncertainties into the operation of mechanisms that have only recently been implemented and are just now starting to be better understood after a few years of experience. With such perspective as backdrop, NTCA addresses below specific questions raised by the NPRM regarding potential changes to RLEC USF mechanisms or reporting requirements.

A. The Commission Should Not Lower the $250 Cap on Per-Line Support as There is No Principled Policy Justification for Such a Change, It Would Penalize Consumers in Higher-Cost Areas, and It Yields no Material Budget Savings for the Benefit of Other Areas or Consumers.

The NPRM seeks comment on lowering the $250 per-line per-month cap on high-cost universal service support received by rural carriers, a limit established by the Commission nearly seven years ago.[135] Absent a reasoned analysis demonstrating that adoption of this proposal would advance the goals of Section 254 in the potentially affected study areas or would benefit rural

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[134] *See, e.g., Ex Parte* Letter from Michael R. Romano, Sr. Vice President, NTCA, to Marlene H. Dortch, Secretary, Commission, WC Docket No. 10-90, *et al*. (filed June 21, 2013), at 38 (describing how unpredictability caused by various USF reforms, including but not limited to the Quantile Regression Analysis caps, and the lingering overhang of potential for additional reforms, had caused nearly 70 percent of NTCA members to cancel or postpone broadband deployment projects worth nearly $500 million in 2012).

[135] 2011 Order, 26 FCC Rcd at 17764-66, ¶¶ 272-279.

consumers more generally, the Commission should decline such "moving of the goalposts." Indeed, the motivating factor behind such a proposal with respect to the $250 cap appears to be nothing more than a belief that not enough companies are capped. Absent from the discussion is any consideration or analysis of whether the number of companies subject to the $250 cap is an indication that the provision might be functioning properly, an analysis of factors that may lead to a certain subset of companies incurring costs at such a level, or whether a reduction of the cap to $225 or $200 would harm consumers in the potentially affected study areas.

Such a reasoned analysis is important for several reasons. For one, as noted above, the RLEC high-cost programs have been subjected to a nearly perpetual state of pending reform since at least 2010, if not longer, limiting support recipients' ability to plan for investing in network infrastructure with long useful lives the costs of which are recovered over decades. Stabilization that produces a "predictable"[136] support mechanism should be the Commission's goal; tinkering with discrete provisions absent any clear justification that they have failed to work is the antithesis of predictability. Moreover, it is not apparent that any significant benefit would accrue to the USF system from such a change; NTCA estimates that moving the cap to $200 might yield "savings" of less than $1.5 million per year to the program – not even 0.01 percent of a "baseline" annual $2 billion budget – even as the impacts on individual rural Americans within the affected study areas could be significant.

Indeed, the Commission should take caution here as lowering the $250 per-line cap amount may further exacerbate the rural/rural divide under which certain rural areas continue to lack much more than even basic levels of broadband service or lack service at affordable or "reasonably comparable" rates. Universal service requires that every location in the United States should be

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136 47 U.S.C. § 254(b)(5).

able to obtain access to broadband that is reasonably comparable in price and quality to the broadband available to urban users. Moving the goalposts with respect to the per-line cap without justification as to the rationale or analysis of the effects risks "walling off" certain rural areas of the nation (inhabited by perhaps tens of thousands of rural Americans for whom broadband is as vitally important as those living in urban areas) and declaring them "no-go zones" for investment in essential networks.

B. There is No Principled Policy Basis for Modifying the 100 Percent Competitive Overlap Provision. To the Contrary, Competitive Overlap Provisions Are Working as Intended.

The Commission should likewise decline to modify the process for determining whether a purported unsubsidized competitor overlaps a RLEC high-cost universal service support recipient in 100 percent of the rural study area.[137] Contrary to the suggestion in the NPRM, there is no basis to believe that purported unsubsidized competitors lack incentive to participate in the process – rather, it could just as easily be said (and is more likely the case) that any lack of participation is due to an inability to demonstrate true competitive presence and the ability to back up census block-based assertions made in Form 477 filings.

As an initial matter, the process applicable to purported unsubsidized competitors claiming to serve 100 percent of a RLEC study area cannot truly be described as burdensome. Indeed, that process is built mostly around the purported unsubsidized competitor stepping forward to provide evidence that what it already said in a prior filing with this Commission is accurate. One would expect such data to be readily available – evidence of where a company's network assets are deployed and where it can provide service to end-users meeting certain performance characteristics. Given that these providers presumably have the evidence on hand to assess and

137 NPRM at ¶¶ 160-163.

report on Form 477 in the first instance where service can and cannot be provided, any failure to post in the 100 percent competitive overlap process is more likely driven by an inability to make the required showing, and thus these providers rightly decline to step forward and certify under penalty of perjury as to competitive presence they know does not exist. Moreover, to the extent that a study area at issue is overlapped by more than one competitor (which may prompt any one provider to decline to participate out of concern that other carriers that could help add up to 100 percent coverage will not),[138] this on its own hardly justifies scrapping the entire process and starting over. A carrier fully confident of actual competitive presence and in possession of the evidence to back up 477 assertions has every incentive to work with other known providers in the area to make the required showing.

Ultimately, the lack of participation referenced in the NPRM is perhaps less of an indication that purported unsubsidized competitors lack incentives to participate than it is a function of a broken Form 477 that fails to capture accurate and granular data necessary to achieve the purposes for which the Commission utilizes the data gathered. Given that the data gathered via Form 477 is critical to important decisions such as whether to reduce or eliminate support for carriers operating in difficult to serve rural areas of the nation in pursuit of the universal service goals set out by statute, the Commission and rural consumers would be much better served by improvements to the granularity and accuracy of data captured by that process. Moreover, to the extent that there is some dissatisfaction with the 100 percent competitive overlap process, the solution is not to create yet another new standard for such analysis when the Commission has a different "unsubsidized competition" process already in place and yet to be implemented.[139]

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138 *Id*. at ¶ 161.

139 2016 Order, 31 FCC Rcd at 3133-3143, ¶¶ 120-145; *see also* NTCA Petition for Reconsideration and/or Clarification, WC Docket No. 10-90, *et al*. (filed May 25, 2016), at 15-18.

Perhaps the most curious aspect of the NPRM's discussion with respect to this issue, however, is the proposal to utilize an auction mechanism to award support where "significant" competitive overlap is found.[140] The entire point of the competitive overlap process is to ensure that support does not flow to areas where overlap exists and thus is theoretically unnecessary for the provision of service meeting certain standards. It is difficult to understand why the process would now morph into one to potentially *award* support to a new provider based upon that provider's claim that it is already operating there on an *unsubsidized* basis. In addition, if the Commission's goal is to ensure that "the benefit of eliminating support from study areas 100 percent served by competitors outweigh[s] the cost of conducting this process,"[141] an auction mechanism and everything such a process entails to replace the 100 percent overlap process certainly misses the mark.

At bottom, much like the proposal to lower the $250 per-line cap discussed above, the proposals to modify the 100 percent competitive overlap rules are solutions in search of problems. That the 100 percent competitive overlap process only attracts a small number of purported unsubsidized competitors to step forward to back up claims made on Form 477 is, again, an indication of the weaknesses of that data rather than a reflection on the process. It should also be viewed as an indication that the Commission can modify the process and still not find what it is looking for because it so rarely exists without a more granular level of data and analysis.

140 NPRM at ¶ 162.

141 *Id*. at ¶ 161.

C. Means-Testing and Voucher Distribution Concepts Fly in the Face of Basic Rural Network Economics, and Implementation of Means-Testing Within the High-Cost USF Programs Would Introduce Further Concerns and Complications.

The notion of using vouchers to distribute high-cost USF[142] suggests that if every rural household were given a freely disposable credit of some kind, providers would compete to serve that customer. Even if this notion had some attraction in theory, as recognized repeatedly by policymakers in debates dating back many years, it is fundamentally at odds with the basic economics of deploying networks in rural America.[143] In an area that cannot support the operation of even just one network without support due to vast distances and low densities, the idea that multiple networks will emerge to compete for customers is utterly misguided. No operator can make a rational business case to build a massive, multi-million dollar infrastructure project (whether telecom, electric, or water) in deeply rural areas where just a few customers may be scattered per mile if – rather than obtaining some reasonable opportunity for cost recovery through a "contracted term" (such as in the CAF Phase II or Mobility Fund II) or regulated mechanisms and a captive monopoly customer base under rate-of-return principles – each customer in that sparsely populated area holds a voucher that may or may not help to subsidize the costs of

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142 *Id*. at ¶ 166.

143 *See, e.g., S.1822: The Communications Act of 1994: Hearings Before the Committee on Commerce, Science, and Transportation*, United States Senate, S. Hrg. 103-599, 103rd Cong., 2nd Sess. (1994), at 405 (Prepared Statement of Sen. Larry Pressler) ("Vouchers may be appropriate in some areas. However, in states like South Dakota, the problem is . . . financing build-out to sparsely populated areas."); *Universal Service: What are we Subsidizing and Why? Part 1: The High-Cost Fund: Hearing Before the Subcommittee on Telecommunications and the Internet*, U.S. House of Representatives, Serial No. 109-109, 109th Cong. 2nd Sess. (2006) (Response for the Record of Tony Clark, President, National Association of Regulatory Utility Commissioners) ("Connections-based limitations are almost always flawed from the onset because they ignore the reality of the telecommunications business, namely, that high cost areas are served by networks. Therefore, it is networks that must be the focus of support. A voucher-type system (which is encompassed in many of the connections-based proposals) would also be an administrative disaster in the making.")

deployment or operation by that operator. Put another way, networks of any and all kinds are not built one connection at a time.

This is precisely why current USF policy logically looks to support only one provider in any given rural area – the network economics in many of these deeply rural areas do not support the business case for two (or more) networks. As an analogy, if regulators were to deny the ability to recover costs through a regulated electric or water rate base, throw electric and water markets open to full unfettered competition, and instead require the provision of a voucher to each potential customer for electric or water service, the incentives for investment in those capital-intensive rural infrastructure systems would quickly fall apart and the prospects for stranded investment would be enormous. The same would be true if the Commission were to scrap all of its current CAF, Mobility Fund, and other high-cost USF initiatives and move instead to a voucher system in the telecommunications/broadband space.

Beyond these concerns about incentives for investment, a voucher system is doomed to fail in recognizing the cost characteristics of serving a given area and the "subsidy" needed to promote investment and enable ongoing provision of services at reasonably comparable rates. The Commission's own model recognizes that there can be vast differences in the costs associated with serving differing parts of the United States; indeed, even within what appear to be discrete rural geographies, density and topography can vary greatly. (For example, open prairie in the Mountain West can segue quickly into canyons and river crossings; in the Southeast, firm ground can quickly turn into protected wetlands.) Indeed, unless each voucher can be "priced" dynamically at a sub-census block level to reflect the cost characteristics of serving the individual customer that holds it, a voucher system would almost certainly turn out to provide *too much* support on a per-location basis in some areas and *too little* support in others, further undermining the basic rural network

economics that justify initial investment and ongoing operations – and ultimately undermining the fundamental goal of "universal" service.

The notion of "means-testing" support within the high-cost USF program presents many of the same considerations and concerns as vouchers – and further complications as well. First, like vouchers, any effort to reduce or eliminate support based upon means-testing of individual customer locations flies in the face of basic rural network economics. As the Commission's own cost model and mobility initiatives rightly indicate, networks are built to locations and/or areas rather than to individuals. To reach less affluent locations in outlying rural areas, a firm building a wireline network may very well need to build past locations where wealthier individuals reside; cell towers are erected without reference to whether a rich or poor person may be drawing a signal from them. Even if it were possible to architect a network "around" particular kinds of customers measured by relative wealth, compelling network builders to determine not only the costs of building in rural areas – a sizeable task in itself – but now also to study the demographics of areas in which they may build networks to ascertain the relative wealth of individuals in specific locations as part of the business plan would erect substantial burdens that will deter, rather than encourage, rural broadband infrastructure investment.

Another unavoidable complication that must be addressed and cannot be breezed past is the law's straightforward mandate of reasonable comparability.[144] Lurking beneath the notion of means testing is a premise that wealthier rural areas can somehow "cover the costs" of higher-cost network deployment and operation even if those costs are multiple times more than what it would cost to build a network and deliver services in an urban area. Put another way, means testing would necessarily translate into an effective requirement that relatively wealthier rural consumers must pay more than *both* other rural consumers *and even their wealthier urban counterparts* – a

[144] 47 U.S.C. § 254(b)(3).

public policy choice that might be debatable in merit, but one that is simply impermissible on the face of a law that calls absolutely for reasonable comparability in services and rates. It is also unclear how a means testing concept might apply to rural businesses. It would be patently contrary to the notion that broadband will foster rural economic development and contribute to a rural American renaissance if every business that desires to stay in or relocate to a rural area faces the prospect of paying substantially more for its communications services just for having done so as compared to moving to (or staying in) a major metropolitan area or the suburbs.

Finally, a means testing proposal portends troubling consequences for consumer privacy. To comport with a requirement that support not flow to "wealthier" households, the FCC, USAC, and/or the provider in question would presumably need to query each and every customer regarding respective income levels or net worth, and then retain this highly personal information for a prolonged period of time to prove a given location's eligibility for service and support. Even if this process were manageable – what happens when customers move, for example? – it seems highly unlikely that consumers would be forthcoming with such information, both because of privacy concerns (to the extent documentation must be provided and retained) and given that the "reward" for self-reporting at a certain level of income or net worth is a massive increase in the price for broadband connectivity above even what billionaires and multinational corporations in urban areas pay for the same service (or denial of service altogether as providers then refuse to build to the wealthier rural consumers). For all of these reasons, the Commission should decline to integrate a means testing notion within the high-cost USF programs.

D. Helping States that Have Less Ability to Fund Broadband Deployment is an Admirable Goal, but it Could Create Perverse Incentives with Respect to "Federal-State Partnership" Toward Achievement of Universal Service Goals – and is Thus a Public Policy Question Better Left to Congress.

The Commission asks in the NPRM whether it might target support to states with less ability to fund the deployment of broadband in rural areas.[145] This notion is an admirable one, consistent fundamentally with the notion of ensuring that universal service is a *national* problem requiring *national* solutions, and recognizing as well that deeply rural states in particular may have difficulty generating sufficient funds to promote and sustain network deployment. The concept is also directionally consistent with the statutory concept that universal service is ultimately an endeavor that requires federal-state partnership.[146]

This being said, the Commission should not adopt special provisions that tilt universal service toward particular states based upon the systems they adopt. In many ways, this question hearkens back to, and yet flips on its head, a contentious prior debate in telecommunications circles. Specifically, more than a decade ago when questions were raised about how to migrate away from implicit subsidies in intercarrier compensation rates and toward more explicit support mechanisms, a significant amount of time and energy was spent debating the "early adopter" question – although, in that instance, the question was whether certain actions by the Commission might unfairly *penalize* states that had made their own efforts to undertake such a migration.[147]

In the case of current explicit USF mechanisms, the Commission's programs already seek to strike an appropriate balance by providing support based first and foremost upon the cost

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[145] NPRM at ¶ 166.

[146] 47 U.S.C. § 254(a)(1) and (f).

[147] *See, e.g., Comment Sought on Amendments to the Missoula Plan Intercarrier Compensation Proposal to Incorporate a Federal Benchmark Mechanism*, CC Docket No. 01-92, Public Notice, 22 FCC Rcd 3362 (2007).

characteristics of the discrete areas served, rather than "turning dials" based upon whether a given state has taken steps to "fund broadband" itself. This focus upon the nature of the area to be served helps to ensure that more rural areas and states (which are those that would seem less able to "self-fund" broadband) have a reasonable opportunity for greater levels of support, and is consistent otherwise with the primary goal of promoting "reasonable comparability" throughout rural America. Indeed, if the Commission were to adopt a new metric that directs greater USF support toward States that lack their own broadband funding mechanisms, this could have the perverse effect of *discouraging* such mechanisms, thereby undermining rather than promoting federal-state partnership toward universal service goals.

Addressing budget controls that artificially cut off support at insufficient levels is far more important and useful for very rural states than adopting a factor of some kind that tilts funding toward one state versus another.[148] Moreover, to the extent that there is a public policy motivation to either encourage states to do more, or to do more for states that cannot themselves "kick in" funding for rural broadband, these are public policy questions more appropriately tackled and decided by Congress in the context of existing infrastructure and Farm Bill debates. For example, Congress could provide additional weighting in deciding to direct funds toward states that either provide matching funds or toward states that based upon some measure of "relative rurality" or socioeconomic data appear unable to generate such funds on their own. But, rather than wading into such debates, this Commission should focus upon the core goals of universal service – ensuring sufficiency, predictability, and reasonable comparability based upon the nature of the

[148] In fact, if the Commission desires to ensure that more funding goes toward those areas that can least sustain broadband themselves (at a more granular level than on a Statewide basis), modifying the HCLS mechanism as described in the following section offers a much more promising and straightforward way of doing so.

areas to be served – while leaving broader debates about the appropriate precise level of state involvement in promoting broadband deployment and sustainability to Congress.

E. Certain Other Targeted Changes Proposed in the NPRM Could Help Improve the Operations and Effectiveness of the Existing USF Mechanisms and Warrant Further Consideration and Development.

Although several of the changes posited for discussion in the NPRM are things the Commission should decline to pursue further for reasons addressed above, a number of other changes identified in the NPRM warrant more detailed development and additional consideration. This is not to say that such proposals should necessarily be adopted, but these proposals could offer promise and should be examined further to determine whether they will enhance regulatory certainty and otherwise promote the goals of universal service.

1. "A Connection is a Connection" Reform of CAF-BLS

For example, the NPRM asks about the prospect of shifting from the CAF-BLS mechanism adopted in 2016 to a system where, essentially, "a connection is a connection" – meaning that all working loops, whether enabling voice or broadband or both, would receive the same level of support based upon the prior Interstate Common Line Support ("ICLS") calculation and the HCLS mechanism still in place today.[149] NTCA believes such a mechanism that leverages well-understood programs *could* hold significant promise, particularly in ensuring proper incentives for "organic," consumer-driven conversions to standalone broadband services in lieu of transitions that occur simply because of the differential treatment of voice and broadband lines within CAF-BLS under the pressure of a budget control. Moreover, this method would on its face reduce cumulative under-funding compared to current rules. Under existing rules, broadband-only loop costs are assigned 100 percent to interstate common line, which in turn increases pressure on CAF

149 NPRM at ¶ 164.

BLS support and leads to significant underfunding given existing budget constraints. Under the alternative approach described in the NPRM, however, 25 percent of broadband-only loop costs would be allocated to common line. This would reduce pressure on CAF BLS funding, but potentially leave 75 percent of broadband-only loop costs to be assigned to interstate special access – substantially increasing rates for customers of standalone broadband services.

This last point is particularly critical to note. Such a reform would not by itself help address cost recovery shortfalls. To the contrary, this sort of change would simply "mask" massive USF shortfalls by shifting loop costs to interstate special access, rendering such costs ineligible for USF support and leading to increased special access rates that then would still fall right back onto rural consumers in the end in the form of higher broadband rates. Put another way, while this proposal would seem at first glance to reduce the budget control effects to very low levels, it would do so only by sweeping all of the unrecovered loop costs under a "different rug" (interstate special access) and leaving those rates (which are ultimately part of the same retail broadband prices paid by rural households and businesses) unaffordably high.

Thus, this "a connection is a connection" notion could offer great promise indeed in simplifying and rationalizing distribution mechanics – but such a change can and will only work to fulfill universal service policy *if* it does not then allow cost recovery shortfalls to end up "hidden away" in special access. In the absence of sufficient funding, even such a simplified and streamlined plan would still yield retail broadband rates that remain unaffordable and "unreasonably incomparable" for rural consumers despite appearing on its face to "reduce" the effects of the USF budget controls. This sort of plan should therefore be considered for adoption *if and only if*: (a) it comes with sufficient support resources; and (b) it will not, because of the "masked" appearance of reduced support and budget cuts, choke broadband investment incentives and leave consumers with unreasonably incomparable rates for broadband.

