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

In The Matter of	)	
	)	
Modernizing the E-rate	)	WC Docket No. 13-184
Program for Schools and Libraries	)	

REPLY COMMENTS OF EDUCATIONSUPERHIGHWAY

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EducationSuperHighway respectfully submits these reply comments in the above-referenced proceeding.

INTRODUCTION AND SUMMARY

As a non-profit organization whose mission is to ensure that every student can take advantage of the promise of digital learning, EducationSuperHighway strongly supports the President's ConnectED Initiative and the Commission's goal of improving education by expanding access to high-speed broadband. Consistent with those goals, in its initial comments EducationSuperHighway set forth a vision for reforming the E-rate program to cost-effectively fund the connectivity and network infrastructure necessary to support a 21st-century, technology-driven transformation of America's schools. That vision focuses on a few key components: (1) focusing limited E-rate funds on supporting high-speed broadband infrastructure that is scalable to meet current and future digital learning needs; (2) creating a one-time upgrade fund to enable schools and libraries to meet realistic broadband goals for the next generation; and (3) reforming the administration of the E-rate program to help reduce costs, improve efficiency, and ensure that all students have access to the connectivity they need. Each of those proposed changes garnered broad support in the comments of key E-rate program stakeholders.

First, there is widespread agreement that ubiquitous broadband is needed to create 21st century classrooms. Over 80 commenters – ranging from state boards of education to national coalitions to service providers – agree with the Commission's proposal to refocus the E-rate program on high-speed broadband.[1] And although some commenters do not yet agree with the idea of eliminating E-rate support for legacy services like paging and telephone lines capable of enabling learning only at yesterday's dial-up speeds, there is broad consensus that the primary emphasis of the E-rate program must shift to funding broadband.[2]

Second, there is broad support both for implementing a one-time, future-focused investment fund and for funding fiber as a means to get to 21st century broadband. For example, more than 20 commenters comprised of national and state organizations, state departments of education, and commercial service providers – including AT&T[3] – expressed support for a one-time investment fund, while more than 50 commenters expressed explicit support for fiber-based network solutions. Support for fiber is especially strong among key E-rate beneficiaries,

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[1] *See, e.g.*, Initial Comments by Alaska Dep't of Education & Early Development & Alaska State Library; Initial Comments by the California Dep't of Education; Utah Education Network Comments; Comments of CSM, Inc.; Bureau of Indian Affairs/Education Comments; Comments of New America Foundation's Open Technology Institute & Education Policy Program; Comments of the Leading Education by Advancing Digital ("LEAD") Commission; Comments of the Minority Media & Telecommunications Council, the Rainbow Push Coalition, and the League of United Latin American Citizens; Comments of Comcast Corp.; Comments of AT&T Inc.; Comments of McGraw-Hill Education; Comments of General Communication Inc.; Comments of Windstream Corporation.

[2] *See, e.g.*, Comments of American Library Ass'n; Comments of Cisco Systems, Inc.; Comments of General Communication Inc.; Comments of State Educational Technology Directors Ass'n ("SETDA"); Initial Comments of the State of Nebraska, Office of the Chief Information Officer; Comments of Hawaii; Comments of Communication Workers of America; Comments of CSM, Inc.; Comments of American Cable Ass'n.

[3] *See* Comments of AT&T Inc. at 3.

including school districts, state boards of education, and state-based organizations such as consortia.[4]

Third, in order to further improve program efficiency, there is widespread agreement that the Commission should collect and release more data about existing network infrastructure, the percentage of a school's broadband capacity that is currently being utilized, and the costs of E-rate services. Indeed, except for service providers, who may have business reasons to oppose transparency, there is widespread agreement among commenters that the Commission should release and make searchable currently collected E-rate application information, including Form 471 Item 21 attachments. Similarly, there is broad support for increasing transparency in pricing and for collecting more meaningful data about broadband capacity.[5]

Fourth, there is almost unanimous agreement that the E-rate program should be streamlined administratively and that such streamlining should include a standard, searchable

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[4] *See, e.g.*, Initial Comments by the West Virginia Dep't of Education; Comments from the Wisconsin Department of Public Instruction; Comments from the Kansas Dep't of Education; Initial Comments by the California Dep't of Education; Comments of the School District of Philadelphia; Comments of Houston Independent School District; Comments of the Missouri Research & Education Network; Comments by Mississippi Educational Technology Leaders Ass'n; Initial Comments of the Illinois Dep't of Central Management Services; Comments by the San Diego County Office of Education; Comments by Connected Nation, Inc.; Comments of the Council of the Great City Schools; Comments of The Quilt.

[5] *See, e.g.*, Comments of LEAD Commission; Comments of the New York City Dep't of Education; Comments by Los Angeles Unified School District; Comments by the South Carolina K-12 School Technology Initiative; Comments of the Benton Foundation; Comments of ADTRAN, Inc.; Education Coalition Comments; Comments of the Massachusetts Dep't of Telecommunications & Cable; Comments of Merit Network, Inc.; Comments of the National Education Ass'n; Comments by Illinois Fiber Resources Group; Comments of the National Ass'n of State Utility Consumer Advocates.

web portal. Of the more than 30 commenters who addressed the proposal of a unified portal, only one of those commenters did not express support.[6]

Despite this widespread agreement, a few commenters challenge particular elements of EducationSuperHighway's proposals. These reply comments respond to those challenges, focusing on three issues:

(**1**) **Enabling every student to have equal educational opportunity by establishing threshold connectivity speeds.** Although some commenters oppose any effort by the Commission to set threshold connectivity speeds or other performance goals, other commenters – including Comcast, Verizon, Cisco, and many others[7] – agree with EducationSuperHighway's view that setting threshold speeds is necessary to ensure that all students have equal access to high-speed educational opportunities regardless of the zip code where they were born, the color of their skin, or the income of their parents. To date, the E-rate program has been focused primarily on achieving ubiquitous connectivity regardless of speeds. Since 1997, the program has succeeded in connecting more than 95% of classrooms to the Internet. But despite this success, schools have been unable to keep pace with the rapidly developing market for digital learning devices and the corresponding explosive demand for higher speeds that today's learning environment demands. As a result, nearly 80% of our schools – and more than 40 million of our

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[6] *See* Comments of Education Networks of America at 70 (expressing limited support for electronic filing and data accessibility).

