# White Paper:

## Consequences of Freezing Quantile Regression Analysis Coefficients

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*The quantile regression analysis used by the Federal Communications Commission to limit universal service support to rural rate-of-return carriers is a critically flawed, overly complicated mechanism. This White Paper demonstrates that the number of capped providers is in danger of ballooning dramatically from 71 carriers in 2013 to nearly double that number in 2014 due to the Wireline Competition Bureau's latest interim measure to address the acknowledged deficiencies in the QRA.*

*The lack of transparency in policy decisions that affect over $1 billion in annual support funds to provide universal telecommunications services to millions of rural customers is particularly disturbing and counter-productive. The continued use of flawed assumptions and processes will place more rural local exchange carriers in serious financial risk and deprive rural consumers of the broadband networks needed for economic opportunities, education, health care, public safety and other benefits.*

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# Executive Summary

The Federal Communications Commission introduced the use of a quantile regression analysis ("QRA") to limit the costs reimbursable to certain individual rural rate-of-return carriers through High Cost Loop support ("HCLS") as a part their universal service reforms. The Commission delegated development and implementation of this benchmarking methodology to the Wireline Competition Bureau. On July 26, 2013, the Wireline Competition Bureau ordered a freeze of 2012 QRA coefficients for use in the calculation of 2014 HCLS.

This White Paper provides a quantitative analysis and explanation of the consequences of freezing the 2012 QRA coefficients on the 2014 benchmark caps for HCLS. There are four main takeaways:

1. **Benchmarks should not be lower than the 90$^{th}$ percentiles ordered by the Commission.** Capping individual company support amounts changes the distribution of funds between companies, it does not change the total amount distributed. Changes to the benchmark calculations that result in benchmarks lower than the 90$^{th}$ percentile means that some companies will be improperly punished while others are unfairly rewarded by an arbitrary and capricious method.
2. **The use of frozen 2012 QRA coefficients for 2014 HCLS will improperly lower the benchmark from the 90$^{th}$ quantile to the 81$^{st}$ quantile.** Annual changes in accumulated depreciation have an exaggerated impact on the benchmark caps. Use of frozen coefficients will increase the number of study areas subject to the HCLS cap by 87% (from 71 to 133 study areas) due to the changes in the QRA variable Percentage of Undepreciated Plant. A QRA coefficient freeze causes a mismatch between prior year coefficients and current year cost/variable data that drives the benchmarks lower. Furthermore, the falsely correlated Undepreciated Plant QRA coefficient is an obvious flaw that compounds the impact to the benchmark calculations.
3. **Reductions in company costs cannot overcome the flaws in the QRA.** If frozen 2012 QRA coefficients are used, companies would have to reduce all manageable operating expenses by 23% to overcome the effect of a single year of additional accumulated depreciation. This level of expense reduction is not possible for many companies and would certainly not be sustainable for any company year after year.
4. **Coefficients must be matched with the independent variables used to generate them to maintain data relationships and the intended quantile benchmarks**. The use of both frozen 2012 independent variables with frozen 2012 coefficients will restore the QRA relationships and the 90$^{th}$ percentile benchmarks for capex and opex. Minor adjustments to the capex and opex formula constants would produce a total cost 90$^{th}$ percentile benchmark. It will also achieve the predictability and stability goals expressed in the *HCLS Benchmarking Freeze Order*.

Alexicon offers four recommendations to the Bureau. First, recognize and adjust for the inherent data mismatches that may result from any freeze of QRA coefficients. Second, freeze both the QRA coefficients and independent variables at 2012 levels for the calculation of 2014 HCLS benchmark caps as an interim measure. Third, institute comprehensive analysis and transparency policies so the impacts of proposed and/or enacted QRA changes may be clearly understood by all stakeholders. Fourth, address the noted current QRA flaws in a revised single cap methodology.

# Introduction

The Federal Communications Commission's *USF/ICC Transformation Order* brought sweeping reforms of universal service and intercarrier compensation in late 2011.[1] In that Order, the Commission introduced the use of a quantile regression analysis ("QRA") to limit the costs reimbursable to certain individual rural rate-of-return carriers through High Cost Loop support ("HCLS"). The Commission delegated development and implementation of the benchmark methodology to the Wireline Competition Bureau. Significant commentary and criticism of the QRA precipitated modifications in April 2012.[2,3] The application of the benchmark caps was again modified in February 2013.[4] On July 26, 2013, the Wireline Competition Bureau ordered a freeze of 2012 QRA coefficients for use in the calculation of 2014 HCLS while the Bureau continues to adjust the benchmarking methodology.[5]

*This White Paper analyzes the impact of using 2012 QRA coefficients to determine 2014 HCLS. The complexity of the QRA makes it difficult for stakeholders to understand the functioning of the model and the impact of the Commission's decisions.*

This White Paper provides a quantitative analysis and explanation of the consequences of using 2012 QRA coefficients for the determination of 2014 HCLS. The complexity of the QRA makes it difficult for stakeholders to understand the functioning of the model and the impact of the Commission's decisions. The analysis provides insights into the benchmark cap calculations and quantifies the effects of changes in certain costs and QRA inputs.

## ***Numbering Convention***

Discussions of HCL data can be confusing because of the differing timings of cost incurrence, cost reporting and support disbursement. To illustrate, the 2012 QRA coefficients were calculated using the 2011-1 HCL data submission which represents actual 2010 costs incurred by the carriers. For the sake of simplicity we will use the disbursement year as our reference period. For example we will refer to the

[1] *See 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 Regime; Federal-State Joint Board on Universal Service; Lifeline and Link-Up; Universal Service Reform—Mobility Fund*; WC Docket Nos. 10-90, 07-135, 05-337, 03-109, CC Docket Nos. 01-92, 96-45, GN Docket No. 09-51, WT Docket No. 10-208, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC 17663 (2011) (*USF/ICC Transformation Order and FNPRM*); (hereafter "*USF/ICC Transformation Order*").

[2] *Connect America Fund; High-Cost Universal Service Support*, WC Docket Nos. 10-90, 05-337, Order, 27 FCC Rcd 4235 (Wireline Comp. Bur. 2012) (*HCLS Benchmarks Implementation Order*).

[3] *See, e.g., The FCC's Quantile Regression Analysis is Fatally Flawed, Period: Commenters Provide Dozens of Arguments Against QR, None in Favor* (JSI Capital Advisors, February 7, 2012), available at http://www.jsicapitaladvisors.com/monitors/2012/2/7/the-fccs-quantile-regression-analysis-is-fatally-flawed-peri.html.

[4] *See Sixth Order on Reconsideration and Memorandum Opinion and Order*, 28 FCC Rcd 2572 (2013) (*Sixth Order on Reconsideration*).

[5] *Connect America Fund; High-Cost Universal Service Support*, WC Docket Nos. 10-90, 05-337, Order (Wireline Comp. Bur.), released July 26, 2013 (DA 13-1656) (*HCLS Benchmarking Freeze Order*).

2011 actual costs reported in the 2012-1 HCL data submission and the 2013 HCLS benchmarks calculated from this data all as "2013" information.

