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

In the Matter of	)	
	)	
Connect America Fund	)	WC Docket No. 10-90
	)	
High-Cost Universal Service Support	)	WC Docket No. 05-337

COMMENTS OF THE UNITED STATES TELECOM ASSOCIATION, AT&T, CENTURYLINK, FRONTIER COMMUNICATIONS, VERIZON, AND WINDSTREAM COMMUNICATIONS IN RESPONSE TO THE BUREAU'S PUBLIC NOTICES OF DECEMBER 11 & 17, 2012

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Pursuant to the Public Notices released by the Wireline Competition Bureau on December 11, 2012[1] and December 17, 2012,[2] the United States Telecom Association, AT&T, CenturyLink, Frontier Communications, Verizon, and Windstream Communications (collectively the Coalition) respectfully submit these comments on questions raised in the Cost-Model Virtual Workshop.

I. INTRODUCTION AND SUMMARY

The ABC Coalition welcomes the opportunity to comment on the Bureau's discussion questions for the Cost-Model Virtual Workshop. As an initial matter, the Coalition wishes to stress once again the critical importance of selecting a model design that will allow CAF Phase II to be implemented as expeditiously as possible. The interim support available to carriers while the cost model is being prepared is far smaller than the amounts budgeted for CAF Phase II, and many traditional sources of support that carriers rely on are rapidly being phased out. The growing delays in implementing the cost model and disbursing CAF Phase II support[3] result in substantial hardship for carriers and pose a significant obstacle to the deployment of broadband service to rural areas. Therefore, when evaluating alternative design options, the Coalition urges that—other things being equal—the Bureau select the design option that can be implemented most expeditiously.

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[1] *Wireline Competition Bureau Announces Availability of Version One of the Connect America Fund Phase II Cost Model*, WC Docket Nos. 10-90 & 05-337, DA 12-2011 (Wireline Comp. Bur. rel. Dec. 11, 2012) ("December 11, 2012 Public Notice").

[2] *Wireline Competition Bureau Releases Further Discussion Topics for Connect America Cost Model Virtual Workshop*, WC Docket Nos. 10-90 & 05-337, DA 12-2029 (Wireline Comp. Bur. rel. Dec. 17, 2012) ("December 17, 2012 Public Notice").

[3] *See, e.g.*, *Connect America Fund*, WC Docket No. 10-90, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd. 17663, 17722, paras. 148 (2011) (*USF/ICC Transformation Order*) ("Our expectation is that CAF Phase II will begin on January 1, 2013.").

The key element in designing a sound forward-looking cost model should be the selection of a green-field, rather than brown-field, deployment. As the Coalition has explained in its prior comments, a brown-field approach is unacceptable for legal, policy, and practical reasons. The brown-field options in the CQBAT and CACM models do not address the problems we have identified. In fact, the "quick and dirty" approach to estimating a brown-field model, adopted in both the CQBAT and CACM, starkly illustrates many of these problems. Among other issues, the brown-field option in both models ignores variation in the age and quality of existing plant and neglects the associated capital expense that carriers must recover to remain whole, and it makes no allowance for the ***actual*** network adjustments, replacements, and augmentations required to achieve 1 Mbps upstream speeds over existing copper wire. Those problems are not easily solved: at a minimum, it would require massive data inputs that are not presently available and significant modifications to the model. Even if these data could be collected, it likely would result in years of delay and a model too complex to comply with the criteria the Bureau has set forth. The only feasible way to meet the Bureau's stated goals is to model a green-field approach.

With respect to the specific questions posed by the Bureau, the Coalition's position is as follows:

A. In the absence of actual geo-code data, the Bureau should adopt the methodology used by CQBAT for determining customer locations. The CQBAT model is consistent with current best practice and has been tested in a variety of contested proceedings.

B. The Coalition believes that the CQBAT model's approach to clustering is appropriate and knows of no reason to deviate from this approach.

C. The Coalition supports the CQBAT routing algorithm, which is superior to the approach taken by HCPM and which has been used in other wireline models.

D. The Coalition believes that three density zones provide for sufficient variation in model assumptions based on density. Although the HCPM used nine density zones, the additional rural zones do not appear have much effect on the model's precision, and other important geographic variations in cost—such as for labor or materials costs—are captured through other variables. The Coalition believes that the potential benefits in terms of slightly increased precision resulting from adding additional rural density zones do not outweigh the costs of delay.

E. The Coalition believes that CQBAT's approach to modeling inter-office transport costs is reasonable for a green-field model and does not require modification. If the Bureau decides to adopt a brown-field model, however, then significant modifications will be required, because a brown-field model cannot assume either that no inter-office network exists or that the existing inter-office is adequate. The problem of calculating inter-office transport costs using available data is another reason to prefer a green-field model and not a brown-field model.

F. The Coalition agrees with the Bureau that voice capability should be included in the model if voice is a supported service. If a green-field model is employed, the Bureau may simply assume that there will be one soft-switch per state and that carriers will use SIP signaling. If a brown-field model is used, however, the Coalition rejects the Bureau's proposal to estimate the cost of voice service by calculating the cost of providing VOIP in a green-field model and subtracting the associated capex. That approach wrongly assumes that carriers will retain their circuit-switched voice equipment and fails to acknowledge that circuit-switched equipment has higher operating costs. The cost of providing voice service in a brown-field network cannot be

accurately estimated without significant changes to the model and extensive input data that is likely unavailable.

G. The Coalition generally agrees with the Bureau's proposal for estimating the costs of wire center facilities, and if a green-field model is used, we propose that it adopt the cost categories used in the CQBAT model

H. The Coalition agrees with the Bureau's view that the general approach to network sizing taken by CQBAT is reasonable and does not believe there is any reason to deviate from it.

I. The Coalition believes that the Bureau should use nationwide average values with regional adjustments to capture variations in labor and materials costs, rather than company-specific, cost inputs. The Commission previously—and, in our view, correctly—rejected the use of company-specific input values in the HCPM because there is no administratively feasible means to collect such data (and certainly not in a reasonable timeframe) and because it would not be consistent with estimating the forward-looking costs of an efficient provider.

J. The Coalition believes that the CQBAT approach to calculating operating expense is reasonable and that there is generally no reason to deviate from it. We recognize, however, that modifications may be necessary to address out-of-state Internet backbone interconnection arrangements and to reflect any additional costs that may be unique to a particular geographic region.

K. The Coalition does not support modifying the economic-life assumptions adopted for the HCPM. These economic lives were approved by the Commission and have been used in the HCPM model, by state public utility commissions in UNE pricing proceedings, and in previous versions of CostQuest models. Moreover, it would be enormously complicated, burdensome, and time-consuming to attempt to establish new values now, and doing so would

delay implementation of the model possibly for years. If the Commission does wish to review existing economic lives, it should initiate a separate rulemaking proceeding, since economic lives and regulatory depreciation have implications that extend beyond the CAF Phase II proceeding.

L. The Coalition believes that sharing factors used in the CQBAT model, which are very close to those used by the HCPM, are reasonable and that there is no reason to deviate from them. The Coalition is opposed to adjusting the CQBAT sharing factors to assume that, wherever there is a cable operator, three entities will share structure costs. This assumption is often inaccurate as a matter of practice—often the assumption of three providers sharing plant is too high, and other times it is too low—and the proposed modification will only affect results in cases where feeder or distribution pass through a cable operator's franchise area but then terminates to locations outside that area. Given the questionable basis for this change, and because modifying the programming code of the model to accommodate this change is likely to involve significant time and effort, the Coalition believes that any small benefits from such a change are greatly outweighed by their costs and delay.

M. The Coalition believes that the CQBAT approach of using carrier-specific plant-mix data where it is available is reasonable. We further support the decision to use national default values where carrier-specific data are not available, particularly given the need to implement the model expeditiously. We also include updated plant-mix data from Coalition members as an attachment to this filing.

N. The Coalition supports CQBAT's use of labor-cost adjustments based on data from R.S. Means. The R.S. Means data on regional variations in construction costs, which are based on a large national survey, are widely recognized and used in numerous contexts, and

therefore provide an objective and reliable basis for adjusting inputs to reflect regional differences in wage and materials costs.

O. The Coalition cannot support the proposal to calculate unit costs on a per-location basis until the Bureau reveals what other changes it intends to make in the thresholds, take-rate assumptions, etc., and what the implications of those changes will be for support levels.

P. The Coalition opposes the Bureau's proposal to assign common costs using a modified subtractive approach. Not only is the subtractive approach conceptually flawed and the modified approach logically inconsistent, but implementing this approach would significantly delay adoption of the model and disbursement of CAF Phase II support.

Q. The CQBAT model, when deploying FTTD technology, currently only ensures upstream speeds of 768 Kbps. The CQBAT and CACM should be modified to ensure upstream speeds of 1 Mbps to conform to the requirements set forth in the *USF/ICC Transformation Order*. Finally, because the Bureau has yet to provide documentation cataloguing and explaining the differences between the CQBAT model and the CACM model and the Coalition has not had an adequate opportunity to examine the logic of the CACM, the Coalition cannot yet comment in detail on the CACM or on whether there "are any other functionalities or capabilities that should be added to" the CACM platform.[4]

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[4] December 11, 2012 Public Notice, *supra* note 1, at 2.

II. SIMPLICITY AND ADMINISTRATIVE FEASIBILITY ARE CRITICAL TO THE SUCCESS OF CAF PHASE II.

As the Coalition indicated in its initial comments on the Bureau's Public Notice of June 8, 2012,[5] it supports the six design criteria identified in that Public Notice.[6] At the same time, the Coalition is extremely concerned by delays in the implementation of the cost model and CAF Phase II support. Although the Commission has recently sought comment on possible interim policies it could adopt until the cost model is ready,[7] the proposed interim reforms will result in support amounts that are far smaller than the amount budgeted for CAF Phase II. As the Coalition explained in its July Comments, "other universal service and intercarrier compensation reforms . . . will eliminate subsidies that carriers have traditionally relied upon to support service in high-cost, rural areas. If CAF Phase II support is not yet available to fill the gap, carriers serving these areas may find it difficult, if not impossible, to continue to provide service."[8]

Accordingly, the Coalition believes that it is critical that the Bureau make every effort to implement the cost model and the CAF Phase II support program as expeditiously as possible. It follows that simplicity and administrative feasibility should be among the Bureau's paramount goals to ensure timely implementation and disbursement of CAF Phase II support. Thus, when

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[5] *Wireline Competition Bureau Seeks Comment on Model Design and Data Inputs for Phase II of the Connect America Fund*, WC Docket Nos. 10-90 & 05-337, DA 12-911 (rel. June 8, 2012) ("June 8, 2012 Public Notice"), *reprinted at* 77 Fed. Reg. 38804 (June 29, 2012).