[7] *See* Comments of Comcast Corporation at 16 (bandwidth capacity and latency targets necessary "to enable students to take advantage of digital learning tools in the classroom"); Comments of Verizon and Verizon Wireless at 2 (bandwidth goals will help "ensure that American students have access to next-generation broadband"); Comments of Cisco Systems, Inc. at 16 (proposing recommendations for minimum and ideal Internet access bandwidth targets for 2014 and 2018); *see also, e.g.*, Comments of American Library Ass'n at 10-11 (proposing bandwidth targets for libraries); Comments of the Partnership for 21st Century Skills at 2; Initial Comments of the State E-rate Coordinators' Alliance ("SECA") at 10-12; Bureau of Indian Affairs/Education Comments at 2; Comments of the National Ass'n of State Boards of Education at 2-3.

students – lack the speeds that they need to take full advantage of digital learning opportunities. Accordingly, the essential focus for connecting our children to a brighter digital future has changed from a connectivity challenge to a capacity imperative.[8] Setting threshold speeds and providing the necessary support for schools to obtain those speeds can close the opportunity gap. Commenters who suggest that threshold connectivity speeds will prevent schools and libraries from dictating their own needs are mistaken. To the contrary, while the status quo constrains students' and teachers' ability to take advantage of a multitude of emerging high-speed learning technologies, threshold connectivity speeds that account for rapidly growing bandwidth demands will give *every* school the flexibility to choose and use a broader and more diverse range of digital learning tools. Moreover, as new technologies develop and further explode bandwidth needs, evolving threshold speeds will ensure that E-rate funds are used to implement network solutions that not only meet the needs of their current students, but also have the ability to rapidly and cost-effectively scale their bandwidth to meet the needs of next-generation students.

(2) Enabling schools to harness the power of fiber networks. Although the vast majority of commenters support investments in high-speed fiber networks, some commenters nonetheless oppose using the E-rate program to invest in such networks on the basis that the program must remain "technology neutral." We agree that the E-rate program should focus support on any technology that will cost-effectively connect schools and libraries to high-speed broadband networks that are continually upgradable and allow students to take full advantage of rapidly expanding digital learning opportunities. The reality, however, is that in the vast

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[8] *See In re Modernizing the E-rate Program for Schools and Libraries*, Notice of Proposed Rulemaking, 28 FCC Rcd 11,304, 11,472, Statement of Commissioner Jessica Rosenworcel (2013) ("NPRM") ("E-Rate has helped connect more than 95 percent of classrooms to the Internet. Impressive! But laurels are not good resting places. Because we are quickly moving from a world where what matters is connectivity to a world where what matters is capacity.").

majority of situations, fiber networks are the only cost-effective way to truly "future-proof" the underlying infrastructure so that E-rate funds are used to meet students' needs not just for the next semester or next school year, but for the next generation. Creating a one-time upgrade fund to support schools and libraries in making the capital investments needed to deploy fiber networks would acknowledge that reality while continuing to make alternative options available for circumstances in which fiber would be cost-prohibitive or other technologies would be more cost-effective.

Although eliminating the existing discrimination against dark fiber by putting dark fiber on par with lit fiber is consistent with the goal of advancing greater technology neutrality, some commenters oppose funding dark fiber because they believe that schools cannot manage dark fiber networks or do not understand the costs associated with them. But maintaining fiber networks and evaluating the long-term costs of such networks are tasks that many schools and libraries have already demonstrated they are capable of doing. Equally misguided are commenters who oppose dark fiber on the basis that it is ineligible for funding under the Communications Act. The Commission has already extended E-rate support to leased dark fiber applying reasoning that has withstood judicial scrutiny in a related context. And although EducationSuperHighway agrees with commenters who argue that self-provisioned fiber networks should be funded only where more cost-effective alternatives are not offered by commercial service providers, schools and libraries should be permitted to self-provision fiber networks where commercial providers impose pricing and/or scalability limitations that make using such providers cost-ineffective over the long term. Simply put, dark fiber is essential to enlightening our students.

(3) Maximizing the effectiveness of every E-rate dollar by improving transparency with respect to schools' and libraries' current networks and the way E-rate funds are being spent. In view of widespread agreement that more information about the connectivity of schools and libraries is needed to help the E-rate program function more efficiently, the Commission should move as quickly as possible to collect the essential data and make it more widely available. That information – including the types of services schools and libraries currently have deployed, how much of their bandwidth capacity is being used, and the costs of E-rate services – will not only assist the Commission and policymakers in making allocation decisions and setting upgrade priorities, but it will help schools and libraries manage E-rate funds more effectively and reduce costs. Contrary to the suggestion of commenters who claim that data collection would be too onerous or expensive, collecting and releasing the information that EducationSuperHighway proposes will not impose substantial additional costs or burdens on E-rate applicants because that information is either readily available or collectable through automated monitoring solutions. Finally, because the Commission already has ample information to decide what changes are needed to ensure the long-term success of the E-rate program, there is no reason to follow the suggestion of commenters who claim that the Commission needs to collect or analyze additional data before moving forward with comprehensive reform.

I. **THRESHOLD CONNECTIVITY SPEEDS ARE ESSENTIAL TO PROVIDING EVERY STUDENT WITH EQUAL EDUCATIONAL OPPORTUNITY AND TO GOOD STEWARDSHIP OF E-RATE FUNDS.**

Virtually all commenters agree that the first goal of the revamped E-rate program should be to ensure that every school has broadband capacity sufficient to provide every student with equal access to educational opportunity through digital learning – both now and in the future. As EducationSuperHighway has explained, every school needs a certain level of bandwidth capacity

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and broadband infrastructure to enable such opportunity.[9] Some commenters resist this idea, arguing instead that schools know best what they need and should thus be given blank checks to spend on services regardless of their performance. That approach, however, supports local autonomy only superficially and fails to ensure responsible stewardship of the E-rate fund. By setting threshold connectivity speeds (and providing the funding support to achieve those speeds), the Commission can guarantee that limited E-rate funds facilitate digital learning for the next generation of students and address the current program's inability to accommodate rapidly growing demand for bandwidth.

   We agree with commenters who oppose efforts to use threshold connectivity speeds to strip schools or libraries of E-rate funding where they are unable to achieve those speeds. Rather, the Commission should use threshold speeds to identify schools and libraries that need additional support in developing the infrastructure needed to give their students equal access to educational opportunity and to help fill those gaps so that no students are left in the slow lane for learning. We disagree, however, with commenters who argue that threshold connectivity speeds would waste E-rate funds by encouraging unnecessary investment in and over-provisioning of fiber. Such comments fail to appreciate both the cost-efficiencies of fiber and the correlative relationship between bandwidth capacity and usage.

A. Threshold Speeds That Account For Dramatically Increasing Demands Are Necessary To Ensure That The E-rate Program Supports The Next Generation Of Learners.