# Background

## ***USF/ICC Transformation Order***

In November 2011, the Federal Communications Commission's *USF/ICC Transformation Order* sought to reform universal service funding for high-cost rural areas.[6] Among these adoptions, the Commission adopted a benchmarking rule that placed limits on capital and operating expenses eligible for reimbursement from HCLS. The expressed goal of the benchmarking rule was to moderate the costs of rate-of-return carriers with very high costs compared to their similarly situated peers, while further encouraging other rate-of-return carriers to invest and advance broadband deployment.[7] The Commission authorized the Wireline Competition Bureau to adopt and implement a benchmarking methodology within the parameters set forth by the Commission.[8] The Commission also directed the Bureau to annually publish updated benchmarks for rate-of-return cost companies.[9]

## ***HCLS Benchmarks Implementation Order***

In the April 2012 *HCLS Benchmarks Implementation Order*, the Bureau adopted a quantile regression analysis ("QRA") methodology to establish benchmarks for capital expenditures ("capex") and operating expenses ("opex") to be used in the formulas that determine HCLS for each rate-of-return cost company study area. The QRA used the 2012 HCLS data inputs submitted to the National Exchange Carrier Association ("NECA") to generate the 2012 coefficients.[10] The capex and opex benchmarks were implemented as of July 1, 2012. The Bureau used the same 2012 coefficients for the calculation of 2013 capex and opex benchmarks.[11] The Bureau's *January 29 Public Notice* announced the HCLS benchmarks for 2013.[12] The use of the 2012 coefficients with 2013 data resulted in an approximate 50% increase in the number of study areas with HCLS capped by the QRA benchmarks.[13]

*The 2012* HCLS Benchmarks Implementation Order *adopted a method to establish cost limits used to determine universal service support for each rate-of-return carrier.*

[6] *See USF/ICC Transformation Order and FNPRM*, 26 FCC at 17670, para. 11.

[7] *See id.* at 17741-47, paras. 210-26; 47 C.F.R. §36.621(a)(5).

[8] *See id.* at 17743-44, 17747, paras. 214, 217, 226.

[9] *See id*. at 17744, para. 218.

[10] Note that the 2011-1 data collection represents annual 2010 study area cost data and is used for 2012 HCLS calculations.

[11] *See HCLS Benchmarks Implementation Order*, 27FCC Rcd at 4251-52, para 45.

[12] *Wireline Competition Bureau Announces High-Cost Loop Support Benchmarks for 2013*, WC Docket No. 10-90 et al., Public Notice (Wireline Competition Bureau), rel. January 29, 2013, DA 13-99 (*January 29 Public Notice*)

### ***White Paper: Lessons from Rebuilding the FCC Quantile Regression Analysis***

In February 2013, Alexicon Consulting and Balhoff & Williams released the *White Paper: Lessons from Rebuilding the FCC Quantile Regression Analysis ("QRA Lessons White Paper").*[14] The *QRA Lessons White Paper* provides a disciplined review of the inputs, design and execution of the QRA as well as a perspective on the QRA's role in meeting policy obligations. The *QRA Lessons White Paper* provides many insights and identifies pervasive and serious flaws in the QRA. Among the problems discussed is the false correlation of Percentage of Undepreciated Plant (an independent variable used as a proxy for age of plant) and capex. The primary component of capex - as defined by the QRA - is depreciation expense. The circular use of depreciation in both the predictive independent variable (Percentage of Undepreciated Plant) and the predicted cost (capex) is highly problematic.[15]

*The QRA's circular use of depreciation in both a predictive variable and the cost to be predicted is highly problematic.*

### ***Sixth Order on Reconsideration***

In the February 2013 *Sixth Order on Reconsideration*, the Commission reconsidered some aspects of the benchmarking rules for HCLS. Specifically, the FCC directed the Bureau to develop a benchmark methodology that will result in a single total loop cost cap. As an interim measure, the Commission further directed the Bureau to sum the capex and opex caps generated by its current methodology for purposes of calculating 2013 HCLS. The summed cap reduced the number of capped study areas from 159 to 71. The Commission also reconsidered the annual QRA update requirement and delegated determination of the frequency for running the regression analysis to the Bureau.

*The FCC's* Sixth Order on Reconsideration *adopted an interim summed capex/opex for 2013 while a single cost cap method is developed.*

### ***HCLS Benchmarking Freeze Order***

In the July 26, 2013 *HCLS Benchmarking Freeze Order*, the Bureau retained the 2012 QRA coefficients for use in the calculation of 2014 HCLS caps. The Bureau further noted that the greater of a carrier's number of loops for 2012 or 2013 would be used to calculate its summed capex/opex cap for 2014 because:

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[13] *See January 29, 2013 NTCA Ex Parte Communication*, Letter from Michael R. Romano, WC Docket No. 10-90, et al.

[14] *See February 21, 2013 Alexicon Telecommunications Consulting Ex Parte Communication*, Letter from Vincent H. Wiemer, WC Docket No. 10-90, et al. The *QRA Lessons White Paper* is also available at http://www.alexicon.net/wp-content/uploads/2011/12/Lessons-from-Rebuilding-the-FCC-Quantile-Regression-Analysis.pdf

[15] Depreciation expense is the primary component of capex. Percentage of Undepreciated Plant is calculated as Net Plant divided by Telephone Plant in Service ("TPIS"). Net Plant is equal to TPIS less Accumulated Depreciation and Amortization. Accumulated Depreciation is the cumulative depreciation expense over the life of the assets.

> *"Under the current methodology, a carrier's benchmark cap decreases as the number of lines decrease. Therefore, by using the greater of the number of loops in 2012 or 2013, we will ensure that carriers experiencing line loss will have additional stability in support during this transition year, while ensuring that carriers that have made investments to increase the number of loops are not unduly penalized."*[16]

The Order also waived the application of the benchmarking rule for rate-of-return study areas in Alaska for the remainder of 2013 and 2014 due to recognized concerns with the QRA independent variable data for those areas.[17]

## Understanding the Quantile Regression Analysis

The purpose of the Commission's statistical methodology is "to identify study areas that have capex [capital expenditure expense] and opex [operating expense] costs that are much higher than their similarly-situated peers and to cap their cost recovery at amounts that are no higher than the vast majority of similarly-situated study areas."[18] To accomplish its goal, the Commission employed a quantile regression analysis to estimate the relationships between assumed company cost drivers (independent variables) and defined operating and capital costs (dependent variables).

*The QRA analyzes whether and to what extent a change in operating variables correlates to a change in costs.*

The definitions of capex and opex per study area were developed from the National Exchange Carrier Association HCLS algorithm.[19] The QRA used the 2012 HCLS data inputs submitted to NECA for 726 rate-of-return cost study areas to generate the 2012 coefficients.[20,21]

The Commission concluded that capex and opex are affected by scale of operations, age of plant, customer dispersion, and geography. The Bureau defined sixteen independent variables as proxies for

[16] *See HCLS Benchmarking Freeze Order* at para 13.

[17] *See HCLS Benchmarking Freeze Order* at para 15.

[18] *HCLS Benchmarks Implementation Order*, para 59.

[19] The Commission defined capex costs as the sum of depreciation expense and return on capital attributed to local loop cable and circuit equipment (NECA HCL algorithm steps 17, 18, 23 and 24). The Commission defined opex costs as the sum of plant maintenance, network and general support, network operations, corporate operations, operating taxes, benefits, and rents attributed to local loop cable and circuit equipment (NECA HCL algorithm steps 13, 14, 15, 16, 19, 20, 21 and 22).