[6] Comments of the United States Telecom Association, AT&T, CenturyLink, Fairpoint Communications, Frontier Communications, Verizon, and Windstream Communications, WC Docket Nos. 10-90 & 05-337 (July 9, 2012) ("Coalition July Comments").

[7] *In the Matter of Connect America Fund*, WC Docket No. 10-90, Further Notice of Proposed Rulemaking (rel. Nov. 19, 2012)

[8] Coalition July Comments, *supra* note 6, at 6.

evaluating alternative design options, the Bureau should, other things being equal, choose the design option that is the simplest and that can be implemented most expeditiously.

III. THE BUREAU SHOULD ADOPT A GREEN-FIELD MODEL

The Bureau should model a green-field, rather than a brown-field deployment. As the Coalition explained in greater detail in its July Comments, both theoretical and practical considerations favor adoption of a green-field approach.[9] Neither the CQBAT model nor the Connect America Cost Model ("CACM"), which the Bureau recently released, addresses the problems of a brown-field approach nor accurately measures the costs of a brown-field deployment.

A. Neither The CQBAT Model Nor The CACM Address The Critical Flaws Of A Brown-field Approach.

As an initial matter, the Coalition is concerned that neither the CQBAT model nor the CACM adequately addresses the three problems with a brown-field model that the Coalition discussed in its previous comments.

First, a green-field approach estimates the full forward-looking economic cost of constructing and operating a network. This is the reason that the Commission previously has adopted a green-field approach, both in designing the TELRIC costing methodology and in designing the HCPM, and in both cases the green-field approach was sustained on appeal.[10] As the Commission explained in the *Universal Service First Report and Order*, "the proper measure of cost for determining the level of universal service support is the forward-looking economic

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[9] *Id*. at 13-22.

[10] *See Verizon Commc'ns Inc. v. FCC*, 535 U.S. 467, 475, 497-528 (2002) (upholding the Commission's authority to set rates "on a forward-looking basis untied to the incumbents' investment"); *Qwest Corp. v. FCC*, 258 F.3d 1191, 1194, 1205-07 (10th Cir. 2001) ("We review and uphold the FCC's computer model of the costs of providing service in a given area.").

cost of constructing and operating the network facilities and functions used to provide the supported services as defined per section 254(c)(1)."[11] It further explained that, "in the long run, forward-looking economic cost best approximates the costs that would be incurred by an efficient carrier in the market . . . [and] that the use of forward-looking economic costs as the basis for determining support will send the correct signals for entry, investment, and innovation."[12] As the Coalition previously explained, the Commission, in adopting this approach, did ***not*** exclude from the forward-looking cost estimates the costs associated with sunk network investments. Rather, it included all the forward-looking costs of "constructing and operating the network facilities and functions used to provide the . . . [relevant] services."[13]

Second, a brown-field approach, in contrast, is logically flawed because it fails to consider the costs associated with existing infrastructure. These costs include ongoing operating expenses, including replacement capital and maintenance expense,[14] and the capital costs associated with the undepreciated plant, including both depreciation expense and a return on capital. By focusing only on required incremental investment and ignoring these other costs that would be included in a green-field approach, the brown-field approach inevitably underestimates the total forward-looking economic cost of constructing and operating a network that can provide

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[11] *Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, Report and Order, 12 FCC Rcd. 8776 para. 224 (1997) (*Universal Service First Report and Order*).

[12] *Id.* (footnotes omitted).

[13] *Id.*

[14] As the Bureau notes, operating and maintenance expenses for DSL networks, which require active electronics in the outside plant, are higher than for other technologies. *See* June 8, 2012 Public Notice, *supra* note 5, at 10-11, paras. 31, 35, 39.

voice and broadband service at the specified speed.[15] But these excluded costs are real costs, which regulators and courts have long recognized that carriers should be able to recover. For example, the ongoing operational expense associated with the existing network, including replacement capital and maintenance expense, involves actual monetary outlays that must be recovered if the carrier is to remain in operation. Similarly, unamortized depreciation and return on capital must be recovered if the carrier is to remain whole and to continue to have an incentive to invest going forward.[16] By ignoring these real costs—real because price cap carriers relying on embedded plant to meet CAF Phase II obligations will continue to incur those costs—the brown-field approach will underestimate the forward-looking cost of constructing and operating a broadband wireline network.[17]

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[15] *Cf.* Henry Ergas, *TSLRIC, TELRIC and Other Forms of Forward-Looking Cost Models in Telecommunications: A Curmudgeon's Guide* at 12 (available at http://ssrn.com/abstract=1430248) ("The choice between [brown-field and green-field] boils down to the treatment of sunk costs. As a matter of theory, forward looking cost models are intended to act 'as if' sunk costs did not exist. As a result, it seems inconsistent with the purpose to assume that some sunk costs (say, those associated with trenching) should be treated as sunk, while others (say, those associated with cabling) are not. Moreover, the line drawn between these would seem to be arbitrary, and would hence reduce the significance of the results. Consequently, it seems best to consistently adopt a greenfield approach." (footnotes omitted)).

[16] We note that neither the brown-field model nor the green-field model account for the costs of that part of the existing network that will be replaced as it is rendered technologically obsolete, though regulators have frequently allowed recovery of such "stranded costs." *See* Coalition July Comments, *supra* note 6, at 16 n.39.

[17] This underestimation of costs is exacerbated by the levelization of capital costs employed in both the CQBAT and CACM models and by the fact that support will be guaranteed for only five years. With respect to levelization, as CostQuest explained, both depreciation cost and cost of money will decline over the life of the plant as short-lived assets are depreciated and the amount of undepreciated plant declines. Under levelization, however, capital costs are levelized to produce a constant annual capital cost throughout the life of the asset. This means that, during the first few years of a network, the levelized capital costs will be less than the actual capital costs, but during the last years of the network's life, they will be greater. *See* CQBAT Model Presentation: Part I at 76-77 (available at http://transition.fcc.gov/wcb/tapd/universal_service/caf/CAF2-Part1.pdf). While levelization would not have a distorting effect if support were provided throughout the life of the network, it will result in underestimated costs where, as under

The only conditions under which it would be correct to employ a brown-field model would be if the existing network were breaking even with respect to the services currently being provided and if it were expected to continue to break even for the relevant period in the future. But this clearly is not the case. The existing infrastructure in high-cost areas has never broken even based solely on end-user revenues. Rather, carriers serving rural, high-cost areas have relied on both explicit legacy universal service support payments and implicit subsidies from above-cost intercarrier charges.[18] But both these sources of subsidies are being eliminated as a result of the Commission's recent reform of its universal service and intercarrier compensation policies.[19] The erosion of these legacy sources of support, combined with continuing subscriber losses,[20] clearly belies any assumption that price-cap carriers were breaking even in high-cost rural areas or can be expected to break even in the future absent ***sufficient*** explicit universal service support. Accordingly, it would be inappropriate to adopt a brown-field model that excludes a significant percentage of carrier's forward-looking costs.

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the current FCC plan, support will be given for only five years—a fraction of the life of the network. Thus, under this approach, support will be too low, both because levelization systematically underestimates cost during the first five years and because the five year support period completely ignores costs that will be incurred and must be recovered in later years.

[18] Moreover, because in some cases price-cap carriers have been subject to carrier-of-last-resort obligations, it is likely that, even with explicit and implicit legacy support, carriers were (and still are) operating at a loss in the least-dense, highest-cost rural areas.

[19] For a more detailed discussion, see Coalition July Comments, *supra* note 6, at 18-19.

[20] According to the Commission's own statistics, by the end of 2011, the number of ILEC switched access lines had declined by more than 50 percent since early 2000, and was continuing to decline by more than 10 percent per year. *See* Federal Communications Commission, *Local Telephone Competition: Status as of December 31, 2002*, at 5 tbl. 1 (June 2003); Federal Communications Commission, *Local Telephone Competition: Status as of June 30, 2011*, at 5 fig. 4 (June 2012).

Third, a brown-field approach is impractical and would significantly delay implementation of CAF Phase II. As the Coalition explained in its July Comments, in order to construct an accurate and reliable brown-field model, it would be necessary to have detailed and accurate information on carriers' existing infrastructure, including the age and quality of existing plant and the gauge of the copper wires.[21] In addition, in order to achieve 1 Mbps upstream speed, carriers will have to use pair bonding, which means that the brown-field model would require data on the amount of spare copper pair per location.[22] Finally, one would need data on the nature and capacity of existing inter-office transport in order to determine whether that capacity would need to be augmented. Unfortunately, the Coalition members do not keep these data, or do not keep them in an easily accessible form. Moreover, many of these data may be inaccurate or outdated. As the Coalition explained, it would be extremely costly and time-consuming to retrieve these data, verify their accuracy, and put them in a form that the Commission could use—especially at a sufficiently granular level to meet the model's requirements.[23]

B. Neither CQBAT's Brown-field Option Nor CACM's Brown-field Option Accurately Measures The Costs Of A Brown-field Deployment.

The CQBAT model adopts a "quick and dirty" approach to estimate a brown-field option. Under this brown-field option, the model reduces the annual charge factor to zero for depreciation, cost of money, and taxes for any existing network investment that is assumed to be

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[21] Coalition July Comments, *supra* note 6, at 20 (citing June 8, 2012 Public Notice at 12, para. 35).