2. Potential Combination of CAF-BLS and HCLS

By contrast, it is harder to see any value in a potential combination of HCLS and CAF-BLS as also discussed in the NPRM.[150] Although HCLS may have been "originally designed to support voice services"[151] and focuses on intrastate cost recovery, it remains essential to help justify investment and sustain ongoing operations by targeting support toward higher-cost areas in particular – and the network plant it helps to enable is broadband-capable and thus in furtherance of universal service objectives even if the mechanism's history derives from voice support. Moreover, as noted above, the Commission must keep in mind that any changes, if sweeping rather than targeted in nature, pose the risk of introducing volatility, regulatory uncertainty, and unintended consequences – and a full-bore remake of HCLS and CAF-BLS through some combination is just such a sweeping change. The Commission should therefore focus upon surgical modifications that improve and build upon the workings of the existing mechanisms (such as the approach discussed in the immediately preceding section), rather than fostering regulatory uncertainty and the prospect of unintended consequences by scrapping the mechanisms altogether and starting over *yet again* (for the third time in eight years) with comprehensive distribution reform deliberations.

On a somewhat related note, however, the Commission *should* consider how to make the HCLS mechanism more effective in promoting investment incentives and operations in high-cost areas in particular. As noted in Section III.D above, relatively higher cost areas and states can present greater challenges in terms of stimulating deployment, and thus are generally in need of greater support; HCLS is the mechanism aimed at playing such a role by targeting some level of

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150 *Id*. at ¶ 165.

151 *Id*.

additional funds to higher-cost areas, even as the mechanism itself is subject to a cap on the overall level of such support available. Indeed, the cap on HCLS has been *declining* each year – resulting in *fewer* funds being targeted to relatively higher-cost areas – due to the operation of an ironically named "rural growth factor" that was designed nearly two decades ago and does not reflect the realities of today's marketplace.[152]

To remedy this concern and make more effective use of HCLS to target areas (and states) most in need of support, the Commission could consider removing the effect of line loss within the so-called "rural growth factor," allowing HCLS to keep track with inflation consistent with other budget recommendations herein. Alternatively, and at a minimum, the Commission should retain the current capped level of funding for HCLS, but eliminate the reductive effects of the "rural growth factor" – in essence, the Commission should at the very least *freeze* HCLS at its overall level of support going forward. Although not a carrier-specific freeze, this would still help to provide greater certainty and stability for those RLECs that rely upon HCLS to recover investments and ongoing costs of operating in higher-cost areas, and it would reduce even further the concerning dynamic the Commission previously took steps to address where relatively lower-cost carriers see their HCLS support dissipate or even "fall off the cliff" over time.[153] Moreover, while such a measure should be adopted independent of any other reforms that may be adopted, it is worth noting that such a reform could provide a particularly useful and logical complement to the change proposed in the NPRM and discussed above that would consider returning from CAF-

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[152] *In the Matter of Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, *Multi-Association Group (MAG) Plan for Regulation of Interstate Services of Non-Price Cap Incumbent Local Exchange Carriers and Interexchange Carriers*, CC Docket No. 00-256, Fourteenth Report and Order, Twenty-Second Order on Reconsideration, and Further Notice of Proposed Rulemaking, and Report and Order, 16 FCC 11244, 11267-69 (2001), at ¶¶ 48-53.

[153] *Connect America Fund*, *et al.*, WC Docket No. 10-90, *et al.*, Report and Order, 29 FCC Rcd 15644, 15682-84 (2014), at ¶¶ 106-114.

BLS back to "a connection is a connection" approach that leverages HCLS and ICLS to distribute support without reference to the type of line (*i.e.*, voice, data, or both voice and data) at issue.[154]

3. Potential Changes to CapEx and OpEx Limits

The NPRM also inquires about potential changes to the existing limits on capital and operating expenses.[155] Consistent with the introduction to this section, the Commission should aim to address clearly articulated concerns about how these caps work rather than revising them altogether (or even scrapping them) for the promise of "something better" and thereby potentially introducing uncertainty or creating new disruptions. For this reason, the Commission should *not* alter the overall operating expense limits at this time, having just addressed two of the most significant concerns raised previously with respect to those caps – that is, how they apply on tribal lands,[156] and the lack of an inflationary factor within the calculations.[157]

Turning to the capital investment allowance ("CIA"), however, changes are warranted because this mechanism has failed to operate as initially intended and proposed. When the predecessor to the CIA was first suggested, the accounting aspects of compliance therein were simpler, applying to a limited category of loop costs and requiring tracking of fewer records.[158]

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154 It should be noted that such changes to HCLS would then require additional Cost-Based Support going forward beyond that projected in Attachment 2 (which in present form assumes no change to HCLS calculations and thus presumes ongoing reductions in HCLS in future years during the Budget Term due to the "rural growth factor"); if, for example, the alternative "HCLS freeze" approach suggested herein were adopted, NTCA estimates that $22 million in additional support would be needed to offset declines otherwise slated to affect HCLS this year, and that such additional amounts needed could rise to more than $250 million by 2026 to keep HCLS at current levels rather than permit it to continue to decline.

155 NPRM at ¶¶ 167-168.

156 *Connect America Fund*, WC Docket No. 10-90, Report and Order (rel. April 5, 2018).

157 Order at ¶ 88.

158 *See, e.g.*, *Ex Parte* Letter from NTCA, WTA, USTelecom, and NECA, to Marlene H. Dortch, Secretary, Commission, WC Docket No. 10-90, *et al*. (filed Dec. 16, 2013), at 13-22.

But the final version of the CIA as adopted and implemented expanded the cost accounts that needed to be tracked under the limit, and thereby increased significantly the burdens associated with compliance.[159] Moreover, experience over the past few years has shown that monitoring the per-project, per-location limit within the CIA structure is difficult and burdensome for all stakeholders.

Nonetheless, given that RLECs operate under a shared fixed USF budget, there is value in retaining a "metering influence" to promote efficiency and continued responsible investment practices over time. To this end, the existing CIA construct should be replaced with a more streamlined measure that is simpler to implement, monitor, and enforce. For example, the Commission should consider replacing the current CIA mechanism with a structure that includes: (1) an annual certification filing by a licensed professional engineer on behalf of each RLEC attesting that the network has been designed and upgraded in an efficient manner reflecting circumstances in the area to be served and the RLEC's migration over a certain period of years toward higher broadband speeds, greater network reliability, and a forward-looking architecture such as that contemplated in the Commission's own model;[160] and (2) a requirement to retain for a period of at least five years the contracts showing how procurement of supplies and labor costs track to network deployment efforts in furtherance of an efficient broadband buildout. This would provide carriers with incentives for efficiency in advance of making such an annual certification, and it would allow the Commission and USAC to identify how support dollars ultimately "tick

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159 2016 Order, 31 FCC Rcd at 3130-32, ¶¶ 110-115; *see also* 47 C.F.R. § 54.303(b) and (c) (identifying accounts relevant to calculation of capital expense limitations).

160 But, as with the current CIA, the Commission should retain a *de minimis* threshold that obviates the need for annual certification by a professional engineer to the extent that capital investment in the relevant year is less than $4 million (although the RLEC would still need to retain the underlying contracts that track to its incurrence of the relevant capital expenses).

and tie" to underlying network deployment efforts. At the very least, however, the Commission should eliminate the project-based limitation within the CIA to help simplify and streamline compliance, monitoring, and enforcement.

4. Reporting and Accounting Modifications

Finally, the NPRM asks a series of questions related to certain reporting requirements and accounting standards. As an initial matter, NTCA supports reconciliation of filing deadlines so that voice and broadband-only line counts on Form 507 are submitted at the same time (*e.g.*, March 31 of each year) in connection with CAF-BLS, HCLS, and for any other purposes. Although this would bring the line count deadline for HCLS forward by a few months, this new gap would be much less than what exists today for purposes of the budget control due to the current timing of Form 507,[161] and a consolidated filing would relieve duplicative filing burdens. For similar reasons, NTCA supports conforming accounting of operating leases between the Uniform System of Accounts and more generally applicable accounting standards.[162] Unless there is a particular reason to require regulated operators to utilize different accounting methods (*e.g.*, due to unique industry issues or to avoid disruption and confusion arising out of any change in practices) – and NTCA is unaware of any in this instance – the Commission should promote the use of uniform accounting standards in carrier operations for telecom regulatory *and* general accounting purposes.

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161 NPRM at ¶ 170.

162 *Id.* at ¶¶ 173-174.

IV. CONCLUSION

As 193 members of Congress, Chairman Pai, and other commissioners have all rightly observed, action on the instant NPRM is necessary to address a universal service sufficiency crisis that is years in the making. In the face of USF budget shortfalls, at a time when policymakers have made rural broadband one of our highest national priorities, those entities devoted to advancement of rural broadband are ratcheting back on broadband investment and being compelled to increase broadband rates (or to decline to offer standalone broadband at all) because of an insufficient and outdated budget. To be clear, the Commission has taken initial much-welcomed and much-needed steps to fund its A-CAM program and to provide a "stop-gap" to mitigate a serious budget shortfall in Cost-Based Support. But it is long past time for a comprehensive approach to budgeting for the high-cost USF program to ensure sustainable progress toward statutory mandates for sufficiency, predictability, and reasonable comparability of services. NTCA therefore urges the Commission to take steps consistent with the recommendations herein to provide sufficient resources to advance the mission of universal service in high-cost areas of the United States with provisions to ensure fiscal accountability and proper use of resources, and to consider other targeted measures to improve the workings of the USF programs without causing disruption or creating regulatory uncertainty.

Respectfully submitted,
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May 25, 2018

ATTACHMENT 1

Deploying a Broadband Network – From Start to Finish (and Beyond)
Vantage Point Solutions, January 2018

JANUARY 2018

Deploying a Broadband Network – From Start to Finish (and Beyond)

VANTAGEPNT.com 605-995-1777
2211 N Minnesota Street Mitchell SD 57301

Table of Contents

1 Executive Overview

Building a broadband network is a time-consuming, capital-intensive endeavor, which requires a considerable amount of planning and analysis to be successful. To be successful, a broadband network must be able to meet the customer's demands both today and into the future. Much of the investment in a broadband network is used to install elements that have economic lives of 30 years or longer, a term for which it can be difficult – if not impossible – to accurately predict customer demands over the life of the network. Long-term capital investments such as this can therefore be very risky ventures for the broadband provider and their investors.

The risk is significantly greater still in rural areas where the cost to construct to any given customer is much higher than urban areas. The lower population densities in the rural areas require the provider to make much larger investments in infrastructure and incur more expense associated with environmental permitting processes. The low customer density and large geographies of rural areas also result in higher operational costs as well.

There are a variety of network architectures being used today to deliver broadband, but nearly all providers understand that fiber provides the best broadband capabilities both immediately and over the longer term. Wireline networks are most commonly based on copper cables, such as coaxial or twisted pair, which struggle to keep up with the rapidly increasing broadband demands. As these copper networks reach the end of their useful lives, it is common for the copper cables to be replaced with fiber.

Like wireline copper networks, many wireless networks also struggle to deliver adequate broadband speeds because of limited spectrum availability, environmental effects, or over-loading. To minimize these broadband bottlenecks, wireless and wireline providers alike are replacing large portions of their networks with fiber.

It is costly to deploy a broadband network even in ideal conditions. However, there are many local factors and customer demographics that can dramatically increase the costs. Customer density is one of the largest contributors to network costs. There is often no business case to serve customers who live outside areas with customer densities less than what is typical for a town customer. In rural areas that surround larger metropolitan areas, the broadband provider may be able to justify serving the rural customers by cost averaging the lower cost town customers with the higher cost rural customers. However, in some rural areas, the towns themselves are too small to have enough lower cost customers to make the rural areas economical to serve. In these instances, even where capital to build is on hand or otherwise in theory available, the provider must rely on mechanisms such as Universal Service Funding to make a business case to serve the rural customers.

Deploying a broadband network is a very capital-intensive undertaking, regardless if it is in a greenfield environment or when replacing an existing network. The extensive planning, long construction timeframes, and the coordination of approvals and permits from various regulatory, government and private entities add to the complexity and cost. The intent of this document is to give a brief overview of the process often needed to deploy a broadband network. This document is not intended to be exhaustive, since there are often local or regional rules and regulations that impact deployment costs and increase timeframes. This document will overview the processes common to nearly all deployments, focusing on the initial deployment but also covering some aspects of the operational expense and complexity introduced once the network is built.

2 Network Deployment Steps

For this document, the network deployment discussion has been divided into five primary phases. These are, 1) Business Planning, 2) Financing, 3) Design and Engineering, 4) Construction, and 5) Operations. As shown in Figure 2-1, each of these stages require complex, time-consuming, and costly efforts to be performed before the deployment can proceed to the subsequent phase or services ultimately delivered. Many of these tasks require a provider to obtain outside resources to properly and fully complete the requirements. Each of these phases are described in the following sections.

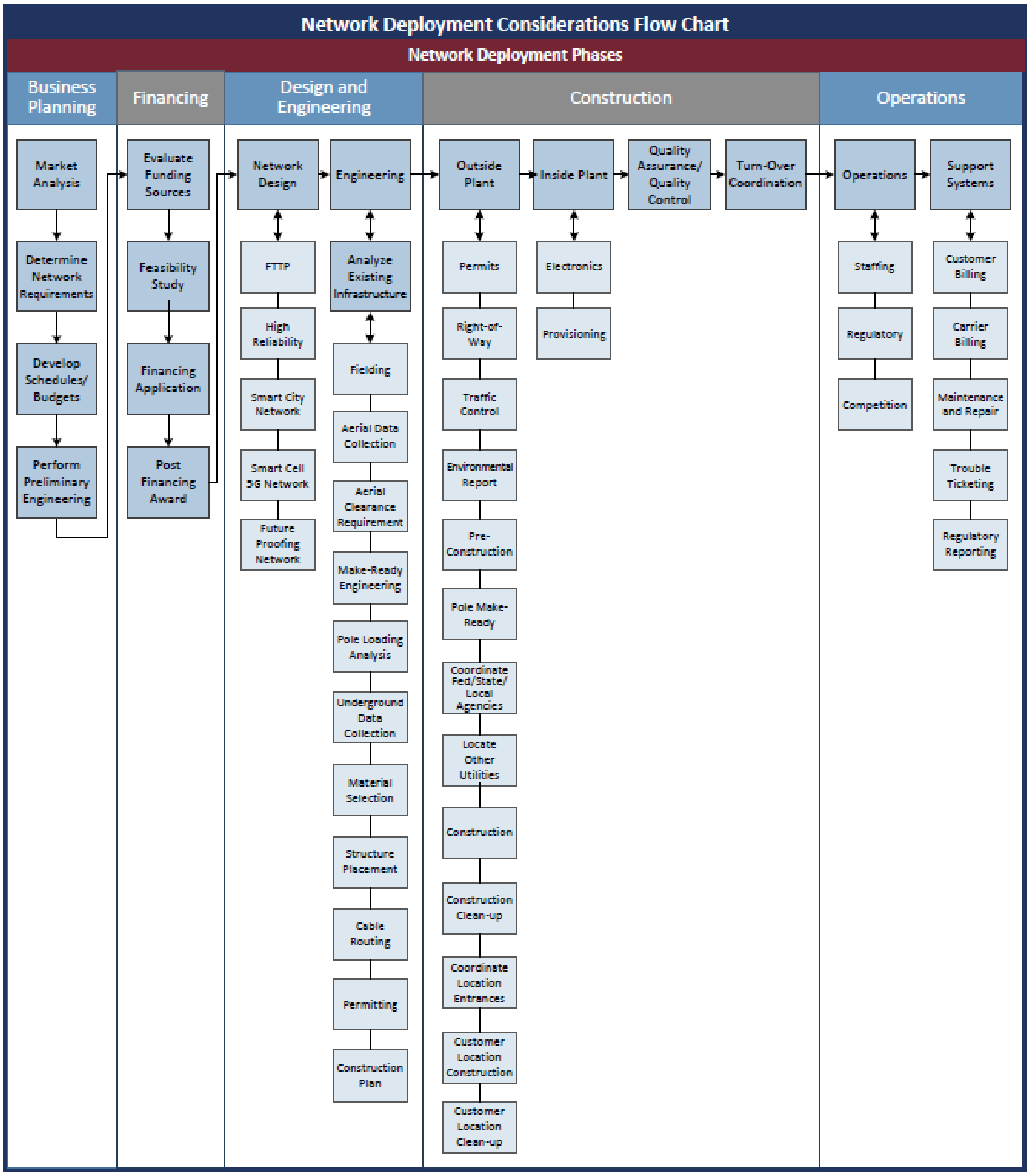


Figure 2-1: Network Deployment Phases

3 Business Planning

The initial step of a network deployment is the business planning phase. The business planning determines the area to be built, the services to be offered, the deployment schedule, and the overall project budget. The business planning requires a significant amount of effort and research and often requires outside resources to perform surveys, market studies, and high-level technical studies for compiling estimated budgets and schedules.

Once a business plan has been developed, it is typically reviewed by the provider's senior management, board of directors, business partners, and/or investors to decide whether to proceed with the project or not. A viable business plan is often a balance between the cost to deploy the broadband network along with anticipated upgrade costs and the expected revenues from customers and other sources that will provide at least some reasonable return and/or the ability to repay any debt.

3.1 Market Analysis

When offering new services to existing customers or building a network outside of a service provider's existing footprint, it is important to study the demographics and needs of the potential customers. To determine market demand and penetration rates, the provider must analyze the current wireline and wireless competition in the market. A detailed market analysis often includes a survey process to gather information from the potential customers to determine many key factors, such as:

- Capabilities and product pricing of current service providers
- Customer satisfaction with current service providers
- Customer demand
- Estimates of take rates
- Pricing sensitivity

This process is time consuming and typically utilizes outside sources to make phone calls and conduct focus groups.

The market analysis may also include coordinating with the local governments to determine interest in Smart City-type applications and identify potential anchor institutions. This could include service to local institutions (schools, libraries, public safety and other government buildings), as well as sensors (street lights and traffic signals).

3.2 Competition Analysis

Another item to consider when deploying a broadband network is determining the competitive environment in the areas being overbuilt. This step is often missed or only partially completed. In reviewing the market, a competitive analysis should be completed to determine how the service take rates may be impacted. In completing a competitive analysis, the main items to be considered consist of the following:

- Identify the Incumbent Service Provider(s) – The incumbent could be a price cap carrier, a wireless carrier, and/or a cable provider. Research of the market should be completed to determine which carriers are currently providing service today.
- Determine Presence of Competitive Providers – In addition to incumbent providers, determine if there are any competitive providers which may include both wireline/cable providers as well as wireless carriers.
- Strength of Name Recognition – Having a strong name and/or brand recognition and being known for high quality service would carry over in to a new market. Customers' perception of the services provided will have a significant impact on whether a new broadband provider will have a solid take rate and customer following.
- Current Services and Rates – A review of what services are currently being offered to the market as well as the current rates being charged will be the precursor of the services and rates to be offered when deploying a new broadband network.

In addition, an assessment must be made regarding the incumbent's ability and willingness to react to an additional competitor. Since building a competing network takes months or years of effort, the incumbent has the opportunity to upgrade its network if able and willing to do so, which could have impacts on the business plan.

3.3 Determine Network Required to Deliver Services

Following the market analysis, the second element of business planning is to determine the network topologies that would support the services the customers desire. This is necessary for compiling high-level project cost estimates and schedules. The correct network may be a combination of more than one network technology to meet the needs of all types of users including residential, business, and anchor institutions.

Much planning goes into the network topology planning and requires engineering resources to perform preliminary designs and options, cost estimates and technical reports regarding the pros and cons of various options. The following are types of modern wireline networks that are often considered, although the processes and procedures outlined in this paper are not limited to such networks; most are equally applicable to other terrestrial networks, particularly when one considers again that even "wireless" networks are in most cases dependent upon increasing densification of cells and wired backhaul to handle current and future data needs. To use a colloquial phrase: Wireless needs wires.

Fiber to the Premises (FTTP) Network

Most broadband networks today, regardless if they are wireless or wireline, rely heavily on fiber optic cable. Most modern wireline networks are constructed entirely of fiber because it is the least expensive medium to deploy and operate measured over the life of the network assets and has the largest bandwidth capabilities as an initial matter and as a matter of scalability in the future. These wireline networks are generically referred to as Fiber-to-the-Premises (FTTP) networks. FTTP networks can be architected as either a shared or dedicated design depending on the service needs of subscribers.