[20] Note that the 2011-1 data collection represents annual 2010 study area cost data and is used for 2012 HCLS calculations.

[21] Study areas are defined service regions within a state. The FCC and the states require reports from those study areas to detail service, investment and other regulatory data. An incumbent local telephone carrier may have only one study area within a state or several, generally as a result of acquisitions.

these factors.[22] In simple terms, the QRA analyzes whether and to what extent changes in the independent variables (number of loops, road miles, etc.) correlate to changes in company capex and opex costs.

QRA outputs take the form of a mathematical equation that describes a straight line through the data. The lines can be drawn at "quantiles," a location where a percentage of the data observations fall above and below the line. For example, the median is the 50th quantile—the line where 50% of the data observations are above the line and 50% below the line. The Commission's selection of a 90th quantile benchmark means that the QRA outputs a formula that describes a line where 10% of the actual study area costs are above the line and 90% are below the line.

### ***Coefficients and Constants***

The Bureau's methodology actually consists of two regressions – one for capex and one for opex. The Bureau used the same independent variables to "predict" both capex and opex costs. Consequently, the QRA output consists of two formulas each consisting of a constant and sixteen coefficients. The constant denotes the regression line's intersection with the y-axis. One can think of the constant as the "starting point" of the regression line while the coefficients describe the slope of the line through the data. To calculate a 90th quantile predicted capex or opex amount, one must multiply the coefficient by the independent variable value for each of the sixteen variables and sum these with the constant. Since the Bureau uses a logarithm approach, the exponent of this sum must then be calculated.

*The QRA actually consists of two regressions – capex and opex. By definition, the QRA coefficients only describe the relationship between the costs and variables used to generate them. They are not valid for other data or other time periods.*

It is important to note that the QRA coefficients describe a relationship only for the cost data and independent variables used to generate them. When the cost data or independent variables change, the previous QRA coefficients and constants are no longer valid representations of the relationships between costs and variables. Unfortunately, this is precisely what the Bureau did by continuing to use 2012 QRA coefficients to determine 2013 and 2014 HCLS.

### ***Benchmark Quantiles and the Number of Capped Study Areas***

The selection of the quantile (or percentile) benchmark has a direct impact on the number of study areas subject to caps. The Bureau concluded that the QRA-derived benchmark limits should be set at the "90th percentile of costs for capex and opex compared to similarly situated companies."[23] By definition, fewer than 10% of the total study areas used in the regression would exceed a 90th percentile QRA benchmark.

[22] The independent variables selected include number of (1) loops, (2) road miles, (3) number of road crossings, (4) number of commonly controlled study areas in the state for Scale; (5) percentage of undepreciated plant for Age of Plant; (6) customer density, (7) number of exchanges, (8) percentage of households in urban areas for Customer Dispersion; and (9) soil difficulty index, (10) percentage of bedrock, (11) frost index, (12) percentage of study area on tribal land, (13) percentage of study area on national park land, (14) Alaska, (15) Midwest, (16) Northeast for Geography.

[23] *HCLS Benchmarks Implementation Order*, para. 32.

The *Sixth Order on Reconsideration* confirmed the Commission's intent to continue the use of a 90th percentile limit with a single cost cap method on both a permanent and interim basis:

> *"As a matter of statistics, the sum of the quantiles is not the quantile of the sums, which is to say that summing two 90th percentile benchmark caps does not produce the same result as would setting a cap based on the 90th percentile of total costs. Although summing is imperfect as an estimate of the 90th percentile of overall costs, we find that as an interim measure it provides a reasonable way to recognize that there are tradeoffs between capital and operating expenditures."*[24]

So when the 2012 *HCLS Benchmarks Implementation Order* established two regression analyses (capex and opex), one would expect the capex QRA to result in approximately 70 of the 726 study areas subject to the capex cap and the opex QRA also to result in about 70 study areas subject to the opex cap for 2012 HCLS.[25] A regression analysis of a single total cost as directed by the 2013 *Sixth Order on Reconsideration* should result in about 70 total study areas subject to a 90th percentile benchmark cap.

*A 90th percentile benchmark applied to 730 companies should produce about 70 capped companies.*

The 2012 QRA conducted by the Bureau produced 66 study areas subject to the capex cap and 63 study areas subject to the opex cap out of 726 total study areas.[26] The interim 2013 summed capex/opex cap resulted in 71 of 738 total study areas subject to the benchmark limit, an effective percentile benchmark of 90%. However, it is important to note that the 2013 summed cap percentile was ***purely coincidental***. The 2012 QRA coefficients combined with 2013 data and the interim measure of summing two benchmarks had a fortuitous result. As noted by the Commission, the summing of two 90th percentile partial cost caps does not produce the same result as a 90th percentile cap on the total costs. In fact, the use of frozen 2012 QRA coefficients with the 2013 data was the equivalent of lowering the 2013 QRA benchmarks to the 84th and 88th quantiles for capex and opex, respectively, with the effect of a total cost 90th percentile benchmark.[27]

**Figure 1: Comparison of Benchmark Percentiles**

| | NUMBER OF CAPPED STUDY AREAS | |
|---|---|---|
| | 2012 | 2013 (frozen 2012 QRA coefficients) |
| **Total Study Areas** | 726 | 738 |
| **Capex Cap** | 66 | 111 |
| **Percentile Benchmark** | 90% | 84% |
| **Opex Cap** | 63 | 86 |
| **Percentile Benchmark** | 91% | 88% |
| **Summed Capex/Opex Cap** | n/a | 71 |
| **Percentile Benchmark** | | 90% |

[24] *Sixth Order on Reconsideration*, para. 29.

[25] A 90th percentile benchmark of 728 study areas would result in 73 (+/-7) capped study areas.

[26] *See HCLS Benchmarks Implementation Order*, Appendix B.

[27] Effective quantile benchmark = 1- (number of capped study areas/total study areas) rounded down to the nearest percentage.

We would further note the number of capped study areas ***does not*** affect the total HCLS distributed. Due to a limited total fund size combined with the redistribution of capped support, caps only affect the distribution of support among companies and not the total support distributed. So there is no incentive to engage in a benchmark system that results in more companies subject to benchmark limits. A methodology that results in cost benchmarks less than the 90th percentile is contrary to the Commission's *Sixth Order on Reconsideration*. Such a system would be arbitrary and capricious and would result in certain companies' HCLS being improperly limited while others would be unfairly rewarded with redistributed funds.

*Caps affect the distribution of support among carriers and not the total HCLS distributed. A methodology that results in cost benchmarks less than the 90th percentile is contrary to the* Sixth Order on Reconsideration.

## Analysis

The Bureau's *January 29 Public Notice* announcing the updated HCLS benchmarks for 2013 exposed another significant flaw in the use of the QRA. Overnight, the number of capped companies rose from approximately 106 to 159. Preliminary analysis revealed that the mismatch of 2012 QRA coefficients with 2013 cost and variable data was the cause.

As noted previously, the 2012 QRA coefficients describe a relationship only for the 2012 cost data and independent variables used to generate them. The QRA does not provide a universal formula that can be used with any data set; rather it is specific to the data that generates the coefficients. When the cost data or independent variables change, the previous QRA coefficients may no longer be a valid representation of the relationships between costs and variables. The 2013 HCL data used to calculate the updated benchmarks not only changed the capex and opex costs, it also changed two independent variables: loops and percentage of undepreciated plant. The changes in these two variables combined with the use of depreciation expense as the measure of capex was responsible for the marked increase in capped areas.