[22] *Id.*

[23] Moreover, as the Bureau, with significant understatement, observed, "this approach may create administrative burdens on both the carriers and the Commission, and would be subject to approval by OMB." June 8, 2012 Public Notice, *supra* note 5, at 28, para. 95.

able to be used in the future (though it does include operating expense associated with that network investment). In effect, it simply excludes all capital expense associated with those parts of the existing network that it assumes will continue to be used.

There are numerous problems with this approach. First, as previously noted, it ignores the fact that the distribution plant may vary in terms of age, quality and gauge of copper wire. For example, CQBAT and CACM model a 12,000 foot copper distribution design where the existing copper distribution networks may not in fact comport with this idealized network. Depending on the condition of the existing plant, parts of the distribution plant may need to be replaced or copper loops exceeding the 12,000-foot design limit may need to be shortened. The CQBAT brown-field option fails to capture these variations in existing plant. Second, as noted, pair bonding is required in order to ensure upstream speeds of 1 Mbps or more, but there may be no spare copper, new copper pairs may have to be installed, or copper pairs may need to be rearranged. The CQBAT model makes no allowance for these network adjustments, replacements, or augmentations. Third, as CostQuest acknowledges, it is not clear whether certain existing capital equipment, such as conduit, will be able to be used for the upgrade, or whether it will have to be augmented or replaced.[24] Fourth, the incremental cost of upgrading the feeder network in this brown-field approach is calculated from the green-field distribution network the model designs. If the brown-field feeder network costs are to be properly calculated, they need to be estimated based on the actual locations of the distribution network nodes. The effect of these unrealistic simplifying assumptions will almost surely be to underestimate the cost of a brown-field network.

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[24] *See* CQBAT Model Presentation: Part I, *supra* note 17, at 86.

To illustrate the extent of this underestimate, we note that in price-cap areas where there is no cable operator, distribution plant represents approximately 60 percent of total plant investment. To the extent the CQBAT brown-field model assumes that this distribution plant can continue to be used, the brown-field option effectively writes off 60 percent of total plant investment.

The December 11 Public Notice indicated that the CACM, which is based on the CQBAT model, has an improved brown-field option, which includes replacement capital.[25] Because the Bureau has provided no detailed documentation that catalogues the changes that were made between the two models, the Coalition is unable to comment in depth on the new brown-field option in the CACM. But, since the Bureau clearly lacks detailed data on existing infrastructure, the CACM brown-field model must be making sweeping generalizations and assumptions as a substitute for real data, both respect to existing infrastructure and required replacement capital. These sweeping assumptions make the model far too inaccurate to use, because, as the Bureau acknowledged, the differences between nationwide average plant mixes and the actual plant mix in a given area "would have potentially significant impact on the support levels for smaller prices cap carriers or for states that have large variances from the average."[26]

These problems are not easily solved. A brown-field model, if done correctly, would violate several of the principles that the Bureau laid out in its June 8, 2012 Public Notice. It

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[25] December 11, 2012 Public Notice, *supra* note 1, at 2.

[26] June 8, 2012 Public Notice, *supra* note 5, at 28, para. 96. Although such simplifying assumptions may have been acceptable when estimating the likely total support required to deploy broadband nationally, as the Commission did in the National Broadband Plan, they clearly are not acceptable when estimating relative costs among highly granular geographic areas. *Cf. OBI Technical Paper No. 1*, at 24-25 (discussing likelihood of errors "in any single, particular, small geography," when using statistical modeling as a substitute for actual disaggregated data concerning existing infrastructure).

would not be simple. It would be not be meaningfully accessible to the public, and it would not be administratively feasible. And most importantly, even if it were possible to compile the required data over time, this would significantly delay the implementation of CAF Phase II, possibly by years. But the "quick and dirty" approach adopted in the CQBAT model (and apparently in the CACM) would be worse. Because of its lack of precision and its sweeping and inherently inaccurate assumptions, it would likely generate unjustified and unacceptable variations in support levels among various price cap areas that do not reflect the actual forward looking costs of deploying broadband. The Coalition therefore submits that Bureau should reject a brown-field and instead model a green-field deployment.

IV. RESPONSE TO SPECIFIC QUESTIONS RAISED IN THE VIRTUAL WORKSHOP

A. Customer Locations

In the absence of actual geo-code data, the Coalition believes that the Bureau should adopt the methodology used by CQBAT for determining customer locations. CQBAT's approach to determining customer locations, which is described in the CQBAT Model Description, essentially uses a combination of data sources to estimate residential and business customers by zip code and then distributes those customers randomly along the roads in the census block.[27]

[27] Letter from Robert W. Quinn, Jr. *et al.* to Marlene H. Dortch, WC Docket No. 10-90, Appendix 3 at 10 (filed July 29, 2011) ("CQBAT Model Description"). *See also* CQBAT Model Presentation: Part I, *supra* note 17, at 51; CQBAT Model Presentation: Part II at 18 (available at http://transition.fcc.gov/wcb/tapd/universal_service/caf/CAF2-Part2.pdf).

As the Bureau notes, the CQBAT model is "consistent with current best practice" and is an improvement over the HCPM.[28] Moreover, CostQuest's wireline models have been used in a variety of contested proceedings, including unbundled network element pricing proceedings, universal service proceedings, interconnection arbitrations, and ad valorem tax studies. These models, which use the same methodology for determining customer locations as the CQBAT model, have been filed and examined in numerous states, including Alabama, Georgia, South Carolina, Kentucky, Mississippi, Louisiana, Florida, Texas, California, Nevada, Missouri, Oklahoma, Kansas, Arkansas, Wisconsin, Michigan, Massachusetts, Iowa, Virginia, Delaware, Maryland and Wyoming. In addition, a CostQuest model was used to support the FCC's National Broadband Plan. Given the extensive testing and acceptance of these CostQuest models and the customer location algorithm, it appears reasonable to adopt the approach taken in the CQBAT model.

B. Clustering

The Coalition believes that the CQBAT model's approach to clustering is appropriate, and there appears to be no reason to deviate from it. The CQBAT's clustering algorithm derives from the algorithm used in the HCPM, but it has been improved. In particular, as the Bureau notes, CQBAT "uses road-based routing to determine the maximum size of the clusters," which results in "more realistic estimates of cluster size."[29] The CQBAT clustering algorithm is substantially the same as that used in other CostQuest models that have been examined in numerous state proceedings. The Coalition knows of no reason to deviate from this approach.

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[28] Cost Model Virtual Workshop: Determining Customer Locations (available at http://www.fcc.gov/blog/wcb-cost-model-virtual-workshop-2012-determining-customer-locations).

[29] *Id.*

C. Routing

As the Bureau notes, the CQBAT model builds plant along roads and uses a spanning tree algorithm to find the lowest cost route to serve all customers.[30] This approach is significantly more realistic than the approach taken by the HCPM. And it is identical to the routing algorithms CostQuest used in previous wireline models that were reviewed by multiple state regulatory agencies and in the model it developed for the National Broadband Plan.

We do not believe that additional information is needed to understand the model's approach to routing. But if other parties have questions, they should submit their questions to CostQuest.

D. Capturing Variation by Geography

The primary driver of variations in cost among geographic areas is differences in customer-location density, which results in differences in the length (and cost) of distribution and feeder. The CQBAT model also adjusts certain model assumptions based on geographic density zone; adjusts certain input values (for labor and material costs) based on region, specifically at the zip-3 level; and adjusts other input values based on terrain characteristics.

Although CQBAT assumes only three density zones, in contrast to the nine density zones used in HCPM,[31] the Coalition nevertheless believes that three zones provide for sufficient variation in model assumptions based on density. Upon examining the cost differences by density zone as determined by the HCPM, one finds that there is a significant difference between the costs estimates for zone 2 (5-100 lines per square mile) and those estimated for zone 3 (100-200 lines per square mile). This suggests that zones 1 (0-5 lines per square mile) and 2 represent

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[30] *See also* CQBAT Model Presentation: Part I, *supra* note 17, at 51.

[31] HCPM has nine zones that are defined in terms of lines per square mile.

the more rural, high cost areas. Zones 1 and 2 in the HCPM, which account for approximately 11 percent of total customer locations, correspond to zone 1 in the CQBAT model, though CQBAT's zone 1 includes a somewhat higher percentage of customer locations.

In both the HCPM and CQBAT models, the density zones affect assumptions concerning distribution plant mix, copper-feeder plant mix, fiber-feeder plant mix, fill factor, manhole spacing, and sharing. In the HCPM model, there is no variation or little variation in the assumptions for those variables for zones 1 and 2—the rural zones. For example, there is no variation in the assumptions for copper-feeder plant mix, fiber-feeder plant mix, and manhole spacing between zones 1 and 2. As for the inputs, where there is some difference between zones 1 and 2, those differences appear small. For example, for distribution plant mix, HCPM assumes zero percent underground, 60 percent buried, and 40 percent aerial for zone 1, compared with 1 percent underground, 62 percent buried, and 37 percent aerial for zone 2. And HCPM assumes 70 percent and 50 percent fill factors for distribution and feeder, respectively, for zone 1, while it assumes 77.5 percent and 55 percent for zone 2. Given these relatively small differences, it does not appear worth the time or effort to attempt to divide zone 1 in the CQBAT and CACM models into more than one zone.

There are several additional reasons why the coalition does not support further disaggregation of the three current density zones. First, attempting to create additional rural density zones would involve arbitrary line-drawing, would require the collection of additional detailed data, and would likely significantly delay implementation of the model. Second, the density zones affect a relatively limited number of model assumptions. Other important geographic variations in cost, such as for labor or materials costs, are captured through regional variation (at the zip-3 level) based on third-party sources. And as noted previously, the primary

driver of geographic differences in cost is customer location density. Given the relatively small variations in assumptions resulting from subdividing the rural density zone under the HCPM, which the Coalition members believe to be no more accurate than those produced by CQBAT, and the other adjustments for geographical cost differences contained in the CQBAT model, the potential benefits in terms of slightly increased precision resulting from adding additional rural density zones do not outweigh the costs of delay.