   Threshold connectivity speeds will help reconcile the growing bandwidth demands of schools with the reality of limited E-rate funding by ensuring that schools use E-rate funds to build cost-effective networks that are scalable to meet the long-term needs of students and

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[9] Comments of EducationSuperHighway at 6-7 ("*Initial Comments*").

teachers. By focusing E-rate funding first on schools and libraries that do not meet threshold

speeds and supporting investments in future-proofed network infrastructure, the Commission can

make sure that the program operates in a way that is both cost-efficient and maximizes long-term

flexibility and choices for schools and libraries. The alternative approach – giving E-rate

applicants unfettered discretion to prioritize short-term needs over long-term planning – would

permit schools and libraries to invest E-rate funds in expensive equipment and bandwidth-limited

networks that are often not cost-effective over the long term and may be outdated or overloaded

in just a few years or even a few months.

Many of the commenters who oppose threshold speeds or other performance benchmarks

argue that benchmarks are unnecessary because schools know how best to meet their own unique

needs.[10] EducationSuperHighway agrees wholeheartedly that schools should define their own

priorities and decide for themselves what types of digital learning tools will meet their curricular

needs. Indeed, our initial comments gave numerous examples of how robust connectivity in the

classroom facilitates the use of individualized instruction and innovative educational methods.[11]

Threshold connectivity speeds will neither encroach on schools' ability to make decisions about

what digital learning tools to use or how to use them, nor will they limit schools from choosing

the most cost-effective way to upgrade and maintain their network infrastructure. Instead,

threshold speeds will simply guarantee that *every* student has access to high-speed digital

learning opportunities regardless of where his or her school is located.[12]

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[10] *See, e.g.*, Comments of CenturyLink at 3; Comments of National Cable &
Telecommunications Ass'n ("NCTA") at 6-7; Comments of the National Education Ass'n at 5-6;
Comments of Cox Communications, Inc. at 4-5.

[11] *Initial Comments* at 2-3.

[12] *See, e.g.*, NPRM, 28 FCC Rcd at 11,313 ¶ 17; Fact Sheet, The White House, ConnectED:
President Obama's Plan for Connecting All Schools to the Digital Age (June 6, 2013), *available*

Experience under the current E-rate program, which does not have in place performance benchmarks of any kind, further supports the need for threshold speeds. Although the E-rate program has been enormously successful in bringing Internet access to schools and libraries across the country, multiple data sources confirm that the vast majority of schools – upwards of 80% – do not have the bandwidth capacity or network infrastructure to meet even their current needs, much less their future needs.[13] In other words, over 40 million students do not have the Internet infrastructure that they need for digital learning today. While the gap in meeting the schools' needs cannot be blamed entirely on the absence of threshold speeds, such requirements certainly can help encourage schools to invest in network infrastructure that will allow them to meet their bandwidth demands over the long term.

The Commission thus should encourage higher aspirations by setting threshold speeds that appropriately take into account the rapidly growing bandwidth needs of schools and libraries. The President and the State Educational Technology Directors Association ("SETDA") have suggested pragmatic connectivity goals that are suitable to meet short- and medium-term needs, and the Commission should adopt those as initial benchmarks that schools can and should work toward meeting immediately. But the Commission must also recognize that a new set of transformative learning tools are just over the horizon and that those tools will continue to dramatically expand schools' bandwidth needs beyond the 2017 goals set by SETDA.[14] Thus, EducationSuperHighway recommends that E-rate applicants seeking funding for network

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at http://www.whitehouse.gov/sites/default/files/docs/connected_fact_sheet.pdf ("ConnectED will help provide new learning opportunities to level the playing field for rural students.").

[13] *Initial Comments* at 3-4 (citing sources); *see also* Comments of Connected Nation, Inc. at 8-10.

[14] *Initial Comments* at 6-7, 11; *see, e.g.*, Comments of Cisco Systems, Inc. at 16 ("As technology advances and schools use applications such as high-definition video more intensively, they will need to grow their capacity over time.").

upgrades be required to demonstrate that their network infrastructure will (1) support current and

near-term broadband needs by meeting threshold connectivity speeds;[15] and (2) be able to cost-

effectively scale to dramatically increased speeds in the future.

B. Threshold Connectivity Speeds Will Not Lead To Unnecessary Investment.

In addition to opposing threshold connectivity speeds on the basis that schools know their

own needs, some commenters argue that such requirements promote inefficiency by using E-rate

funds to pay for network infrastructure that E-rate applicants do not actually need and will not

actually use. Those concerns are unfounded for a number of reasons.

First, as we explained in our initial comments, fiber dramatically lowers the per-megabit

connection cost, meaning that the absolute cost of providing a 10 gigabit connection is not much

more expensive than providing a 100 Mbps connection.[16] Thus, even if a school or library might

not use all of its bandwidth capacity right away, there is no cost-inefficiency in installing fiber

that they can grow into over time. In the same vein, concerns from school districts that threshold

speed requirements may force them to invest more total dollars for bandwidth that they do not

need are misplaced. When per-connection rather than per-megabit cost structures are used – as

they should be in competitive markets and in self-provisioned networks – investments in

connectivity cost roughly the same regardless of bandwidth.

Second, because most digital learning tools require a threshold level of bandwidth in

order to be reliable, without threshold speeds, teachers are not likely to risk integrating digital

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[15] Those targets should include both external Internet connection speeds of 100 kbps per student
or staff member today and 1 Mbps per student or staff member by 2017, in addition to WAN
connection speeds of 1 Mbps per student or staff member today and 10 Mbps per student or staff
member by 2017. *See* SETDA, *The Broadband Imperative: Recommendations to Address K-12
Education Infrastructure Needs* 25 (2012), *available at*
http://www.setda.org/c/document_library/get_file?folderId=353&name=DLFE-1517.pdf.
[16] *Initial Comments* at 9-10.

tools into their lesson plans until they know that those tools will work. For example, online

learning content providers such as Khan Academy suggest bandwidth speeds of at least 1 Mbps

per student to utilize certain applications.[17] Cisco has likewise explained that without similar

bandwidth capacity, the download times associated with typical classroom activities – such as

file transfer, video on demand, and two-way video conferencing – are likely to be "viewed by

teachers as ineffective and unacceptable."[18] Given those circumstances, teachers will only have

the ability and the desire to choose from the full range of digital learning tools once threshold

connectivity speeds are met. For that reason, EducationSuperHighway parts ways with

commenters who endorse the concept of threshold connectivity speeds but emphasize that any

such requirements should not be "one size fits all."[19] Although, as noted above, the E-rate

program should be supportive of the unique curricular needs of schools, data shows that all

schools need the connectivity speeds suggested by state educational experts and the President in

order to fully integrate digital learning tools into their classrooms.