The shared network architecture utilizes passive optical network (PON) topology. Optical splitters are utilized in the network to share the broadband capacity between groups of subscribers

(typically up to 32 subscribers). It is generally targeted to residential subscribers and small businesses that require up to 1 Gbps services, and has a cost advantage over a dedicated system because not every fiber has to “home run” back to an active equipment location, which results in fewer fibers and fewer fiber splices.

Some FTTP architectures rely on a dedicated fiber to each customer and often utilize Active Ethernet (AE) technology. This design implements a point-to-point architecture with dedicated fiber to serve residential and business customers. This means that each subscriber is served by a fiber strand that is dedicated from their premises back to the site where the distribution electronics are located. AE technology provides for speeds of 1 Gbps or more both upstream and downstream for each user. It is generally targeted to businesses and “power user” residential subscribers that require 1 Gbps or higher services, with 10 Gbps services planned for some areas.

Dedicated Circuit Services

While FTTP services are typically utilized for providing Internet service, some end users may request services to enable private transport connections between the sites. For example, this could be a large business with multiple sites. Carrier Ethernet technologies such as Ethernet Private Line (EPL) can be utilized to enable these private circuits between customer locations.

Custom Services

The network can also be designed to support a variety of Smart City services depending on the needs of the city. This could include supporting Smart City applications such as street light sensors, traffic sensors, cameras and connecting various city institutions. Depending on specific needs of the applications, the network could support dedicated dark fiber, private dedicated circuits, or broadband connections such as 1 Gbps or 10 Gbps, and be ready for 100 Gbps when demand requires.

Likewise, the network can also be designed to support Small Cell services depending on the needs of service providers. This could include dark fiber or broadband connections (such as 1 Gbps or 10 Gbps) to the Small Cell locations.

3.4 Develop Preliminary Schedules and Budgets

A final step of the business planning phase is to determine preliminary project schedules and budgets. The project schedules may include a phased plan for how the network will be constructed over several years. The project phases could be determined by specific geographic areas based on ease of construction, customer density, or political or government factors, or based on expected penetration rates. Alternatively, the project phases could be determined by the prioritization of services that are being provided, such as residential and business.

Once the project phases are determined, budgetary estimates can be compiled for each of the phases of the projects. This would include outside plant, electronics, operations and maintenance budgets. Additionally, operations and maintenance budgets are compiled. This includes staff salary and benefits requirements for the provider’s various departments. It also includes areas such as vehicles, test equipment, billing systems, trouble ticket systems, and mapping systems.

4 Financing

4.1 Evaluation of Funding Sources

Depending on the geographic location, the status of competition, and the types of services to be offered, there are several state and federal financing options in addition to private lending institutions that are typically evaluated as potential funding sources.

Several states have developed broadband grant programs to provide funds for broadband deployments in areas that are currently unserved or underserved. Minnesota and New York are a couple of examples of states that have recently offered broadband grant awards.

Additionally, federal grant and low interest loan programs are available through the USDA's Rural Utilities Service (RUS). These include the Telecommunications Infrastructure, Farm Bill Broadband, and Community Connect programs.

These programs are often targeted to providing broadband to customers that meet specific criteria such as rurality of the serving area, currently available broadband speeds, number of competitors, and proposed service offerings that affect the eligibility of the specific proposed project. Therefore, considerable effort is required to understand the requirements of each program and to identify potential projects that satisfy the requirements.

In some areas, the cost to serve the customer is simply too great. The end user revenues needed to deploy and then support the network over time are beyond what the end user is willing or able to pay. In these instances, a business case cannot be made with a low interest loan (or even a federal, state, or local grant or the provider's own cash on hand), and the provider must therefore rely upon outside sources of funding such as what is available through the Universal Service Funds (USF) to make the business case.

4.2 Feasibility Study and Financing Application

Any external funding source will require some form of feasibility study to be provided. Depending on the program, it is likely that portions of the application may need to be developed and certified by a provider's professional engineering firm and financial consultant.

These studies incorporate the budgets, market penetration, rates and service offering information from the business planning phase to develop a multi-year financial forecast. A financial forecast includes the capital costs and depreciation, balance sheet, operating revenues and expenses and cash flows for each future year. Sample feasibility study information is included in Appendix A. Some key financial statements in the feasibility study include:

- Projected balance sheet
- Projected income statement
- Projected cash flow
- Projected ROR on investment
- Projected breakeven
- Projected financing ratios (DSCR, Debt-to-Equity, TIER)

In addition to the feasibility study, there is a large amount of additional information that most financing applications require. This may include:

- Company history
- Management experience
- Service plans and pricing
- Marketing plan
- Competition analysis
- Network maps
- Existing and proposed network descriptions
- Demonstration of community support
- Financial references

4.3 Post Financing Award

Once a provider has been awarded financing, there is typically a large amount of reporting requirements and procedures that must be followed, including:

- Construction progress reports
- Periodic financial reports
- Requests for reimbursement
- Audit support

The financing entity may also have specific procedures that the provider must adhere to regarding how construction contracts are awarded. This may include utilizing the entity's contract forms and obtaining approvals prior to the award of contracts.

5 Design and Engineering

Assuming the business plan and financial studies look positive, the design and engineering of the network commences. This is a time- and labor-intensive phase in which detailed designs and engineering plans are developed. A detailed engineering plan requires extensive on-site surveys and research to develop construction maps. Licensed professional engineers are often engaged to ensure that the plans meet local, state, and national codes in addition to industry standards, as well as protect the public safety.

5.1 Design

The overall design is based on delivering the services that were determined to be required in the business plan in the most cost-effective manner. Each of the service offerings require that specific network design needs be met.

Rural network designs are almost always more expensive on a per-subscriber basis than urban designs. It is not uncommon for the cost to serve a rural customer to be 4 or more times the cost to serve a town customer. The lower subscriber density of rural networks results in fewer subscribers over which to spread the network costs across. Additionally, rural network designs are unable to obtain the efficiencies of scale that can be achieved with urban networks. For example, a centralized electronics building in an urban network typically serves thousands of subscribers. This allows an urban provider to spread the building, back-up power, and other infrastructure elements across many subscribers. Rural networks typically must distribute their electronics across remote cabinets or huts that serve small numbers of subscribers. This is unavoidable and results in less efficiency in a rural network design.

Early in the design phase, aggregation sites must be identified. These are the primary locations of the electronics which directly serve the locations within the serving area, and all the local connections within the serving area must have a connection path back to an aggregation site. The aggregation site may serve as a co-location site for multiple entities that are utilizing the network to place their service electronics. The aggregation site may be a cabinet or a small building, or it may be located inside an existing building somewhere within the network footprint. Aggregation sites are typically placed in secure locations with 24/7 access and backup power capabilities. Some local codes may require that the aggregation sites be entirely underground or disguised as another type of building such as a house.

Next, the backbone fiber network that connects the various aggregation sites is designed. The backbone fiber network is typically deployed in ring architectures to provide network redundancy. To provide additional resiliency, backbone fiber typically enters the aggregation locations in two separate entrances and separation of the ring segments is maintained throughout the network. This allows for aggregation sites to remain connected in the event of a fiber cut, and for customers paying for ring protected services to maintain service during most network outage events.

Once the aggregation site and backbone fiber designs have been completed, the distribution networks, as described in the following sections, can be designed. The selection of the distribution architecture or combination of architectures affects the size of fiber cables and the amount and type of electronics that are required. Figure 5-1 depicts the various distribution network elements that are addressed in the design phase.

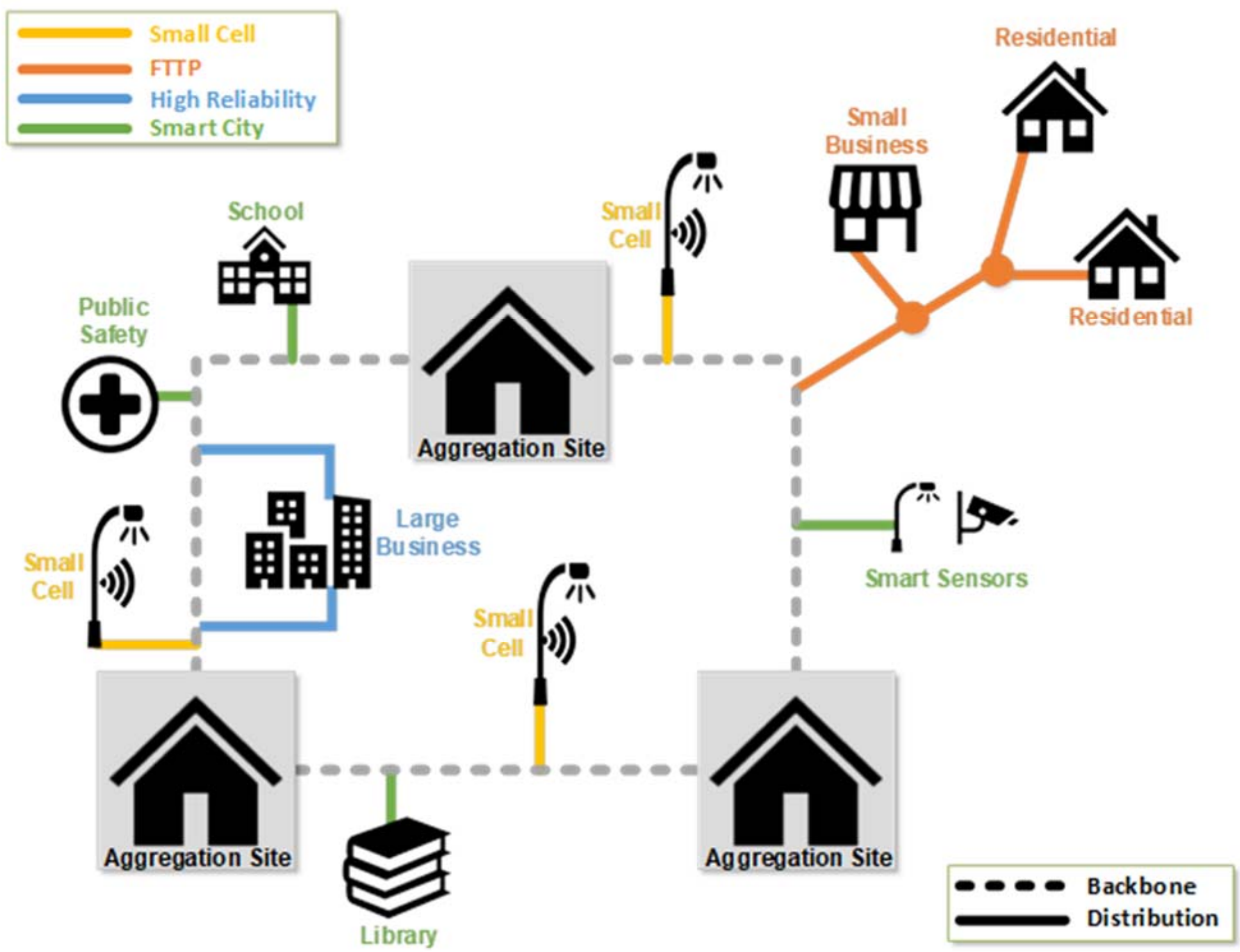


Figure 5-1: Distribution Network Design Elements

5.1.1 FTTP

As described in Section 2.2, an FTTP network can deliver services over a shared PON architecture or a dedicated AE architecture. In a PON architecture, optical splitters may be centrally located at the aggregation site or they may be distributed in the field. If they are distributed in the field, less fiber is required all the way back to the aggregation site. However, centrally locating the splitters allows for more efficient use of the splitters and the associated electronics ports. It also provides for an easier transition to an AE architecture in the future.

In an AE architecture, dedicated fiber connects from the subscriber back to the aggregation site. This requires more fiber in the distribution network than a distributed PON architecture and more electronics are required since each customer has a dedicated electronics port. However, it provides the most broadband capability to the subscriber.

5.1.2 High Reliability

Some medium and large businesses (or other entities that provide critical services) require higher service reliability than may be required for residential and smaller business applications. In these

cases, a fiber ring topology can be utilized to connect the businesses and provide redundancy that can survive a fiber cut or network outage on a portion of the ring.

5.1.3 Smart City Network

Smart City architectures could include items such as cameras at intersections, connections to traffic signal boxes, light sensors, and SCADA systems. It may also include fiber to city institutions such as schools, municipal buildings and libraries. The fiber design develops terminal locations for sensor connections and may include ring architectures for applications that require high levels of redundancy.

5.1.4 Small Cell 5G Network

A fiber deployment design may include working with carriers to design appropriate endpoints, route diversity and redundancy for Small Cell 5G deployments. This is typically designed based on coordination with the wireless carrier's backhaul and fronthaul requirements.

5.1.5 Future Proofing the Network

It is also important to build capacity and flexibility into the network design to accommodate future growth and technologies. The growth capacity can be built into the fiber network by increasing spare fiber availability at various network locations. Growth capacity can also be included in the aggregation sites to allow for more equipment racks. In addition to spare fiber and space availability, future growth and technology support can sometimes be accommodated by replacing the electronics that are attached to the fiber network. This capacity planning helps minimize future capital expenditures in the event of customer growth.

5.2 Engineering

Once the network design has been completed, detailed engineering is performed. This engineering results in construction plans that dictate construction materials, facility placement and network routing. Additionally, permit packages are completed and submitted during the engineering phase.

In preparation of the field engineering and permitting, the first step is to determine all agency jurisdictions that are impacted by the project. This includes municipal, state, federal, railroad, water, and environmental agencies that have jurisdiction in the project area. Once this list has been established, the next step is to meet with each agency to obtain their specific requirements.

5.2.1 Fielding

Fielding involves detailed onsite data collection, material selection, structure placement, and cable routing. The fielding staff develop construction plans that ensure the network design parameters, pole owner, and jurisdictional agency requirements are being met. The following describe the primary fielding tasks in more detail. Many providers utilize outside engineering firm resources to perform the fielding. Examples of fielding design maps are included in Appendix B.

Aerial Fielding

Data collection of existing and proposed aerial facilities is required on all poles that the new infrastructure will be framed on. This includes mainline, drop, and guy poles. The fielding staff gather both telecommunications and power infrastructure information.

Regional, state, and national regulating bodies have established minimum clearance requirements that all aerial installations must uphold. These entities include the National Electric Safety Code (NESC) and the National Electric Code (NEC). The fielding staff review the existing aerial infrastructure to determine if new cables can be added to the poles while meeting clearance and loading requirements.

In many instances additional communications plant cannot be added to a pole without creating a clearance violation. This violation may be a ground clearance issue or an overcrowding of different attachments. To resolve these violations, engineers perform make-ready engineering. This involves determining the work that needs to be performed on the pole to allow for the new attachment while not creating any violations. This commonly involves relocating existing attachments to a different height to create additional room on the pole. If no existing cables can be moved to create room on a pole, while maintaining all code requirements, the engineer often proposes a pole changeout to a taller pole or proposes an alternate construction method, such as underground construction.

Using the data collected in the field for each pole, an engineer also performs pole loading analysis (PLA) to ensure that the pole will not be overloaded. PLA is performed to meet federal, state, local, and pole owner requirements. In some instances, pole owners have higher standards than national, state, or local codes. If a pole does not meet the loading requirements, the engineer develops alternative solutions. This may be in the form of a pole change out or an alternate construction method. A sample PLA report for a single pole is included in Appendix B.

Underground Fielding

For underground data collection, the fielding staff determine the optimal running line of the underground fiber cable. To do this, the fielding staff must first research the existing utilities and right-of-way information in the project area. This research process includes meeting with local officials and residents to obtain maps and preliminary information and can take weeks or months depending upon the size of the area being constructed.

In determining existing utilities locations, cable and utility locates are also conducted. Any entity who has infrastructure near the proposed facilities will mark the exact location of their utility. The fielding staff will note the existing utilities from a reference point, such as the centerline of the road, along with the proposed fiber. Additionally, the fielding staff meets with local officials and residents to discuss items such as storm sewer information, soil conditions, and areas that may contain high amount of rock in the soil.

Material Selection

As part of the engineering process, an approved material list is created. During the fielding, this material list is utilized to select the actual products to be utilized for each facility placement. In the selection of materials, the engineer must review local codes, environmental requirements, manufacturer requirements and unique requirements of each placement location. For example, a structure that is being placed in a high-traffic area will have different requirements than a structure placed in a low traffic area. The engineer must also evaluate the upfront costs and long-term maintenance expenses associated with various materials choices.

There are numerous choices within each of the material types that must be decided upon. Each of these choices have cost and maintenance trade-offs and sometimes reliability or regulatory tradeoffs. This includes materials such as:

- Field cabinets
- Optical splitters
- Aerial cable
- Underground cable
- Conduit
- Aerial strand and materials
- Splice closures
- Manholes, handholes and vaults
- Grounding

<u>Structure Placement</u>

Structure placement is determined to minimize construction and operations/maintenance costs while meeting the design, engineering and agency jurisdiction requirements. This includes structures such as cabinet, handholes, vaults, and manholes. Some areas considered in the structure placement include:

- Permitting requirements – The permitting agency may have specific requirements that detail the acceptable placement of the structures.
- Location access – The placement must be evaluated to ensure that it can be easily accessed in the future for maintenance. For example, typically areas that require significant traffic control to access the structure are avoided.
- Interference with sidewalks or driveways
- Americans with Disabilities Act (ADA) compliance work – Placing a structure within an ADA area may result in significant cost to restore the area to ADA compliance.
- Grade of the terrain – Areas of steep grade of terrain are typically avoided as significant effort may be required in order to meeting permit and manufacturer requirements for the installation of the structure.

<u>Cable Routing</u>

The fielding staff plan the cable routing for the network. The fielding staff design the most efficient routes while adhering to the design and engineering specifications. Some considerations during the routing include:

- Minimum separations with other utilities, as specified in NESC and local codes, must be maintained along the route
- Locating splices where they can be easily accessed
- Avoiding easements that may be time consuming or expensive to obtain
- Avoiding locations that may have extensive permit requirements

The cable routing selection is critical, since a significant amount of the network investment is the labor associated with the placement of this cable. If this cable must be relocated for some reason before the end of the cable's economic life, the feasibility of the business plan can change dramatically.

5.2.2 Permitting

The permitting process is usually conducted in parallel to the fielding process. For a typical rural project there are usually many more agencies that require permits than an urban deployment. An urban deployment may only require coordination with a single municipality, while a rural deployment may require coordination with federal, state, county, and tribal agencies. Rural deployments may also require substantial amounts of private right-of-way coordination in some states depending on the rural roadway right-of-way laws. The permitting process often takes at least 30-60 days and involves the following entities:

- **Department of Transportation (DOT)** - DOT agencies often have specific permit drawing requirements. These include showing existing utilities, detailing the placement of cable relative to center line or right-of-way line, and inclusion of stationing and mile post information for all equipment placed in the right-of-way. The agencies may also require traffic control plans and storm water prevention plans. Often, they also request drive throughs with the field personnel to review proposed cable placement.
- **State/School** - Some states own land for purposes of recreation or wildlife conservation. To cross state-owned lands, a survey completed by a licensed surveyor may be required. In environmental sensitive areas, additional surveys may be required to ensure endangered species will not be affected. Completing these types of surveys requires significant time of three to six months to complete the necessary paperwork.
- **County Roads** - Counties may have specific construction requirements that need to be determined in the permitting process. This may include items such as: all roads and approaches must be bored, boring extra depth under culverts, cables may need to be placed on the edge of the road or in the actual road bed.
- **Municipal Permits** – Municipal entities may require such items as showing existing utilities, meetings with the city council to review the project, traffic control plans, and storm water prevention plans. These all require significant time and resources to engineer, compile drawings, and meet with the local officials.
- **Railroad** - Railroads often require engineered drawings to be submitted with the permits. The fees for crossing railroads can often be high cost and may take as long as 6 months for permits to be approved by the railroad.