*The July 2013* HCLS Benchmarking Freeze Order *ignores the impact of the mismatch between 2012 QRA coefficients and 2014 data and accumulated depreciation on the benchmark calculations.*

The Commission itself appears to be at least partially cognizant of these issues. The February 2013 *Sixth Order on Reconsideration* directed the Bureau to sum the capex and opex caps into a single cap which reduced the number of capped study areas from 159 to 71. Also, the Bureau noted the impact of decreasing access lines on the benchmark caps in the recent *HCLS Benchmarking Freeze Order* and ordered the use of the greater of a carrier's number of loops for 2012 or 2013 in the calculation of 2014 caps. ***However, the Bureau has ignored the greater impact of accumulated depreciation on the benchmark calculations when ordering a freeze of QRA coefficients.***

The *HCLS Benchmarking Freeze Order* prompted four questions:

1. What is the impact on the 2014 HCLS benchmark calculations when QRA coefficients are frozen at 2012 amounts?
2. To what extent could the decrease in the 2014 benchmark caps caused by frozen 2012 coefficients be offset by reduced costs?
3. What would the impact be to 2014 benchmark caps if a 2013 QRA is used instead of 2012 QRA coefficients?
4. What interim alternatives for 2014 HCLS benchmark calculations will retain the 90th percentile benchmarks and provide the desired predictability of support?

Appendix B contains the quantitative analysis of the consequences of freezing the QRA coefficients on the HCLS benchmark caps. The following narrative explains the reasoning, processes and summary results of the analysis.

## ***Recalculation of the 2013 Capex and Opex Benchmark Caps***

The first step in the analysis was to recreate the calculation of 2013 study area costs and summed capex/opex caps. The Bureau released the calculation of the 2013 study area summed capex/opex caps in the *March 26th Public Notice.*[28] The data included the 2012 QRA coefficients as well as the independent variable data; the study area costs; and calculations of the capex, opex and summed caps for each of the 738 rate-of-return cost study areas.[29] The FCC data and calculations were copied into a single spreadsheet labeled *2013 FCC Summed Cap* as a reference (see Appendix B).

The 2013 study area costs were developed using the 2012-1 HCL data submission which is available to the public on NECA's website.[30] The cost data for the 738 rate-of-return cost study areas was copied into a spreadsheet. The calculations of Study Area Cost per Loop and the Corporate Operations Expense Limit for each study area were added as described in NECA's *Overview and Analysis of 2012 USF Data Submission* algorithms.[31] Study area independent variables, 2012 QRA coefficients, and calculations of capex, opex and summed caps were added. The calculations of Allowable Corporate Operations Expense, Study Area Costs and Summed Capex/Opex Caps were compared to the NECA and Bureau amounts, respectively, and verified for accuracy.[32] This baseline model of benchmark cap calculations is labeled *2013 Summed Cap Recalc* (see Appendix B).

[28] *Wireline Competition Bureau Releases New High-Cost Loop Support Benchmarks for 2013*, WC Docket No. 10-90 et al., Public Notice (Wireline Competition Bureau), rel. March 26, 2013, DA 13-551 (*March 26th Public Notice*).

[29] Available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-319802A1.xlsx.

[30] *See* https://www.neca.org/PublicInterior.aspx?id=1190 , USF 2012 Cost Data.

[31] *See id.*, Appendix B.

[32] Minor rounding differences appear. The maximum difference range for Summed Caps was +/-$0.01. The maximum difference range for Study Area Costs was +/-$17. These differences are immaterial and do not affect results.

## ***The Impact of 2012 Coefficients on 2014 Benchmark Caps***

The first question in our investigation is: ***"What is the impact on the 2014 HCLS benchmark calculations when QRA coefficients are frozen at 2012 amounts?"***

The most direct way to isolate any changes due to a coefficient freeze is to assume that 2014 study area costs are equal to 2013 study area costs with an additional year of accumulated depreciation. We use this assumption for two reasons. The first reason is academic; the assumption allows us to isolate the impact of depreciation and expose one of the flaws in using frozen QRA coefficients. The second reason is objective business reality; the Commission's USF reforms seriously depressed infrastructure investment by rate-of-return carriers in 2012 (the cost period reported in 2014 HCLS data).

*2014 costs can be estimated as 2013 amounts plus an added year of accumulated depreciation. This assumption recognizes the reality that USF reforms caused the cessation of broadband investment in rural America and highlights a major QRA flaw.*

For instance, the National Telecommunications Cooperative Association ("NTCA") conducted a survey among its membership of small rural telecommunications companies (about half of which are cooperatives) and found that 69% of the respondent carriers were postponing or cancelling "fixed network upgrades as a result of the uncertainty surrounding [*the USF/ICC Transformation Order*]."[33]

Additionally the two major lenders to rural carriers, CoBank and the Rural Utilities Service, reported sharply lower lending for network infrastructure in 2012. CoBank made no 2012 infrastructure loans in light of the challenging and uncertain investment environment caused by the Commission's recent reforms.[34] The U.S. Department of Agriculture's Rural Utilities Service ("RUS") only loaned 11.6% ($68.4 million) of its $590 million in annual funds and only 9.4% ($68.9 million) of the $736 million available in RUS broadband loans was borrowed in 2012.[35]

The total loaned by RUS in 2012 is equal to less than 10% of the total 2012 depreciation expense of the 738 rate-of-return cost settlement study areas.[36] This does not include the additional 366 average schedule study areas. In other words, carriers would have to invest more than 10 times the amount that was borrowed in 2012 to offset a single year of depreciation expense.

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[33] National Telecommunications Cooperative Association, "Survey: FCC USF/ICC Impacts: Summary of Results," February 2013, available at www.ntca.org.

[34] January 23, 2013, conversation between Michael J. Balhoff and Robert F. West, CoBank, Senior Vice President, Division Manager; see, also, Letter of Robert F. West to FCC, Marlene H. Dortch, May 18, 2012, available at https://prodnet.www.neca.org/publicationsdocs/wwpdf/0511cobank.pdf

[35] The United States Department of Agriculture / Rural Development, "The Telecommunications Program," presentation by RUS Deputy Administrator Jessica Zufolo to the National Association of Regulatory Utility Commissioners, Washington, DC, February 2, 2013, slide 5.

[36] See Appendix B, *2014EST Net Plant Investment*. Total estimated 2012 depreciation expense was $1.378 billion.