In short, E-rate funds should be used to help schools future-proof their network

infrastructure by making capital investments in scalable technology that can keep pace with

explosive bandwidth demands. Threshold connectivity speeds will provide the Commission with

a mechanism for incentivizing long-term investment and ensuring that universal service fees are

used to meet the Commission's goal of providing affordable access to digital learning for the

next generation of students.

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[17] Khan Academy, Technology set-up and maintenance (for classroom use),
https://www.khanacademy.org/coach-res/become-a-coach/coach-set-up/a/technology-set-up-and-maintenance-for-classroom-use (last visited Oct. 31, 2013).

[18] *See* Cisco White Paper at 24 (Exhibit A to Comments of Cisco Systems, Inc.).

[19] *See, e.g.*, Comments by the New York City Dep't of Education at 2; Initial Comments of the
National Education Ass'n at 6; Initial Comments by Alaska Dep't of Education & Early
Development & Alaska State Library at 3.

II.   E-RATE FUNDING SHOULD BE AVAILABLE FOR INVESTMENT IN FIBER NETWORKS (DARK AND LIT), AS FIBER IS CONSISTENT WITH THE COMMUNICATIONS ACT AND THE MOST-COST EFFECTIVE WAY TO MEET THE NEEDS OF THE STUDENTS OF TODAY AND TOMORROW.

As discussed above, setting threshold connectivity speeds is essential to ensuring equal educational opportunity through digital learning, but expecting schools to meet those speeds without sufficient support from the E-rate program is neither realistic nor desirable. That is why, in its initial comments, EducationSuperHighway proposed a one-time upgrade fund to support, where cost-effective, fiber connections to schools and libraries (as well as LAN and Wi-Fi network upgrades) sufficient to support 1:1 digital learning. We described how fiber deployment will permit schools and libraries to repeatedly and dramatically grow their bandwidth capacity with only modest capital outlays required after an up-front capital investment.[20] We further explained that without fiber, annual WAN connectivity costs will rise by 400% to meet schools' bandwidth needs, but that with fiber, such costs could drop by over 40%.[21] For these reasons, investing in fiber provides an opportunity to reduce long-term costs while building infrastructure that will permit schools and libraries to scale their bandwidth capacity over the next generation. Put simply, fiber has the ability to – and is a critical component of – ensuring good stewardship of the E-rate program's necessarily limited funds.

A.   E-Rate Should Remain Technology Neutral, But Invest Only In Technologies That Can Cost-Effectively Meet Today And Tomorrow's Growing Bandwidth Needs.

Some commenters oppose explicitly supporting fiber on the basis that doing so would require the Commission to abandon the principle of technology neutrality that has been a

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[20] *Initial Comments* at 10.
[21] *Id.* at 11.

hallmark of the E-rate program since its inception.[22] That concern is misplaced, because there is

no reason that the E-rate program cannot provide support for fiber deployment and still remain,

in principle and in practice, as "technology neutral" as the program has always been.[23]

Accordingly, EducationSuperHighway agrees with other commenters that E-rate should support

any technology applicants can use to meet, in a cost-effective manner, the advancing threshold

connectivity speeds adopted by the Commission.

 As a practical matter, however, fiber connections will almost always be the most cost-

effective way for schools and libraries to build broadband networks that are tailored to their

current needs and can scale to fulfill growing needs going forward.[24] Indeed, the President

recognized that connecting schools to fiber networks would be an integral part of the ConnectED

Initiative.[25] The reason for this is simple: after a one-time investment, fiber provides essentially

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[22] *See* Comments of AT&T Inc. at 4-5; Comments of CenturyLink at 6; Comments of CTIA –
The Wireless Ass'n at 7-8; Comments of NCTA at 9; Comments of Sprint Corp. at 2-3.

[23] Of course, E-rate has never been truly "technology neutral," as the Eligible Services List has
always promoted certain types of technology while excluding others. *See In re Schools and
Libraries Universal Service Support Mechanism*, Third Report and Order and Second Further
Notice of Proposed Rulemaking, 18 FCC Rcd. 26,912, 26,925 ¶ 31 (2003) ("Since the initial
implementation of the [E-rate program], USAC has developed various procedures and
guidelines, consistent with the Commission's rules and requirements, for applicants to ensure
that funding is provided only for eligible services. These policies include . . . the eligible
services list maintained on USAC's website . . . ."); *see also id.* at 26,928 ¶ 40 (formalizing
process for updating eligible services list and acknowledging that under prior system, "the only
way an applicant [could] determine whether a particular service or product" was eligible for
funding was to "seek funding for that service or product, and then seek review of the
Administrator's decision to deny discounts").

[24] *See, e.g.*, Comments of South Dakota Dep't of Education & South Dakota Bureau of
Information and Telecommunications at 8 (agreeing that E-rate must remain technology neutral,
but explaining that "[i]n order to establish broadband services with speeds of 100 mbps up to 1
gbps next generation speeds, fiber technology, or a comparable technology that may not yet be
conceived of or in the developmental phase, is required").

[25] *See* Remarks by the President at Mooresville Middle School – Mooresville, NC (June 6, 2013),
available at http://www.whitehouse.gov/the-press-office/2013/06/06/remarks-president-
mooresville-middle-school-mooresville-nc ("[W]e're going to partner with private companies to

unlimited capacity with relatively low recurring costs and dwarfs all other available services in

its ability to accommodate rapidly growing demand for speed.

