

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Connect America Fund	)	WC Docket No. 10-90
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51
	)	
Establishing Just and Reasonable Rates for Local Exchange Carriers	)	WC Docket No. 07-135
	)	
High-Cost Universal Service Support	)	WC Docket No. 05-337
	)	
Developing an Unified Intercarrier Compensation Regime	)	CC Docket No. 01-92
	)	
Federal-State Joint Board on Universal Service	)	CC Docket No. 96-45
	)	
Lifeline and Line-Up	)	WC Docket No. 03-109
	)	
Universal Service Reform – Mobility Fund	)	WT Docket No. 10-208

**To: The Commission**

**REPLY COMMENTS OF  
THE BLOOSTON RURAL BROADBAND CARRIERS**

The law firm of Blooston, Mordkofsky, Dickens, Duffy & Prendergast, LLP, on behalf of its clients listed in Attachment A (“the Blooston Rural Broadband Carriers”) submits these Reply Comments on subsections A through K of Section XVII of the Commission’s *Report and Order and Further Notice of Proposed Rulemaking*, FCC 11-61, released November 18, 2011 (“*Order and FNPRM*”),<sup>1</sup> in the above-captioned proceedings.

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<sup>1</sup> *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 a Unified Intercarrier Compensation*

In their initial Comment, the Blooston Rural Broadband Carriers demonstrated that the proposed use of the Quantile Regression Analysis (“QRA”) should not be used for any purpose associated with prudency review. Dr. Janice Hauge, an empirical economist experienced in utility benchmarking and universal service fund economic issues, supported this view. Dr. Hauge noted that critical data necessary to evaluate the QRA model is missing, and would require months to independently validate were the data available. The model also fails to take into account important variables, such as terrain conditions, and improperly reduces the relevant universal service reimbursement, across time, resulting in increasingly fewer financially sustainable carriers.

These initial comments also discussed the legality (or lack thereof) of two related proposals. First, the Comments demonstrated that the Commission may not lawfully use forbearance as a mechanism to eliminate the service obligations of ETCs under the Act, after having uncoupled certain ETCs from USF revenues as a result of its plan. This idea is flatly contrary to Section 214 of the Act, and to statutory provisions limiting the Commission’s forbearance authority to federal, and not state, requirements.

Second, the proposal to require an irrevocable standby letter of credit (LOC) to be drawn upon by the Chief of the Wireline Bureau, upon suspected non-compliance, is fraught with due process issues and practically unworkable in any event.

A review of the initial comments filed by other parties confirms that a host of legal difficulties attend the proposals floated in the *Order and FNPRM*. Chief among those is the proposal to substitute QRA as a prudency review. This subject is discussed first, and the

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*Regime; Federal-State Joint Board on Universal Service; Lifeline and Link Up; Universal Service Reform – Mobility Fund; Report and Order and Further Notice of Proposed Rulemaking, WC Dockets No. 10-90, 07-135, 05-337, 03-109; CC Dockets No. 01-92, 96-45; GN Docket No. 09-51; WT Docket No. 10-208, released November 18, 2011.*

conclusions reached in the Blooston Rural Broadband Comments filed earlier are buttressed by further analysis accompanying these Reply Comments, by Dr. Hauge. Additionally, these Reply Comments discuss the Commission's proposal to require funding recipients to obtain irrevocable letters of credit.

These points are discussed in order.

### **I. The Proposed QRA Model Should Not Be Used As A Substitute Prudency Review**

In addition to the initial comments of the Blooston Rural Broadband Carriers,<sup>2</sup> a welter of well-based criticism was leveled at the use of the QRA model.<sup>3</sup> Based upon the many initial comments critical of QRA, and data provided therein which describe critical flaws and data errors in the model, Dr. Hauge has identified additional criticisms of the QRA model.<sup>4</sup> Dr. Hauge's analysis is appended to these Reply Comments, and is discussed later.