The estimation of one year of depreciation expense and added accumulated depreciation for each study area is relatively straightforward. In accordance with the federal rules, rate-of-return carriers record depreciation expense in subaccounts relative to asset accounts:[37]

*The HCLS data submission contains virtually all of the data needed to estimate an additional year of accumulated depreciation for all carriers.*

- Depreciation Expense – General Support Facility
- Depreciation Expense – Central Office Switching
- Depreciation Expense – Central Office Operator Systems
- Depreciation Expense – Central Office Transmission Equipment
- Depreciation Expense – Cable and Wire Facility
- Depreciation Expense – Information, Originating/Terminating Equipment (IOT)
- Amortization Expense

Fortunately, the depreciation expense for Central Office Equipment ("COE") accounts and for Cable and Wire Facilities ("CWF") is included in the HCL data submission.[38] These two asset categories represent over 88% of total Telecommunications Plant in Service ("TPIS") assets and subsequently the majority of depreciation expense as well. Only the depreciation expense related to General Support Facility, IOT, and amortizable assets (collectively "Other TPIS") needs to be estimated. This was accomplished by calculating the Other TPIS asset amount from the HCL data.[39] We then applied an average 7.33% annual depreciation rate to the Other TPIS asset balance to estimate Depreciation Expense - Other TPIS.[40] The calculated Total Depreciation Expense was subtracted from the 2013 Net Plant Investment (DL 190) to arrive at estimated 2014 Net Plant Investment. The estimates of Total Depreciation Expense and Adjusted Net Plant Investment are contained in the spreadsheet labeled *2014EST Net Plant Investment* (see Appendix B).

The baseline model was revised to reflect the 2014 estimated Net Plant Investment in HCL data line 190. This change updates the Percentage of Undepreciated Plant independent variable and changes the 2013 HCL benchmark calculations to reflect estimated 2014 benchmarks.[41] This model is labeled *2014EST Summed Cap Calc* (see Appendix B).

[37] *See 47 C.F.R. §32 – Uniform System of Accounts for Telecommunications Companies.*

[38] Data Lines 510, 515, 520, 525 and 530.

[39] Other TPIS = Total Telecommunications Plant in Service (DL 160) – Total COE (DL 245) – Total CWF (DL255)

[40] The rate was imputed from NECA Tariff Data. See *NECA Transmittal No. 1314*, Volume 2, Exhibit 2, page 5 of 8 (July 2011). Total Depreciation Expense (line 190) is calculated as 5.46% of Total Telecommunications Plant in Service (line 370). Application of a 7.33% depreciation rate for Other TPIS results in an estimated total depreciation expense equal to 5.46%.

[41] Percentage of Undepreciated Plant = 100 * Net Plant Investment / TPIS

Figure 2 provides a summary comparison of the 2013 and estimated 2014 benchmark caps:

**Figure 2: Impact of Frozen Coefficients on 2014 HCLS Benchmarks**

| | NUMBER OF CAPPED STUDY AREAS | |
|---|---|---|
| | 2013 | 2014 Est |
| **Total Study Areas** | 738 | 738 |
| **Capex Cap** | 111 | 217 |
| **Percentile Benchmark** | 84% | 70% |
| **Opex Cap** | 86 | 111 |
| **Percentile Benchmark** | 88% | 84% |
| **Summed Capex/Opex Cap** | 71 | 133 |
| **Percentile Benchmark** | 90% | 81% |

Accumulated depreciation has an enormous impact on the benchmark caps when frozen 2012 QRA coefficients are used. ***The use of frozen 2012 QRA coefficients for 2014 HCLS benchmarks will lower the percentile benchmark to 81%***; it results in an 87% increase in the number of capped study areas. This amounts to a $400 million reduction in the summed cost caps calculated for all study areas. This result is contrary to the Commission intended 90th percentile benchmark confirmed in the *Sixth Order on Reconsideration.* The magnitude of the change should not be surprising considering the *January 29 Public Notice* resulted in a 50% increase in the number of capped study areas when the 2012 QRA coefficients were used. There are three reasons that accumulated depreciation has such a large impact:

*Freezing QRA coefficients will almost double the number of capped companies in 2014. It will lower the effective percentile benchmark from 90% to 81%. The increase is caused by the QRA's circular use of depreciation and the mismatch between 2012 QRA coefficients and 2014 data.*

1. ***Annual depreciation lowers the Percentage of Undepreciated Plant independent variable.*** An additional year of accumulated depreciation lowers the Net Plant Investment amount used to calculate the independent variable Percentage of Undepreciated Plant. When the lowered variable amounts are multiplied by frozen QRA coefficients, it significantly lowers the benchmark caps.

2. ***Freezing coefficients creates a mismatch between the coefficients and data.*** The 2012 QRA coefficient for Percentage of Undepreciated Plant only applies to the 2012 data (e.g., 2012 Net Plant Investment and TPIS) used to generate it. By definition, the 2012 QRA coefficients do not describe the relationships between the cost data and independent variables for 2013 or any other year.

3. ***Flaws in the QRA design result in a false correlation.*** The Percentage of Undepreciated Plant variable is used as proxy for the age of plant. However, capex – as defined in the QRA – consists primarily of depreciation expense. This circular use of depreciation in both the predictive variable and predicted cost causes a false correlation in the QRA. The QRA is not detecting a correlation between age of plant and capital expenditures, but rather the correlation between

accumulated depreciation and depreciation expense.[42] Evidence of this can be seen in the exaggerated impact to the capex cap which is reduced from the 84th to 70th percentile (nearly doubling the number of capex capped study areas) due to a single year of accumulated depreciation.

## *The Impact of Reduced Costs*

The impact of frozen coefficients on the benchmark calculations is acute. Some might postulate that the impact of frozen coefficients would not need to be addressed if it could be reasonably offset by actions such as managing other costs. So the question remains: ***"To what extent could the decrease in the 2014 benchmark caps caused by frozen 2012 coefficients be offset by reduced costs?"***

*Network assets, depreciation expense and operating taxes are not "manageable" costs when considering possible future cost reductions.*

To answer this question, we first considered which costs were "manageable" in the future and could reasonably be reduced by changes in operations. We defined manageable operating costs as all of the HCL costs with the exception of assets, depreciation expense and operating taxes. Assets have been placed in service and it is not reasonable to assume that they could be reduced or retired without undesirable service and operational consequences. Depreciation expense is the product of the asset balances (already determined to be an unmanageable) and depreciation rates. Depreciation rates are often set by state public utility commissions, not by the company, and are therefore not manageable. Likewise, operating taxes include state and federal income taxes, property taxes, operating investment tax credits, deferred operating taxes, and other operating taxes. Operating tax amounts are based on corporate organization form as well as federal, state and local tax rates and procedures. Changes in operating taxes are wholly outside of the control of the company and therefore are not manageable.[43]

The estimated 2014 benchmark model was revised to enable a flexibility analysis of operating costs by adding a formula to allow percentage reductions to all manageable HCL cost data lines. This model is labeled *2014OPX Summed Cap Calc* (see Appendix B).

**Figure 3: Impact of Reduced Operating Costs**

| | NUMBER OF CAPPED STUDY AREAS | | | | |
|---|---|---|---|---|---|
| | 2013 | 2014 Est | 2014 OPX ( -X% of Manageable Costs) | | |
| | | | -10% | -15% | -23% |
| **Capex Cap** | **111** | **217** | 217 | 217 | **217** |
| **Percentile Benchmark** | **84%** | **70%** | 70% | 70% | **70%** |
| **Opex Cap** | **86** | **111** | 76 | 59 | **37** |
| **Percentile Benchmark** | **88%** | **84%** | 89% | 92% | **94%** |
| **Summed Capex/Opex Cap** | **71** | **133** | 96 | 87 | **71** |
| **Percentile Benchmark** | **90%** | **81%** | 86% | 88% | **90%** |

[42] *See QRA Lessons White Paper* for further discussion.

[43] *See id.*, Appendices B and C for further discussion of the problems with using depreciation expense and operating taxes in the QRA.