Figure 1.
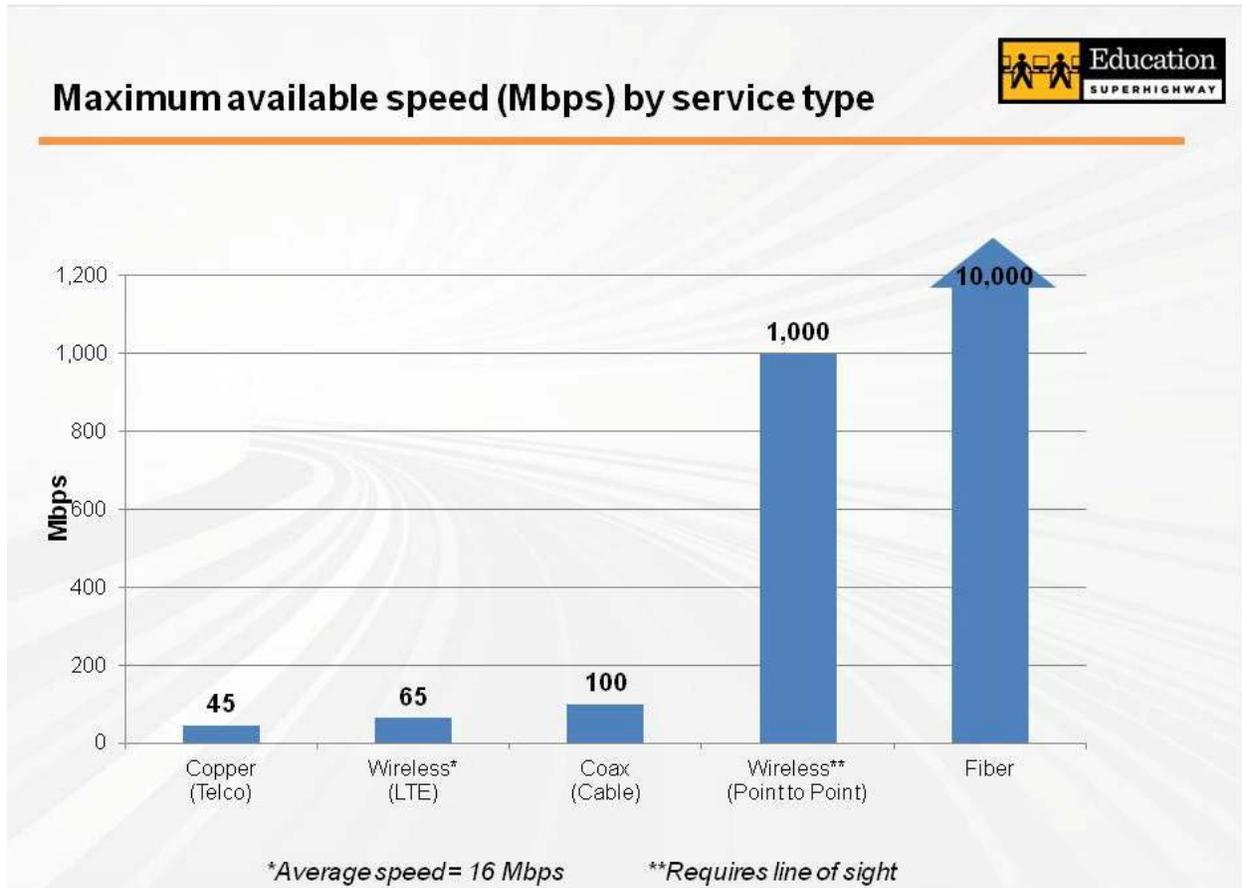
The relative cost of fiber is also key. By simply changing electronics on each end of a

fiber path, bandwidth can be dramatically increased for relatively small incremental investments.

EducationSuperHighway is aware of no other existing technology that is high-speed, scalable,

and cost-effective, but should another technology prove equal to or better than fiber in a given

circumstance, it should also be eligible for funding.

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put people to work laying fiber optic cables to our schools and setting up wireless connections in
our schools with speeds 10 to 100 times faster than what most schools have today.").

Of course, as EducationSuperHighway recognized in its initial comments, there will be circumstances due to geography or other factors in which the investment in fiber networks would be cost prohibitive. Those situations, however, will largely be limited to circumstances in which fiber networks are not already in place and either physical conditions make it difficult or impossible to dig and lay fiber or fiber cables would need to go extraordinarily long distances. In such scenarios, point-to-point wireless or other technologies may be effective alternatives to fiber. If anything, though, those situations simply underscore the point that recognizing fiber as a high-speed solution that is usually both cost-effective *and* scalable is not the same as dictating technology. Rather, providing a capital investment fund to expand the availability of fiber simply reflects the reality that the long-term sustainability of the E-rate program depends upon finding a way to help schools and libraries meet the increasing demand for bandwidth capacity without dramatically increasing the size of the program. The Commission should not ignore the fact that, for the vast majority of schools and libraries, fiber provides such a solution by allowing up-front investments in scalable infrastructure that will reduce long-term costs and meet the digital learning needs of students both now and in the future. And because broad deployment of fiber will lower long-term recurring costs, investing in fiber deployment now will actually free up E-rate funding for additional projects down the road.

B. **Supporting Dark Fiber Is Consistent With The Communications Act And Key To Ensuring School Connectivity.**

Consistent with the principle of technology neutrality, there is widespread support across constituencies for the notion that lit fiber and dark fiber should be treated equally under the E-rate program.[26] But even among those who generally support funding fiber networks, some

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[26] Indeed, among almost 50 comments addressing the treatment of lit and dark fiber, only a few commenters suggested that the existing rules treating the services differently should be

commenters oppose the expanded use of dark fiber in particular. Opponents of dark fiber, especially commercial service providers, claim that using dark fiber is inefficient and cost-ineffective, either because schools lack the technical expertise to run their own networks or because there are long-term maintenance costs associated with dark fiber that schools may fail to consider when comparing network costs.[27] Some commenters go even further and claim that funding dark fiber violates the Communications Act.[28] These arguments, however, are largely the same as those that the Commission rightly rejected when it first expanded E-rate support to leased dark fiber in 2010.[29] It is now settled that dark fiber is eligible for E-rate funding, and there is no basis to conclude that schools are incapable of running their own fiber networks or appreciating the long-term maintenance costs of dark fiber. In fact, there are many reasons to reach the opposite conclusion.

1. **Funding Dark Fiber Is Consistent With The Communications Act.**

Some commenters claim that dark fiber is ineligible for E-rate funding under the Communications Act because it is neither a telecommunications service, an advanced telecommunications service, or an information service.[30] That argument has already been rightly rejected by the Commission.[31]

Under its statutory authority to designate telecommunications and other services eligible for support under the E-rate program, the Commission has extended E-rate support to services

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maintained. *See* Comments of CenturyLink at 5-6; Comments of the Independent Telephone & Telecommunications Alliance ("ITTA") at 15-16; Comments of United States Telecom Association ("USTelecom") at 15-16.

[27] *See, e.g.*, Comments of Cox Communications, Inc. at 6-8.

[28] *See, e.g.*, Comments of USTelecom at 15-16.

[29] *See In re Schools and Libraries Universal Service Support Mechanism*, Sixth Report and Order, 25 FCC Rcd 18,762, 18,770-72 ¶¶ 16-18 (2010) ("*Sixth Report and Order*").

[30] *See, e.g.*, Comments of USTelecom at 15-16 (citing 47 U.S.C. § 254(h)(1)(A) & (h)(2)(A)).