Relevant particularly to rural construction and operations, the Federal government owns 28% of the land in the United States. When constructing in rural areas, it is therefore not uncommon to have to cross Federal land. When constructing on Federal lands, there are a variety of agencies that also require permits, which can be a time-consuming and costly process. These agencies could include one or more of the following:

- Bureau of Reclamation
- Bureau of Land Management

- US Forest Service/Grasslands
- US Park Service
- US Fish & Wildlife Waterfowl Areas
- Army Corp of Engineers
- Department of Natural Resources

These Federal entities often require additional information before permits will be granted. They may require cultural resource surveys and/or biological surveys (botany, mammalian, reptilian, insect). They may also require that construction only occur during specific times of the year to reduce impact to specific plant or wildlife species. They may require cable placement at deeper than normal depths, especially crossing larger water bodies. These items add significant time to reach an approved permit. Most Federal lands require a minimum of 6 months and often longer to receive an approved permit.

In many areas of the country, the provider may be constructing on tribal areas which may include the following coordination:

- Obtaining a tribal business license
- Complying with a Tribal Employment Rights Ordinance (TERO)
- Performing cultural surveys (could be in addition to other environmental surveys)
- Bureau of Indian Affairs (BIA) road and land permit approvals
- Tribal council permit/easement approvals for construction on tribal-owned tracts
- Allotted land easements (may require surveys, payment and signatures of 50% of interest holders)

To complete all the necessary paperwork and signatures for easements may require 6 months. Completion of the permit packages is often prioritized based on the processing lead-times indicated by the permitting agencies. Each required permit package is assembled according the specific permitting agency standards.

Once submitted, there is ongoing coordination that occurs with the permitting agency. This includes obtaining periodic updates from the permitting agency to verify that the permit is being processed and to answer questions.

5.2.3 Construction Plans

Once the design and engineering has been completed, the construction plans are developed. The construction plans include the proposed construction maps, guide drawings, and construction standards. The construction plans are typically combined with contract requirement documents and then utilized in a competitive bid process to select a construction contractor for the project.

The competitive bid process typically requires pre-bid meetings with the potential contractors to answer questions and ensure that the bidders have full understanding of the project. Once the bids are received, they are tabulated and reviewed to ensure the accuracy of the bids and to select the successful contractor.

6 Construction

6.1 Outside Plant

The construction of the outside plant network is very time-intensive and requires many resources. Again, rural networks are more expensive to construct on a per-subscriber basis than urban networks. Factors that make the costs more expensive include higher contractor deployment costs to these remote areas, long subscriber drops, and low density of subscribers in the service area. There is also typically a shorter construction season for rural networks since the buried construction techniques utilized in rural areas are impacted more by the freezing of the soil. Urban construction typically utilizes existing conduit and boring techniques that are not as impacted by freezing soil.

Outside plant construction requires large amounts of construction equipment, construction materials, contractor staff, and service provider representatives. Much effort is taken to ensure that the network is properly constructed. Improper construction can result in safety issues, expensive rework costs, and long-term maintenance issues.

6.1.1 Pre-Construction

Prior to actual construction, there are many logistical and communication items that need to be coordinated between the provider, the engineer, and the outside plant contractor.

Once awarded the contract, an initial step of the contractor is to place the order for the materials required by the construction plans. To receive, store, and distribute these materials, the contractor will need to procure a warehouse. Additionally, the contractor will need to obtain an equipment staging area for storing equipment when not in use and for performing equipment maintenance.

The contractor may also be required to conduct crew training prior to construction. This could include training certification by local government agencies for street cuts and restoration as well as safety training. It may also include training by specific material manufacturers regarding acceptable construction techniques.

The contractor and the provider also finalize the sequencing of the construction areas to be built. This may be prioritized by customer demand, status of construction permits, type of construction, or other factors. Based on the agreed upon sequencing, the contractor provides the provider a projection of the number of crews and construction schedule for each of the build areas.

Finally, prior to construction, the provider and contractor establish communication and escalation protocols. This typically includes contact lists and discussion regarding the types of issues that various staff should be notified of when they occur. These communication protocols may also include third-party provider representatives that will assist the provider through the construction process, such as quality control.

6.1.2 Construction

The contractor's construction is dictated by the construction and permit packages for the work. This includes ensuring that all material is installed per the provider's requirements, material manufacturer instructions, and local, state and national codes. The construction also includes performing more than just the placement of the fiber cable and materials, encompassing tasks such as tree trimming, aerial pole make-ready, locating of utilities, and restoration of the impacted

area after construction. Each of these items requires teams of workers to perform the necessary work.

Once construction has commenced, there is much ongoing coordination between the contractor and the provider's representatives. It is important for the provider to be aware of daily contractor crew locations and activities. This is necessary for notifying residents and business of upcoming construction in the area, performing quality control inspections and providing updates to local government officials. For aerial construction, is also necessary for keeping poles owners aware of make-ready and cable placement schedule and construction status.

During the construction, there are many safety processes that are implemented. Traffic control plans are implemented to provide for safe construction along roadways. Additionally, protocols are implemented that dictate zones around the construction where only specific personnel with the appropriate safety equipment can be located. Other safety procedures include digging holes to visually observe utilities that are being crossed by the new constructions.

Inspection of the contractor's work is performed by the provider's representatives throughout the construction process. This process is described in more detail in section 6.3. Additionally, the provider's representatives answer questions regarding construction plans, make decisions regarding field changes, and ensure that construction is being performed according to the plans and specifications.

Daily production is typically reported by the contractor and verified by the provider's representatives. The production information is utilized to assess construction status, such as whether construction timeline goals are being met and the accuracy of contractor payment requests. When goals are not being met, the production reports are useful in determining potential resolutions, such as additional crew personnel, additional crew training, or more efficient construction techniques.

The provider also keeps the permit agencies and pole owners informed of construction status to ensure timely inspection of the construction and to close-out permits and applications as soon as possible.

Once the construction in an area has been completed, the construction corridor must be restored to its previous condition. This includes removing any waste materials and filling and repairing holes in roads, sidewalks and driveways. It may also include restoring residents' lawns and seeding areas with grass.

After the fiber has been constructed, the fiber cables are spliced together to provide connectivity throughout the network. This requires careful planning to ensure that the fibers are spliced efficiently throughout the network and to maximize the use of the fiber. It also requires documentation and labeling to allow for future maintenance and troubleshooting of the network. After the fibers are spliced, they are tested to ensure that the fiber splices meet minimum requirements and to verify that the correct fibers have been spliced together. Example splice diagrams and test results are included in Appendix C.

6.2 Inside Plant

6.2.1 Electronics

Once the fiber network has been constructed, the operations and management of the system begins. At the aggregation sites, several electronics systems must be installed and provisioned. This includes the core data network, transport electronics, distribution electronics, voice service electronics, and potentially video electronics. The service provider typically conducts a competitive bid process for these systems and evaluates the proposals to determine which solutions best fit their network.

6.2.2 Provisioning

Once the electronics systems have been installed and tested, they must be configured to interoperate, and the appropriate circuits and services must be provisioned. As part of this installation process, the management systems for each of the electronics systems is installed. The service provider's technicians also undergo training in the operations and troubleshooting of each of the systems.

6.3 Quality Assurance / Quality Control

To speed time to market, save costs, and maximize construction quality many providers develop Quality Assurance (QA) and Quality Control (QC) procedures for the outside and inside plant construction. QA is the act of observing and providing feedback to correct potential issues during construction but prior to project final acceptance. The purpose of QA is to identify potential problems and allow them to be corrected early in the construction process. This may include issues such as:

- Training deficiencies
- Poor crew performance
- Incorrect understanding of requirements
- Inconsistency between subcontractors
- Use of outdated specifications
- Installation of incorrect material

QC is the final inspection of the construction product. An effective QA process should result in very few issues being identified during the QC inspections.

Both QA/QC are most often performed by strategically sampling the construction. Critical construction elements and items that are very difficult to correct are sampled at higher rates than less critical items. Additionally, the sampling is typically adjusted depending on the contractor crew performance.

Third-party firms are typically utilized by the provider to perform the QA/QC. The third-party firm tasks may include inspection of work to confirm conformance with the specifications, development of deficiency punch lists, analyzing trends, performing contractor training, and verifying correction of issues.

6.4 Turn-over Coordination

Once the construction has been completed, the contractor provides a turn-over package to the provider. This package typically includes fiber test results, tabulation of all constructed units, and contract close-out paperwork.

It is common for the provider to utilize the third-party QA/QC firm to review this information and to also perform the as-built redlines of the construction maps. This includes compiling a geo accurate inventory of the constructed system and building databases and maps of the information required to maintain and locate the facilities. This results in every fiber strand being accounted for and traceable in the network.

6.5 Customer Location Construction

Once the fiber routes have been constructed and the electronics systems have been installed and provisioned, the customer turn-up can begin. This involves constructing a drop to the customer, installing customer premises equipment, provisioning the customer's service, testing the service, and educating the customer.

The installation requires coordination and scheduling with the customers. Providers may have several staff that are dedicated to maintaining installation schedules and coordinating the installation crews.

During the installation, installation crews perform grounding/bonding work and must adhere to NEC and local safety standards and codes. The installation crew must also interface or perform rework of the customer's inside wiring.

7 Operations and Management

7.1 Operations

Once the network has been constructed, the job is hardly done; from one perspective, the job of delivering broadband is just starting as of that point. There are several items that need to be considered and completed to ensure a successful operation of the network. The operations and maintenance of a rural network is more expensive on a per-subscriber basis than an urban network. Low subscriber density results in maintenance staff having to cover large service territories. Additionally, rural networks are more susceptible to environmental factors such as floods, grass fires, and ice storms that may take down miles of pole lines.

7.1.1 Staffing

A significant part of the operations and management planning is ensuring adequate staffing is allocated. Staffing levels need to be established based on the size of the service market and services offered. Positions include technicians experienced in maintaining the outside plant facilities, the central office, distribution electronics, and data network elements.

Staff should be qualified with the experience in operating and maintaining the network. In addition to subscriber turn-ups, the service provider must troubleshoot network issues and perform network maintenance and repair.

In addition to operating the network, positions will be required in customer service as well as marketing and sales to sell the services and in accounting for billing and financial accountability.

7.1.2 Regulatory Considerations

State and federal regulatory requirements are another area that is often overlooked during the planning stages of building a broadband network. Deploying a network capable of delivering voice, broadband and even video services comes with a long list of regulatory considerations that could have a strain on the operations from labor demand to the financials. The level of complexity in regulatory components varies depending on the services that are offered.

A few of the regulatory considerations to be addressed may consist of the following:

- Obtaining Regulatory Authority and/or Eligible Telecommunications Carrier (ETC) status
- Interconnection Agreements
- Obtaining Numbering Resources and Local Number Portability
- E911 Plans
- Tariff Development and Filings – Both State and Interstate Tariffs
- Obtaining FCC Registration Number and Completing FCC Regulatory Filings (*e.g.*, Forms 477, 499, and 502; any ETC reporting duties)
- CPNI Compliance
- Red Flag Compliance
- CALEA Compliance

- Video – Programming and Retransmission Negotiations

In addition to the upfront startup regulatory considerations, there are regular regulatory filings that are required. These filings vary in recurrence with some being quarterly, semi-annually and annually.

7.2 Support Systems

There are several support systems that a typical service provider deploys to aid in the operations and management of the network. Each of these systems adds costs and requires staff and training to utilize.

A mapping system is needed to maintain the maps of the placed facilities. These systems contain information such as cable route, cable size, fiber splicing information and structure placement types and locations. These mapping systems typically also incorporate GPS location information regarding the facilities.

System providers also deploy trouble ticket systems. These systems are utilized to log subscriber troubles, assign them to staff for troubleshooting, and for escalating the issues. Trouble ticket systems can also be utilized to categorize the types of issues that are occurring and aid in identifying issue trends.

Providers also utilize complex billing and provisioning systems. These systems track customer information, financial information, service information, and various report functions. These systems may also be tied to flow through provisioning capabilities that allow a provider's customer representative to enable subscriber services through the network.

Appendices

Appendix A – Business Plan Examples

ABC COMPANY - FTTP FEASIBILITY STUDY
PROJECTED BALANCE SHEETS FOR YEARS 1 - 5

	Year 1	Year 2	Year 3	Year 4	Year 5
ASSETS					
CURRENT ASSETS					
CASH	$ 23,233	$ 69,016	$ 218,670	$ 398,844	$ 765,244
DEFERRED TAX ASSET	50,655	121,572	152,147	134,662	61,511
TOTAL CURRENT ASSETS	$ 73,888	$ 190,588	$ 370,817	$ 533,506	$ 826,755
PROPERTY, PLANT & EQUIPMENT					
PROPERTY, PLANT & EQUIPMENT	3,946,128	4,505,338	4,785,031	5,064,549	5,341,627
LESS: ACCUMULATED DEPRECIATION	47,218	251,580	491,161	754,218	1,040,565
NET PROPERTY, PLANT & EQUIP.	$ 3,898,910	$ 4,253,758	$ 4,293,870	$ 4,310,331	$ 4,301,062
TOTAL ASSETS	$ 3,972,798	$ 4,444,346	$ 4,664,687	$ 4,843,837	$ 5,127,817
LIABILITIES & EQUITY					
CURRENT LIABILITIES					
TOTAL CURRENT LIABLITIES	$ -	$ -	$ -	$ -	$ -
EQUITY					
PAID IN CAPITAL	$ 4,071,128	$ 4,680,338	$ 4,960,031	$ 5,105,240	$ 5,247,221
RETAINED EARNINGS	(98,330)	(235,992)	(295,344)	(261,403)	(119,404)
TOTAL EQUITY	$ 3,972,798	$ 4,444,346	$ 4,664,687	$ 4,843,837	$ 5,127,817
TOTAL LIABILITIES AND EQUITY	$ 3,972,798	$ 4,444,346	$ 4,664,687	$ 4,843,837	$ 5,127,817

ABC COMPANY - FTTP FEASIBILITY STUDY
PROJECTED INCOME STATEMENT FOR YEARS 1 - 5

	Year 1	Year 2	Year 3	Year 4	Year 5
OPERATING REVENUE					
VoIP SERVICES REVENUE	$ 45,000	$ 135,000	$ 202,500	$ 247,500	$ 292,500
VIDEO SERVICES REVENUE	90,804	354,889	419,297	512,511	621,995
BROADBAND DATA REVENUE	79,425	238,275	357,413	436,838	516,263
LESS: UNCOLLECTIBLE REVENUE (1%)	(2,152)	(7,282)	(9,792)	(11,968)	(14,308)
TOTAL OPERATING REVENUE	$ 213,077	$ 720,882	$ 969,418	$ 1,184,881	$ 1,416,450
OPERATING EXPENSE					
PLANT SPECIFIC OPERATIONS EXPENSE	$ 68,609	$ 120,524	$ 123,712	$ 129,955	$ 136,282
PLANT NON-SPECIFIC OPERATIONS EXPENSE	20,100	55,236	82,273	100,311	118,350
DEPRECIATION & AMORTIZATION EXPENSE	47,218	204,362	239,581	263,057	286,347
CUSTOMER OPERATIONS EXPENSE	107,044	215,673	217,708	165,844	96,003
CORPORATE OPERATIONS EXPENSE	50,950	50,074	52,455	54,278	56,135
VIDEO PROGRAMMING AND BROADBAND EXPENSE	65,478	274,581	331,498	405,199	490,477
GENERAL TAX [1]	2,663	9,011	12,118	14,811	17,706
TOTAL OPERATING EXPENSES	$ 362,062	$ 929,461	$ 1,059,344	$ 1,133,454	$ 1,201,300
NET OPERATING INCOME (LOSS)	$ (148,985)	$ (208,579)	$ (89,927)	$ 51,426	$ 215,150
PROVISION FOR INCOME TAXES [2]	$ (50,655)	$ (70,917)	$ (30,575)	$ 17,485	$ 73,151
NET INCOME (LOSS)	$ (98,330)	$ (137,662)	$ (59,352)	$ 33,941	$ 141,999
EBIDTA	*$ (101,767)*	*$ (4,217)*	*$ 149,654*	*$ 314,483*	*$ 501,497*

[1] The General Tax Expense has been calculated at 2.5% on half of the annual gross revenues.
[2] The Federal Income Tax Expense has been calculated at a rate of 34%. The tax benefit of tax losses in the initial years has been taken into consideration in subsequent years.

ABC COMPANY - FTTP FEASIBILITY STUDY
PROJECTED CASH FLOW STATEMENT FOR YEARS 1 - 5

	Year 1	Year 2	Year 3	Year 4	Year 5
CASH FLOW FROM OPERATING ACTIVITIES:					
NET INCOME (LOSS)	(98,330)	(137,662)	(59,352)	33,941	141,999
DEPRECIATION & AMORTIZATION EXPENSE	47,218	204,362	239,581	263,057	286,347
(INCREASE) DECREASE IN DEFERRED TAX ASSET	(50,655)	(70,917)	(30,575)	17,485	73,151
NET CASH PROVIDED (USED) BY OPER. ACT.	(101,767)	(4,217)	149,654	314,483	501,497
CASH FLOW FROM INVESTMENT ACTIVITIES:					
PROPERTY, PLANT AND EQUIPMENT ADDITIONS	(3,946,128)	(559,210)	(279,693)	(279,518)	(277,078)
NET CASH USED BY INVESTING ACTIVITIES	(3,946,128)	(559,210)	(279,693)	(279,518)	(277,078)
CASH FLOW FROM FINANCING ACTIVITIES:					
EQUITY INVESTMENT	4,071,128	609,210	279,693	145,209	141,981
NET CASH PROVIDED (USED) BY FIN. ACT.	4,071,128	609,210	279,693	145,209	141,981
NET INCREASE (DECREASE) IN CASH	$ 23,233	$ 45,783	$ 149,654	$ 180,174	$ 366,400
CASH, BEGINNING OF PERIOD	$0	$ 23,233	$ 69,016	$ 218,670	$ 398,844
CASH, END OF PERIOD	$ 23,233	$ 69,016	$ 218,670	$ 398,844	$ 765,244

ABC COMPANY - FTTP FEASIBILITY STUDY
PROJECTED PROPERTY, PLANT AND EQUIPMENT INVESTMENT

Projected Subscribers	Year 1	Year 2	Year 3	Year 4	Year 5
VoIP	188	375	469	563	656
Broadband Data	250	500	625	750	875
Video	200	400	500	600	700
Projected Electronics & Switching Equipment Investment	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Standard STB Count	229	229	115	114	115
DVR STB Count	98	98	49	49	49
Fiber-to-the-Premises (FTTP)					
Electronics	287,515	287,515	143,758	143,758	143,758
VIDEO					
Customer Premise Equipment - STB Standard	37,785	37,785	18,975	18,810	16,500
Customer Premise Equipment - STB DVR	24,500	24,500	12,250	12,250	12,250
Middleware - Incremental Cost (Licenses)	12,000	12,000	6,000	6,000	6,000
Encryption - Incremental Cost	3,270	3,270	1,640	1,630	1,500
Total Projected Electronics and Video [1]	**$ 365,070**	**$ 365,070**	**$ 182,623**	**$ 182,448**	**$ 180,008**
Projected Outside Plant Investment	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Mainline					
Town Fiber	3,156,907				
Fiber Drop to Premise	$194,140	$194,140	$97,070	$97,070	$97,070
Total Projected Outside Plant [1]	**$ 3,351,047**	**$ 194,140**	**$ 97,070**	**$ 97,070**	**$ 97,070**
Central Office Investment	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Hut	$ 230,011	$ -	$ -	$ -	
Total Central Office and Hut Investment [1]	**$ 230,011**	**$ -**	**$ -**	**$ -**	**$ -**
Total Projected Property, Plant & Equipment Investment	**$ 3,946,128**	**$ 559,210**	**$ 279,693**	**$ 279,518**	**$ 277,078**
Cumulative Investment Totals	$ 3,946,128	$ 4,505,338	$ 4,785,031	$ 5,064,549	$ 5,341,627
Total Projected Subscribers	250	500	625	750	875
Investment per Subscriber	$ 15,785	$ 9,011	$ 7,656	$ 6,753	$ 6,105

[1] Overheads to cover engineering, taxes and delivery have been included. - Year 1 is the construction year for the outside plant fiber and electronics.