The results indicate that on average, companies would have to ***reduce all manageable operating expenses by 23%*** to overcome the effect of a single year of additional accumulated depreciation if 2012 QRA coefficients are frozen. This draconian level of expense reduction is not possible for many companies and would certainly not be sustainable for any company year after year.

*Today's HCLS funding is based on costs from two years ago. So a carrier needs to know what the benchmarks will be in 2015 in order to make prudent investment decisions today.*

Furthermore, the implementation of the QRA makes management of operating expenses impractical. Recall that HCLS is a backward-looking support mechanism – support received in 2013 is payment for expenditures made two years ago in 2011. Therefore, a carrier seeking to adjust its operating expenses today needs to know what the QRA benchmarks will be in 2015 – two years in the future. The Commission has placed rate-of-return carriers in the completely untenable position in which current expenditure decisions are dependent on future data using a benchmarking methodology that has yet to be determined.

## ***The Impact of Updating the 2013 Quantile Regression Analysis***

The results of the analysis of frozen 2012 QRA coefficients and accumulated depreciation on the benchmarks caps leads to the question: ***"What would the impact be to 2014 benchmark caps if a 2013 QRA is used instead of 2012 QRA coefficients?"***

Alexicon ran updated 2013 capex and opex quantile regression analyses of the 738 rate-of-return cost study areas using the 2013 independent variable data from the Bureau's *March 26th Public Notice* and cost data from the 2013 HCL data submission. The 2013 QRA coefficients developed are presented in Appendix B. The estimated 2014 benchmark model was revised to calculate the benchmark caps using updated 2013 QRA coefficients instead of frozen 2012 QRA coefficients. This model is labeled *2014QRA Summed Cap Calc* (see Appendix B).

Figure 4 provides a summary comparison of the results:

**Figure 4: Impact of Updated 2013 QRA Coefficients**

| | NUMBER OF CAPPED STUDY AREAS | | |
|---|---|---|---|
| | 2013 | 2014 EST (2012 QRA Coefficients) | 2014 QRA ( 2013 QRA coefficients) |
| **Capex Cap** | 111 | 217 | 183 |
| **Percentile Benchmark** | 84% | 70% | 75% |
| **Opex Cap** | 86 | 111 | 89 |
| **Percentile Benchmark** | 88% | 84% | 87% |
| **Summed Capex/Opex Cap** | 71 | 133 | 88 |
| **Percentile Benchmark** | 90% | 81% | 88% |

If the Bureau used updated 2013 capex and opex QRAs instead of using frozen 2012 QRA coefficients, there would be about 45 fewer study areas subject to the 2014 summed capex/opex benchmark caps. However, the updated 2013 coefficients still yield a benchmark lower than the Commission ordered 90th percentile. While there is a better relationship between estimated 2014 costs and the 2013 QRAs, there is still a mismatch and the impact of the additional year of accumulated depreciation cannot be overcome.

*An updated 2013 QRA would result in benchmarks lower than the 90th percentile because of the interim use of a summed capex/opex cap.*

## ***2014 HCLS Benchmark Interim Alternatives***

The analyses of frozen QRA coefficients discussed to this point indicate that the Bureau's decision to continue the use of 2012 QRA coefficients for 2014 HCLS benchmark calculations will effectively lower the benchmark percentile to 81%, well below the Commission's intended 90th percentile level and will improperly subject a significant number of additional study areas to capped HCLS recovery. Furthermore, updating the coefficients with 2013 data still falls short of the 90th percentile benchmark. The final question remains: ***"What interim measures for 2014 HCLS benchmark calculations will retain the 90th percentile benchmarks and provide the desired predictability of support?"***

*The Bureau's decision to use 2012 QRA formulas for 2014 HCLS will effectively lower the benchmark to the 81st percentile, well below the Commission's intended 90th percentile.*

Three possible solutions have been identified:

1. Run an updated 2014 single cost cap regression analysis.
2. Freeze both the QRA coefficients and independent variables at 2012 values.
3. Freeze both the QRA coefficients and independent variables at 2012 values and adjust the QRA constants.

**Updated 2014 Regression Analysis**

The first possible solution would be to run an updated 2014 QRA possibly with the revisions needed for a single cost cap. While not addressing the many flaws in the current methodology, this approach would provide a matched relationship between coefficients and the costs and variables that generate them. If the Bureau continued use of a summed cap approach, a 2014 updated QRA would still result in benchmarks lower than the 90th percentile. Revising the 2012 methodology to a 2014 single cost cap would not solve the noted deficiencies in the current QRA assumptions and design. Additionally, the Bureau has recognized the desire of rate-of-return carriers for greater predictability of benchmark results and HCLS.[44] This desire would not be afforded by a 2014 QRA update due to the timing of data submissions and additional time needed to perform the regression analysis. Given these considerations, we do not recommend this approach.

*An updated 2014 QRA would not solve the noted deficiencies in the current model and would provide added uncertainty and delay to the process.*

[44] *See HCLS Benchmarking Freeze Order*, paras. 12-13.

**Freeze QRA Coefficients and Variables**

The second possible solution is to freeze both the QRA coefficients and independent variables at 2012 values. Our analysis has identified the primary problem with using frozen 2012 QRA coefficients in subsequent years – namely, the mismatch between the coefficients and the cost and variable data. The annual changes in loop count and accumulated depreciation materially change two of the sixteen independent variables (Loops and Percentage of Undepreciated Plant) and drive the benchmarks lower. However, the relationship between coefficients and costs could be substantially restored by freezing both the 2012 QRA coefficients and the 2012 independent variables used to generate those coefficients.

*Freezing both the QRA coefficients and variables at 2012 levels restores the data relationships. However, the use of a summed cap will result in benchmarks slightly higher than the 90th percentile.*

The 2012 loops, net plant investment and total telecommunications plant in service were obtained from NECA.[45] The remaining fourteen variables are unchanged from 2012 so the revised Loops and Percentage of Undepreciated Plant complete the frozen independent variable scenario.

With this data, the baseline model was revised to calculate the estimated 2014 benchmark caps using the 2012 independent variables with the 2012 QRA coefficients (labeled *2014FCV Summed Cap Calc* - see Appendix B).

**Figure 5: Impact of Frozen Coefficients and Independent Variables**

| | NUMBER OF CAPPED STUDY AREAS | |
|---|---|---|
| | 2013 | 2014 FCV (2012 Coefficients & Variables) |
| **Capex Cap** | 111 | 74 |
| Percentile Benchmark | 84% | 90% |
| **Opex Cap** | 86 | 71 |
| Percentile Benchmark | 88% | 90% |
| **Summed Capex/Opex Cap** | 71 | 56 |
| Percentile Benchmark | 90% | 92% |

The use of 2012 independent variables with 2012 coefficients successfully restores the relationships between the data and results in 90th percentile benchmarks for capex and opex even when used with estimated 2014 costs. However, as previously discussed the sum of two 90th percentile partial cost caps does not produce the same result as would setting a cap based on the 90th percentile of total costs. In this case we end up with a 92nd percentile summed capex/opex benchmark. This result may be sufficiently reasonable as an interim measure for 2014 HCLS benchmarking purposes with the knowledge that all options are imperfect.

[45] *See* https://www.neca.org/PublicInterior.aspx?id=1190 , USF 2011 Cost Data.