[31] *See Sixth Report and Order*, 25 FCC Rcd at 18,765-73, ¶¶ 8-19.

that "enhance access to advanced telecommunications and information services for public and non-profit elementary and secondary school classrooms and libraries."[32] In the *Sixth Report and Order*, the Commission explicitly concluded that leased dark fiber qualifies as a "service" under the Act, reasoning that dark fiber "is part of the transmission path that enables the requisite functionality (delivery of voice, video and/or data) to be delivered to the classroom."[33] In addition, the Commission found that providing funding for dark fiber was justified by its authority to extend E-rate support to services that enhance access to advanced services, because "allowing schools and libraries to lease fiber from any provider will give the institutions more flexibility to select the most cost-effective broadband solutions."[34]

The Commission is entitled to the highest deference in making these kinds of decisions, and at least one appellate court deferred to the Commission's interpretation of the same statutory provision in a similar circumstance.[35] There is no meaningful difference here. Accordingly, the Commission should not revisit its decision extending E-rate support to leased dark fiber, and commenters who disagree with the decision in the *Sixth Report and Order* do not provide a reason that it should.

2. Schools Have The Expertise To Maintain Dark Fiber Networks.

Some commenters acknowledge that dark fiber is eligible for E-rate funding but nevertheless oppose support for it because they claim that schools lack the technical expertise to manage a dark fiber network. That is a common misconception, as many school systems currently manage dark fiber networks effectively. In fact, dark fiber is quite simple to manage

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[32] *Id.* at 18,767-68 ¶ 10 (citing 47 U.S.C. § 254).
[33] *Id.* at 18,769 ¶ 12.
[34] *Id.*
[35] *See Tex. Off. of Pub. Util. Counsel v. FCC*, 183 F.3d 393, 440-43 (5th Cir. 1999) (deferring to Commission's interpretation of § 254(h) extending E-rate support to internal connections).

because it is a completely passive medium. There are no electronic components or software that can fail except for the switch or router at the end of the fiber run, which is already the school's responsibility to maintain. Rather, dark fiber consists essentially of a very long cable that extends outside the school building but is otherwise similar to the cabling inside the building. Only two types of failure may impact service over dark fiber: physical damage to the fiber itself or malfunctioning equipment inside the school building that connects to the fiber. Schools already manage their equipment inside the building, whether directly or through a contractor, and maintenance of the physical fiber is commonly available from a third party through relatively simple Service Level Agreements. Moreover, physical problems with dark fiber are far less frequent than with electronics and software.

Dark fiber is also easier to manage than the Wi-Fi networks already managed by most schools today. Wi-Fi networks, especially those that incorporate multiple access points, require active management of finite spectrum shared by many users in a constantly changing operating environment. They also require implementation of SSIDs, encryption, guest access controls, and passwords. On the other hand, fiber is dedicated and enclosed, meaning that the operating environment varies very little and therefore requires minimal management. Whereas Wi-Fi networks require constant monitoring and adjustment of operating parameters to prevent interference and meet growing demands for bandwidth, the capacity of fiber is almost limitless, and thus requires very little attention from network personnel.

Finally, school systems do not need to hire additional staff or even require existing staff to acquire new skills before using dark fiber, because a large network of third parties are available to design, build, and maintain dark fiber networks. Dark fiber is a mature industry with a large ecosystem of suppliers. Many school systems have already leveraged this network to

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outsource some or all of these functions, just as thousands of large enterprises, governmental

agencies, and even telecommunications operators have done for many years. Firms that do this

kind of work are available on a virtually nationwide basis. Some are national in scope, but many

are small- to medium-sized businesses working locally or regionally, which provides competitive

pricing as well as strong and long-lasting relationships with local customers such as school

systems.

Many schools and libraries thus already manage dark fiber networks at reasonable cost.

For example, in West Windsor-Plainsboro, New Jersey, the school district owns and manages a

dark fiber network that provides 10 schools and 4 administrative locations with high-speed

broadband access, initially implementing 1 Gbps WAN capacity and recently upgrading some of

its locations to 10 Gbps. The district employs one network administrator who spends a small

percentage of his time on the WAN network, and recently canceled a maintenance contract with

a local cable service technician because it was not needed.[36]

3. Maintaining Dark Fiber Networks Does Not Involve Substantial Or Unknown Long-Term Costs.

Some commenters oppose the expansion of dark fiber networks on the basis that schools

and libraries will not be able to understand and evaluate the long-term costs of such networks.[37]

But as the Commission recognized in the *Sixth Report and Order*, the E-rate rules already

"require all applicants to select the service or equipment offering that will be the most cost-

effective means of meeting their educational needs and technology goals," and applicants are

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[36] The initial investment required to build the network in this wealthy suburban district was funded through a 20-year bond. This kind of funding mechanism is not available to most school districts, where E-rate support is essential.

[37] *See* Comments of Cox Communications, Inc. at 6-8.

accustomed to and capable of "making apples-to-apples comparisons when evaluating competing bids."[38] Dark fiber networks are no different.

Although the costs of maintaining a dark fiber network can vary, the categories of potential costs are limited and relatively predictable. After the initial investment in the fiber itself (whether through a lease, an IRU, or a newly built network), the only other long-term expenses associated with dark fiber networks are the costs associated with (1) operating and maintaining the network, and (2) upgrading the equipment required to increase fiber capacity as bandwidth needs increase. Both maintenance costs and equipment upgrades entail expenses that are well-known and easily identifiable.

Operating costs associated with dark fiber networks can include pole-attachment fees, easement costs, routine maintenance and emergency repairs, registration and marking of fiber routes ("locates"), and road moves (*i.e.*, where infrastructure improvements such as widening of roads, new interchanges, or new roadways require the temporary or permanent relocation of fiber).[39] Some of those costs can require large one-time expenditures, but because such costs are infrequent, their amortized monthly cost is quite low. The following table shows the average range of operating costs that a school district could expect to pay on a per-month per-mile basis.

Cost per month per mile			
	Low	**Average**	**High**
Operating Costs			
Pole Attachment Fees	$ 22.00	$ 29.33	$ 36.67
Easements	$ 7.26	$ 9.68	$ 12.10
Locates	$ 24.55	$ 32.73	$ 40.91

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[38] *Sixth Report and Order*, 25 FCC Rcd at 18,772 ¶ 18 (internal quotation marks omitted) (acknowledging that dark fiber networks include costs beyond connectivity alone and that applicants should assess these costs during bid process).
[39] As noted above, these costs and the administrative burdens associated with them can be managed through a Service Level Agreement with an experienced supplier. *See supra* Section II.B.2.

Maintenance & Repair	$	20.83	$	50.61	$	46.88
Road Moves	$	20.83	$	41.67	$	62.50
Opex, Underground	**$**	**73.47**	**$**	**134.68**	**$**	**162.38**
Opex, Aerial	**$**	**88.21**	**$**	**154.33**	**$**	**186.95**

Source: Analysis of Frank Mastrobattista, Magnolia Network Consulting (conducted at EducationSuperHighway's request).