As a threshold matter, however, these Commenters again urge the Commission to abandon the proposed use of QRA alone as a substitute for the sort of prudency review which it has traditionally discharged through its tariff review and auditing process. Indeed, the *Order and FNPRM* is silent as to why abandoning such individual examination is warranted, and the Commenters question whether such a radical policy shift can survive under such circumstances.<sup>5</sup>

Regardless of the shortcomings in the present record, the use of QRA alone to judge prudency is bound to produce arbitrary results. Consider for example the circumstance of a

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<sup>2</sup> See Comments of the Blooston Rural Broadband Carriers at pp. 2-8.

<sup>3</sup> See, e.g., Initial Comments of the National Exchange Carriers Association ("NECA") et al. at pp. 66-67; Comments of TCA at p.5 ("The FCC should not adopt its proposed quantile regression caps for the allowable recovery of capital expenditures and operating expenses..."); Comments In Response To Further Notice Of Proposed Rulemaking By The Washington Independent Telecommunications Association et al., at p.2 (without "substantial revision" QRA "should not be used for any purpose").

<sup>4</sup> See Attachment B – Second Declaration and Report of Dr. Janice Hauge ("Hauge Report").

<sup>5</sup> *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto Ins. Co.*, 463 U.S. 29, 41-42 (1983)(Holding that when an agency departs from settled policy, it must provide an explicit justification).

company who has recently completed a system-wide upgrade of obsolete switching and loop plant installed in the late 1960's and 1970's. The upgrade was accomplished by virtue of a loan from the Rural Utilities Service, who requires construction to certain standards as a result of the loan.

It is not hard to imagine (indeed, the circumstances exist), that a recent, relatively large construction project will look like an "outlier" relative to the ILEC's peers under QRA. This is particularly true if, as exists in both eastern and western areas of the U.S., the construction project involved long loop lengths and/or rocky terrain - - neither of which are recognized by the QRA model.

What is more, the opposite example yields much the same result. Suppose instead that instead of implementing a system-wide upgrade, a company has instead chosen to maintain old plant which, despite its age, is still useful. Due to high maintenance costs, the company still looks like an "outlier" relative to its peers under QRA, despite having lower depreciation and lower rates of network error.

Unlike the tariff review process or a Commission audit, the QRA model would identify such valid investment as imprudent, without further inquiry. In fact, several companies have recently been through audits and received flawless reports - - yet under QRA, they will experience a dramatic decrease in support. Worse yet, as Dr. Hauge and the Nebraska Rural Independent Companies explain, errors and omissions in the model, including the use of irrelevant and error prone independent variables, lead to the conclusion that the QRA cannot possibly provide accurate estimates.<sup>6</sup>

Indeed, there are considerable shortcomings with the model based upon economic discipline and these are discussed below. As a policy matter, however, the proposed use of the

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<sup>6</sup> Hauge Report at pp 2-4.

model accomplishes no lawful purpose. It does not affect the decision to have constructed the new plant, as that has already occurred. Nor does it spur any further rural broadband investment, supposedly the very purpose of this proceeding, as Dr. Hauge finds in her analysis.<sup>7</sup>

In sum, the decision to abandon actual prudency review, in favor of a highly flawed model, is certainly arbitrary under the circumstances and would not survive review. The Blooston Rural Broadband Carriers respectfully submit that the failure to predict the future operation of the model, together with its retroactive application, further threatens its viability. Its retroactive nature, coupled with a lack of predictability, will unquestionably interfere with investor expectations of repayment, including the federal government itself. Under these circumstances, the model would effect a classic, unconstitutional taking.<sup>8</sup>

## **II. The Model's Technical Flaws Disqualify Its Use**

Dr. Hauge's analysis reveals four major areas where the model is either misapplied, or is flawed beyond utility. These are discussed in turn.