**Frozen 2012 QRA with Adjusted Constants**

As indicated, matching the 2012 coefficients and independent variables maintains the relationships in the QRA formulas and results in a 90th percentile capex and opex benchmarks. However, this approach results in a 92nd percentile summed capex/opex cap. If the goal is a 90th percentile single cost cap, how can that be accomplished in the interim given the two QRA formulas? The solution is simple – make a minor adjustment to the constants in the capex and opex QRA formulas. Recall that the QRA outputs take the form of two mathematical equations (each consisting of a constant and sixteen coefficients) that describe a straight line through the data. One can think of the constant as the "starting point" of the regression line while the coefficients describe the slope of the line through the data. So if the line through the data needs to be adjusted so that 10% instead of 8% of the study areas are above the regression line, a simple alternative is to lower the starting points of the regression lines by making minor adjustments to the QRA formula constants.

*A 90th percentile benchmark can be achieved for 2014 HCLS using frozen 2012 coefficients and variables by making minor adjustments to the constants in the QRA formulas.*

The estimated 2014 benchmark caps model was revised to use the 2012 independent variables with the 2012 QRA coefficients with the capex and opex constants adjusted to result in a 90th percentile summed cap benchmark.[46] This model is labeled *2014CNT Summed Cap Calc* (see Appendix B). Figure 6 presents a summary of the results:

**Figure 6: Impact of 2012 Coefficients & Variables with Adjusted Constants**

| | NUMBER OF CAPPED STUDY AREAS | |
|---|---|---|
| | 2013 | 2014 CNT (2012 QRA w/Adj Constants) |
| Capex Constant | 6.03897961246 | 6.01000000000 |
| Capex Cap | 111 | 93 |
| Percentile Benchmark | 84% | 87% |
| Opex Constant | 8.19807869533 | 8.15500000000 |
| Opex Cap | 86 | 90 |
| Percentile Benchmark | 88% | 87% |
| Summed Capex/Opex Cap | 71 | 70 |
| Percentile Benchmark | 90% | 90% |

As indicated in Figure 6, a 90th percentile benchmark can be achieved for 2014 HCLS using frozen 2012 coefficients and variables by making minor adjustments to the constants in the QRA formulas.

[46] The capex and opex constants were lowered from 6.03897961246 to 6.01 and from 8.19807869533 to 8.155, respectively. This results in reductions in the exponent constant values of 2.9% for capex and 4.2% for opex.

# Conclusions

This White Paper posed four questions regarding the consequences to 2014 HCLS benchmark caps when the QRA coefficients are frozen at 2012 levels. The subsequent analyses provided the following answers:

**Q: What is the impact on the 2014 HCLS benchmark calculations when QRA coefficients are frozen at 2012 amounts?**

**A:** Estimated 2014 study area costs were assumed to be equal to 2013 study area costs with an additional year of accumulated depreciation. 2012 coefficients used with 2014 costs will increase the number of study areas subject to the HCLS summed cap by 87% (from 71 to 133 study areas). An additional year of accumulated depreciation lowers the Net Plant Investment amount used to calculate the independent variable Percentage of Undepreciated Plant. The 2012 QRA coefficients only describe the relationships between the 2012 cost data and independent variables and may not be valid in other time periods. Furthermore, the coefficient for Percentage of Undepreciated Plant is a false correlation caused by QRA design flaws.

**Q: To what extent could the decrease in the 2014 benchmark caps caused by frozen 2012 coefficients be offset by reduced costs?**

**A:** The mismatch of 2012 coefficients and flawed use of depreciation in the QRA cannot reasonably be overcome by other cost reductions. The results indicate that on average, companies would have to reduce all manageable operating expenses by 23% to overcome the effect of a single year of additional accumulated depreciation. This level of expense reduction is not possible for many companies and would certainly not be sustainable for any company year after year.

**Q: What would the impact be to 2014 benchmark caps if a 2013 QRA is used instead of 2012 QRA coefficients?**

**A:** If the Bureau used updated 2013 capex and opex QRAs instead of using frozen 2012 QRA coefficients, there would be about 45 fewer study areas subject to the 2014 summed capex/opex benchmark caps. However, the updated 2013 coefficients still yield a benchmark lower than the Commission ordered 90$^{th}$ percentile. While there is a better relationship between estimated 2014 costs and the 2013 QRAs, there is still a mismatch and the impact of the additional year of accumulated depreciation cannot be overcome.

**Q: What interim alternatives for 2014 HCLS benchmark calculations will retain the 90th percentile benchmarks and provide the desired predictability of support?**

**A:** The use of 2012 independent variables with 2012 coefficients successfully restores the relationships between the data and results in 90$^{th}$ percentile capex and opex caps even when used with estimated 2014 costs. If a 90$^{th}$ percentile summed cap is desired, this approach can be combined with minor adjustments to the QRA formulas constants.

The evidence presented supports the following conclusions:

1. The use of frozen 2012 QRA coefficients for 2014 HCLS benchmarks will lower the percentile benchmark to 81%; it results in an 87% increase in the number of capped study areas.
2. The *HCLS Benchmarking Freeze Order* is contrary to the Commission's *Sixth Order on Reconsideration* because it results in cost benchmarks significantly lower than the 90th percentile.
3. The *HCLS Benchmarking Freeze Order* is arbitrary and capricious because it is not based on proper consideration of relevant factors and is contrary to Commission Orders.
4. The *HCLS Benchmarking Freeze Order* would result in certain companies' HCLS being improperly limited while others would be unfairly rewarded with redistributed funds.
5. The *HCLS Benchmarking Freeze Order* must be modified.

The *HCLS Benchmarking Freeze Order* is another example of the greater problems with the Commission's efforts to reform the universal service fund mechanisms and incent broadband investment. The Commission's purported universal service goals to reduce inefficiency, improve accountability, incent broadband investment and avoid policies with unintended or perverse consequences are not met by the use of the QRA or the *HCLS Benchmarking Freeze Order.* The QRA benchmarks are unpredictable, do not identify inefficiency, provide a disincentive for broadband investment, and produce perverse consequences.

As stated by Commissioner Pai, "universal service support should be stable and predictable and distributed consistent with the law and common sense."[47] The evidence presented in this White Paper proves that future HCLS benchmarks are unpredictable and arbitrary due to numerous flaws in the assumptions, design and execution of the QRA.

The QRA does not identify inefficient operations but rather statistical cost outliers. The Commission has made the presumption that costlier operations are inefficient without properly identifying and accounting for the causes of higher deployment and operating costs.[48] The lack of cost causation means the QRA cannot distinguish between a costly operation that is efficiently managed and a less costly operation that is less efficient; it simply equates higher cost to greater waste. The result is a highly flawed, poorly correlated, non-cost causative analysis used to arbitrarily shuffle support between carriers.

The ultimate impact of the QRA benchmarks is the suppression of broadband investment in rural America. As shown in this study, a carrier with same exact same costs in 2013 and 2014 may be judged by the QRA as "efficient" in one year but not the next. The resulting unpredictability of support incents zero or low levels of investment to avoid shortfalls in support. If most carriers take this rational approach, the QRA yields a death spiral of lower HCLS caps and a potential "race to the bottom." The *HCLS Benchmarking Freeze Order* only exacerbates these problems.

[47] *See Sixth Order on Reconsideration*, Statement of Commissioner Ajit Pai.