E. Inter-Office Transport

The CQBAT model constructs a fiber-based middle mile network to estimate inter-office transport costs.[32] The model assigns only a portion of these inter-office costs to the modeled broadband services, on the assumption that the transport network is built for multiple purposes, including supported broadband services. For example, by default, CQBAT assigns 50 percent of the costs associated with the middle mile network to supported broadband services.

The Coalition believes that CQBAT's approach to modeling inter-office transport costs is reasonable for a green-field model and does not require modification. If the Bureau decides to adopt a brown-field model, however, then significant modifications will be required. Under a brown-field model, one would need to know the location and nature of the existing inter-office infrastructure and how much traffic is currently being carried over that infrastructure. One would then need to identify where the existing network is likely to be insufficient for future traffic demands (*e.g.*, if certain wire centers are connected by inter-office copper cable rather than inter-office fiber) and then add all necessary forward-looking components, including possibly additional fiber or electronics, to ensure that there is sufficient capacity for expected traffic demands. Under a brown-field approach, it would not be sufficient to assume either that

[32] CQBAT Model Description, *supra* note 27, at 11, 13-14.

no inter-office network exists or alternatively that the existing inter-office is adequate and does not need to be augmented, since this can distort the relative brown-field costs between different areas.

F. Voice Capability

The Coalition agrees with the Bureau that it makes sense to include voice capability in the model if voice is a supported service. However, because carriers are in many cases just beginning to convert their circuit-switched voice networks to VOIP networks, it is not surprising that they are adopting a variety of strategies, including as to where they install soft-switches and how many switches they install.

With respect to switching, the coalition believes a reasonable approach would be to assume that a carrier installs one soft-switch per state, as the Bureau proposed. Both commercial and back-up power would also need to be added. With respect to signaling, the Coalition believes that the model should employ Session Initiation Protocol ("SIP"), since SS7 is a legacy of the circuit-switched world that would not be installed in a network built today. Backup power would have to be added at the customer premises if the Bureau models a FTTD architecture, but it should already be included under the FTTP option in CQBAT.

As discussed above, we find a brown-field approach to be unacceptable for legal, policy, and practical reasons. In addition, the Coalition finds the Bureau's proposal for estimating the cost of adding voice service in a brown-field model to be inadequate and unacceptable. The Bureau proposes to calculate the total cost of providing VOIP as in the green-field case and then to remove the capex from the calculation. By refusing to allow any capital expense for voice service, the Bureau implicitly assumes that carriers will retain their circuit-switched voice equipment. But, under this approach, one should at least include the operating cost associated with providing voice via a circuit-switched network, which is higher than the operating costs

associated with VOIP. But the Bureau does not do so; rather, its approach would only estimate the much lower expected operating expense associated with VOIP service.

The proposed approach therefore is wrong on two grounds. First, as carriers are upgrading their networks to broadband, many are simultaneously transitioning from providing circuit-switched telephony service to providing VOIP. This requires that carriers incur certain capital expenditures, such as a soft-switch and possibly new signaling equipment, which should be considered. And for carriers that decide to retain their circuit-switched equipment, the model should estimate the operating expense of a circuit-switched network. But the Bureau's approach neither makes any allowance for capital expense nor properly considers the operating expense associated with a circuit-switched network. If anything, the Bureau's proposal provides another illustration of how the brown-field approach systematically and significantly underestimates the cost of providing broadband service, including voice.

Finally, according to the Bureau's December 11, 2012 Public Notice, the CACM has added voice capability. Unfortunately, because the Bureau has yet to provide any documentation describing how voice capability was implemented in the CACM, the Coalition is unable to comment on the CACM's approach to modeling voice.

G. Wire Center Facilities

As the Bureau notes, the CQBAT model "includes costs for an all IP network, including routers, Ethernet switches, and rack space, in addition to buildings, land, and power."[33] And, if it adopts a green-field approach, it proposes to adopt the cost categories used in the CQBAT model. The Coalition generally agrees with this approach, though, if the Bureau decides to model voice service, it may need to create additional cost categories to reflect the equipment

[33] Cost Model Virtual Workshop: Wire Center Facilities (available at http://www.fcc.gov/blog/wcb-cost-model-virtual-workshop-2012-wire-center-facilities).

necessary for the provision of voice. Because of a lack of documentation, we cannot comment on any new cost categories that may have been added to the CACM to reflect the cost of installing VOIP equipment.

As previously indicated, the coalition opposes the use of a brown-field model. And, for the reasons previously explained, we find it unrealistic and unjustified to simply eliminate broad categories of capital expense based on broad-sweeping assumptions about the adequacy of the existing network.

H. Sizing of Network Facilities

In the Virtual Workshop, the Bureau explained that the "CQBAT model sizes the network according to the digital throughput required at the time of peak usage based on a busy-hour offered load," and it noted that this was essentially the same approach taken in the National Broadband Plan modeling.[34] We agree with the Bureau's view that the general approach to network sizing taken by CQBAT is reasonable and do not believe there is any reason to deviate from it. The Coalition notes, however, that, if voice capability is added to the model, the peak load demands associated with voice service should be included in the sizing calculations, though we do not expect that this incremental demand should have a significant impact.

I. Use of Company-Specific Values

In the *Universal Service Tenth Report and Order*, the Commission generally adopted nationwide, rather than company-specific, input values for the HCPM. It provided two basic reasons for doing so. First, it found that nationwide values, rather than company-specific values, were more appropriate because the universal service support mechanism is "based on the estimated costs that an efficient carrier would incur to provide the supported services, rather than

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[34] *Id.*

on the specific carrier's book costs."[35] Second, it concluded that "it would be administratively unworkable to use company-specific values in the federal nationwide model."[36] At the same time, however, the Commission recognized the desirability of having data that accurately and objectively reflect "variations in forward-looking costs based on objective criteria,"[37] and it stated that it was open to additional modifications of inputs in the future.[38] As an example, it noted that it did "not adjust [the] maintenance expense estimates to reflect regional wage differences . . . because we have not found and no party has suggested a specific data source or methodology that would be useful in making such adjustments."[39]

Consistent with the *Tenth Report and Order*, the CQBAT model does not use company-specific inputs, though it does adjust for regional differences in labor and materials costs, based on objective third-party data.[40]

The Coalition agrees with the Bureau that CQBAT's approach of using regional adjustments to capture labor and materials costs is reasonable, and we do not see any reason to deviate from this approach. The Coalition further believes that the Bureau should not use company-specific input values. First, gathering company-specific data would be extremely

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[35] *Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, Tenth Report and Order, 14 FCC Rcd. 20156, 20172, para. 31 (1999) (*Tenth Report and Order*), *aff'd*, *Qwest Corp. v. FCC*, 258 F.3d 1191 (10th Cir. 2001); s*ee also id.* at 20198, para. 90 (finding that "average, rather than company-specific data, are better predictors of the forward-looking costs that should be supported.").

[36] *Id.* at 20172, para. 31*; see also id.* at 20198, para. 90 (finding that "using company-specific data . . . would be administratively unmanageable and inappropriate.").

[37] *Id.* at 20171, para. 30.

[38] *Id.*

[39] *Id.*

[40] *See CQBQT Model Presentation: Part I, supra* note 17, at 146-47.

complicated. For example, carriers are increasingly employing contractors as well as full-time employees. When considering labor costs, would one consider only the cost of full-time employees or also contractors, and if the latter, how would one choose among contractors charging different hourly rates? Second, gathering such data would take a significant amount of time and unnecessarily delay implementation of the model. Finally, as the Commission recognized over a decade ago, using company-specific data would not necessarily be consistent with the principle of estimating the forward-looking costs of an efficient provider.[41]

J. Calculating Opex

As the Bureau observes, CQBAT, like HCIPM, calculates plant-specific expenses as a ratio to capex. The Bureau states that, instead of using ARMIS data, CQBAT uses NECA data as well as data from the ABC Coalition companies for plant and plant-specific expenses, which are further broken down by size of company. CQBAT then runs a regression to determine weighting factors and the impact of scale. To calculate non-plant-specific expenses, general and administrative expenses, and overhead, CQBAT uses data from third party sources and the Coalition members. It then uses averages and results from the regression models to develop factors that capture the impact of scale.[42] The Coalition believes that the CQBAT approach is reasonable and that there is no reason to deviate from it.

CQBAT also calculates and includes the cost of transporting data to an edge router at an Internet peering point. It assumes, however, that all price-cap carriers benefit from tier-one peering arrangements with Internet peering points within the state or serving area. The Coalition

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[41] *Tenth Report and Order*, 14 FCC Rcd. at 20198, para. 90.

[42] *See also* Cost Model Virtual Workshop: Calculating Opex (available at http://www.fcc.gov/blog/wcb-cost-model-virtual-workshop-2012-calculating-opex); CQBAT Model Description, *supra* note 27, at 16-17.

recognizes that modifications to the model may be necessary to address out-of-state Internet interconnection points and interconnection arrangements that are not Tier 1 peering arrangements, since these may result in higher transport costs per location. The Coalition further recognizes that the necessary inputs to reflect these additional costs may be unique to a particular geography, study area, or state. The Coalition believes that an opex input could be added to the model, which could be invoked where a carrier demonstrates the existing model fails adequately to capture these additional costs.