### **A. The 90<sup>th</sup> Percentile Cut-Off Is Arbitrary**

First, Dr. Hauge explains, as she did in her original analysis, that the 90<sup>th</sup> percentile cut-off appears purely arbitrary and as having been selected without rhyme or reason.<sup>9</sup> She explains that by targeting individual cost lines instead of total costs, carriers will be subject to lower HCF reimbursement unequally, even where their overall costs may be lower than those of an

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<sup>7</sup> Hauge Report at 3-4. *See also*, Comments of Pensaco Valley Telecommunications Cooperative at p 6. (demonstrating that PVT has no means of understanding QRA results and predicting capped values in the future, and may forego \$37.5 million in RUS/ARRA loans grants as a result.) Indeed, in Penasco Valley's case, it must deal with up to five separate state, local, and federal agencies, not counting tribal authorities, when trenching fiber. Moreover, it must install "lizard ladders" for endangered lizards, and spotted owl habitats reduce the construction season to two months in the portions of Pensaco Valley's study area which these creatures inhabit. Despite the fact that all of these factors have significant, upward effects on the company's costs, none are recognized in the proposed QRA model.

<sup>8</sup> *See Penn Central Transportation Co. et al. v. New York City et al.*, 438 US 104 (1978)(emphasizing, among other factors, the importance of investment-backed expectations in determining whether a taking has occurred).

<sup>9</sup> Hauge Report at p. 1.

uncapped peer. Dr. Hauge cites comments of other parties in agreement as to the arbitrary selection of the 90<sup>th</sup> percentile and concludes that the Commission, in capping individual cost categories at the 90<sup>th</sup> percentile, has improperly failed to account for interdependence among cost elements and has overlooked the importance of total cost of a carrier's expenditure and investment.

### **B. The Backwards Application of the Model**

Dr. Hauge also criticizes the model for its backwards application.<sup>10</sup> She explains that the proposed use is to designate certain operators as outliers subject to cost cut-offs, rather than evaluating why "outliers" may have high costs.<sup>11</sup> For this reason, her initial analysis cautioned against using the model as anything but a tool for further inquiry, much as the HHI analysis is used by the Department of Justice in corporate mergers.<sup>12</sup>

That criticism aside, Dr. Hauge identifies significant flaws in the construction of the model. For instance, she takes issue with the fact the FCC used the same independent variables for all eleven cost categories used in the model, despite the fact that most of the variables are statistically insignificant. This should have been an indication to FCC that more relevant cost drivers were omitted.

Dr. Hauge then catalogs a long list of cost predictor data that would have improved the model, some of which the FCC has indeed relied upon before (e.g., terrain data).<sup>13</sup> This data includes topological conditions, geographical conditions, and terrain, among others.

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<sup>10</sup> Hauge Report at pp. 2-5.

<sup>11</sup> *Id.*

<sup>12</sup> Comments of the Blooston Rural Broadband Carriers, Declaration and Report of Dr. Janice Hauge, Attachment B, at 5.

<sup>13</sup> Hauge Report at p.3.

Significantly, the model also omitted loop length data - - one of the primary drivers of loop cost, and a significant number of other cost drivers were similarly excluded from the model.<sup>14</sup>

Aside from factors ignored, discussed above, Dr. Hauge also discusses numerous categories of erroneous data that were used in the model.<sup>15</sup> For instance, she identifies errors in rural LEC density in Washington state (overestimated on average 73.81%), and twenty-six carriers in Oregon whose density is overestimated on average by 78.35%. In this same vein, NECA reports errors in geographical mapping in more than 90% of study areas.<sup>16</sup> She reports that the FCC's estimate for Penasco Valley accounts for only half of this actual study area, which consists of rocky and mountainous terrain.<sup>17</sup> Relatedly, Dr. Hauge criticizes the model for using census blocks per study area as a proxy for density.<sup>18</sup> No correlation has been demonstrated, and the reliance upon 2000 census block data, when 2010 data is available, further casts doubt on the QRA.

In short, too many cost factors have either been ignored or are erroneous. Dr. Hauge concludes: "This means the QRA cannot possibly provide accurate estimates."<sup>19</sup>

### **C. The FCC's Rejection of Other Regression Approaches Requires Explanation**

Dr. Hauge also questions the FCC's rejection of Ordinary Least Squares Regression, based upon its failure to provide data or analysis in support of its argument.<sup>20</sup> She notes that Dr. Koenker (relied upon by the Commission in its *Order and FNPRM*) likewise criticizes the current proposal and suggests a different model. She notes additional techniques that were used

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<sup>14</sup> *Id.*

<sup>15</sup> Hauge Report at p. 4.