[48] *See QRA Lessons White Paper*, pp. 14-24.

# Recommendations

We recommend the following actions to the Wireline Competition Bureau:

1. ***Recognize and adjust for the inherent data mismatches that may result from any freeze of QRA coefficients.*** "Freezing" QRA coefficients may seem like an expedient solution, but it must be used with caution. The QRA describes relationships between data. When that data is altered, the relationships are also altered and may render the QRA invalid without adjustments.

2. ***Freeze both the QRA coefficients and independent variables at 2012 levels for the calculation of 2014 HCLS benchmark caps.*** This interim measure will restore the QRA relationships and the 90$^{th}$ percentile benchmarks for capex and opex. Minor adjustments to the capex and opex formula constants would produce a total cost 90$^{th}$ percentile benchmark. It will also achieve the predictability and stability goals expressed in the *HCLS Benchmarking Freeze Order*.

3. ***Institute comprehensive analysis and transparency policies***. The QRA is a complex tool and the impacts of proposed and/or enacted changes need to be clearly understood by all stakeholders. Quantitative analysis similar to that provided by this White Paper should be standard Bureau practice before decisions are made to avoid unintended consequences and should be disseminated to the public for review.

4. ***Address the present QRA flaws in a revised methodology***. As the Bureau develops a revised single cap benchmarking methodology subsequent to the *Sixth Order on Reconsideration*, we encourage the Bureau to strongly consider and address all of the weaknesses of the current QRA noted in this document as well as in the *QRA Lessons White Paper*.

# APPENDIX A: Author Biography

Vincent H. Wiemer, CPA is a Principal and founder of Alexicon Consulting, a management consulting firm that provides financial, regulatory, and advisory services to the independent telecommunications industry. He is the co-author of the *White Paper: Lessons from Rebuilding the FCC's Quantile Regression Analysis*. Mr. Wiemer's practice concentrates on financial modeling, strategic planning, regulatory impact analysis, rate-of-return, valuations, and business development for his clients. He is a popular industry speaker and has presented such diverse topics as metrics, effective communications, incentives, and personal accountability among others. Prior to working in the telecommunications industry, Mr. Wiemer provided public accounting and consulting services to a spectrum of industries including energy providers, government agencies, and major hotel chains. Mr. Wiemer has a bachelor's degree in business administration from the University of Tulsa and is a Certified Public Accountant.

# APPENDIX B: 2012 QRA Coefficient Freeze Analysis.xlsx (electronic)

Appendix B may be downloaded at: www.alexicon.net/qrafreeze

Appendix B contains the data analysis performed and is an integral part of this White Paper. Due to the volume of data involved (several hundred printed pages) a values-only version of the spreadsheet workbook is available to the public for download. Parties who wish a copy of the fully functional spreadsheet may contact the author regarding non-disclosure and licensing agreements.

Appendix B contains the following spreadsheets:

- *2013 FCC Summed Cap* – A presentation of the Bureau's calculation of the 2013 study area costs and summed caps. The calculations use 2013 cost and variable data and 2012 QRA coefficients (calculated using 2012 cost and variable data) to determine support beginning April 2013 for 738 rate-of-return cost settlement study areas. Provided for reconciliation and verification of calculations.

- *2013 Summed Cap Recalc* – Recalculates the 2013 study area costs and summed caps using 2013 cost and variable data and 2012 QRA coefficients for 738 rate-of-return cost settlement study areas. This spreadsheet provides the baseline calculation model. The results match the FCC calculations.

- *2014EST Net Plant Investment* – Calculates estimated 2014 Net Plant amounts from the 2013 (12-1) HCL data and adding one additional year of accumulated depreciation.

- *2014EST Summed Cap Calc* – Calculates the estimated 2014 study area costs and summed caps using estimated 2014 cost and variable amounts and 2012 QRA coefficients for 738 study areas.

- *COMPARISON Frozen Coefficients* – Shows the impact of 2012 QRA Coefficients on estimated benchmark caps by comparing the *2013 Summed Cap* and *2014EST Summed Cap* results. Includes the Number (and identity) of Capped Study Areas, the Summed Cap amounts, and the amount of HCL costs rendered non-reimbursable by the benchmark caps under each scenario. Due to the assumption that estimated 2014 costs are equal to 2013 costs plus an additional year of accumulated depreciation, this analysis isolates the impact of Accumulated Depreciation on the benchmarks when QRA coefficients are frozen at 2012 levels.

- *2014OPX Summed Cap Calc* – This spreadsheet is a flexibility analysis that calculates the impact of reduced manageable operating costs on the estimated 2014 HCLS benchmark caps. Manageable costs include all HCL costs except assets, depreciation expense and operating taxes. Calculates the estimated 2014 study area costs and summed caps using estimated 2014 cost and variable amounts with manageable operating costs reduced by various percentages and 2012 QRA coefficients for 738 study areas.

- *COMPARISON 2014OPX* – Shows the impact of reduced operating costs on the estimated 2014 benchmark caps by comparing the *2013 Summed Cap, 2014EST Summed Cap* and *2014OPX Summed Cap* results. This comparison highlights the exaggerated impact of depreciation expense on the QRA results compared to other costs.

- *2013 Updated QRA Coefficients* – Results of updated quantile regression analyses for capex and opex using the 2013 (2012-1) HCL data and the Commission-provided values of the sixteen independent variables for 738 rate-of-return cost settlement study areas.

- *2014QRA Summed Cap Calc* – Calculates the estimated 2014 study area costs and benchmark caps using estimated 2014 cost and variable data with updated 2013 QRA coefficients for 738 study areas.

- *COMPARISON 2014QRA Update* – Shows the impact of using updated 2013 versus frozen 2012 QRA coefficients on the estimated 2014 benchmark caps by comparing the *2013 Summed Cap* and *2014QRA Summed Cap* results.

- *2012 Loops & Net Plant* – Shows the 2012 loop counts, net plant investment and telecommunications plant in service amounts from the 11-1 HCL data for 736 rate-of-return cost settlement study areas. These amounts were used in the calculation of the 2012 QRA coefficients.

- *2014FCV Summed Cap Calc* – Calculates the 2014 estimated study area costs and summed caps using 2012 Loop and Percentage of Undepreciated Plant amounts and 2012 QRA coefficients for 738 study areas. Note that 4 of the 738 study areas were not cost companies in 2012, so 2013 data was used in the calculations of those study areas.[49]

- *COMPARISON Frz Coef & Var* – Shows the impact on the estimated 2014 benchmark caps of matching the 2012 independent variables with the 2012 QRA coefficients by comparing the *2013 Summed Cap* and *2014FCV Summed Cap* results.

- *2014CNT Summed Cap Calc* – Calculates the 2014 estimated study area costs and summed caps using 2012 Loop and Percentage of Undepreciated Plant amounts and 2012 QRA coefficients with the capex and opex constants adjusted to provide a total cost benchmark at the 90$^{th}$ percentile.

- *COMPARISON Adj Constant* – Shows the impact on the estimated 2014 benchmark caps of matching the 2012 independent variables with the 2012 QRA coefficients with the capex and opex constants adjusted to provide a total cost benchmark at the 90$^{th}$ percentile by comparing the *2013 Summed Cap* and *2014CNT Summed Cap* results.

[49] Study areas 310777, 330968, 391688 and 421876.