ABC COMPANY - FTTP FEASIBILITY STUDY
PROJECTED PENETRATION RATES & REVENUES

Exchange	Total Locations[1]	Line Growth %	Year 1	Year 2	Year 3	Year 4	Year 5
Unserved USA	2,500	0.0%	2,500	2,500	2,500	2,500	2,500
Totals	2,500	0	2,500	2,500	2,500	2,500	2,500
Penetration Rate							
VoIP Access Lines			7.5%	15.0%	18.8%	22.5%	26.3%
Projected Subscribers							
VoIP Access Lines			188	375	469	563	656
Total VoIP Lines			188	375	469	563	656

VoIP Revenues	Year 1	Year 2	Year 3	Year 4	Year 5
Monthly Local Rate - Includes LD	$ 40.00	$ 40.00	$ 40.00	$ 40.00	$ 40.00
Local Service Revenue	45,000	135,000	202,500	247,500	292,500
Total VoIP Revenue[2]	$ 45,000	$ 135,000	$ 202,500	$ 247,500	$ 292,500

Video Subscribers at Year End	Subscriber Growth %	Year 1	Year 2	Year 3	Year 4	Year 5
Total Potential Video Subscribers [1*]	0.0%	2,500	2,500	2,500	2,500	2,500
Penetration Rate		8.0%	16.0%	20.0%	24.0%	28.0%
Video Subscribers		200	400	500	600	700
Basic Package Percentage		18%	18%	18%	18%	18%
Basic Package Subscribers		36	73	91	109	127
Expanded Package Percentage		50%	50%	50%	50%	50%
Expanded Package Subscribers		100	199	249	299	348
Digital Package Percentage		32%	32%	32%	32%	32%
Digital Package Subscribers		64	128	160	192	224
Premium Channels Package Percentage		18%	18%	18%	18%	18%
Premium Channels Package Subscribers		36	72	89	107	125
Additional Set Top Box Percentage		64%	64%	64%	64%	64%
Additional Set Top Box Subscribers		127	254	318	381	445
DVR Percentage		49%	49%	49%	49%	49%
DVR Subscribers		98	196	245	294	343
Whole Home DVR Percentage		17%	17%	17%	17%	17%
Whole Home DVR Subscribers		34	68	85	102	119

	Year 1	Year 2	Year 3	Year 4	Year 5
Video Rates					
Growth in Rates		0%	3%	0%	3%
Basic Package	$ 31.95	$ 31.95	$ 32.91	$ 32.91	$ 33.90
Expanded Package	$ 68.95	$ 68.95	$ 71.02	$ 71.02	$ 73.15
Digital Package	$ 82.95	$ 82.95	$ 85.44	$ 85.44	$ 88.00
Premium Channels	$ 12.95	$ 12.95	$ 13.34	$ 13.34	$ 13.74
Projected Video Revenues					
Basic Package	6,901	27,988	32,383	39,492	48,002
Expanded Package	41,370	164,653	190,902	233,514	283,968
Digital Package	31,853	127,411	147,640	180,449	219,648
Premium Channels	2,797	11,189	12,886	15,688	19,126
Total Video Revenues[2]	$ 82,921	$ 331,241	$ 383,811	$ 469,143	$ 570,744
CPE Lease Rates					
Additional Set Top Box	$ 4.95	$ 4.95	$ 4.95	$ 4.95	$ 4.95
DVR	$ 5.95	$ 5.95	$ 5.95	$ 5.95	$ 5.95
Whole Home DVR	$ 3.00	$ 3.00	$ 3.00	$ 3.00	$ 3.00
Projected CPE Revenues					
Additional Set Top Box	3,772	11,316	16,988	20,760	24,532
DVR	3,499	10,496	15,744	19,242	22,741
Whole Home DVR	612	1,836	2,754	3,366	3,978
Total CPE Lease Revenues[4]	$ 7,883	$ 23,648	$ 35,486	$ 43,368	$ 51,251

[1] Per information provided by VPS engineering Cap Ex estimates

[1*] No marketing survey completed. Penetration estimate based on previous feasibilities in the area by VPS

[2] Annual Revenues are based on avg Projected Subscribers at the beginning and end of the year multiplied by Projected Rates

ABC COMPANY - FTTP FEASIBILITY STUDY
PROJECTED PENETRATION RATES & REVENUES

Broadband Data Subscribers at Year End	Year 1	Year 2	Year 3	Year 4	Year 5
Broadband penetration rate [1]	10.0%	20.0%	25.0%	30.0%	35.0%
Broadband Data Subscribers	250	500	625	750	875
Total	250	500	625	750	875
Broadband Data Subscribers-4M / 1M - Penetration	45%	45%	45%	45%	45%
Broadband Data Subscribers-4M / 1M - Subscribers	113	225	281	338	394
Broadband Data Subscribers-10M / 2.5M - Penetration	23%	23%	23%	23%	23%
Broadband Data Subscribers-10M / 2.5M - Subscribers	56	113	141	169	197
Broadband Data Subscribers-25M / 6.25M - Penetration	23%	23%	23%	23%	23%
Broadband Data Subscribers-25M / 6.25M - Subscribers	56	113	141	169	197
Broadband Data Subscribers-50M / 12.5M - Penetration	5%	5%	5%	5%	5%
Broadband Data Subscribers-50M / 12.5M - Subscribers	13	25	31	38	44
Broadband Data Subscribers-100M / 25M - Penetration	5%	5%	5%	5%	5%
Broadband Data Subscribers-100M / 25M - Subscribers	13	25	31	38	44
Broadband Data Rates					
Broadband Data Subscribers-4M / 1M	$ 39.95	$ 39.95	$ 39.95	$ 39.95	$ 39.95
Broadband Data Subscribers-10M / 2.5M	$ 49.95	$ 49.95	$ 49.95	$ 49.95	$ 49.95
Broadband Data Subscribers-25M / 6.25M	$ 59.95	$ 59.95	$ 59.95	$ 59.95	$ 59.95
Broadband Data Subscribers-50M / 12.5M	$ 79.95	$ 79.95	$ 79.95	$ 79.95	$ 79.95
Broadband Data Subscribers-100M / 25M	$ 124.95	$ 124.95	$ 124.95	$ 124.95	$ 124.95
Projected Broadband Data Revenues					
Broadband Data Subscribers-4M / 1M	26,966	80,899	121,348	148,314	175,281
Broadband Data Subscribers-10M / 2.5M	16,858	50,574	75,862	92,720	109,578
Broadband Data Subscribers-25M / 6.25M	20,233	60,699	91,049	111,282	131,515
Broadband Data Subscribers-50M / 12.5M	5,996	17,989	26,983	32,979	38,976
Broadband Data Subscribers-100M / 25M	9,371	28,114	42,171	51,542	60,913
Total Broadband Data Revenues [2]	**$ 79,425**	**$ 238,275**	**$ 357,413**	**$ 436,838**	**$ 516,263**

[1] No marketing survey completed. Penetration estimate based on previous feasibilities in the area by VPS

[2] Annual Revenues are based on an average of Projected Subscribers at the beginning and end of the year multiplied by Projected Rates

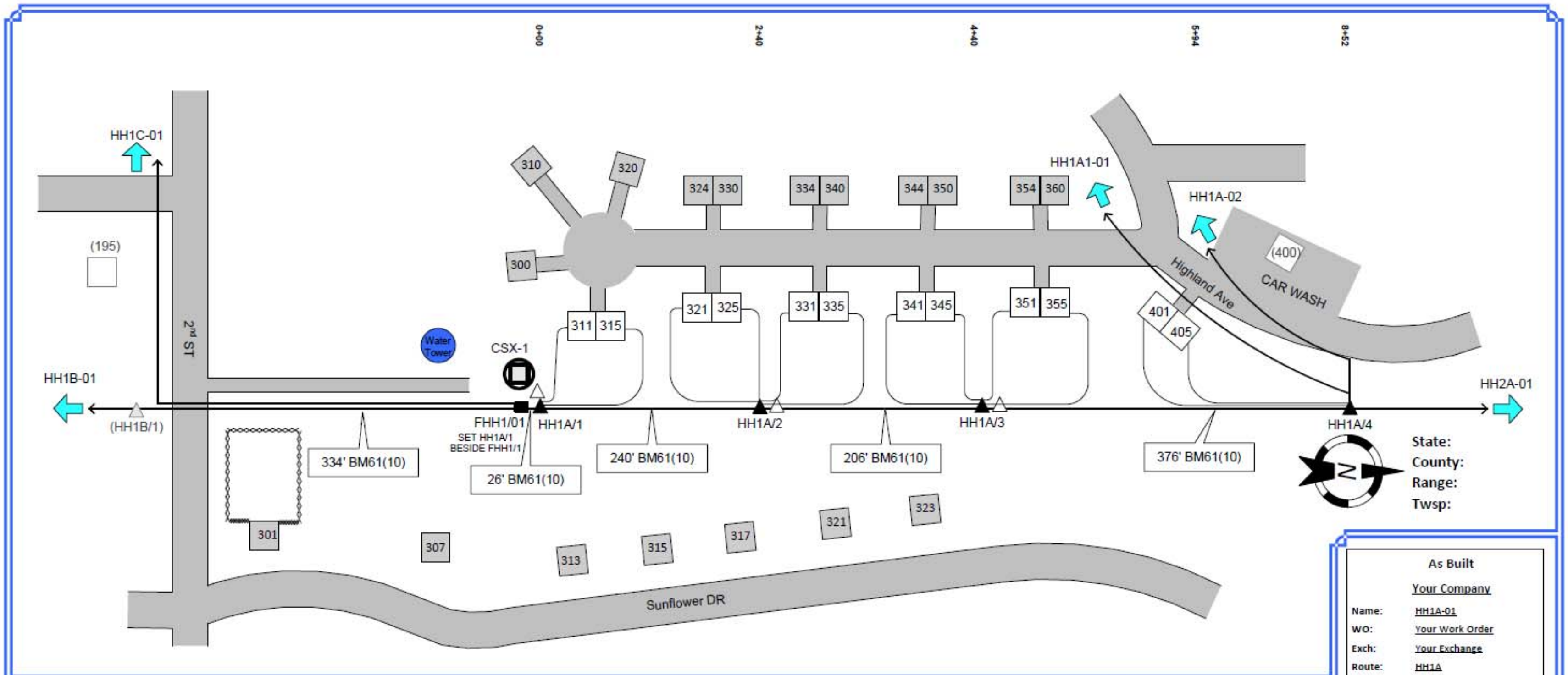
ABC COMPANY - FTTP FEASIBILITY STUDY
TOTAL PROJECTED OPERATING EXPENSES

	Year 1	Year 2	Year 3	Year 4	Year 5
Annual Expense Growth Factor	3%	3%	3%	3%	3%
Projected VoIP subscribers	188	375	469	563	656
Projected video subscribers	200	400	500	600	700
Projected data subscribers	250	500	625	750	875
Network Expenses					
Vehicle					
Number of Vehicles-Maintenance	1	1	1	1	1
Monthly Operating Cost (Service Vehicle)	$ 600	$ 618	$ 637	$ 656	$ 676
Total Vehicle Expense	$ 7,200	$ 7,416	$ 7,644	$ 7,872	$ 8,112
Contracted Services					
Contracted Inside Wiring ($150 per installation) [1]	-	-	-	-	-
Digital Headend Encoding Cost ($2.50 /Sub/Mo)	3,000	9,000	13,500	16,500	19,500
EPG Annual Fee ($500 min plus $0.50/sub)	550	650	725	775	825
Annual Support Fee - License ($3.50/sub)	350	1,050	1,575	1,925	2,275
Annual Encryption Fee ($1.50/STB)	285	1,140	1,425	1,710	1,995
Personnel Related Network Expenses	33,614	69,243	71,320	73,459	75,664
Electronics & Equip. Investment warranty & support	6,000	6,180	6,365	6,556	6,753
Miscellaneous Plant Materials & Supplies ($50 per sub)	9,375	9,375	4,688	4,688	4,687
Total Contracted Services	$ 53,174	$ 96,638	$ 99,598	$ 105,613	$ 111,700
VoIP Services					
VoIP Costs ($16.00/Sub - includes LD costs)	19,500	54,000	81,000	99,000	117,000
Total VoIP Services	$ 19,500	$ 54,000	$ 81,000	$ 99,000	$ 117,000
Facility Leases					
Pole Lease Rate-In town(per attachments per yr)	$10.00	$10.00	$10.00	$10.00	$10.00
In town Attachments [2]	1,647	1,647	1,647	1,647	1,647
Lease - Pole Attachment(In town) Expense	8,235	16,470	16,470	16,470	16,470
Total Facility Leases	$ 8,235	$ 16,470	$ 16,470	$ 16,470	$ 16,470
Miscellaneous					
Electricity / Utilities	600	$ 1,236	$ 1,273	$ 1,311	$ 1,350
Total Network Expenses	**$ 88,709**	**$ 175,760**	**$ 205,985**	**$ 230,266**	**$ 254,632**
Video Programming and Internet Expense					
Basic Expense %	57%	57%	57%	57%	57%
Expanded Package Expense %	70%	70%	70%	70%	70%
Digital Package Expense %	75%	75%	75%	75%	75%
Premium Expense %	78%	78%	78%	78%	78%
HD Expense %	78%	78%	78%	78%	78%
Incremental cost per Data Sub per Month - 4/1	$ 4.53	$ 4.53	$ 4.53	$ 4.53	$ 4.53
Incremental cost per Data Sub per Month - 10/2.5	$ 7.59	$ 7.59	$ 7.59	$ 7.59	$ 7.59
Incremental cost per Data Sub per Month - 25/6.25	$ 10.65	$ 10.65	$ 10.65	$ 10.65	$ 10.65
Incremental cost per Data Sub per Month - 50/12.5	$ 18.30	$ 18.30	$ 18.30	$ 18.30	$ 18.30
Incremental cost per Data Sub per Month - 100/25	$ 32.56	$ 32.56	$ 32.56	$ 32.56	$ 32.56
Basic Package Programming Cost [3]	3,934	15,953	18,458	22,510	27,361
Expanded Package Programming Cost [3]	28,959	115,257	133,631	163,460	198,778
Digital Package Programming Cost [3]	23,890	95,558	110,730	135,337	164,736
Premium Programming Cost [3]	2,182	8,727	10,051	12,237	14,918
HD Programming Cost [3]	-	-	-	-	-
Total Video Programming Expense	$ 58,964	$ 235,496	$ 272,871	$ 333,544	$ 405,793
Projected Incremental High Speed Internet Expenses [4]	6,514	39,085	58,627	71,655	84,684
Total Video Programming and Internet Expense	**$ 65,478**	**$ 274,581**	**$ 331,498**	**$ 405,199**	**$ 490,477**
Customer Operations Expense					
Personnel Related Customer Operations Expenses	12,448	25,642	26,411	27,203	28,019
Marketing [5]	93,750	187,500	187,500	125,000	62,500
Billing & Collection Costs [6]	846	2,531	3,797	4,641	5,484
Total Customer Operations Expenses	**$ 107,044**	**$ 215,673**	**$ 217,708**	**$ 165,844**	**$ 96,003**

[1] Inside Wiring installations assumes existing employees will complete and the labor costs are assumed to cover the cost.
[2] Assumes 30 attachments per fiber mile.
[3] Assumes basic channel line ups and applied average programming costs for the packages based on a % of revenue for the expenses
[4] Estimated cost per subscriber is based on the following costs: $4.53 for the 5/1.5; $10.65 for the 25/5; and $18.30 for the 50/5 offering - includes costs for bandwidth, call center tech support and additional maintenance. Subscribers added during year are assumed added in middle of year.
[5] Marketing costs are calculated at an annual rate of $10 per year per potential location in Year 1. In the remaining years, marketing costs are calculated at an annual rate of $5 per year per potential location.
[6] Billing & Collection costs are assumed to be $0.75 per subscriber.

Appendix B – Design and Engineering Examples

Field Design Maps Examples



From	To	PType	Units	Feet	BM		HB	HO		NID	Remarks
(HH1B/1)	FHH1/01	BHF(48x72x36)	BFO 576RI	412	2(5/8)(8)	1	FO(576)	12	48		TYCO 450D
	FHH1/01		BFO 576RI	334	61(10)	334					LEAVE 100 COILS IN FHH1/1
	FHH1/01		BFO 576RI	334							
	FHH1/01		BFO 576RI	334							
	FHH1/01		BFO 576RI	334							
	FHH1/01		BFO 576RI	334							
	FHH1/01		BFO 144RI	334							
	FHH1/01		BFO 48RI	412							
	FHH1/01		BFOV(2x1.25)	334							

Field Design Maps Examples - Continued

From	To	PType	Units	Feet	BM		HB	HO		NID	Remarks
	FHH1/01		BFOV(9x2)	334							
	CSX-1	E(CSX-216)									
FHH1/01	HH1A/1	TV-106	BFO 576RI	26	2(5/8)(8)	1	FO(48)	1	2		TYCO 450B
	HH1A/1		BFO 576RI	26	61(10)	26					
	HH1A/1		BFO 576RI	26							
	HH1A/1		BFO 576RI	26							
	HH1A/1		BFO 576RI	26							
	HH1A/1		BFO 144RI	44							
	HH1A/1		BFO 96RI	44							
	HH1A/1		BFO 48RI	104							
	HH1A/1		BFO 48RI	44							
	HH1A/1		BFOV(4x1.25)	26							
	HH1A/1		BFOV(8x2)	26							
HH1A/1	HH1A/1		BFOV(2x1.25)	8							
HH1A/1	311		SEBF 4	124	83	1		1	1	3	
HH1A/1	315		SEBF 4	236	83	1		1	1	3E	
HH1A/1	HH1A/2	TV-106	BFO 576RI	240	2(5/8)(8)	1	FO(48)	1	4		TYCO 450B
	HH1A/2		BFO 576RI	240	61(10)	240					LEAVE 36' COIL IN HH1B/2
	HH1A/2		BFO 576RI	240							
	HH1A/2		BFO 576RI	240							
	HH1A/2		BFO 576RI	240							
	HH1A/2		BFO 144RI	240							
	HH1A/2		BFO 96RI	240							
	HH1A/2		BFO 48RI	276							
	HH1A/2		BFO 48RI	240							
	HH1A/2		BFOV(4x1.25)	240							
	HH1A/2		BFOV(8x2)	240							
HH1A/2	HH1A/2		BFOV(2x1.25)	8							
HH1A/2	321		SEBF 4	212	83	1		1	1	3	
HH1A/2	325		SEBF 4	108	83	1		1	1	3	
HH1A/2	331		SEBF 4	88	83	1		1	1	3	
HH1A/2	335		SEBF 4	168	83	1		1	1	3	
HH1A/2	HH1A/3	TV-106	BFO 576RI	206	2(5/8)(8)	1	FO(48)	1	4		TYCO 450B
	HH1A/3		BFO 576RI	206	61(10)	206					LEAVE 36' COIL IN HH1B/3
	HH1A/3		BFO 576RI	206							
	HH1A/3		BFO 576RI	206							
	HH1A/3		BFO 576RI	206							
	HH1A/3		BFO 144RI	206							
	HH1A/3		BFO 96RI	206							
	HH1A/3		BFO 48RI	242							
	HH1A/3		BFO 48RI	206							
	HH1A/3		BFOV(4x1.25)	206							
	HH1A/3		BFOV(8x2)	206							
HH1A/3	HH1A/3		BFOV(2x1.25)	8							
HH1A/3	341		SEBF 4	180	83	1		1	1	3	