K. Determining the Annualized Cost of Capital Investments

CQBAT uses the same economic lives that the Commission adopted for the HCPM. In the Virtual Workshop, the Bureau suggests that some of these economic lives may be outdated, and it asks which specific values are outdated and what specific modifications should be.[43]

The Coalition recommends against attempting to modify these economic lives. First, these economic lives were approved by the Commission and have been used in the HCPM model, by state public utility commissions in UNE pricing proceedings, and in previous versions of CostQuest models. Second, it would be enormously complicated, burdensome, and time-consuming to attempt to establish new values now, and doing so would delay implementation of the model possibly for years. Third, to the extent that the Bureau believes that economic lives need to be modified, this is not the appropriate forum in which to do so. Since economic lives and regulatory depreciation have implications that extend beyond the CAF Phase II proceeding, the Commission, if it wishes to review existing economic lives, should initiate a new rulemaking proceeding to consider its rules governing regulatory depreciation in general and economic lives

[43] *See* Cost Model Virtual Workshop: Determining the Annualized Cost of Capital Investments (available at http://www.fcc.gov/blog/wcb-cost-model-virtual-workshop-2012-determining-the-annualized-cost-of-capital-investments).

in particular. Fourth, the coalition believes that, to the extent that existing economic lives are inaccurate, they tend to overstate the actual economic lives today. For example, the most significant changes that have occurred in network equipment have occurred in circuit equipment, where lives have shortened. To the extent the Commission's current economic lives are too long, this simply results in a slight, but consistent, understatement in costs, not an overstatement. Finally, the Coalition notes that support under CAF Phase II will be provided for only five years, which is significantly shorter than the economic lives at issue. Given this time horizon, it does not seem worth the expense or delay of updating the economic lives assumptions.

L. Determining the Sharing Factor for Outside Plant

The sharing factor represents the extent to which certain outside plant costs, such as the costs of poles or conduit, are shared among multiple providers, such as local exchange carriers, electric utilities, and cable companies (to the extent that the cable network reaches a particular geographic area). In the CQBAT model, the sharing factors vary depending on whether the outside plant is aerial, buried, or underground, and on whether the plant is used for feeder, distribution, or middle mile. The sharing factors also vary with the three density zones used in CQBAT.

The Coalition believes that CQBAT's approach to sharing is reasonable and that there is no reason to deviate from it. Nor do we think that there is any need to modify specific input values for sharing factors. We note that the sharing factors used in CQBAT are very close to those used by the HCPM.

In the Virtual Workshop, the Bureau asks (1) whether the Bureau should assume that "three providers are sharing plant in any area where the SBI data set suggests that there is a cable operator," and (2) whether this assumption should vary depending on whether the outside plant is

aerial, buried or underground.[44] The Coalition believes that this proposal is unnecessary and ill-advised for several reasons. First, the CQBAT sharing factors already account for the presence of cable companies, as well as electric utilities, by adjusting sharing factors by density zone in a manner similar to that used in HCPM. Second, the assumption that there are always three providers in areas where there is a cable operator may be incorrect. For example, in some areas, there may be more than three companies sharing the cost of a pole, such as when a CLEC shares the structure. In other cases, however, the assumption of three providers will be too high. For example, it is highly unlikely that the local exchange carrier, electrical utility, and cable company will all share the same conduit, and even less likely that they will share the costs of underground deployment. Third, even if this approach improved the model's accuracy—which, as just explained, is far from clear—the impact on funding of any changes is likely to be negligible in this case. As the Bureau recognizes, areas with cable providers will be ineligible for support. Thus, making this change will only affect results in cases where feeder or distribution pass through a cable operator's franchise area but then terminates to locations outside that area. Fourth, and most importantly, modifying the programming code of the model to accommodate this change is likely to involve significant time and effort, and will likely delay significantly implementation of the model. Given the questionable basis for this change and the minimal impact it is likely to have, the Coalition does not believe that any small potential benefits from this change outweigh the costs of implementation and delay.

The Bureau also asks whether these sharing assumptions continue to make sense if the Bureau were to adopt a brown-field model. For the reasons given above, the Coalition opposes

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[44] *See* Cost Model Virtual Workshop: Determining the Sharing Factor for Outside Plant (available at http://www.fcc.gov/blog/wcb-cost-model-virtual-workshop-2012-determining-the-sharing-factor-for-outside-plant).

the brown-field approach. If the Bureau nevertheless decides to adopt a brown-field approach, however, then the Coalition believes that significant changes would need to be made in the sharing assumptions. Specifically, if a brown-field approach is adopted, then the model should reflect actual facilities and network nodes as currently placed in the network, as well as the sharing that is currently taking place in the structure associated with those facilities. This will require significant changes in the sharing assumptions and require significant new data. For example, if the brown-field model requires additional fiber feeder to be built to a particular node, the carrier will not have the opportunity to share the cost of the buried structure with the cable company, since the cable companies will already have built their facilities. Similarly, additional aerial fiber feeder may be needed to the extent that distribution areas need to be rearranged to attach new network nodes that shorten distribution lengths to the extent required to achieve speeds of 4 Mbps/1 Mbps. But this incremental investment may incur make-ready costs if poles are already full, which should be taken into account. In summary, if the Bureau decides to adopt a brown-filed approach, it should use actual sharing factors rather than average sharing factors as employed in CQBAT and the HCPM.

M. Plant Mix

Based on data supplied by Coalition members, including the update attached to this filing,[45] CQBAT has developed plant mix percentages for aerial, buried, and underground plant, broken out by three density zones (rural, suburban, and urban) for the country as a whole and for

[45] Certain coalition members had new data sources from which to extract plant-mix data, and the table was updated to include these new data.

the fifty states, the District of Columbia, and Puerto Rico. Where CQBAT lacks carrier-specific data, it uses national default values.[46]

The Coalition believes that CQBAT's approach of using carrier-specific data to develop plant mix percentages is reasonable. The Coalition further believes that it is reasonable to use national average data as a default where carrier-specific or state-specific data are unavailable, particularly given the need to implement the model expeditiously.

Without knowing the missing data, the Coalition is unable to assess whether the use of national defaults introduces any systematic bias. The Coalition believes, however, that any errors that may result from the use of national defaults are likely to be small and are outweighed by the need to implement the model expeditiously.

N. Labor-Cost Adjustment Based on Location.

Using data from R.S. Means concerning building construction costs,[47] CQBAT develops a cost-adjustment factor that is applied to capital costs—specifically labor and materials. These regional adjustment factors are broken down to the three-digit Zip code level for every area of the country.[48]

The Coalition believes that CQBAT's approach is reasonable and should not be changed. In the *Tenth Report and Order*, the Commission stated that it had "tried to account for variations in costs by objective means," but then explained that it was not making adjustments to "reflect regional wage differences . . . because we have not found and no party has suggested a specific

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[46] *See* Cost Model Virtual Workshop: Plant Mix (available at http://www.fcc.gov/blog/wcb-cost-model-virtual-workshop-2012-plant-mix).

[47] R.S. MEANS, BUILDING CONSTRUCTION COST DATA (69th Annual Ed. 2010).

[48] *See* Cost Model Virtual Workshop: Labor-Cost Adjustment Based on Location (available at http://www.fcc.gov/blog/wcb-cost-model-virtual-workshop-2012-labor-cost-adjustment-based-on-location); *see also* CQBT Model Description, *supra* note 27, at 15.

data source or methodology that would be useful in making such adjustments."[49] The R.S. Means data governing regional variations in construction costs, which is based on a large national survey, is widely recognized and used in numerous contexts. The Coalition believes that these data provide objective and reliable data for adjusting inputs to reflect regional differences in wage and materials costs.

The Coalition does not believe that there is any inconsistency between adjusting labor costs based on regional differences in construction costs and maintaining operating expenses at the national level. As the Bureau noted, CQBAT basically calculates operating expenses as a ratio to applicable plant investment.[50] Thus, to the extent that investment in plant is higher in one geographic area than another due to higher labor costs, this will translate into correspondingly higher operating expense. The two approaches—that of adjusting capex to reflect changes in regional labor costs while calculating operating expense at the national level—are thus logically consistent because of the way that opex is derived..

O. Calculating Average Per-Unit Costs/Take Rate

In the Virtual Workshop, the Bureau observed that the first version of the CACM ("CACM v.1") model calculates "the average cost per-subscriber by dividing the total cost (the fixed cost of passing all locations in a given area plus the variable cost associated with serving active subscribers) by the number of active subscribers."[51] The Bureau proposes to "calculate all unit costs on a per-location basis, rather than on a per-subscriber basis," and it observes that

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[49] *Tenth Report and Order*, 14 FCC Rcd. at 20171, para. 30; *see also id.* at 20311-13, paras. 361-64.

[50] CQBAT Model Presentation: Part II, *supra* note 27, at 63-65.

[51] *See* Cost Model Virtual Workshop: Calculating Average Per-Unit Costs (available at http://www.fcc.gov/blog/calculating-average-per-unit-costs-take-rate).

doing so would reduce the variability in average-cost per location as the penetration rates for voice and data vary.[52] The Bureau further indicates that it will explore "adjustments to the take rate in CACM v.1 to determine the impact of varying assumptions on calculated support per location."[53]

The Coalition understands why the Bureau is considering a shift to calculating per-location unit costs. But, if the Bureau changes to a per-location cost basis, it must then modify its thresholds. Moreover, depending on the take rates the Bureau assumes, this could change relative costs among areas by changing the per-subscriber variable cost.

The Coalition cannot support this change until the Bureau makes clear what other changes it intends to introduce (with respect to thresholds, take rates, etc.) and until the Coalition members have an opportunity to assess the impact these changes may have on eligible census blocks, support levels, and build-out requirements.

P. Assigning Shared Costs

In the June 8, 2012 Public Notice, the Bureau sought comment on how it should assign the shared costs of the network between eligible and ineligible areas. It proposed to use what it called a subtractive approach, though it acknowledged concern about whether such an approach was computationally tractable.[54] In the Virtual Workshop, the Bureau proposed a variant of this subtractive approach. Specifically, the Bureau proposed:

> First, use a cost allocation method like that used in CACM v.1 to define the following three footprints: (1) areas that are commercially viable, (2) areas that are eligible for the Remote Areas Fund, which are too high in cost to be supported through Connect America Phase II, and (3) areas that are eligible for Phase II

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[52] *Id.*

[53] *Id.*

[54] June 8, 2012 Public Notice, *supra* note 5, at 16-20.