<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

<sup>18</sup> *Id.*

<sup>19</sup> Hauge Report at p. 4.

<sup>20</sup> Hauge Report at p. 5.

in the FCC's proposed methodology, such as linearizing the data, which are unjustified by the FCC.

#### **D. The FCC's Claimed Economic Incentives Do Not Exist**

Dr. Hauge concludes her analysis with the observation that the QRA does anything but provide correct economic incentives for appropriate investment and efficient production. She notes, for instance, that the arbitrary 90<sup>th</sup> percentile cut-off discourages companies from making justified investments that would decrease costs even more in other categories.<sup>21</sup> This introduces incentives to cut costs simply to justify the QRA model, even if there are negative impacts on customers, such as lower service quality.<sup>22</sup> She concludes that the model does not account for actual investment patterns, as telephone investment for aging plant does not occur on a consistent or moderate level. These comments discuss this phenomenon earlier. Dr. Hauge concludes, logically, that if a company cannot depend upon reimbursement for past investments, it is unlikely to make even prudent future investments, especially given the non-transparent nature of the model vis-à-vis affected exchange carriers.

### **III. Letters of Credit Should Not Be Required to Obtain Support**

The Blooston Rural Broadband Carriers also support commenters proposing to eliminate or restrict the Commission's letter of credit (LOC) requirement. In their initial comments, the Blooston Rural Broadband Carriers pointed out the difficulty (if not impossibility) of determining the amount of an LOC necessary to ensure compliance in the broadband context,

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<sup>21</sup> Hauge Report at p. 6.

<sup>22</sup> *Id.*

since carriers are required to provide broadband service only “on reasonable request.”<sup>23</sup>

Additionally, the Blooston Rural Broadband Carriers noted that the ability of the Chief of the Wireline Bureau to draw on an LOC based on mere suspicion of non-compliance likely runs afoul of due process requirements.<sup>24</sup>

As other commenters point out, the LOC requirement creates a heavy burden on rural carriers. United States Telecom Association states, for example, that imposing a LOC requirement can, among other things, reduce a carrier’s flexibility to conduct business.<sup>25</sup> Many commenters indicate small and rural carriers will have a disproportionately difficult time obtaining such letters.<sup>26</sup> Most rural carriers and small businesses simply do not have the financial resources or the established financial relationships with major banks necessary to obtain an LOC as contemplated by the Commission. Rural carriers primarily rely on the Rural Utilities Service (RUS), the Rural Telecommunications Finance Cooperative (RTFC), or CoBank for funding, and it does not appear that these entities will have any interest (and, in RUS’ case, statutory authority) in furnishing LOCs for the substantial amounts the Commission may require. Other commenters point to the costs associated with obtaining and maintaining LOCs.<sup>27</sup>

As such, most rural carriers and other small businesses will not be able to obtain LOCs from any of the institutions with which they have established financial relationships, and those carriers that are able to obtain them may find the burden outweighs the benefits of CAF funding.

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<sup>23</sup> Comments of the Blooston Rural Broadband Carriers at p. 11.

<sup>24</sup> *Id.* at pp. 11-12.

<sup>25</sup> Comments of United States Telecom Association at p. 22; *see also*, Comments of Independent Telephone & Telecommunications Alliance (“ITTA”) at p. 12.

<sup>26</sup> *See* Comments of Alaska Communications Systems Group; Comments of Alaska Rural Coalition.

<sup>27</sup> *See, e.g.*, Comments of Frontier at p. 12 (discussing fees associated with maintaining an LOC); Comments of ITTA at p. 12.

#### **IV. Conclusion**

In conclusion, the Commission should not rely on the proposed Quantile Regression Analysis as a method of prudency review. QRA is simply not suitable for any use associated with prudency review and, as discussed above, it is bound to produce arbitrary results due to a number of technical shortcomings.