As Built

Your Company

Name: HH1A-01
WO: Your Work Order
Exch: Your Exchange
Route: HH1A
ROW: Public

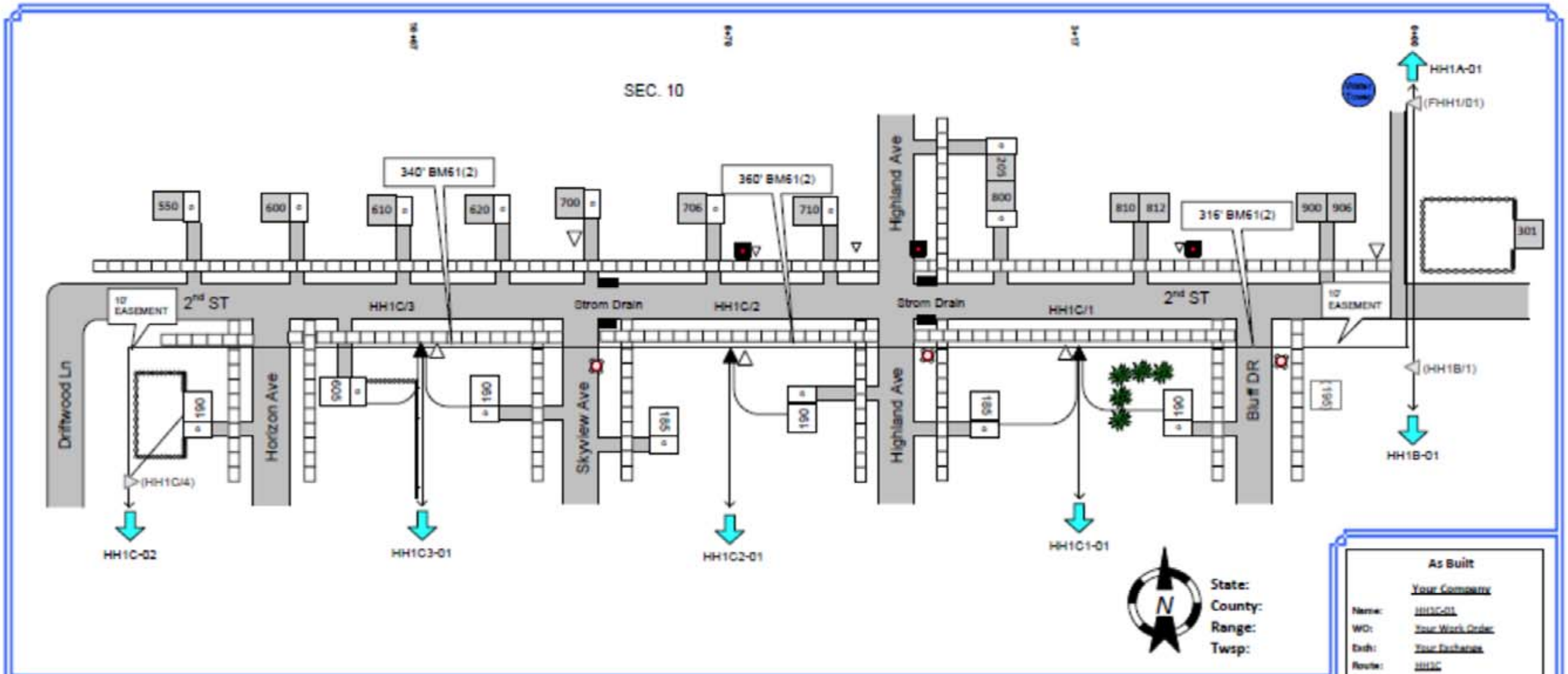
Staked By: ______ Date: ______
Revised By: ______ Date: ______
Plowed By: ______ Date: ______
Tabbed By: ______ Date: ______

VantagePoint

Drawing Not to Scale

Sheet	1A	of	3

Field Design Maps Examples - Continued



From	To	PType	Units	Feet	BM		HB	HO		NID	Remarks
(FHH1/01)	HH1C/1	TV-106	BFO 144RI	334	2(5/8)(8)	1	FO(144)	1	2		TYCO 450B
	HH1C/1		BFOV(1x1.25)	316	61(2)	316		12	4		LEAVE 36' COIL IN HH1C/1
HH1C/1	185		SEBF 4	194	83	1		1	1	3E	
HH1C/1	190		SEBF 4	310	83	1		1	1	3	
HH1C/1	HH1C/2	TV-106	BFO 144RI	396	2(5/8)(8)	1	FO(144)	1	1		TYCO 450B
	HH1C/2		BFOV(1x1.25)	368	61(2)	360		12	4		LEAVE 36' COIL IN HH1C/2
HH1C/2	190		SEBF 4	206	83	1		1	1	3	
HH1C/2	HH1C/3	TV-106	BFO 144RI	376	2(5/8)(8)	1	FO(144)	1	2		TYCO 450B
	HH1C/3		BFOV(1x1.25)	348	61(2)	340		12	4		LEAVE 36' COIL IN HH1C/3

As Built

Your Company

Name: HH1C-01
WO: Your Work Order
Exch: Your Exchange
Route: HH1C
ROW: Public

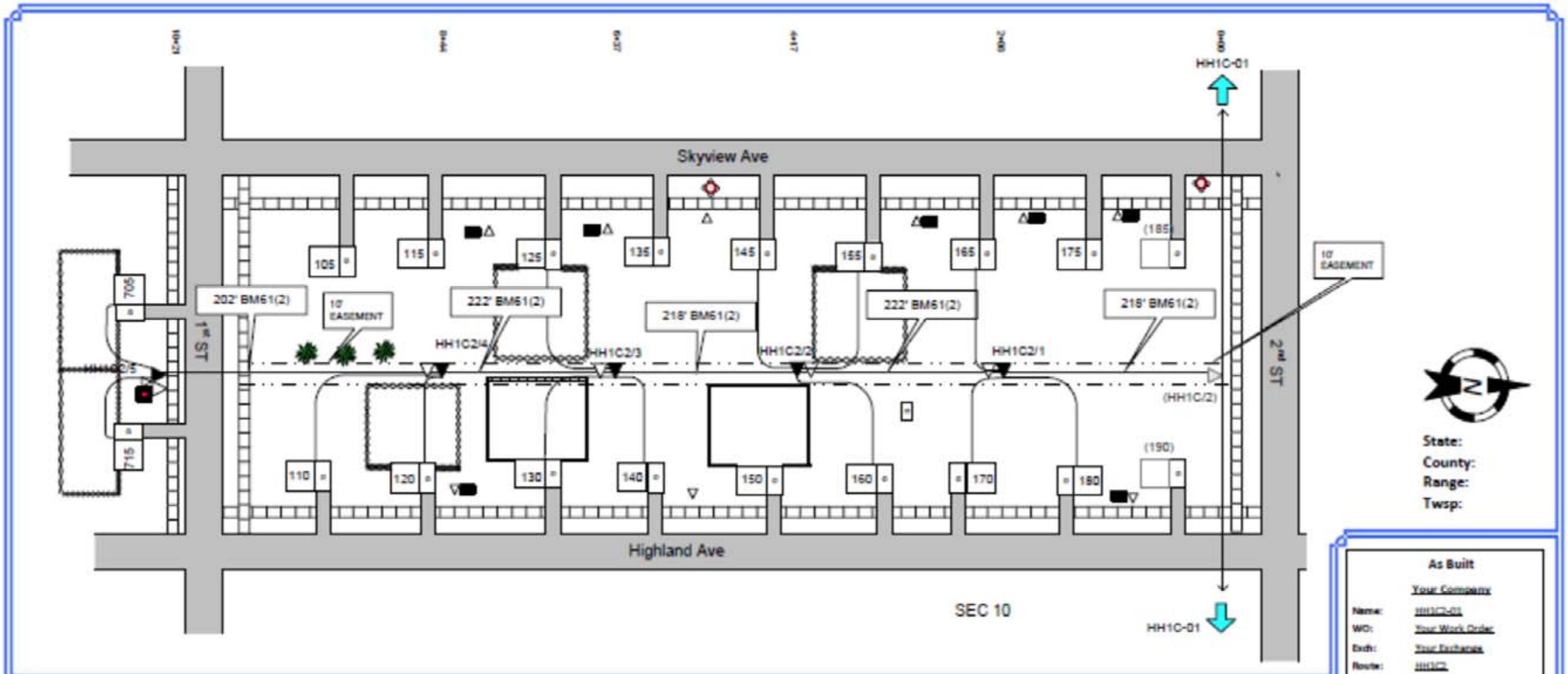
Staked By: ______ Date: ______
Revised By: ______ Date: ______
Plowed By: ______ Date: ______
Tabbed By: ______ Date: ______

VantagePoint

Drawing Not to Scale

Sheet	1	of	2

Field Design Maps Examples - Continued



From	To	PType	Units	Feet	BM		HB	HO		NID	Remarks
(HH1C/2)	HH1C2/1	TV-106	BFO 48RI	254	2(5/8)(8)	1	FO(48)	1	3		TYCO 450B
	HH1C2/1		BFOV(1x1.25)	218	61(2)	218					LEAVE 36' COIL IN HH1C2/1
HH1C2/1	170		SEBF 4	214	83	1		1	1	3	
HH1C2/1	165		SEBF 4	240	83	1		1	1	3	
HH1C2/1	180		SEBF 4	212	83	1		1	1	3	
HH1C2/1	HH1C2/2	TV-106	BFO 48RI	258	2(5/8)(8)	1	FO(48)	1	3		TYCO 450B
	HH1C2/2		BFOV(1x1.25)	222	61(2)	222					LEAVE 36' IN HH1C2/2
HH1C2/2	155		SEBF 4	148	83	1		1	1	3	
HH1C2/2	145		SEBF 4	128	83	1		1	1	3	

As Built

Your Company

Name: [illegible]
WO: Your Work Order
Exch: Your Exchange
Route: [illegible]
ROW: Public

Staked By: ______ Date: ______
Revised By: ______ Date: ______
Plowed By: ______ Date: ______
Tabbed By: ______ Date: ______

VantagePoint

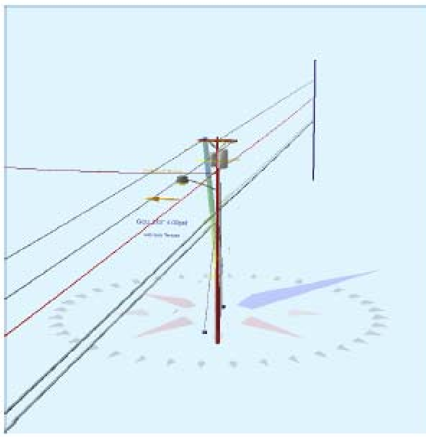
Drawing Not to Scale

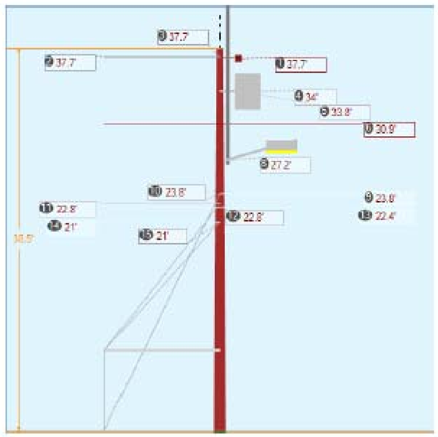
Sheet	1	of	1

Pole Loading Analysis Example (for a single pole)

Pole ID:Pole_99_pplx.pplx **O-Calc® Pro *Standard Report*** Thursday, December 28, 2017 5:11 PM

Pole Num:	**99**	Pole Length / Class:	**45 / 3**	Code:	**NESC**	Structure Type:	**Guyed Tangent**
Map Number	**B1101C**	Species:	**DOUGLAS FIR**	NESC Rule:	**Rule 250B**	Status	**Guy Wires Adequate**
Aux Data 2	**Unset**	Setting Depth (ft):	**6.50**	Construction Grade:	**B**	Pole Strength Factor:	**0.65**
Aux Data 3	**Unset**	G/L Circumference (in):	**37.31**	Loading District:	**Medium**	Transverse Wind LF:	**2.50**
Aux Data 4	**Unset**	G/L Fiber Stress (psi):	**8,000**	Ice Thickness (in):	**0.25**	Wire Tension LF:	**1.65**
Aux Data 5	**Unset**	Allowable Stress (psi):	**5,200**	Wind Speed (mph):	**39.53**	Vertical LF:	**1.50**
Aux Data 6	**Unset**	Fiber Stress Ht. Reduc:	**No**	Wind Pressure (psf):	**4.00**		
Latitude:	**0.000000 Deg**	Longitude:			**0.000000 Deg**	Elevation:	**0 Feet**





Pole Capacity Utilization (%)		Height (ft)	Wind Angle (deg)
Maximum	86.6	0.0	233.4
Groundline	86.6	0.0	233.4
Vertical	7.0	24.1	146.0

Pole Moments (ft-lb)		Load Angle (deg)	Wind Angle (deg)
Max Cap Util	60,228	211.9	233.4
Groundline	60,228	211.9	233.4
GL Allowable	71,284		

Pole Loading Analysis Example (for a single pole) - Continued

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Guy System Component Summary				Load From Worst Wind Angle on Pole	
Description	**Lead Length (ft)**	**Lead Angle (deg)**	**Height (ft)**	**Nominal Capacity (%)**	**Wind Angle (deg)**
Single - 10" - Soil Class 4	6.0	326.0		24.2	233.4
10M (Sidewalk)			21.0	34.0	233.4
Sidewalk Strut	6.0	326.0	8.0	77.9	233.4
EHS 1/4 (Sidewalk)			22.8	29.6	233.4
Single - 10" - Soil Class 4	14.0	146.0		0.0	233.4
10M (Down)			23.8	0.0	233.4
Single - 10" - Soil Class 4	188.0	326.0		17.4	233.4
HS 7/16 (Span/Head)			37.7	26.6	233.4
			System Capacity Summary:	**Adequate**	

Groundline Load Summary - Reporting Angle Mode: Load - Reporting Angle: 211.9°

	Shear Load* (lbs)	Applied Load (%)	Bending Moment (ft-lb)	Applied Moment (%)	Pole Capacity (%)	Bending Stress (+/- psi)	Vertical Load (lbs)	Vertical Stress (psi)	Total Stress (psi)	Pole Capacity (%)
Powers	1,816	48.5	**59,794**	99.3	**83.9**	**4,808**	230	2	**4,810**	**92.5**
Comms	2,227	59.5	**41,494**	68.9	**58.2**	**3,337**	897	8	**3,345**	**64.3**
GuyBraces	-804	-21.5	**-51,859**	-86.1	**-72.8**	**-4,170**	6,734	61	**-4,109**	**-79.0**
PowerEquipments	114	3.0	**2,978**	4.9	**4.2**	**239**	1,928	17	**257**	**4.9**
Pole	287	7.7	**5,028**	8.4	**7.1**	**404**	1,774	16	**420**	**8.1**
Crossarms	5	0.1	**171**	0.3	**0.2**	**14**	159	1	**15**	**0.3**
Streetlights	44	1.2	**1,561**	2.6	**2.2**	**126**	114	1	**127**	**2.4**
Risers	47	1.3	**805**	1.3	**1.1**	**65**	43	0	**65**	**1.3**
Insulators	7	0.2	**256**	0.4	**0.4**	**21**	44	0	**21**	**0.4**
Pole Load	3,742	100.0	**60,228**	100.0	**84.5**	**4,843**	11,923	108	**4,950**	**95.2**
Pole Reserve Capacity			**11,056**		**15.5**	**357**			**250**	**4.8**

Detailed Load Components:

Power		Height (ft)	Horiz. Offset (in)	Cable Diameter (in)	Sag at Max Temp (ft)	Cable Weight (lbs/ft)	Lead/Span Length (ft)	Span Angle (deg)	Wire Length (ft)	Tension (lbs)	Tension Moment* (ft-lb)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Secondary	TRIPLEX 2 AWG	30.92	7.11	0.8060	2.04	0.248	188.0	326.0	188.0	1,710	-35,686	44	2,883	-32,760
Secondary	TRIPLEX 2 AWG	30.92	7.11	0.8060	0.45	0.248	50.0	236.0	50.0	143	6,656	12	16	6,684

Pole Loading Analysis Example (for a single pole) - Continued

Secondary	TRIPLEX 2 AWG	30.92	7.11	0.8060	1.54	0.248	149.0	146.0	149.0	1,710	35,686	35	2,285	38,006
Neutral	#4 COPPER 7 STRAND	37.67	43.95	0.2316	0.54	0.129	149.0	146.0	149.0	1,000	25,428	-6	1,560	26,981
Neutral	#4 COPPER 7 STRAND	37.67	43.95	0.2316	0.54	0.129	149.0	146.0	149.0	1,000	25,428	10	1,560	26,997
										Totals:	57,512	94	8,303	65,909

Comm		Height (ft)	Horiz. Offset (in)	Cable Diameter (in)	Sag at Max Temp (ft)	Cable Weight (lbs/ft)	Lead/Span Length (ft)	Span Angle (deg)	Wire Length (ft)	Tension (lbs)	Tension Moment* (ft-lb)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Overlashed Bundle	1/4" EHS	22.42	7.11	0.2500	1.24	0.121	149.0	146.0	149.0	1,142	17,282	48	3,244	20,574
CATV	CATV .75	22.13	7.11	1.0700	1.66		149.0	146.0	149.0			95	2,576	2,671
Overlashed Bundle	1/4" EHS	22.42	7.11	0.2500	1.95	0.121	188.0	326.0	188.0	1,351	-20,442	61	4,093	-16,288
CATV	CATV .75	22.13	7.11	1.0700	2.27		188.0	326.0	188.0			120	3,250	3,371
Overlashed Bundle	10M	21.00	4.70	0.3060	0.72	0.165	149.0	146.0	149.0	3,030	42,946	15	3,035	45,996
Telco	TELE 1.0	20.71	4.70	1.0000	0.52		149.0	146.0	149.0			19	2,407	2,426
Fiber	ADSS Fiber	22.83	4.59	0.4640	0.93	0.071	149.0	146.0	149.0	544	8,385	5	1,246	9,635
Overlashed Bundle	10M	23.83	4.53	0.3060	0.16	0.165	188.0	326.0	188.0	1,496	-24,075	-8	1,435	-22,648
										Totals:	24,096	357	21,284	45,738

PowerEquipment		Height (ft)	Horiz. Offset (in)	Offset Angle (deg)	Rotate Angle (deg)	Unit Weight (lbs)	Unit Height (in)	Unit Depth (in)	Unit Diameter (in)	Unit Length (in)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Transformer	75KVA	34.03	22.93	100.0	100.0	1015.00	44.00	52.00	--	26.00	--	2,515	1,433
Transformer	15KVA	33.85	18.94	175.0	175.0	270.00	34.00	52.00	--	18.00	--	1,338	1,850
										Totals:	-571	3,854	3,282

Crossarm		Height (ft)	Horiz. Offset (in)	Offset Angle (deg)	Rotate Angle (deg)	Unit Weight (lbs)	Unit Height (in)	Unit Depth (in)	Unit Length (in)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Normal	CROSSARM 3-1/2 X 4-1/2 X 8	37.67	5.46	146.0	146.0	53.00	4.50	3.50	96.00	0	188	188
									Totals:	0	188	188

Streetlight		Height (ft)	Horiz. Offset (in)	Offset Angle (deg)	Rotate Angle (deg)	Unit Weight (lbs)	Unit Height (in)	Unit Depth (in)	Unit Diameter (in)	Unit Length (in)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
General	Street Light	27.25	4.33	236.0	236.0	76.00	24.00	31.81	3.00	72.00	533	1,187	1,720
										Totals:	533	1,187	1,720

Riser		Height (ft)	Horiz. Offset (in)	Offset Angle (deg)	Rotate Angle (deg)	Unit Weight (lbs)	Unit Height (in)	Unit Depth (in)	Unit Diameter (in)	Unit Length (in)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Riser 90.0°	Riser	28.92	6.09	90.0	90.0	28.92	347.00	3.50	3.50	347.00	-15	903	888
										Totals:	-15	903	888

Pole Loading Analysis Example (for a single pole) - Continued

Pole ID:Pole_99_pplx.pplx | **O-Calc® Pro *Standard Report*** | Thursday, December 28, 2017 5:11 PM

Insulator		Height (ft)	Horiz. Offset (in)	Offset Angle (deg)	Rotate Angle (deg)	Unit Weight (lbs)	Unit Diameter (in)	Unit Length (in)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Bolt	Three Bolt CATV	22.42	0.00	236.0	146.0	5.00	3.00	0.00	4	0	4
Deadend	Three Bolt Telco	21.00	0.00	146.0	146.0	5.00	3.00	0.00	1	0	1
Deadend	F/O	22.83	0.00	146.0	146.0	5.00	3.00	0.00	1	0	1
Deadend	Three Bolt MCI	23.83	0.00	326.0	326.0	5.00	3.00	0.00	-1	0	-1
Spool	Spool 4"	30.92	0.00	236.0	146.0	3.00	4.00	4.12	2	33	35
Deadend	Deadend 12.75"	37.67	-40.00	63.8	0.0	3.00	3.80	12.75	-11	118	107
Deadend	Deadend 12.75"	37.67	40.00	228.2	0.0	3.00	3.80	12.75	16	118	134
								Totals:	**13**	**269**	**282**

