



Federal Communications Commission
Washington, D.C. 20554

March 19, 2014

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re. WC Docket No. 10-90

Dear Ms. Dortch:

On November 18, 2011, the Federal Communications Commission (Commission) released the *USF/ICC Transformation Order*, which comprehensively reformed and modernized the universal service and intercarrier compensation systems.¹ In the *USF/ICC Transformation Order*, the Commission adopted a framework for providing ongoing support to areas served by price cap carriers, known as Connect America Phase II. The Commission delegated to the Wireline Competition Bureau (Bureau) the task of implementing various aspects of Connect America Phase II.²

With this letter, the Bureau formally submits into the record the illustrative model results for the Connect America Cost Model version 4.0 (v4.0).³ The model results that we are submitting into the record illustrate model outputs from running v4.0 using different illustrative funding thresholds. The report shows the number of locations that would newly receive broadband for each funding threshold. The reports also depict the number of locations in price cap areas that would fall above the extremely high-cost threshold. The reports are available at <http://www.fcc.gov/encyclopedia/connect-america-cost-model-illustrative-results>. Because the Bureau has not yet finalized and adopted a cost model, the illustrative results that we are submitting into the record are not final support amounts.

The Bureau also submits into the record an analysis of the costs associated with providing fiber to the premises (FTTP) Metro Ethernet-like service to schools and libraries undertaken as part of our ongoing efforts to finalize the inputs and assumptions for the Connect America Cost Model. This analysis was carried out using v4.0 employing an illustrative funding threshold of \$50. Below, we summarize the methodology and assumptions for determining these costs. We also discuss how those costs could impact the eligibility of particular census blocks for the offer of Phase II model-based support.

¹ See *Connect America Fund et al.*, WC Docket No. 10-90 et al., Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663 (2011) (*USF/ICC Transformation Order*), *pets. for review pending sub nom.* In re: *FCC 11-161*, No. 11-9900 (10th Cir. argued Nov. 19, 2013).

² See *USF/ICC Transformation Order*, 26 FCC Rcd at 17701, 17729, paras. 103, 170.

³ See *Wireline Competition Bureau Releases New and Improved Illustrative Results for Connect America Cost Model Version 4.0 and Updated Methodology Documentation*, WC Docket No. 10-90, Public Notice, 28 FCC Rcd 16827 (Wireline Comp. Bur. 2013).

The Bureau previously sought comment in the Connect America Cost Model virtual workshop on whether it was appropriate to exclude the cost of dedicated fiber to community anchor institutions from cost to serve calculations and, in particular, whether any changes should be made to the model regarding its treatment of anchor institutions (specifically, schools, libraries and health care providers). We also sought comment in the virtual workshop on how to implement the Commission's intent that the model not be skewed to shift more funds to communities with anchor institutions.⁴

In order to test the sensitivity of cost to serve calculations in v4.0 of the Connect America Cost Model to the inclusion or exclusion of anchor institutions, we developed an analysis of the added costs associated with Metro Ethernet-like service provided to schools and libraries. This analysis relied on model outputs of the cost to serve residential and small business (hereinafter "mass market") locations as the starting point for calculating the additional cost to serve schools and libraries.

For purposes of this exercise, we assume that schools and libraries require Metro Ethernet-like service using a dedicated fiber (rather than a share of a Gigabit Passive Optical Network (GPON) fiber that passes through a splitter as we assume for mass market locations) and equipment required to connect a dedicated fiber.

We summarize below the steps undertaken in the analysis:

- Overview of methodology used to calculate incremental cost
 - Develop database of schools and libraries
 - Determine design for network connecting schools and libraries
 - Determine assumptions for cost calculations and inputs not already included in Connect America Cost Model
 - Calculate investment and cost for schools and libraries
 - Determine costs for schools and libraries in areas potentially eligible for Connect America Phase II support
- Develop database of schools and libraries
 - Collect raw data from:
 - Libraries: http://www.ims.gov/research/public_libraries_in_the_united_states_survey.aspx
 - Public Schools: <http://nces.ed.gov/ccd/pubschuniv.asp>
 - Private Schools: <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2012320>
 - Load into database, taking each school's or library's location (latitude, longitude) as given

⁴ Letter from Michael J. Jacobs, Legal Advisor to the Chief, Wireline Competition Bureau, Federal Communications Commission, to Marlene H. Dortch, Secretary, Federal Communications Commission, WC Docket No. 10-90 (filed July 22, 2013). See *USF/ICC Transformation Order*, 26 FCC Rcd at 17728, para. 167 n.269 (noting that references to community anchor institutions "should not signal an intention that the model will skew more funds to communities that have community anchor institutions" as "it may be the case that the most unserved areas do not have community anchor institutions due to their low population density").