Additionally, the Commission should not require small rural carriers to obtain letters of credit in order to obtain support. The LOCs are a substantial burden on rural carriers, so much so that it may outweigh the benefits of support in some cases.

Respectfully submitted,  
**BLOOSTON RURAL CARRIERS**

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**The Blooston Rural Broadband Carriers**

Arlington Telephone Company  
The Blair Telephone Company  
Butler-Bremer Communications  
Cameron Telephone Company, LLC  
Citizens Telephone Company  
Eastern Nebraska Telephone Company  
Elizabeth Telephone Company, LLC  
Holway Telephone Company  
Interior Telephone Company  
Kennebec Telephone Co.  
KLM Telephone Company  
Manti Telephone Company  
Mukluk Telephone Company, Inc.  
Northern Arkansas Telephone Company  
Penasco Valley Telephone Cooperative, Inc.  
The Ponderosa Telephone Co.  
Public Service Telephone Company  
Rock County Telephone Company  
Star Telephone Company, Inc.  
Strata Networks  
Table Top Telephone Company, Inc.  
Townes Telecommunications, Inc.  
Venture Communications Cooperative, Inc.  
Walnut Telephone Company, Inc.  
West River Cooperative Telephone Company

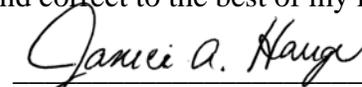
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	)	

**SECOND DECLARATION AND REPORT OF JANICE A. HAUGE**

I, Dr. Janice A. Hauge, do hereby, under penalty of perjury, declare and state as follows:

1. My name is Janice A. Hauge. I am an Associate Professor of Economics at the University of North Texas, Department of Economics, in Denton, Texas. I have been retained by the carriers listed in Attachment A of the Reply Comments to study the economic topics discussed in these Reply Comments and prepare the forgoing Report, and that I am familiar with the facts of the relevant Commission rulemaking proceedings upon which my Report is based.
2. I have reviewed the factual assertions set forth in my Report, as follows, and hereby certify that such factual assertions are true and correct to the best of my knowledge.

  
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Janice A. Hauge

Dated February 17, 2012

This report follows and builds upon my first report, filed in connection with the Comments of the Blooston Rural Broadband Carriers on January 18, 2011. Each of the four points addressed in the first report are restated and expanded upon below, in light of comments filed by other parties in this proceeding.

**Point 1: The 90<sup>th</sup> percentile as a cut-off is not supported in the FCC's explanation of the methodology.** The FCC has estimated the amount that payments for HCLS must be reduced, and has estimated that by the proposed methodology, approximately 40 percent (280 out of 707) of rural rate-of-return cost study areas would receive lower payments.<sup>1</sup> This means that for one or more steps of the currently-applied algorithm, 40 percent have at least one category of costs greater than the 90<sup>th</sup> percentile of similarly situated companies and therefore HCLS payments would be reduced. Given that there is nothing in the FCC's chosen econometric method that identifies the 90<sup>th</sup> percentile as having greater significance than any other percentile, it is unclear whether the methodology identifies carrier study areas that are unjustifiably costly in some (or multiple) categories of costs.

**Comments pertinent to Point 1:**

I again assert that the 90<sup>th</sup> percentile as a cut-off appears arbitrary. There is no justification that the 90<sup>th</sup> percentile is the threshold at which costs become unreasonable. This assertion is confirmed by the comments of the National Exchange Carrier Association, Inc., et al.<sup>2</sup>

By the proposed model, overall cost is not targeted; rather, certain lines of costs are considered. Aggregating potentially capped lines results in total cost estimates that overestimate in some cases and underestimate in others.<sup>3</sup> This means that the methodology risks punishing high expenditure on one cost category, even though such high expenditure is not necessarily a sign of poor overall management or general carrier inefficiency. In other words, the FCC's chosen methodology could result in a decrease in USF support if one category is over the 90<sup>th</sup> percentile but all other categories are lower, so that total overall costs may be lower than a peer's costs even though that peer may not be affected at all by the cap.