> support. These footprints would be determined by setting two thresholds and using the cost-per-block calculated using the allocation method. Then, using the subtractive approach to calculate the support amount in each area could be relatively straightforward, requiring only two calculations (commercially viable alone and commercially viable eligible areas).
>
> Depending on the thresholds that are chosen to set the three footprints, the cost of serving eligible areas may exceed or fall short of the $1.8 billion budget once the subtractive method is applied. If this occurs, it would be necessary to use different thresholds to determine the three footprints and re-run the subtractive method.[55]

The Coalition opposed the subtractive approach in its July Comments, and we continue to oppose this approach, even as recently modified by the Bureau. As we explained in greater detail in the July Comments, the subtractive approach is conceptually flawed and will result in insufficient levels of support. Moreover, despite the proposed simplification, the modified subtractive approach remains computationally extremely complex, which is likely to delay significantly implementation of CAF Phase II.

1. Common Costs Should Be Allocated and Recoverable.

As explained in our July Comments, it has long been recognized that, because of the extensive common costs[56] associated with telecom networks, setting prices or support on the basis of incremental cost[57] will not result in the recovery of the total costs of the plant.[58]

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[55] Cost Model Virtual Workshop: Assigning Shared Costs (available at http://www.fcc.gov/blog/assigning-shared-costs).

[56] "Common costs" refer to "costs that are incurred in connection with the production of multiple products or services, and remain unchanged as the relative proportion of those products or services varies." *In the Matter of Implementation of the Local Competition provisions in the Telecommunications Act of 1996*, CC Docket No. 96-98, First Report and Order, 11 FCC Rcd. 15499, 15845, para. 676. (1996) ("*Local Competition First Report and Order"*).

[57] For purposes of this discussion, the terms "total cost," "incremental cost," and "common cost" are defined as follows. Suppose that a carrier serves areas A and B. The Incremental Cost of serving area A is defined as equal to the Total Cost of serving areas A and B less the Stand-Alone Cost of serving area B. Likewise the Incremental Cost of serving Area B is equal to the Total Cost of serving A and B less the Stand-Alone Cost of serving A. The Common Cost associated with serving areas A and B is then equal to the Total Cost of serving A and B less the

Because of this, regulators have adopted various methods of allocating common costs in a way that reflects cost causation.[59] As we explained, the subtractive approach departs from this long tradition because it would assign all the common costs of the network to census blocks that are ineligible for support.

2. The Subtractive Approach Is Conceptually Flawed.

As we explained in the Coalition's July Comments, the subtractive approach is conceptually flawed for a number of reasons.

First, because the subtractive approach only allocates the incremental portion of shared plant to eligible areas, the carrier will break even (*i.e.*, recover its total cost of the network) only if it can earn revenues equal to or greater than the stand-alone cost of providing service to the ineligible census blocks. But to the extent that the revenues are greater than the stand-alone cost, this means that we are assuming that subscribers in the ineligible areas will be cross-subsidizing subscribers in the supported areas.[60] Not only is this inefficient and undesirable from a policy perspective, but it is unsustainable in competitive markets.[61]

Incremental Cost of A less the Incremental Cost of B. These identities can be expressed in symbols as follows:

$$IC_A = TC_{A+B} - SA_B \qquad IC_B = TC_{A+B} - SA_A \qquad CC_{A,B} = TC_{A+B} - [IC_A + IC_B]$$

For a more detailed discussion, *see* WILLIAM J. BAUMOL, JOHN C. PANZAR & ROBERT D. WILLIG, CONTESTABLE MARKETS AND THE THEORY OF INDUSTRY STRUCTURE 67 (1982).

[58] Coalition July Comments, *supra* note 6, at 30-31; *see also Local Competition First Report and Order*, 11 FCC Rcd. at 15852, para. 694) (noting that setting prices of unbundled network elements solely on the basis of forward-looking incremental costs "will not recover the total forward-looking costs of operating the wholesale network").

[59] Coalition July Comments, *supra* note 6, at 31.

[60] *See, e.g.,* Gerald Faulhaber, *Cross-Subsidization: Pricing in Public Enterprise,* 65 AM. ECON. REV. 966 (1975) (defining an economic cross subsidy as occurring when a multiproduct firm sells one product or a group of products at a price below incremental cost or above stand-alone cost). Note that, by definition, if the price of one service or group of service is less than its

Moreover, as we explained in the Coalition's July Comments, there is no reason to believe that a carrier will be able to earn revenues that at least equal the stand-alone cost of providing service to ineligible areas. In cases where a carrier is not currently providing broadband service in an ineligible area, we can infer that it was not economical to provide service in that area and thus that revenues will not exceed the stand-alone cost. But even where the carrier has already built out broadband throughout the ineligible area, this does not necessarily mean that the LEC was breaking even (much less recovering its stand-alone costs) over that infrastructure. Instead, the LEC may have been able to provide the service only because of the heavy explicit and implicit subsidies from legacy USF and ICC systems.[62] Thus, there is no basis to assume that a carrier will be able to generate revenues in its ineligible census blocks that exceed the stand-alone cost of serving those census blocks. If it cannot, then supplying the carrier only enough support to cover the incremental cost of service to the ineligible areas will not be enough to make it economical to build out broadband in the study area. Accordingly, the support required for carriers to accept CAF Phase II funds must be greater than the mere incremental costs that the subtractive approach would offer.

3. The Modified Subtractive Approach Remains Conceptually Flawed, Computationally Complex, Logically Inconsistent, and Will Delay Implementation of CAF Phase II.

Recognizing the complexity of the subtractive approach, the Bureau in the Virtual Workshop proposed a modification which it claims will simplify the computation of support

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incremental cost, then the revenues of another service or group of services must exceed its stand-along cost if the firm is to break even.

[61] *See, e.g.*, BAUMOL *ET AL.*, *supra* note 57 at 352-56 (explaining why prices violating the cross-subsidy test are inefficient and unsustainable in contestable markets).

[62] Coalition July Comments, *supra* note 6, at 32-33.

levels using the subtractive approach. Although its explanation is not completely clear to us, the Bureau apparently would set the two cost thresholds (for eligibility for the CAF Phase II Fund and for the Remote Areas Fund) and then use the current cost-causation allocation methodology of the CACM to identify which areas are (1) below the lower benchmark and therefore ineligible for support, (2) above the lower benchmark and therefore eligible for CAF Phase II support, and (3) above the higher benchmark and therefore eligible for Remote Areas support.[63] The Bureau would then change cost allocation logic in the CACM to assign common costs on the basis of the subtractive approach to the ineligible areas and then calculate support as the difference between the newly calculated costs for the eligible areas and the cost threshold. The Bureau acknowledges, however, that the "cost of serving eligible areas may exceed or fall short of the $1.8 billion budget once the subtractive method is applied," and that if it did, then both thresholds would need to be adjusted.[64]

There appear to be a number of practical and logical problems with this approach. First, implementing this hybrid approach, which employs both the cost-causation and incremental approaches to allocating the common cost of shared plant, is likely to involve significant and time-consuming modifications of the model logic. Once these changes were introduced, the Bureau would then need to provide sufficient opportunity for parties to review the model logic. As a result, adoption of the model and implementation of CAF Phase II is likely to be delayed significantly.

Second, there is no reason to expect that the Bureau will be able to set the correct thresholds initially. If it does not, the process will need to be repeated—possibly many times—

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[63] Though not mentioned, the Bureau would also have to identify those areas that are ineligible for support by reason of the presence of an unsubsidized competitor.

[64] Cost Model Virtual Workshop: Assigning Shared Costs, *supra* note 28.

which will require multiple model runs. This likewise could significantly delay implementation of CAF Phase II.

Finally, there appears to be a logical inconsistency between identifying eligible and ineligible areas using a cost-causation allocation methodology, which assigns common costs to both eligible and ineligible areas, and then determining support based on only the incremental cost of the eligible census blocks. One would expect that, if one were consistent in applying the subtractive methodology, both in identifying eligible and ineligible census blocks as well to determining support levels, the list of eligible census blocks would likely differ significantly from those generated by this new hybrid approach, as would the levels of support.

It simply makes no sense to significantly delay the implementation CAF Phase II in order to adopt a conceptually flawed, computationally complex, and logically inconsistent methodology for allocating common costs and determining support levels. Simplicity, administrative feasibility, and theoretical consistency all favor retaining CostQuest's current cost-causation approach for allocation the common costs of shared plant.

Q. Additional Functionalities and/or Capabilities That Should Be Added to the Model

In both the December 11, 2012 and December 17, 2012 Public Notices, the Bureau asks whether there are additional functionalities or capabilities that should be added to the model.[65]

As the Coalition previously pointed out, the CQBAT model, when deploying FTTD technology, is designed to ensure a minimum of 4 Mbps downstream and 768 Kbps upstream.[66] In order to achieve 1 Mbps upstream speed to all locations, carriers will need to use pair

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[65] December 11, 2012 Public Notice, *supra* note 1, at 2; December 17, 2012 Public Notice, *supra* note 2, at 1.

[66] Coalition July Comments, *supra* note 6, at 7 n.11.

bonding. The pair bonding will require additional pairs as well as the use of two ports at the DSLAM. The model needs to be modified to recognize these costs in the green-field build mode.

Finally, as previously noted, because the Bureau has yet to provide documentation cataloguing and explaining the differences between the CQBAT model and the CACM model and the Coalition has not had an adequate opportunity to examine the logic of the CACM, the Coalition cannot yet comment in detail on the CACM or on whether there are other functionalities or capabilities that should be added to the CACM platform.

V. CONCLUSION

For the foregoing reasons, the Coalition again urges the Bureau to adopt a green-field model and, other things being equal, choose the design option that is the simplest and that can be implemented most expeditiously. In response to the specific questions posed by the Bureau, the Coalition respectfully recommends that the Bureau:

(a) adopt the methodology used by CQBAT for determining customer locations;

(b) retain the CQBAT clustering algorithm;

(c) use the CQBAT routing algorithm;

(d) retain three density zones;

(e) use the CQBAT approach to inter-office transport costs for a green-field model, but if a brown-field approach is used then significant modifications will be required;

(f) include voice capability, with one soft-switch per state and SIP signaling, but if a brown-field approach is used then VOIP capex or circuit-switched opex must be considered;

(g) use the CQBAT cost categories with the possible addition of an additional category for voice;

(h) follow the general approach to network sizing taken by CQBAT;

(i) reject the use of company-specific cost inputs;

(j) estimate operating expenses using the CQBAT methodology, with a possible modification to reflect out-of-state peering arrangements;

(k) retain the economic-life assumptions adopted for the HCPM, and if the Bureau believes the economic lives must be modified in the future, do so in a separate rulemaking proceeding;

(l) adopt the CQBAT sharing factors without modification;

(m) use the CQBAT carrier-specific plant-mix data where it is available and national default values where it is not;

(n) employ the CQBAT labor-cost adjustment based on data from R.S. Means;

(o) refrain from adopting a per-location cost calculation without revealing what other related changes might be adopted and without giving parties time to assess the impact of the changes on support levels and build-out requirements; and

(p) reject the subtractive approach to assigning the common costs of shared plant and instead use the cost-causation principles contained in the CQBAT model.