- Geocode each school and library to a census block using FCC Application Program Interface; see <http://broadbandmap.gov/developer> (schools or libraries with lat/lon that placed them in bodies of water were manually coded)
- Determine which schools and libraries are located close enough to other schools and libraries to be served by a single fiber
 - Compare libraries only to libraries, public schools only to public schools, and private schools only to private schools (i.e., assume each type of institution will purchase service independently from the other types)
 - Find the nearest school-and-library neighbor for every school and library using Euclidean distances
 - Assume schools or libraries within 250' of another school or library within the same census block will be served by a single fiber (i.e., assign each such institution a share of the cost of a fiber)
- Determine design for network connecting schools and libraries using Metro Ethernet-like service
 - For each school or library, assume a fiber termination panel, network interface device and voice gateway. Assume the drop is the same as for mass market consumers; assume the mass-market Optical Networking Terminal will not be deployed
 - Assume a dedicated fiber from the central office to the school or library. This implies a whole fiber for the school or library in the feeder and distribution plant (instead of as little as 1/32nd of a feeder fiber for mass market), and that the school or library will not have a splitter port associated with it
 - In the central office, assume an Ethernet router for a dedicated connection; assume the same fiber termination panel as for mass market
 - Assume a dedicated Gigabit Ethernet fiber channel from the central office to the Internet access point, rather than a fiber capacity that assumes aggregation in the central office as for mass market service
 - Assume an Ethernet router at the Internet access point to terminate that dedicated fiber channel
 - Assume an IP Multimedia Subsystem (IMS) for VoIP service as is the case with mass market service
- Determine assumptions for cost calculations and inputs
 - Assume costs for equipment unique to schools and libraries, inclusive of capitalized labor (in school or library, central office and network core)
 - Fiber termination panel: \$61.20
 - Network interface device: \$3,528
 - Voice gateway: \$499
 - Ethernet router (central office): \$3,960
 - Ethernet router (Internet access point): \$3,840
 - Take costs for additional equipment from the Connect America Cost Model v4.0
 - Central office fiber termination panel
 - VoIP cost per subscriber
 - Determine costs for fiber
 - Drop cost assumed same as the cost of the drop for mass-market locations in the block in which each school or library is located (if a school or library is located in a block that does not have any mass market locations, we take the average costs of the census block group)
 - Distribution portion of dedicated fiber strand cost assumed to be the same as mass market in the census block the school or library falls within

- Feeder dedicated fiber strand cost is assumed to be the average cost for a strand to the splitter locations that serve the census block the school or library falls within (from 1 to 32 times the feeder cost for mass market locations in each block)
 - Middle mile and undersea backhaul costs calculated the same way as feeder fiber cost using the middle mile cost associated with the serving area the school or library falls within
 - Make additional assumptions about number of voice lines per school or library
 - For schools, assume 1 voice line for every 100 students (e.g., 5 outside lines for a school of 500 students)
 - For libraries assume 4 lines per library
- Calculate investment and cost for schools and libraries
 - Sum investments for each school and library for each network component
 - Determine monthly cost, including levelized capital cost – i.e., capital return (depreciation) and post-tax cost of capital (tax and cost of money) – and operating cost for each school and library
 - Ratio of depreciation, cost of money and tax to investment for each school or library based on the ratio from the Connect America Cost Model for the census block in which that school or library resides
 - Ratio of opex to investment based on the ratio from the Connect America Cost Model, exclusive of customer operations and marketing
- Determine costs for schools and libraries in areas potentially eligible for Connect America Phase II support
 - Pull the costs for schools and libraries in those census blocks potentially eligible for Connect America Phase II support (no unsubsidized competitor, costs above the \$50 funding threshold and below the associated potential extremely high cost threshold of \$183,532).

Detailed information on cost assumptions for equipment

Equipment	Sample vendor	Sample model	List price	Assumed discount	Loading factor for labor	Final (fully loaded) capex
Fiber term panel	FiberTronics	FOTB-6-24	\$42.50	20%	80%	\$61.20
Network Interface Device	Canoga Perkins	9145-4	\$2,450	20%	80%	\$3,528
Voice Gateway	Cisco	SPA8800	\$499	20%	25%	\$499
Ethernet router (central office)	Cisco	7609-S	\$2,400	0%	65%	\$3,960
Ethernet router (internet access point)	Cisco	7609-S	\$2,400	0%	60%	\$3,840

Based on this analysis, we summarize below our estimates of the incremental cost of extending the facilities necessary to provide a Metro Ethernet-like service to all schools and libraries within the potential areas receiving the offer of model-based support. The average cost per school or library (\$441 per month per location) is more than twice the potential extremely high cost

threshold for mass-market locations. This analysis assumes that the incumbent price cap carrier provides service to all schools and libraries in model-supported areas; to the extent that other providers (e.g., cable companies, competitive ETCs, or municipal providers) serve the schools or libraries in the particular census blocks that potentially will receive an offer of support, this analysis will over-estimate costs. In addition, this analysis compares the additional cost to serve schools and libraries without taking into account any revenue that the price cap carrier could receive for serving the school or library.