McKinsey & Company conducted an analysis using an optimized fiber build methodology, which showed that 81% of schools can be connected to fiber in an average 1.3 miles or less and the overall average distance to connect schools to a fiber access location is 1.8 miles.[40] Thus, depending on whether the fiber cables are buried or aerial and the precise distance required to connect a school district to a fiber access location, the average monthly cost of maintaining a dark fiber network is likely to range between $95.51 and $336.51. In contrast, the *median* cost of a managed Ethernet WAN is $1,068, with the costs ranging from $144 to a stunning $14,323.[41]

The upgrade costs associated with dark fiber networks are similarly predictable. To increase the bandwidth capacity of a dark fiber network, all that is required is an upgrade of the electronics at either end of the fiber connection. The cost of upgrading the electronics for a 1 Gbps connection costs only a few hundred dollars, and 10 Gbps can be installed for a few thousand dollars. More expensive systems allow networks to be upgraded to 100 Gbps, but as a result of Moore's law, the cost of a 100 Gbps connection is likely to approximate the current cost

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[40] Brian Cooperman, McKinsey and Co., *Sizing the K-12 Infrastructure Gap*, App. D at 4-5 (unpublished report) (on file with EducationSuperHighway) (analysis based on 3,591 schools across geographic categories as determined by National Center for Education Statistics). The overall average distance was calculated by using a weighted average based on the number of schools in each of the categories listed in the report.
[41] These numbers are the result of an analysis conducted by EducationSuperHighway of per-circuit WAN cost variability based on Form 471 Item 21 data provided by E-rate applicants.

of 10 Gbps in the next five years.[42] In the absence of capacity upgrades, optical equipment will generally last between 7 to 10 years.

In sum, there are no incomprehensible or hidden costs associated with dark fiber networks, and commenters opposed to such networks do not point to any.

C.   EducationSuperHighway Agrees That Self-Provisioning Should Not Be Funded Where Using Existing Provider Networks Would Be More Economical.

Some commenters resist funding self-provisioned fiber, because, they argue, existing provider networks can often provide the necessary bandwidth more cost-effectively.[43] EducationSuperHighway agrees that where existing provider networks can provide a more affordable, cost-effective option for the applicant, self-provisioning should not be funded. But in order to conduct an "apples-to-apples" comparison of cost-effectiveness, schools and libraries must factor long-term scalability into the cost of the available commercial networks. Moreover, E-rate applicants evaluating the cost-effectiveness of a self-provisioned network should be able to amortize the fiber construction costs over at least 30 years, which is the minimum useful life of the fiber. Once these factors are taken into consideration, using a commercial service provider's existing network is likely to be more cost-effective than self-provisioning only where the provider offers lower annual costs and fixed, per-connection prices that give schools and libraries the ability to increase their bandwidth at any time by upgrading the electronics at their locations.

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[42] *See* Rich Cherry, *Collaboration, Dark Fiber and the Challenges of Deploying Mobile Infrastructure* (Mar. 30, 2011), http://www.museumsandtheweb.com/mw2011/papers/ collaboration_dark_fiber_and_the_challenges_of.html (citing industry analysts who conclude that "Moore's law holds true with fiber optics: the cost of transmitting a bit over an optical network decreases by half every nine months").

[43] *See, e.g.*, Comments of AT&T Inc. at 6-7.

By contrast, where – as is often the case – commercial service providers offer only a cost-prohibitive per-megabit pricing structure and/or non-scalable network options, E-rate applicants should not be prohibited from self-provisioning fiber networks simply because existing networks are available in that area.[44] For example, a consortium of schools and libraries in Carroll County, Maryland, in collaboration with the county and a private company that designed and built the network, have self-provisioned a dark fiber WAN that connects 48 school district facilities. The school district now pays only one-third of the amount that it paid for its previous solution from a commercial provider and receives almost 700 times the bandwidth between locations where the WAN speed is the slowest.[45] Schools should not be prohibited from self-provisioning in these kinds of circumstances.

III.   INCREASED TRANSPARENCY IS CRUCIAL TO GOOD STEWARDSHIP OF E-RATE FUNDS AND CAN BE EFFECTUATED WITHOUT DELAYING E-RATE REFORM.

As discussed above, there is widespread agreement that making more information about the E-rate program available would benefit the program and its beneficiaries in a variety of ways. But while the benefits of making more data available are direct and clear, some commenters oppose greater transparency on the ground that these benefits are outweighed by additional costs and burdens. Other commenters support obtaining and making public more data, but argue that E-rate reform should be delayed for some time until such efforts have been completed. As discussed below, both arguments miss the mark. The costs and burdens of the kind of increased

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[44] *Cf.* Comments of NCTA at 11-12 (private networks should only be allowed where there are *no* commercial alternatives); Comments of Cox Communications, Inc. at 7 (existence of service provider in the area should create rebuttable presumption that applicant cannot self-provision).
[45] Importantly, in this example and the example discussed in Section II.B.2 above, the initial capital expenditures in the networks were financed using mechanisms to which most schools do not have access. The one-time upgrade fund that EducationSuperHighway has suggested will fill that gap by helping schools make the initial investment needed to deploy dark fiber, which, once amortized over the useful life of the network, provides a cost-effective network solution.

transparency proposed by EducationSuperHighway are vastly outweighed by its benefits. And there is ample data already available to enable the Commission to make programmatic decisions on how the E-rate program should be comprehensively reformed. The data that is lacking – information about existing network infrastructure, the percentage of a school's broadband capacity that is currently being utilized, and what providers are charging for what services – can and should be collected and analyzed as the new program is implemented.

A. **Collecting Appropriate Data Would Not Impose Undue Burdens On Schools Or Service Providers.**

EducationSuperHighway agrees with the many commenters supporting additional transparency, and the kind of transparency necessary to improve the program would not impose any undue burdens. Specifically, the Commission should take steps to collect, aggregate, and release three types of information as soon as possible: (1) data about what types of broadband infrastructure schools currently have; (2) data about the percentage of a school's broadband capacity that is currently being utilized; and (3) how E-rate funds are being spent and the cost of each school's connectivity and equipment. All of this information should be available in a K-12 Internet Infrastructure Inventory Database ("K-12 Database"), a searchable repository of information that will facilitate review and analysis of the collected data. Making such information available will assist the Commission, the U.S. Department of Education, state education departments, and other policymakers in understanding the current capacity of school and library networks and in prioritizing disbursements for applicants with the greatest gaps in connectivity.