The method does not have reasonable justification here; there is no justification for aggregating the costs as they are, given that there is no attempt to account for the interdependence among cost elements (i.e., an expenditure in one cost category may result in lower costs in another category, but this relationship is not accounted for in the model).<sup>4</sup>

**Point 2: The FCC's application of its econometric method turns the method on its head.**

The chosen regression methodology is designed to focus on characteristics of observations that

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<sup>1</sup> "Based on 2010 NECA data filed with the Commission, we estimate this proposed methodology would reduce HCLS payments to about 280 rural rate-of-return cost study areas by an estimated \$110 million, with approximately \$55 million redistributed to approximately 340 cost company study areas whose unseparated loop cost is not limited by operation of the benchmark methodology." *Order and FNPRM* at ¶1084.

<sup>2</sup> Initial Comments of the National Exchange Carrier Association, Inc.; National Telecommunications Cooperative Association; Organization for the Promotion and Advancement of Small Telecommunications Companies; and the Western Telecommunications Alliance ("Comments of NECA, et al.") at page 66.

<sup>3</sup> *Ibid*, Appendix E.

<sup>4</sup> *Ibid*, Appendix E, page 4.

are determined to be outliers *a priori*. The FCC is essentially implementing the model backwards, by using it to designate certain operators as outliers to be subject to cost cut-offs rather than by evaluating the data in order to determine why service providers who are truly outliers have high costs.

### **Comments pertinent to Point 2:**

Per my initial report, I reiterate that the FCC's methodology seeks to determine whether certain study areas are more costly than they “should be” – in other words whether costs are higher for a given study area than they are for similarly situated peers. To analyze this question one might ask how, on average, various factors affect costs for a given study area. The FCC has chosen to utilize US Census data to model factors that influence various categories of costs. There are a number of issues relevant to this second point.

First, I state in my initial report that QRA asks how various factors affect costs differently for carriers with high cost than they do for carriers with average costs. The first issue then is consideration of these various factors. Specifically, I focus on the FCC's choice to use US Census data as those factors that determine costs.

I first take issue with the fact that the same independent variables are used to determine all eleven cost categories that appear in the algorithm for USF reimbursement. It is unusual that the same input variables would be able to predict the different costs, which should be the first indication to the FCC that some important input factors have been omitted. The fact that most of the included variables are statistically insignificant in the FCC's econometric analysis solidifies this concern.

Given this indication that the variables used may not be the most appropriate, the FCC should seek to improve the robustness of the model through more appropriate cost predictors. To this end, I note that the FCC includes no data on topological conditions, geographical conditions, or terrain. The FCC itself used terrain data in its *Broadband Availability Gap*, so the data are available.<sup>5</sup> Similarly, the Nebraska Rural Independent Companies (“NRIC”) used a frost index in their *CapEx Study* and found frost to be an econometrically significant predictor of costs, indicating its inclusion in the current framework is important.<sup>6</sup> Other important data include wetlands and road crossings, each of which is available but is not used.<sup>7</sup> With respect to directly related industry costs, of greatest concern is the exclusion of loop length, which is a primary component of loop cost. Finally, there are no methods for taking into account carrier of last resort obligations, tribal land designations, or federal land designations, each of which carriers significant additional costs (in particular the latter two designations, which require additional permits for both construction and facility maintenance).

In addition to the cost factors that have not been accounted for in the proposed methodology, there is evidence that some of the data utilized in the model is erroneous, and significantly so.

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<sup>5</sup> FCC, *The Broadband Availability Gap*, OBI Technical Paper No. 1, (April, 2010) at 69.

<sup>6</sup> *In the Matter of a National Broadband Plan for Our Future*, GN Docket No. 09-51, Nebraska Rural Independent Companies' Capital Expenditure Study: Predicting the Cost of Fiber to the Premise filed Jan. 7, 2011 at 14 (“*Capex Study*”).