Outputs from analysis of added cost to serve schools and libraries

Company	Number of school and library connections *	% of locations in potential CAF Phase II areas that are schools and libraries**	Incremental additional cost to serve schools and libraries as percent of potential CAF Phase II offer of model-based support**
ACS Systems, Inc.			
<100 students per school	52	0.1%	2.1%
100-1000 students per school	83	0.1%	2.9%
>1,000 student per school	5	0.0%	0.2%
Libraries	16	0.0%	0.6%
Total	156	0.2%	5.7%
AT&T			
<100 students per school	363	0.0%	0.4%
100-1000 students per school	782	0.1%	0.7%
>1,000 student per school	38	0.0%	0.0%
Libraries	101	0.0%	0.1%
Total	1,284	0.1%	1.2%
CenturyLink			
<100 students per school	471	0.0%	0.6%
100-1000 students per school	469	0.0%	0.4%
>1,000 student per school	15	0.0%	0.0%
Libraries	85	0.0%	0.1%
Total	1,040	0.1%	1.1%
Cincinnati Bell			
<100 students per school	0	0.0%	0.0%
100-1000 students per school	1	0.0%	0.2%
>1,000 student per school	0	0.0%	0.0%
Libraries	1	0.0%	0.2%
Total	2	0.0%	0.3%
Consolidated Communications			
<100 students per school	3	0.0%	0.2%
100-1000 students per school	6	0.0%	0.4%
>1,000 student per school	2	0.0%	0.1%
Libraries	1	0.0%	0.1%
Total	12	0.1%	0.7%

Fairpoint Communications			
<100 students per school	0	0.0%	0.0%
100-1000 students per school	15	0.1%	1.6%
>1,000 student per school	1	0.0%	0.1%
Libraries	2	0.0%	0.4%
Total	18	0.1%	2.0%
Frontier Communications			
<100 students per school	292	0.0%	0.5%
100-1000 students per school	361	0.0%	0.6%
>1,000 student per school	3	0.0%	0.0%
Libraries	70	0.0%	0.1%
Total	726	0.1%	1.2%
Hawaiian Telecom Inc.			
<100 students per school	5	0.0%	0.5%
100-1000 students per school	16	0.1%	1.6%
>1,000 student per school	3	0.0%	0.3%
Libraries	2	0.0%	0.3%
Total	26	0.2%	2.6%
Micronesian Telecom Inc			
<100 students per school	7	0.1%	4.0%
100-1000 students per school	9	0.1%	3.4%
>1,000 student per school	2	0.0%	0.7%
Libraries	0	0.0%	0.0%
Total	18	0.1%	8.1%
Puerto Rico Telephone Co.			
<100 students per school	5	0.0%	0.4%
100-1000 students per school	50	0.1%	3.3%
>1,000 student per school	1	0.0%	0.0%
Libraries	2	0.0%	0.2%
Total	58	0.2%	3.9%
Verizon			
<100 students per school	245	0.1%	0.9%
100-1000 students per school	227	0.1%	0.7%
>1,000 student per school	8	0.0%	0.0%
Libraries	55	0.0%	0.2%
Total	535	0.1%	1.8%

Virgin Islands Tel. Corp. DBA Innovative Telephone			
<100 students per school	0	0.0%	0.0%
100-1000 students per school	15	0.1%	1.6%
>1,000 student per school	1	0.0%	0.1%
Libraries	2	0.0%	0.4%
Total	18	0.1%	2.0%
Windstream			
<100 students per school	123	0.0%	0.4%
100-1000 students per school	189	0.0%	0.5%
>1,000 student per school	4	0.0%	0.0%
Libraries	29	0.0%	0.1%
Total	345	0.1%	0.9%
Total			
<100 students per school	1,638	0.0%	11.0%
100-1000 students per school	2,249	0.0%	16.6%
>1,000 student per school	82	0.0%	1.4%
Libraries	413	0.0%	2.8%
GRAND TOTAL	4,382	0.1%	1.3%

* One connection per school or library except where more than one location can be served by a single fiber as described above. Where schools of different sizes share a fiber, connection numbers for each size category are rounded to the nearest whole number

** Based on CAM v4.0 with \$50 funding threshold.

Respectfully submitted,

/S/

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 Wireline Competition Bureau