(q) Modify the CQBAT and CACM to ensure upstream speeds of 1 Mbps as required by the *USF/ICC Transformation Order*.

Finally, the Coalition urges the Bureau to provide documentation cataloguing and explaining the changes that were made to the CACM so that interested parties may have an opportunity to understand and comment on the Bureau's model

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Respectfully submitted,

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Appendix A

Appendix A
Updated Plant-Mix Data

		Distribution			Feeder			Inter-Office Fiber		
State	Density	Aerial	Buried	Underground	Aerial	Buried	Underground	Aerial	Buried	Underground
(All)	Rural	29.8%	67.9%	2.2%	34.1%	55.5%	10.4%	33.2%	57.5%	9.3%
	Suburban	29.3%	65.2%	5.5%	23.0%	44.9%	32.0%	23.8%	49.5%	26.8%
	Urban	36.2%	54.9%	8.9%	15.4%	33.5%	51.1%	17.8%	39.6%	42.5%
AK	Rural	State-Specific Data Unavailable								
	Suburban									
	Urban									
AL	Rural	34.4%	64.9%	0.7%	37.6%	55.8%	6.6%	34.8%	59.6%	5.6%
	Suburban	28.4%	68.7%	3.0%	26.0%	47.9%	26.1%	26.0%	54.1%	19.9%
	Urban	38.5%	54.8%	6.7%	20.6%	26.8%	52.6%	21.8%	34.3%	43.9%
AR	Rural	15.3%	83.6%	1.1%	17.8%	73.6%	8.6%	15.1%	77.3%	7.6%
	Suburban	15.3%	81.7%	3.0%	10.8%	68.3%	20.9%	10.8%	73.3%	15.9%
	Urban	20.3%	73.6%	6.0%	7.2%	50.5%	42.2%	9.7%	56.8%	33.5%
AZ	Rural	19.0%	80.0%	1.0%	35.0%	60.0%	5.0%	27.0%	70.0%	3.0%
	Suburban	20.0%	75.0%	5.0%	20.0%	50.0%	30.0%	20.0%	62.5%	17.5%
	Urban	21.0%	70.0%	9.0%	11.0%	45.0%	44.0%	16.0%	57.5%	26.5%
CA	Rural	31.7%	58.0%	10.4%	29.9%	45.7%	24.4%	28.8%	48.9%	22.3%
	Suburban	27.1%	52.8%	20.1%	15.5%	27.8%	56.7%	17.2%	31.8%	51.0%
	Urban	34.8%	39.6%	25.6%	12.2%	22.5%	65.2%	13.3%	25.8%	61.0%
CO	Rural	9.0%	90.0%	1.0%	20.0%	75.0%	5.0%	14.5%	82.5%	3.0%
	Suburban	25.0%	70.0%	5.0%	20.0%	50.0%	30.0%	22.5%	60.0%	17.5%
	Urban	31.0%	60.0%	9.0%	26.0%	30.0%	44.0%	28.5%	45.0%	26.5%
CT	Rural	78.0%	17.6%	4.5%	61.5%	33.1%	5.3%	61.5%	33.1%	5.3%
	Suburban	77.5%	17.9%	4.7%	57.4%	27.8%	14.7%	57.4%	27.8%	14.7%
	Urban	75.0%	16.0%	8.9%	44.1%	22.9%	33.0%	44.1%	22.9%	33.0%

		Distribution			Feeder			Inter-Office Fiber		
State	Density	Aerial	Buried	Underground	Aerial	Buried	Underground	Aerial	Buried	Underground
DC	Rural	87.8%	6.1%	6.1%	9.4%	0.0%	90.6%	10.4%	0.0%	89.6%
	Suburban	87.8%	6.1%	6.1%	9.4%	0.0%	90.6%	10.4%	0.0%	89.6%
	Urban	83.6%	5.1%	11.3%	4.7%	0.1%	95.2%	6.0%	0.0%	94.0%
DE	Rural	28.2%	71.7%	0.1%	32.2%	64.5%	3.3%	58.5%	37.1%	4.4%
	Suburban	52.1%	47.1%	0.8%	39.6%	27.6%	32.8%	38.6%	16.4%	45.0%
	Urban	76.4%	20.4%	3.2%	17.6%	3.4%	79.0%	15.7%	2.5%	81.8%
FL	Rural	18.0%	81.3%	0.7%	17.7%	75.1%	7.2%	21.6%	71.8%	6.6%
	Suburban	21.0%	76.6%	2.5%	13.4%	66.5%	20.1%	16.4%	66.6%	16.9%
	Urban	25.3%	70.3%	4.4%	12.6%	59.0%	28.4%	15.8%	59.9%	24.2%
GA	Rural	25.0%	74.3%	0.7%	27.9%	65.3%	6.9%	28.9%	65.3%	5.9%
	Suburban	28.9%	68.2%	2.9%	24.8%	53.5%	21.7%	27.3%	57.2%	15.5%
	Urban	32.1%	61.7%	6.2%	20.7%	37.6%	41.7%	23.2%	43.8%	33.0%
HI	Rural	State-Specific Data Unavailable								
	Suburban									
	Urban									
IA	Rural	19.0%	80.0%	1.0%	50.0%	45.0%	5.0%	34.5%	62.5%	3.0%
	Suburban	20.0%	75.0%	5.0%	30.0%	40.0%	30.0%	25.0%	57.5%	17.5%
	Urban	21.0%	70.0%	9.0%	6.0%	50.0%	44.0%	13.5%	60.0%	26.5%
ID	Rural	14.0%	85.0%	1.0%	40.0%	55.0%	5.0%	27.0%	70.0%	3.0%
	Suburban	15.0%	80.0%	5.0%	20.0%	55.0%	25.0%	17.5%	67.5%	15.0%
	Urban	21.0%	70.0%	9.0%	1.0%	55.0%	44.0%	11.0%	62.5%	26.5%
IL	Rural	20.1%	78.6%	1.3%	26.1%	53.6%	20.3%	22.1%	58.6%	19.3%
	Suburban	20.6%	75.8%	3.6%	14.9%	41.6%	43.5%	16.1%	46.6%	37.3%
	Urban	32.3%	58.7%	9.0%	7.7%	27.9%	64.4%	10.2%	34.2%	55.6%
IN	Rural	22.5%	76.2%	1.3%	34.9%	50.9%	14.2%	32.2%	54.6%	13.2%
	Suburban	22.2%	73.5%	4.3%	18.7%	40.1%	41.2%	20.0%	45.1%	35.0%
	Urban	27.6%	64.3%	8.2%	13.8%	25.6%	60.7%	16.3%	31.8%	51.9%

		Distribution			Feeder			Inter-Office Fiber		
State	Density	Aerial	Buried	Underground	Aerial	Buried	Underground	Aerial	Buried	Underground
KS	Rural	8.5%	90.4%	1.1%	10.3%	82.8%	6.9%	7.5%	86.5%	5.9%
	Suburban	11.1%	85.3%	3.6%	6.4%	62.4%	31.2%	7.6%	66.1%	26.2%
	Urban	24.7%	68.6%	6.7%	7.1%	40.0%	52.9%	9.6%	46.3%	44.2%
KY	Rural	48.7%	50.9%	0.4%	62.0%	29.9%	8.1%	62.0%	29.9%	8.1%
	Suburban	41.9%	56.8%	1.3%	48.7%	34.2%	17.1%	48.7%	34.2%	17.1%
	Urban	58.7%	35.8%	5.5%	37.2%	16.5%	46.3%	37.2%	16.5%	46.3%
LA	Rural	24.4%	74.6%	1.0%	34.4%	55.4%	10.2%	29.2%	61.7%	9.2%
	Suburban	27.8%	68.4%	3.8%	20.0%	49.4%	30.6%	20.0%	54.4%	25.6%
	Urban	38.6%	53.0%	8.4%	14.7%	33.5%	51.8%	18.4%	38.5%	43.0%
MA	Rural	73.3%	26.6%	0.1%	72.7%	21.5%	5.8%	79.2%	14.9%	5.9%
	Suburban	74.4%	25.3%	0.3%	56.0%	12.1%	31.9%	55.8%	9.4%	34.8%
	Urban	77.0%	21.2%	1.8%	24.9%	8.8%	66.3%	23.2%	8.0%	68.8%
MD	Rural	28.2%	71.7%	0.1%	32.2%	64.5%	3.3%	58.5%	37.1%	4.4%
	Suburban	52.1%	47.1%	0.8%	39.6%	27.6%	32.8%	38.6%	16.4%	45.0%
	Urban	76.4%	20.4%	3.2%	17.6%	3.4%	79.0%	15.7%	2.5%	81.8%
ME	Rural	State-Specific Data Unavailable								
	Suburban									
	Urban									
MI	Rural	17.1%	81.5%	1.4%	15.7%	69.1%	15.2%	14.2%	71.6%	14.2%
	Suburban	24.5%	71.1%	4.4%	14.1%	45.8%	40.1%	15.3%	49.6%	35.1%
	Urban	41.4%	50.6%	8.0%	19.7%	24.6%	55.7%	21.0%	32.1%	46.9%
MN	Rural	9.0%	90.0%	1.0%	15.0%	80.0%	5.0%	12.0%	85.0%	3.0%
	Suburban	10.0%	85.0%	5.0%	10.0%	65.0%	25.0%	10.0%	75.0%	15.0%
	Urban	16.0%	75.0%	9.0%	10.0%	55.0%	35.0%	13.0%	65.0%	22.0%
MO	Rural	14.7%	84.4%	0.9%	14.0%	72.0%	14.0%	12.5%	74.5%	13.0%
	Suburban	15.9%	80.3%	3.8%	10.1%	54.1%	35.8%	11.3%	57.9%	30.8%
	Urban	35.1%	57.5%	7.5%	7.9%	35.4%	56.6%	10.4%	41.7%	47.9%