<sup>7</sup> *Ibid.*

For example, RLEC density among fifteen companies in Washington State is overestimated on average 73.81 percent, with standard deviation of only 2.79.<sup>8</sup> Similarly, RLEC density among twenty-six carriers in Oregon is overestimated on average 78.35 percent. For this subset of companies, the inaccurately reported density matters a great deal. NECA reports in a related finding that there are errors in geographical mapping data in more than 90 percent of study areas.<sup>9</sup> They note that in an analysis of 357 study areas in the Tele Atlas Database, 40.37 percent are not accurate within five percent of the actual study area, and 22 percent are not accurate within 20 percent. Penasco Valley similarly reports that the FCC's estimate of 2,331 square miles of service area accounts for only 50.11 percent of their actual area of 4,651 square miles (of rocky and mountainous terrain).<sup>10</sup>

Next I consider the FCC's use of the number of census blocks per study area as a proxy for density. I previously noted that density, although seemingly important, was not relevant in the FCC's QRA. I note also that the Nebraska Rural Independent Companies ("NRIC") found that density was the most significant independent variable in the NRIC's *CapEx Study* and NRIC's *Opex Study*, so it is surprising that it is not significant in the FCC's analysis.<sup>11</sup> While this is of concern, expanding upon this issue illustrates that the problem is actually larger than simply an insignificant variable. The FCC does not provide any evidence that using the number of census blocks per study area is an appropriate proxy for density; no correlation is given. Finally, 2000 census block data was used because 2010 data was not yet available. Surely such density figures have changed a great deal during the past decade, so that 2000 data is likely inaccurate.

In short, QRA shows that many factors influence costs; once those factors are accounted for, the dispersion of carrier study areas at various levels of cost can be seen. Unfortunately, too many relevant cost factors are not taken into account or are in error. This means the QRA cannot possibly provide accurate estimates.

Among the FCC's initial results of the QRA, the only independent variable that is consistently significant for the 90<sup>th</sup> percentile is *loops*. *Housing units in non-urban area* is statistically significant for 58 percent of the steps and *land area in non-urban area* is statistically significant in 67 percent of the steps. Little else is significant. I question, then, whether the independent variables chosen are useful in predicting costs at each step of the algorithm. Some statisticians have argued that more sparse models are more accurate than models with many variables;<sup>12</sup> it is critical then that the variables are selected carefully. As discussed above, there are potentially important omitted variables, which suggests that the independent variables chosen are not appropriate.

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<sup>8</sup> Comments in Response to Further Notice of Proposed Rulemaking by the Washington Independent Telecommunications Association; the Oregon Telecommunications Association; The Idaho Telecom Alliance; Montana Telecommunications Association; Colorado Telecommunications Association, at page 6.

<sup>9</sup> Comments of NECA, et al., at Appendix D, 2-7.

<sup>10</sup> Comments of Penasco Valley Telephone Cooperative, Inc.

<sup>11</sup> *Capex Study* at 14. *In the Matter of a National Broadband Plan for Our Future*, GN Docket No. 09-51, Operating Expense Study Sponsored by the Nebraska Rural Independent Companies: Update to Predicting the Operating Expenses of Rate-of-Return Telecommunications Companies, filed Sep. 29, 2011. ("Opex Study").

<sup>12</sup> Breiman, L. 1992. The little bootstrap and other methods for dimensionality selection in regression: X-fixed prediction error. *Journal of the American Statistical Association* 87: 738-754.

There is a great deal of research on the effects of omitting potentially relevant independent variables, and also research on the effects of including irrelevant independent variables.<sup>13</sup> Per Dr. Koenker, including irrelevant covariates can be damaging to the validity of the model predictions because their inclusion tends to inflate the variability of those predictions.<sup>14</sup> Nebraska points out that the chance that an insignificant factor will, at random, incorrectly be found to be significant is increased when too many insignificant variables are included. They note that with eleven input variables, there is more than a 40 percent chance that some variable is incorrectly found to be significant.<sup>15</sup> Given that it is impossible to include all relevant variables in any one model, we must expect to have some omitted variable bias. Including a subset of relevant variables then may actually increase the bias caused by the omitted variables, and may also cause additional bias through measurement error.<sup>16</sup> This again suggests that the choice of relevant variables must be made carefully, and that it is possible, or even likely, that such variables will differ across carriers. If this is the case, the QRA that uses the same independent variables for each algorithm step and for each carrier, is likely to be a poor predictor of true unjustifiably high costs.