Guy Wire and Brace		Attach Height (ft)	End Height (ft)	Lead/Span Length (ft)	Wire Diameter (in)	Percent Solid (%)	Lead Angle (deg)	Incline Angle (deg)	Wire Weight (lbs/ft)	Rest Length (ft)	Stretch Length (in)
10M	Sidewalk	21.00	0.00	6.00	0.306	75.00	326.0	64.9	0.165	22.16	0.62
EHS 1/4	Sidewalk	22.83	0.00	6.00	0.25	75.00	326.0	67.6	0.121	23.86	0.58
10M	Down	23.83	0.00	14.00	0.306	75.00	146.0	59.4	0.165	27.45	0.00
HS 7/16	Span/Head	37.67	37.67	188.00	0.438	75.00	326.0	0.0	0.399	187.69	3.02

Guy Wire and Brace (Loads and Reactions)		Elastic Modulus (psi)	Rated Tensile Strength (lbs)	Guy Strength Factor	Allowable Tension (lbs)	Initial Tension (lbs)	Loaded Tension*[2] (lbs)	Maximum Tension[2] (lbs)	Applied Tension[3] (lbs)	Vertical Load (lbs)	Shear Load In Guy Dir (lbs)	Shear Load At Report Angle (lbs)	Moment at GL[3] (ft-lb)
10M	Sidewalk	2.30e+7	10,000	0.90	9,000	700	5,600	3,394	3,062	2,772	1,302	-532	-3,924
EHS 1/4	Sidewalk	2.30e+7	6,650	0.90	5,985	700	3,263	1,978	1,771	1,638	675	-276	-2,435
10M	Down	2.30e+7	10,000	0.90	9,000	700	0	0	0	0	0	0	216
HS 7/16	Span/Head	2.30e+7	14,500	0.90	13,050	700	6,178	3,745	3,472	0	3,472	-1,421	-51,020
									Totals:	**4,410**	**5,449**	**-2,229**	**-57,162**

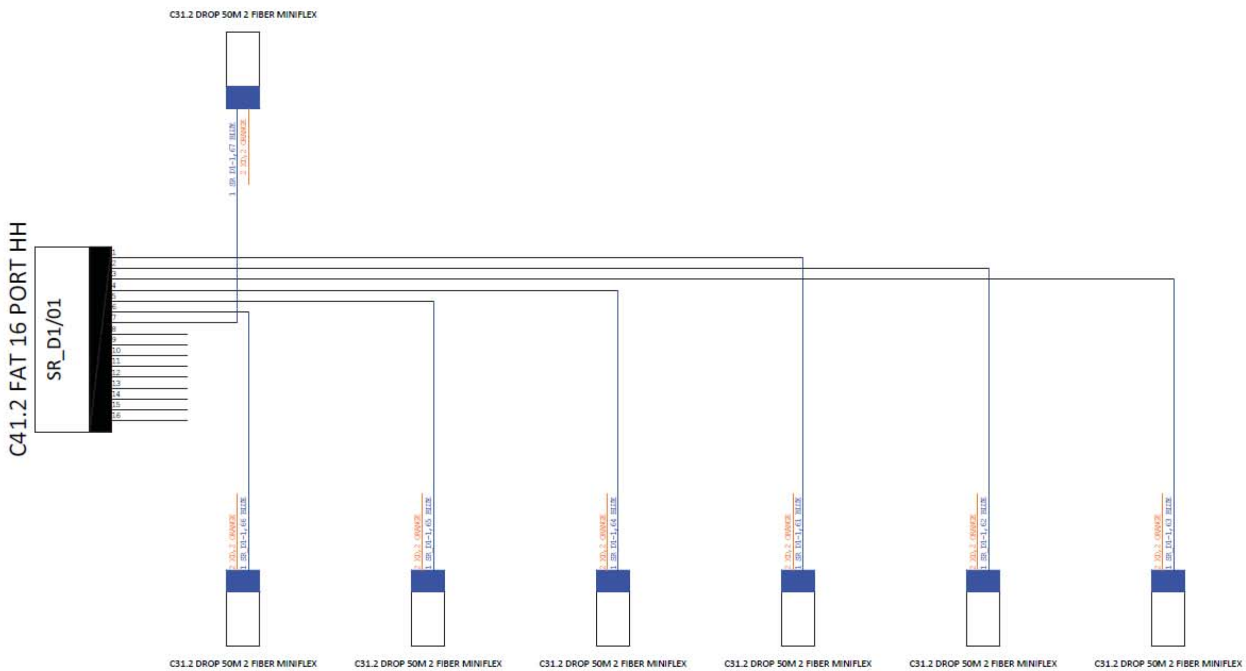
Anchor/Rod Load Summary	Rod Length AGL (in)	Lead Length (ft)	Lead Angle (deg)	Strength of Assembly (lbs)	Anchor/Rod Strength Factor	Allowable Load (lbs)	Max Load[2] (lbs)	Load at Pole MCU[3] (lbs)	Max Required Capacity[2] (%)
Single - 10" - Soil Class 4	0.00	6.00	326.0	20,000	1.00	20,000	5,370	4,832	26.8
Single - 10" - Soil Class 4	0.00	14.00	146.0	20,000	1.00	20,000	0	0	0.0
Single - 10" - Soil Class 4	0.00	188.00	326.0	20,000	1.00	20,000	3,745	3,472	18.7

Pole Buckling

Buckling Constant	Buckling Column Height* (ft)	Buckling Section Height (% Buckling Col. Hgt.)	Buckling Section Diameter (in)	Minimum Buckling Diameter at GL (in)	Diameter at Tip (in)	Diameter at GL (in)	Modulus of Elasticity (psi)	Pole Density (pcf)	Ice Density (pcf)	Pole Tip Height (ft)	Buckling Load Capacity at Height (lbs)	Buckling Load Applied at Height (lbs)	Buckling Load Factor of Safety
0.71	24.15	33.61	10.92	17.12	7.32	11.88	1.60e+6	60.00	57.00	38.50	170,437	**1703.22**	**14.29**

Appendix C - Construction Examples

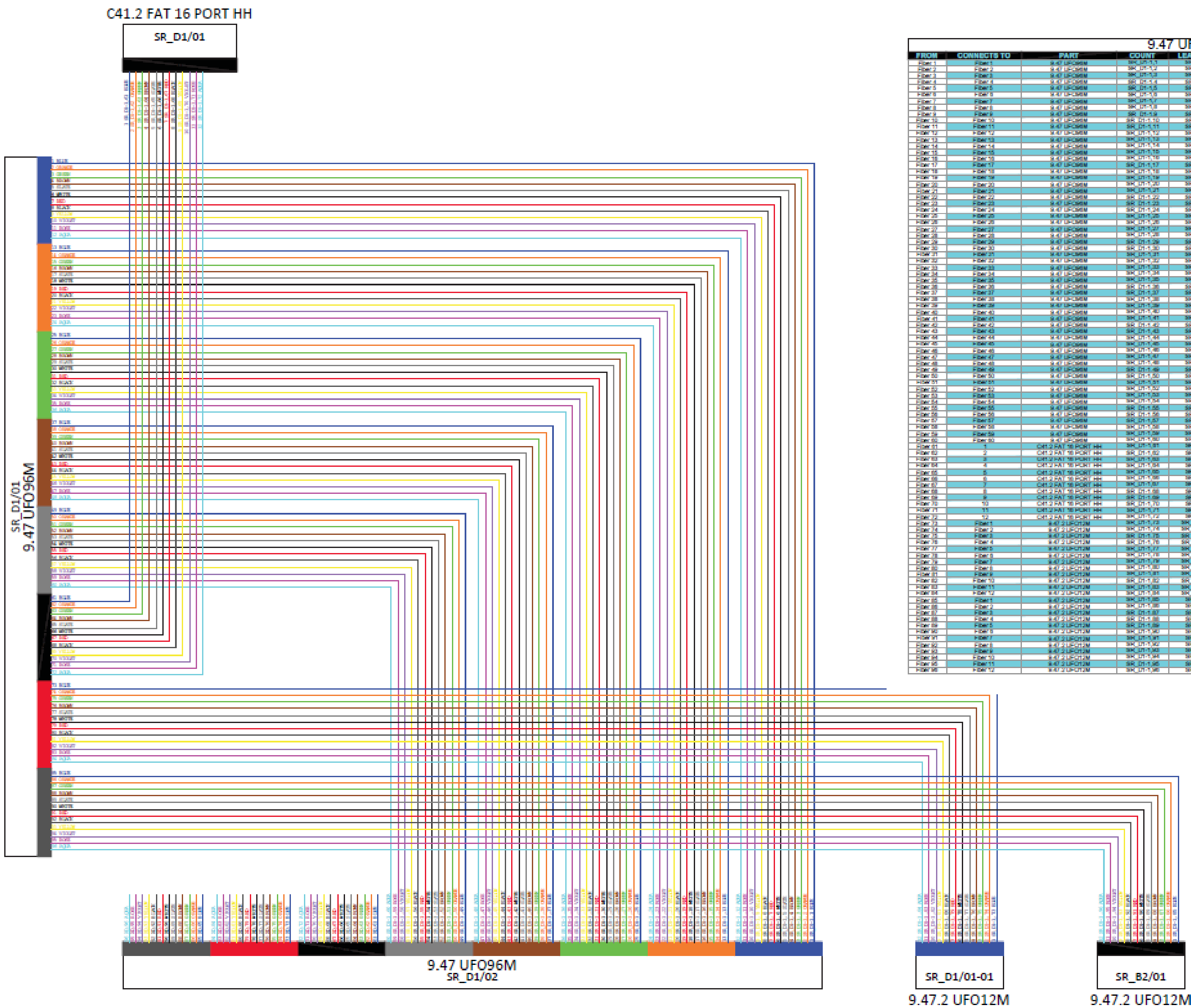
Fiber Splicing Plans



C41.2 FAT 16 PORT HH - SR_D1/01

FROM	CONNECTS TO	PART	COUNT	LEAD/POLE	CUSTOMER	NAME	OWNER	SERVICE CATEGORY	USE	WEIGHT
1	Fiber 1	C31.2 DROP 50M 2 FIBER MINIFLEX	SR_D1-1,61						SR_D1/01 Part: C41.2 FAT 16 PORT HH	
2	Fiber 1	C31.2 DROP 50M 2 FIBER MINIFLEX	SR_D1-1,62						SR_D1/01 Part: C41.2 FAT 16 PORT HH	
3	Fiber 1	C31.2 DROP 50M 2 FIBER MINIFLEX	SR_D1-1,63						SR_D1/01 Part: C41.2 FAT 16 PORT HH	
4	Fiber 1	C31.2 DROP 50M 2 FIBER MINIFLEX	SR_D1-1,64						SR_D1/01 Part: C41.2 FAT 16 PORT HH	
5	Fiber 1	C31.2 DROP 50M 2 FIBER MINIFLEX	SR_D1-1,65						SR_D1/01 Part: C41.2 FAT 16 PORT HH	
6	Fiber 1	C31.2 DROP 50M 2 FIBER MINIFLEX	SR_D1-1,66						SR_D1/01 Part: C41.2 FAT 16 PORT HH	
7	Fiber 1	C31.2 DROP 50M 2 FIBER MINIFLEX	SR_D1-1,67						SR_D1/01 Part: C41.2 FAT 16 PORT HH	
8			XD,8							
9			XD,9							
10			XD,10							
11			XD,11							
12			XD,12							
13			XD,13							
14			XD,14							
15			XD,15							
16			XD,16							

Fiber Splicing Plans- Continued



9.47 UFO96M - SR_D1/01

FROM	CONNECTS TO	PART	COUNT	LEAD/POLE	CUSTOMER	NAME	OWNER	SERVICE CATEGORY	USE	WEIGHT
Fiber 1	Fiber 1	9.47 UFO96M	SR_D1-1,1	SR_D1/02						
Fiber 2	Fiber 2	9.47 UFO96M	SR_D1-1,2	SR_D1/02						
Fiber 3	Fiber 3	9.47 UFO96M	SR_D1-1,3	SR_D1/02						
Fiber 4	Fiber 4	9.47 UFO96M	SR_D1-1,4	SR_D1/02						
Fiber 5	Fiber 5	9.47 UFO96M	SR_D1-1,5	SR_D1/02						
Fiber 6	Fiber 6	9.47 UFO96M	SR_D1-1,6	SR_D1/02						
Fiber 7	Fiber 7	9.47 UFO96M	SR_D1-1,7	SR_D1/02						
Fiber 8	Fiber 8	9.47 UFO96M	SR_D1-1,8	SR_D1/02						
Fiber 9	Fiber 9	9.47 UFO96M	SR_D1-1,9	SR_D1/02						
Fiber 10	Fiber 10	9.47 UFO96M	SR_D1-1,10	SR_D1/02						
Fiber 11	Fiber 11	9.47 UFO96M	SR_D1-1,11	SR_D1/02						
Fiber 12	Fiber 12	9.47 UFO96M	SR_D1-1,12	SR_D1/02						
Fiber 13	Fiber 13	9.47 UFO96M	SR_D1-1,13	SR_D1/02						
Fiber 14	Fiber 14	9.47 UFO96M	SR_D1-1,14	SR_D1/02						
Fiber 15	Fiber 15	9.47 UFO96M	SR_D1-1,15	SR_D1/02						
Fiber 16	Fiber 16	9.47 UFO96M	SR_D1-1,16	SR_D1/02						
Fiber 17	Fiber 17	9.47 UFO96M	SR_D1-1,17	SR_D1/02						
Fiber 18	Fiber 18	9.47 UFO96M	SR_D1-1,18	SR_D1/02						
Fiber 19	Fiber 19	9.47 UFO96M	SR_D1-1,19	SR_D1/02						
Fiber 20	Fiber 20	9.47 UFO96M	SR_D1-1,20	SR_D1/02						
Fiber 21	Fiber 21	9.47 UFO96M	SR_D1-1,21	SR_D1/02						
Fiber 22	Fiber 22	9.47 UFO96M	SR_D1-1,22	SR_D1/02						
Fiber 23	Fiber 23	9.47 UFO96M	SR_D1-1,23	SR_D1/02						
Fiber 24	Fiber 24	9.47 UFO96M	SR_D1-1,24	SR_D1/02						
Fiber 25	Fiber 25	9.47 UFO96M	SR_D1-1,25	SR_D1/02						
Fiber 26	Fiber 26	9.47 UFO96M	SR_D1-1,26	SR_D1/02						
Fiber 27	Fiber 27	9.47 UFO96M	SR_D1-1,27	SR_D1/02						
Fiber 28	Fiber 28	9.47 UFO96M	SR_D1-1,28	SR_D1/02						
Fiber 29	Fiber 29	9.47 UFO96M	SR_D1-1,29	SR_D1/02						
Fiber 30	Fiber 30	9.47 UFO96M	SR_D1-1,30	SR_D1/02						
Fiber 31	Fiber 31	9.47 UFO96M	SR_D1-1,31	SR_D1/02						
Fiber 32	Fiber 32	9.47 UFO96M	SR_D1-1,32	SR_D1/02						
Fiber 33	Fiber 33	9.47 UFO96M	SR_D1-1,33	SR_D1/02						
Fiber 34	Fiber 34	9.47 UFO96M	SR_D1-1,34	SR_D1/02						
Fiber 35	Fiber 35	9.47 UFO96M	SR_D1-1,35	SR_D1/02						
Fiber 36	Fiber 36	9.47 UFO96M	SR_D1-1,36	SR_D1/02						
Fiber 37	Fiber 37	9.47 UFO96M	SR_D1-1,37	SR_D1/02						
Fiber 38	Fiber 38	9.47 UFO96M	SR_D1-1,38	SR_D1/02						
Fiber 39	Fiber 39	9.47 UFO96M	SR_D1-1,39	SR_D1/02						
Fiber 40	Fiber 40	9.47 UFO96M	SR_D1-1,40	SR_D1/02						
Fiber 41	Fiber 41	9.47 UFO96M	SR_D1-1,41	SR_D1/02						
Fiber 42	Fiber 42	9.47 UFO96M	SR_D1-1,42	SR_D1/02						
Fiber 43	Fiber 43	9.47 UFO96M	SR_D1-1,43	SR_D1/02						
Fiber 44	Fiber 44	9.47 UFO96M	SR_D1-1,44	SR_D1/02						
Fiber 45	Fiber 45	9.47 UFO96M	SR_D1-1,45	SR_D1/02						
Fiber 46	Fiber 46	9.47 UFO96M	SR_D1-1,46	SR_D1/02						
Fiber 47	Fiber 47	9.47 UFO96M	SR_D1-1,47	SR_D1/02						
Fiber 48	Fiber 48	9.47 UFO96M	SR_D1-1,48	SR_D1/02						
Fiber 49	Fiber 49	9.47 UFO96M	SR_D1-1,49	SR_D1/02						
Fiber 50	Fiber 50	9.47 UFO96M	SR_D1-1,50	SR_D1/02						
Fiber 51	Fiber 51	9.47 UFO96M	SR_D1-1,51	SR_D1/02						
Fiber 52	Fiber 52	9.47 UFO96M	SR_D1-1,52	SR_D1/02						
Fiber 53	Fiber 53	9.47 UFO96M	SR_D1-1,53	SR_D1/02						
Fiber 54	Fiber 54	9.47 UFO96M	SR_D1-1,54	SR_D1/02						
Fiber 55	Fiber 55	9.47 UFO96M	SR_D1-1,55	SR_D1/02						
Fiber 56	Fiber 56	9.47 UFO96M	SR_D1-1,56	SR_D1/02						
Fiber 57	Fiber 57	9.47 UFO96M	SR_D1-1,57	SR_D1/02						
Fiber 58	Fiber 58	9.47 UFO96M	SR_D1-1,58	SR_D1/02						
Fiber 59	Fiber 59	9.47 UFO96M	SR_D1-1,59	SR_D1/02						
Fiber 60	Fiber 60	9.47 UFO96M	SR_D1-1,60	SR_D1/02						
Fiber 61	1	C41.2 FAT 16 PORT HH	SR_D1-1,61	SR_D1/01						
Fiber 62	2	C41.2 FAT 16 PORT HH	SR_D1-1,62	SR_D1/01						
Fiber 63	3	C41.2 FAT 16 PORT HH	SR_D1-1,63	SR_D1/01						
Fiber 64	4	C41.2 FAT 16 PORT HH	SR_D1-1,64	SR_D1/01						
Fiber 65	5	C41.2 FAT 16 PORT HH	SR_D1-1,65	SR_D1/01						
Fiber 66	6	C41.2 FAT 16 PORT HH	SR_D1-1,66	SR_D1/01						
Fiber 67	7	C41.2 FAT 16 PORT HH	SR_D1-1,67	SR_D1/01						
Fiber 68	8	C41.2 FAT 16 PORT HH	SR_D1-1,68	SR_D1/01						
Fiber 69	9	C41.2 FAT 16 PORT HH	SR_D1-1,69	SR_D1/01						
Fiber 70	10	C41.2 FAT 16 PORT HH	SR_D1-1,70	SR_D1/01						
Fiber 71	11	C41.2 FAT 16 PORT HH	SR_D1-1,71	SR_D1/01						
Fiber 72	12	C41.2 FAT 16 PORT HH	SR_D1-1,72	SR_D1/01						
Fiber 73	Fiber 1	9.47.2 UFO12M	SR_D1-1,73	SR_D1/01-01						
Fiber 74	Fiber 2	9.47.2 UFO12M	SR_D1-1,74	SR_D1/01-01						
Fiber 75	Fiber 3	9.47.2 UFO12M	SR_D1-1,75	SR_D1/01-01						
Fiber 76	Fiber 4	9.47.2 UFO12M	SR_D1-1,76	SR_D1/01-01						
Fiber 77	Fiber 5	9.47.2 UFO12M	SR_D1-1,77	SR_D1/01-01						
Fiber 78	Fiber 6	9.47.2 UFO12M	SR_D1-1,78	SR_D1/01-01						
Fiber 79	Fiber 7	9.47.2 UFO12M	SR_D1-1,79	SR_D1/01-01						
Fiber 80	Fiber 8	9.47.2 UFO12M	SR_D1-1,80	SR_D1/01-01						
Fiber 81	Fiber 9	9.47.2 UFO12M	SR_D1-1,81	SR_D1/01-01						
Fiber 82	Fiber 10	9.47.2 UFO12M	SR_D1-1,82	SR_D1/01-01						
Fiber 83	Fiber 11	9.47.2 UFO12M	SR_D1-1,83	SR_D1/01-01						
Fiber 84	Fiber 12	9.47.2 UFO12M	SR_D1-1,84	SR_D1/01-01						
Fiber 85	Fiber 1	9.47.2 UFO12M	SR_D1-1,85	SR_B2/01						
Fiber 86	Fiber 2	9.47.2 UFO12M	SR_D1-1,86	SR_B2/01						
Fiber 87	Fiber 3	9.47.2 UFO12M	SR_D1-1,87	SR_B2/01						
Fiber 88	Fiber 4	9.47.2 UFO12M	SR_D1-1,88	SR_B2/01						
Fiber 89	Fiber 5	9.47.2 UFO12M	SR_D1-1,89	SR_B2/01						
Fiber 90	Fiber 6	9.47.2 UFO12M	SR_D1-1,90	SR_B2/01						
Fiber 91	Fiber 7	9.47.2 UFO12M	SR_D1-1,91	SR_B2/01						
Fiber 92	Fiber 8	9.47.2 UFO12M	SR_D1-1,92	SR_B2/01						
Fiber 93	Fiber 9	9.47.2 UFO12M	SR_D1-1,93	SR_B2/01						
Fiber 94	Fiber 10	9.47.2 UFO12M	SR_D1-1,94	SR_B2/01						
Fiber 95	Fiber 11	9.47.2 UFO12M	SR_D1-1,95	SR_B2/01						
Fiber 96	Fiber 12	9.47.2 UFO12M	SR_D1-1,96	SR_B2/01						