		Distribution			Feeder			Inter-Office Fiber		
State	Density	Aerial	Buried	Underground	Aerial	Buried	Underground	Aerial	Buried	Underground
MS	Rural	23.5%	75.8%	0.7%	21.7%	72.4%	5.9%	20.2%	74.9%	4.9%
	Suburban	19.5%	77.6%	2.8%	15.2%	64.2%	20.7%	16.4%	67.9%	15.7%
	Urban	32.5%	62.3%	5.2%	15.6%	45.2%	39.2%	19.3%	50.2%	30.4%
MT	Rural	19.0%	80.0%	1.0%	15.0%	80.0%	5.0%	17.0%	80.0%	3.0%
	Suburban	20.0%	75.0%	5.0%	10.0%	65.0%	25.0%	15.0%	70.0%	15.0%
	Urban	21.0%	70.0%	9.0%	11.0%	45.0%	44.0%	16.0%	57.5%	26.5%
NC	Rural	15.1%	84.2%	0.7%	25.9%	67.0%	7.2%	20.6%	73.2%	6.2%
	Suburban	21.8%	74.7%	3.5%	18.5%	59.7%	21.8%	18.5%	64.7%	16.8%
	Urban	27.5%	65.5%	6.9%	17.5%	44.4%	38.0%	18.8%	51.9%	29.3%
ND	Rural	24.0%	75.0%	1.0%	35.0%	60.0%	5.0%	29.5%	67.5%	3.0%
	Suburban	20.0%	75.0%	5.0%	20.0%	50.0%	30.0%	20.0%	62.5%	17.5%
	Urban	21.0%	70.0%	9.0%	11.0%	45.0%	44.0%	16.0%	57.5%	26.5%
NE	Rural	9.0%	90.0%	1.0%	40.0%	55.0%	5.0%	24.5%	72.5%	3.0%
	Suburban	20.0%	75.0%	5.0%	20.0%	50.0%	30.0%	20.0%	62.5%	17.5%
	Urban	21.0%	70.0%	9.0%	11.0%	45.0%	44.0%	16.0%	57.5%	26.5%
NH	Rural	State-Specific Data Unavailable								
	Suburban									
	Urban									
NJ	Rural	61.2%	38.3%	0.6%	71.4%	23.3%	5.4%	69.4%	26.2%	4.5%
	Suburban	52.2%	45.2%	2.7%	45.5%	26.1%	28.5%	44.2%	31.0%	24.9%
	Urban	51.5%	43.1%	5.4%	20.5%	24.4%	55.2%	22.1%	30.3%	47.7%
NM	Rural	19.0%	80.0%	1.0%	20.0%	75.0%	5.0%	19.5%	77.5%	3.0%
	Suburban	20.0%	75.0%	5.0%	15.0%	60.0%	25.0%	17.5%	67.5%	15.0%
	Urban	21.0%	70.0%	9.0%	16.0%	40.0%	44.0%	18.5%	55.0%	26.5%
NV	Rural	36.2%	34.8%	28.9%	46.8%	33.2%	20.0%	41.5%	39.5%	19.0%
	Suburban	20.5%	34.0%	45.6%	19.2%	20.9%	59.9%	19.2%	27.1%	53.6%
	Urban	21.7%	35.9%	42.5%	8.2%	22.7%	69.1%	10.7%	29.0%	60.3%

		Distribution			Feeder			Inter-Office Fiber		
State	Density	Aerial	Buried	Underground	Aerial	Buried	Underground	Aerial	Buried	Underground
NY	Rural	73.3%	26.6%	0.1%	72.7%	21.5%	5.8%	79.2%	14.9%	5.9%
	Suburban	74.4%	25.3%	0.3%	56.0%	12.1%	31.9%	55.8%	9.4%	34.8%
	Urban	77.0%	21.2%	1.8%	24.9%	8.8%	66.3%	23.2%	8.0%	68.8%
OH	Rural	48.1%	50.5%	1.4%	58.9%	27.6%	13.5%	53.7%	33.8%	12.5%
	Suburban	34.7%	60.7%	4.7%	33.8%	27.2%	39.1%	33.8%	33.4%	32.8%
	Urban	50.2%	41.5%	8.4%	21.7%	22.6%	55.7%	25.5%	27.6%	47.0%
OK	Rural	18.9%	79.8%	1.3%	15.5%	74.0%	10.5%	15.2%	75.2%	9.5%
	Suburban	23.0%	72.5%	4.6%	7.9%	55.5%	36.5%	10.4%	59.3%	30.3%
	Urban	32.8%	59.6%	7.5%	7.9%	44.4%	47.7%	10.4%	50.6%	39.0%
OR	Rural	24.0%	75.0%	1.0%	35.0%	60.0%	5.0%	29.5%	67.5%	3.0%
	Suburban	20.0%	75.0%	5.0%	20.0%	50.0%	30.0%	20.0%	62.5%	17.5%
	Urban	16.0%	75.0%	9.0%	11.0%	45.0%	44.0%	13.5%	60.0%	26.5%
PA	Rural	71.2%	28.3%	0.6%	76.4%	18.3%	5.4%	76.9%	18.7%	4.5%
	Suburban	54.7%	42.7%	2.7%	50.5%	21.1%	28.5%	47.9%	27.2%	24.9%
	Urban	51.5%	43.1%	5.4%	27.5%	21.9%	50.7%	25.6%	29.0%	45.4%
PR	Rural	State-Specific Data Unavailable								
	Suburban									
	Urban									
RI	Rural	73.3%	26.6%	0.1%	72.7%	21.5%	5.8%	79.2%	14.9%	5.9%
	Suburban	74.4%	25.3%	0.3%	56.0%	12.1%	31.9%	55.8%	9.4%	34.8%
	Urban	77.0%	21.2%	1.8%	24.9%	8.8%	66.3%	23.2%	8.0%	68.8%
SC	Rural	21.5%	77.6%	0.9%	25.8%	63.7%	10.4%	23.1%	67.5%	9.4%
	Suburban	18.1%	78.7%	3.3%	15.1%	57.6%	27.3%	15.1%	63.9%	21.1%
	Urban	31.5%	58.9%	9.6%	14.1%	34.6%	51.3%	16.6%	40.8%	42.6%
SD	Rural	24.0%	75.0%	1.0%	35.0%	60.0%	5.0%	29.5%	67.5%	3.0%
	Suburban	20.0%	75.0%	5.0%	20.0%	50.0%	30.0%	20.0%	62.5%	17.5%
	Urban	21.0%	70.0%	9.0%	11.0%	45.0%	44.0%	16.0%	57.5%	26.5%

		Distribution			Feeder			Inter-Office Fiber		
State	Density	Aerial	Buried	Underground	Aerial	Buried	Underground	Aerial	Buried	Underground
TN	Rural	62.8%	36.6%	0.6%	70.8%	24.1%	5.2%	70.5%	25.3%	4.2%
	Suburban	43.0%	54.2%	2.8%	46.2%	31.4%	22.4%	46.2%	37.7%	16.1%
	Urban	43.9%	50.1%	6.0%	30.0%	31.5%	38.5%	32.5%	37.7%	29.8%
TX	Rural	24.4%	73.7%	1.8%	22.0%	63.5%	14.5%	30.1%	56.7%	13.2%
	Suburban	23.5%	71.5%	5.0%	17.4%	52.6%	30.0%	23.0%	51.2%	25.8%
	Urban	23.1%	68.6%	8.3%	13.2%	41.4%	45.4%	18.5%	42.5%	39.0%
UT	Rural	24.0%	75.0%	1.0%	35.0%	60.0%	5.0%	29.5%	67.5%	3.0%
	Suburban	20.0%	75.0%	5.0%	20.0%	50.0%	30.0%	20.0%	62.5%	17.5%
	Urban	21.0%	70.0%	9.0%	11.0%	45.0%	44.0%	16.0%	57.5%	26.5%
VA	Rural	28.6%	70.9%	0.6%	38.6%	57.3%	4.2%	47.8%	48.6%	3.7%
	Suburban	38.6%	58.6%	2.9%	32.3%	38.8%	28.9%	31.8%	38.2%	30.0%
	Urban	48.7%	45.2%	6.1%	18.8%	24.2%	57.0%	18.1%	30.0%	51.9%
VT	Rural	State-Specific Data Unavailable								
	Suburban									
	Urban									
WA	Rural	24.0%	75.0%	1.0%	30.0%	65.0%	5.0%	27.0%	70.0%	3.0%
	Suburban	20.0%	75.0%	5.0%	15.0%	60.0%	25.0%	17.5%	67.5%	15.0%
	Urban	26.0%	65.0%	9.0%	11.0%	45.0%	44.0%	18.5%	55.0%	26.5%
WI	Rural	10.6%	87.9%	1.5%	15.6%	73.8%	10.6%	11.6%	78.8%	9.6%
	Suburban	15.8%	80.7%	3.4%	9.7%	55.3%	35.0%	11.0%	60.3%	28.7%
	Urban	27.9%	65.0%	7.2%	9.6%	35.9%	54.5%	12.1%	42.2%	45.8%
WV	Rural	State-Specific Data Unavailable								
	Suburban									
	Urban									
WY	Rural	9.0%	90.0%	1.0%	20.0%	75.0%	5.0%	14.5%	82.5%	3.0%
	Suburban	10.0%	85.0%	5.0%	15.0%	60.0%	25.0%	12.5%	72.5%	15.0%
	Urban	21.0%	70.0%	9.0%	16.0%	40.0%	44.0%	18.5%	55.0%	26.5%