Finally, some of the variables that were included in the model may be collinear. The FCC's analysis does not address multicollinearity among the independent variables, although it is reasonable to suppose some multicollinearity must exist. The FCC stated that extra variables do not harm the model; however, this is not an accurate statement. As written by Nebraska, when two or more independent variables in a multiple regression model are highly correlated, the regression coefficient of any particular independent variable depends on other independent variables.<sup>17</sup> This means the coefficient does not reflect the independent variable's effect on the dependent variable fully, but has only a marginal or partial effect, given whatever other correlated variables are included in the model.

**Point 3: The FCC has not shown evidence to support its rejection of other regression approaches.** The FCC states that it rejects a suggested ordinary least squares method because the rural rate-of-return carriers' data do not follow a normal distribution, as is assumed in ordinary least squares; however, the FCC has provided no data or analysis in support of that argument.

### **Comments pertinent to Point 3:**

In my initial report, I noted the main concerns regarding the chosen methodology.

Dr. Koenker similarly notes that the method is flawed in the way the FCC has chosen to implement it.<sup>18</sup> He suggests the alternative of a conditional quantile model for aggregate costs.<sup>19</sup>

I note further that there are additional issues the FCC must address prior to establishing the QRA as the appropriate methodology for determining USF reimbursement. Specifically, the log-log

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<sup>13</sup> Comments of NECA, et al. at p. 16.

<sup>14</sup> *Id.* at Appendix E, page 1.

<sup>15</sup> Comments of the Nebraska Rural Independent Companies at p. 39, fn 81.

<sup>16</sup> Clarke, Kevin A. 2005. The Phantom Menace: Omitted variable bias in econometric research, *Conflict Management and Peace Science*, 22:341–352.

<sup>17</sup> *Id.* at fn 78.

<sup>18</sup> Comments of NECA, et al. at p. 63.

<sup>19</sup> *Id.* at Appendix D, page 15.

regression was not justified by the FCC. The log-log is appropriate if the dependent variable is a function of independent variables that have a multiplicative relationship. The FCC did not indicate such a relationship, nor did they indicate what part of the cost function was not linear, and therefore required the FCC to linearize the model using logs. For this reason the choice of logs seems arbitrary.

**Point 4: The FCC's method does not provide the economic incentives it claims.** The FCC's method cuts off support for costs above the 90<sup>th</sup> percentile in each cost category. This discourages companies from engaging in cost minimizing activities that would increase costs above the 90<sup>th</sup> percentile in one category in order to decrease costs even more in another category. Also, because the costs above the 90<sup>th</sup> percentile are not reimbursed, operators have an incentive to cut the costs even if there are negative impacts on customers, such as lower service quality. Finally, the method does not provide incentives for operators below the 90<sup>th</sup> percentile to improve their efficiency.

**Comments pertinent to Point 4:**

Subjecting carriers to limitations placed on individual accounts will in many cases produce exactly the opposite outcomes of those intended.<sup>20</sup> It discourages efficiency and encourages gamesmanship.

I reinforce the assertion that the economic incentives for efficiency and appropriate investment do not follow from the QRA. Investment is lumpy. This means that certain cost categories are likely to be above the cap in any given year, while other categories will remain within the accepted range. It is unreasonable to expect a consistent and moderate level of investment due to the nature of installation and upgrading aging plant.

The FCC's methodology caps reimbursement for investment that has already been made or investment that is planned in order to improve outdated plants. If a company cannot depend on reimbursement of this investment they will not plan to make even prudent investments. Additionally, the uncertainty of reimbursement will decrease the willingness of lenders to finance further investment. Unpredictability in reimbursement will stifle efficient investment.

Finally, while the methodology may be transparent to the FCC, whether they deem it uncomplicated or not is irrelevant. If companies find the methodology too complex to understand, they will not be able to plan and investment is liable to be either too little or inappropriate.

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<sup>20</sup> *Id.* at p. 69.