Fiber Testing Results Example

FTTP Acceptance Test Results Form (To Be Completed By OSP Contractor)

Serving Area__________ Client__________ Date______________

				1310 nm			1550 nm					
Fiber #	OTDR Distance in feet	ber of fu splices	umber onnecto	Maximum lowable lo	Power Meter Actual Loss	DR Estima Span Loss	Maximum Allowable loss	Power Meter Actual Loss	OTDR Estimated Span Loss	End Point	Subscriber Address	Notes
1	11601	4	1	2.71		1.123	2.36		0.649			
2	11601	4	1	2.71		1.123	2.36		0.649			
3	11601	4	1	2.71		1.123	2.36		0.649			
4	11601	4	1	2.71		1.123	2.36		0.649			
5	11878	6	2	3.65	2.84	1.218	3.29	1.93	0.802	A3/8	12987 CEDAR HILLS DR	
6	11325	6	2	3.58		1.486	3.24		0.963			
7	11601	4	1	2.71		1.315	2.36		0.793			
8	11604	4	1	2.71		1.488	2.36		1.06			
9	11601	4	1	2.71		1.356	2.36		0.834			
10	11438	6	2	3.59	2.77	1.286	3.25	2.1	0.758	A3/7	13063 CEDAR HILLS DR	
11	11530	6	2	3.61	2.01	1.038	3.25	1.47	0.577	A3/7	13032 CEDAR HILLS DR	
12	11624	6	2	3.62	1.86	1.198	3.26	1.46	0.752	A3/7	13064 CEDAR HILLS DR	
13	11329	4	1	2.68		1.292	2.34		0.914			
14	11609	4	1	2.72		1.299	2.36		0.841			
15	11606	4	1	2.71		1.304	2.36		0.875			
16	11367	6	2	3.59	2.11	1.037	3.24	1.71	0.767	A3/6	13136 CEDAR HILLS DR	
17	11482	6	2	3.60	2.46	1.154	3.25	2	0.792	A3/6	13121 CEDAR HILLS DR	
18	11172	6	2	3.56	1.79	1.506	3.22	1.39	0.973	A3/6	13128 CEDAR HILLS DR	
19	11193	4	1	2.66		1.352	2.32		0.977			
20	11420	6	2	3.59	2.97	2.312	3.24	2.45	2.061	A3B/2	13087 CEDAR HILLS DR	
21	11193	4	1	2.66		1.287	2.32		0.98			
22	11193	4	1	2.66		1.245	2.32		0.924			
23	11155	6	2	3.56	2.45	1.033	3.22	1.98	0.751	A3B/1	1311 CEDAR HILLS DR	
24	11132	6	2	3.56	3.32	1.645	3.22	2.94	1.437	A3B/1	13159 CEDAR HILLS DR	
25	11082	4	1	2.65		1.261	2.31		0.827			
26	11082	4	1	2.65		1.261	2.31		0.827			
27	11082	4	1	2.65		1.261	2.31		0.827			
28	11082	4	1	2.65		1.261	2.31		0.827			
29	11082	4	1	2.65		1.261	2.31		0.827			
30	11082	4	1	2.65		1.261	2.31		0.827			
31	11082	4	1	2.65		1.261	2.31		0.827			
32	11082	4	1	2.65		1.261	2.31		0.827			
33	11082	4	1	2.65		1.261	2.31		0.827			
34	11082	4	1	2.65		1.261	2.31		0.827			
35	11082	4	1	2.65		1.261	2.31		0.827			
36	11082	4	1	2.65		1.261	2.31		0.827			
37	11082	4	1	2.65		1.261	2.31		0.827			
38	11082	4	1	2.65		1.261	2.31		0.827			
39	11082	4	1	2.65		1.261	2.31		0.827			
40	11082	4	1	2.65		1.261	2.31		0.827			
41	11377	6	2	3.59	1.8	1.265	3.24	1.74	1.027	A3/5-1	11707 CEDAR HILLS DR	
42	11082	4	1	2.65		1.346	2.31		0.869			
43	11082	4	1	2.65		1.338	2.31		0.865			

Fiber Testing Results Example - Continued

FTTP Acceptance Test Results Form (To Be Completed By OSP Contractor)												
Serving Area__________		*Client__________*		*Date__________*								
				1310 nm			1550 nm					
Fiber #	OTDR Distance in feet	ber of fu splices	umber onnecto	Maximum owable lo	Power Meter Actual Loss	DR Estima Span Loss	Maximum Allowable loss	Power Meter Actual Loss	OTDR Estimated Span Loss	End Point	Subscriber Address	Notes
44	11084	4	1	2.65		1.316	2.31		0.867			
45	11082	4	1	2.65		1.296	2.31		0.834			
46	11109	6	2	3.55	2.23	1.446	3.22	1.84	0.979	A3/5-2	11762 32ND RD	
47	10982	6	2	3.54	2.36	1.087	3.20	1.9	0.729	A3/5-2	13142 CEDAR HILLS DR	
48	11023	6	2	3.54	2.58	1.066	3.21	2.17	0.882	A3/5-2	13186 CEDAR HILLS DR	
49	11606	4	1	2.71		1.329	2.36		0.83			
50	11606	4	1	2.71		1.315	2.36		0.914			
51	11606	4	1	2.71		1.329	2.36		0.918			
52	10521	6	2	3.48	2	0.948	3.16	1.63	0.461	A3/5	11768 32ND RD	
53	9591	4	1	2.47		1.276	2.18		0.69			
54	9593	4	1	2.47		1.127	2.18		0.624			
55	9807	6	2	3.40	2.12	1.04	3.10	1.63	0.531	A3/4-1	11961 32ND RD	
56	9761	6	2	3.39	2.82	0.928	3.09	2.28	0.473	A3/4-1	11963 32ND RD	
57	11606	4	1	2.71		1.308	2.36		0.662			
58	11606	4	1	2.71		1.283	2.36		0.758			
59	9964	6	2	3.41	2.71	1.141	3.11	2.24	0.615	A3/4	11794 32ND RD	
60	9668	6	2	3.38	2.27	0.97	3.08	1.85	0.635	A3/4	11952 32ND RD	
61	11604	4	1	2.71		1.215	2.36		0.827			
62	9051	6	2	3.30	2.02	1.17	3.03	1.65	0.745	A3/3	12042 32ND RD	
63	11604	4	1	2.71		1.426	2.36		1.162			
64	9042	6	2	3.30	2.06	0.789	3.03	1.66	0.495	A3/2	13140 IRISH RIDGE RD	
65	8538	6	2	3.24		0.954	2.98		0.621			
66	8540	5	1	2.54		0.899	2.28		0.52			
67	8540	7	2	3.44	2.16	0.833	3.18	1.69	0.41	A3A/1	12043 32ND RD	
68	8538	7	2	3.44	2.72	0.819	3.18	2.35	0.449	A3A/1	12039 32ND RD	
69	11604	4	1	2.71		1.367	2.36		1.102			
70	11601	4	1	2.71		1.377	2.36		1.233			
71	11604	4	1	2.71		1.381	2.36		1.177			
72	8532	5	2	3.04	2.38	0.895	2.78	1.85	0.511	A3/1	12123 32ND RD	
73	8684	5	1	2.56		1.038	2.29		0.626			
74	8684	5	1	2.56		0.937	2.29		0.595			
75	8684	5	1	2.56		1.091	2.29		0.594			
76	8684	5	1	2.56		0.807	2.29		0.399			
77	8684	5	1	2.56		0.99	2.29		0.65			
78	8684	5	1	2.56		0.961	2.29		0.474			
79	9130	7	2	3.51	2.25	0.896	3.23	1.78	0.44	A/12	13151 IRISH RIDGE RD	
80	8831	7	2	3.48	2.26	0.751	3.21	1.83	0.373	A/12	13179 IRISH RIDGE RD	
81	8684	4	1	2.36		1.09	2.09		0.654			
82	8682	4	1	2.36		0.947	2.09		0.598			
83	8682	4	1	2.36		0.982	2.09		0.651			
84	8912	6	2	3.29	1.71	0.801	3.01	1.36	0.392	A/11	13158 IRISH RIDGE RD	
85	8381	4	1	2.32		1.031	2.07		0.601			
86	8381	4	1	2.32		0.994	2.07		0.619			

About the Authors

Larry Thompson is a licensed Professional Engineer and CEO of Vantage Point Solutions. Larry has a Physics degree from William Jewell College and Bachelor and Master degrees in Electrical Engineering from the University of Kansas. Larry has helped hundreds of telecommunication companies be successful in this rapidly changing technical and regulatory environment. He has designed many wireless and wireline networks as he has assisted his clients in their transition from legacy TDM networks to broadband IP networks.

Brian Enga is a licensed Professional Engineer and part of the Senior Engineering team at Vantage Point Solutions. Brian has Bachelor of Science degrees in Electrical Engineering and Engineering Physics from South Dakota State University. He has been working in the telecommunications industry for nearly 20 years. Brian has engineered a variety of broadband networks and has been a pioneer in deploying IP video networks.

ATTACHMENT 2

RLEC USF BUDGET ESTIMATES & PROJECTIONS

High Cost Support Under-Funding Projection
Rural Rate of Return Carriers Remaining on Legacy Support

Line #	USAC Projected Total Demand- 2017		2018	2019	2020	2021	2022	2023	2024	2025	2026
1	HCLS	$ 579,203,664	$ 577,452,267	$ 565,241,893	$ 525,526,436	$ 488,432,151	$ 453,902,061	$ 421,484,843	$ 391,170,744	$ 363,636,452	$ 337,572,244
2	SNA	$ 4,092,852	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
3	SVS	$ 4,964,496	$ 4,964,496	$ 4,964,496	$ 4,964,496	$ 4,964,496	$ 4,964,496	$ 4,964,496	$ 4,964,496	$ 4,964,496	$ 4,964,496
4	CAF BLS	$ 769,196,014	$ 837,032,468	$ 909,811,796	$ 983,826,922	$ 1,059,067,019	$ 1,135,227,986	$ 1,210,046,635	$ 1,280,148,848	$ 1,343,585,226	$ 1,389,704,891
5	CAF BLS True-Ups	$ 9,571,047	$ 10,287,129	$ 11,181,587	$ 12,091,233	$ 13,015,934	$ 13,951,952	$ 14,871,473	$ 15,733,029	$ 16,512,662	$ 17,079,473
6											
7	Loop Related High Cost Support	$ 1,367,028,073	$ 1,429,736,360	$ 1,491,199,772	$ 1,526,409,087	$ 1,565,479,600	$ 1,608,046,495	$ 1,651,367,447	$ 1,692,017,117	$ 1,728,698,836	$ 1,749,321,104
8											
9	Budget Control	$ 2,303,100,000	$ 2,303,100,000	$ 2,303,100,000	$ 2,303,100,000	$ 2,303,100,000	$ 2,303,100,000	$ 2,303,100,000	$ 2,303,100,000	$ 2,303,100,000	$ 2,303,100,000
10	*less ACAM* Model Support	$ 631,455,335	$ 631,455,335	$ 631,455,335	$ 631,455,335	$ 631,455,335	$ 631,455,335	$ 631,455,335	$ 631,455,335	$ 631,455,335	$ 631,455,335
11	*less* Alaska Plan Support	$ 44,663,001	$ 44,663,001	$ 44,663,001	$ 44,663,001	$ 44,663,001	$ 44,663,001	$ 44,663,001	$ 44,663,001	$ 44,663,001	$ 44,663,001
12	*less* CAF-ICC	$ 400,435,116	$ 391,922,269	$ 388,937,478	$ 382,585,522	$ 372,861,330	$ 361,636,357	$ 350,095,456	$ 338,267,774	$ 326,295,237	$ 314,745,948
13	Legacy Budget Control Adjusted to reflect declining CAF-ICC	$ 1,226,546,548	$ 1,235,059,395	$ 1,238,044,186	$ 1,244,396,142	$ 1,254,120,334	$ 1,265,345,307	$ 1,276,886,208	$ 1,288,713,890	$ 1,300,686,427	$ 1,312,235,716
14											
15	Under Funded Legacy Support	$ (140,481,525)	$ (194,676,965)	$ (253,155,586)	$ (282,012,945)	$ (311,359,266)	$ (342,701,188)	$ (374,481,239)	$ (403,303,227)	$ (428,012,410)	$ (437,085,388)
16											
17	Percent Underfunded Loop Related Support	-10.3%	-13.6%	-17.0%	-18.5%	-19.9%	-21.3%	-22.7%	-23.8%	-24.8%	-25.0%
18											
19	Cumulative Under-Funding 2017 - 2026	$ (3,167,269,739)									
20											
21	**Calculation with Inflation Adjusted Budget**										
22	Legacy Budget Control Adjusted to reflect declining CAF-ICC with inflation applied	$ 1,226,546,548	$ 1,256,154,640	$ 1,280,597,490	$ 1,308,776,561	$ 1,340,703,270	$ 1,374,512,618	$ 1,409,026,321	$ 1,444,221,912	$ 1,479,964,260	$ 1,515,692,175
23											
24	Under Funded Legacy Support	$ (140,481,525)	$ (173,581,721)	$ (210,602,282)	$ (217,632,526)	$ (224,776,330)	$ (233,533,877)	$ (242,341,126)	$ (247,795,205)	$ (248,734,577)	$ (233,628,930)
25											
26	Percent Underfunded Loop Related Support	-10.3%	-12.1%	-14.1%	-14.3%	-14.4%	-14.5%	-14.7%	-14.6%	-14.4%	-13.4%
27											
28-29	Cumulative Under-Funding 2017 - 2026 with Inflation Adjustment	$ (2,173,108,096)									
30											

31 Notes:

32 Starting point for this analysis is the pre-budget controlled amounts included in USAC projection for 1st half of 2017. These amounts were then annualized.

33 The analysis is based on final decision for study areas opting for ACAM or Alaska Plan as of 1/19/2017.

34 Analysis assumes ACAM Companies share of 2017 budget controlled support equals approximately $564.8 Million inclusive of average transition payments and additional support of $35,6M for full funding @ $146.10 per location. Analysis also assumes ACAM Companies will be offered additional support (approx. $66.6M) to fully fund at $200 per location. These amounts have been added to the line 9 Budget Control and line 10 A-CAM Model Support.

35 Analysis assumes Alaska Plan Companies share of 2017 budget controlled support equals approximately $44.7 Million (2015 Legacy per FCC 16-155 @47) with the difference funded from other sources.

36 Inflation based on 10 year average percent change in GDP-CPI of 1.72%. The annual inflation adjustment is applied to the legacy budget amount starting with base year 2017.

37 High Cost Loop Support amount is adjusted annually to reflect line decline rates that are consistent with assumptions set forth in Appendix E of FCC 3/30/2016 Order.

38 Safety Net Additive Support is projected to lapse after 2017 and is not reflected in the projected amounts for 2018 and beyond.

39 Safety Valve Support is a fixed amount at its 2017 level throughout the entire projection.

40 CAF-BLS amounts are adjusted annually to reflect growth rates that are consistent with the assumptions set forth in Appendix E of FCC 3/30/2016 Order.

41 True-Ups to CAF-BLS are projected based on the relationship of current true-ups to projected CAF-BLS amounts included in the USAC 2017 1st half projection.

42 CAF-ICC amounts are adjusted annually to reflect growth rates that are consistent with the assumptions set forth in Appendix E of FCC 3/30/2016 Order.

43 Rate of Return adjustment factor applied to annualized 2017 data. Calculated results for 2018-2021 include rate of return adjustment in underlying data.

44 Data for Sandwich Isles is included in this analysis for 2018 and forward.

ATTACHMENT 3

EFFECTS OF MODIFYING BUDGET CONTROL CALCULATION

Impact Analysis Current Mechanism vs. Proposed Budget Control
Methodology
2018-2019 Funding Year

Notes: Individual company budget control impacts were calculated based on data contained in the May 2018 USAC Budget Control.
Analysis does not reflect true-up amounts for A-CAM and Alaska Plan companies thus budget impact is slightly less than published.
Analysis then stratified based on loop cost data contained in NECA's 2017 Annual USF Submission.

			Current Rules		Proposed Rules			
Loop Cost Category	**# Study Areas**	**1.3 Loops from USAC HC-05 Appendix 5/2/2018**	**Average BCM Adjust per Customer per Month**	**Ave Percent Reduction**	**Ave Percent Reduction**	**Average BCM Adjust per Customer per Month**	**Average Change in Support per Customer per Month**	
0-$600	62	525,655	$ (3.62)	-23.87%	-15.49%	$ (2.35)	$ 1.27	*
$600 - $750	60	219,791	$ (3.72)	-20.59%	-15.49%	$ (2.80)	$ 0.92	*
$750 - $900	74	200,529	$ (6.19)	-22.17%	-15.49%	$ (4.32)	$ 1.86	
$900 - $1,050	91	288,469	$ (7.29)	-18.64%	-15.49%	$ (6.06)	$ 1.23	
$1,050 - $1,200	52	226,513	$ (7.80)	-17.10%	-15.49%	$ (7.06)	$ 0.74	
$1,200 - $1,350	44	222,729	$ (8.90)	-15.72%	-15.49%	$ (8.77)	$ 0.13	
$1,350 - $1,500	44	140,689	$ (10.16)	-14.73%	-15.49%	$ (10.68)	$ (0.53)	
$1,500 - $1,650	42	143,834	$ (12.16)	-13.70%	-15.49%	$ (13.75)	$ (1.59)	
$1,650 - $1,800	30	101,086	$ (13.07)	-13.21%	-15.49%	$ (15.33)	$ (2.26)	
$1,800 - $2,000	32	68,148	$ (14.68)	-12.85%	-15.49%	$ (17.69)	$ (3.01)	
$2,000 - $2,250	26	53,807	$ (17.06)	-12.21%	-15.49%	$ (21.63)	$ (4.57)	
$2,250 - $2,500	21	34,267	$ (18.43)	-12.01%	-15.49%	$ (23.77)	$ (5.34)	
$2,500 - $3,000	31	38,684	$ (19.44)	-11.89%	-15.49%	$ (25.33)	$ (5.89)	
>$3,000	46	61,207	$ (20.55)	-11.73%	-15.49%	$ (27.13)	$ (6.58)	
Legacy Study Areas	655	2,325,408	$ (8.12)	-15.49%	-15.49%	$ (8.12)	$ -	

* Study areas in these cost categories are not eligible to receive high cost loop support

Source Data: USAC 2018 - 2019 Budget Control Analysis
USF Loop Cost: 2017 NECA USF Submission