EducationSuperHighway has been working diligently to identify gaps through its

independent efforts at data collection and analysis,[46] but obtaining data directly through the E-

rate program would help paint a much more complete picture of precisely what particular schools

and libraries need to meet connectivity goals and which schools and libraries have the most

pressing needs for network upgrades. Such an analysis, in turn, would help the Commission

allocate funding more effectively by identifying and directing funding to schools and libraries

that (1) require upgrades to meet the threshold levels of connectivity, and (2) are approaching or

exceeding their existing bandwidth capacity. Releasing data about how E-rate funds are being

spent would likewise ensure good stewardship of the program by identifying opportunities for

cost savings and by helping schools manage their E-rate funds more effectively.[47]

Few commenters seriously question the premise that collecting and releasing the data

described above would help promote efficient use of E-rate funds and set priorities for funding

and upgrades. The most common objection to these transparency initiatives is that they would

impose unnecessary costs and administrative burdens on schools and service providers. In fact,

however, collecting this data would not be overly burdensome, because it is either readily

available already or can be collected through automated monitoring solutions.

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[46] *See Initial Comments* at 3-6 (describing results of National SchoolSpeed Test).

[47] A number of service providers have objected to such pricing transparency on the basis that
such information is based on individualized circumstances and may therefore be misleading.
See, e.g., Comments of AT&T Inc. at 12-13; Comments of Sprint Corp. at 15-16. But as the
Commission explained in its *Sixth Report and Order*, E-rate applicants are already required to
make sophisticated judgments about the cost-effectiveness of proposed services, *see* 25 FCC Rcd
at 18,772 ¶ 18, and opponents of pricing transparency provide no reason that applicants will be
unable to use that expertise to compare information about program costs and understand
distinguishing circumstances.

1. Data About Existing Network Infrastructure.

EducationSuperHighway has developed a list of recommended data elements that should be collected and maintained in the K-12 Database. Those elements encompass basic information about school and district networks, including the name and location of WANs and LAN/Wi-Fi networks, the number of students and classrooms at each location, and the monthly recurring costs of each network component.[48] Collection of this data could be integrated into the Form 470 and 471 data collection process, and because this type of basic information should be readily available to schools and their network administrators, requiring them to include it as part of the E-rate application process will impose little or no additional administrative burden. Any burden on schools would be further minimized by requiring schools to update the information only when changes are made.

2. Data About Network Utilization.

Data about actual bandwidth utilization can be collected through automated data monitoring solutions. Because these solutions are by their nature passive and automatic, implementing them would impose *no* burdens on schools or service providers. Indeed, the Commission could implement automated bandwidth utilization data collection simply and at very low cost by leveraging existing network monitoring solutions already being used by many districts and virtually all service providers. For example, nearly every switch and router in school and library networks already collect Simple Network Management Protocol ("SNMP") data. These switches and routers track the amount of data that passes through the device in both directions (upload and download) as a matter of course. Using either commercial or open source network monitoring tools, many districts already collect that data in order to

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[48] *See* Appendix A.

monitor the performance of their networks and plan for capacity upgrades. By creating a web service with a simple application programming interface, these network monitoring tools could be easily configured to pass this information to an E-rate database in either real time or batch mode.

For districts and libraries that are not currently monitoring their networks, a simple open-source tool could be provided to collect and transmit this same information while also providing them with basic network-monitoring capabilities that are essential to maintaining a mission-critical network. Those tools could be easily supported by existing network value-added resellers, district intermediate units, state research and education networks, or even by service providers who already collect this information for their own purposes (*e.g.*, operations and capacity planning).

Once collected, such data could be analyzed in the context of the capacity information contained in the K-12 Database. To be clear, data regarding network speeds and bandwidth capacity should *not* be used to remove funding from schools and libraries. Rather, collection and analysis of the data would give the Commission a clear view as to what districts or libraries need additional funding for capacity upgrades in order to meet the threshold bandwidth speeds adopted by the Commission and in what priority that funding should be disbursed. Moreover, by allocating funding based on actual connectivity capacity needs, such an approach would likely free up additional resources for investment in network equipment required to ensure that connectivity can actually be delivered to the classroom.

This approach would also have direct benefits for students and teachers by increasing the up-time and performance of district and library networks. Today, far too many districts lack the tools to monitor their networks in a manner that allows them to quickly identify problems,

diagnose root causes, identify solutions, and plan ahead for capacity upgrades. Implementing SNMP-based capacity utilization tools will help districts monitor their networks, improve performance, and unleash the creativity of teachers and students to leverage digital learning.

3. Data About The Cost Of Connectivity And Equipment.

Data describing how E-rate funds are being spent is absolutely critical to effective stewardship of the program. Today, neither the FCC, E-rate stakeholders, nor the general public has the information they need to understand whether funds are being allocated effectively and spent efficiently. Much of the data required is already being collected as part of the E-rate application process. However, because this data is scattered across various forms submitted by applicants, is often allowed to be submitted in a form that is not machine readable and too loosely defines the nature of the information required, it cannot be used to effectively manage the E-rate program.

To make this information useful to the FCC and other stakeholders, the E-rate reforms implemented by the Commission should include the creation of an on-line portal for the submission of Form 471 Item 21 information. Such a portal would bring together into a single location the critical data elements needed for analysis and would more specifically define the information that applicants are required to provide about each type of eligible service for which they are seeking funding. Far from increasing the burden on E-rate applicants, such a portal would actually *reduce* the data collection burden on applicants by automating much of the process of submitting Item 21 information and reducing the amount of time spent interacting with USAC to clarify what the applicant has proposed to purchase. Over the last several months, EducationSuperHighway has collected, data entered, and coded several hundred Item 21 forms representing over 2,100 funding requests from districts around the country. In virtually every case, districts were able to easily access the additional information required to properly

categorize how the E-rate funds were used. Likewise, even in cases where new information is

being requested, the data collection we have proposed will impose no significant burden on E-

rate applicants.

> **B.   E-rate Reform Need Not And Should Not Be Delayed Until More Data Is Collected.**

Some commenters agree that the Commission should collect more information about

schools' network infrastructure but argue that such collection efforts should be completed before

making any broader changes to the E-rate program.[49] However, the Commission already has

enough information to know what reforms are needed. We already know that the vast majority

of schools and libraries do not have sufficient bandwidth to meet even their current digital

learning needs, and we know that the demand for bandwidth is going to continue its trend of

drastic expansion as digital technologies improve and educators integrate them into their

curricula.[50] We also now know where bottlenecks in bandwidth are – insufficient Internet access

and WAN capacity, insufficient or outdated LAN wiring and switches, and limited Wi-Fi access

points, to name just a few.[51] There is thus no reason to delay making the crucial decisions to

reform the E-rate program and ensure its long-term viability.

Delaying reform is also financially imprudent. It will cost more money in the long-run to

further maintain the current system and allow stranded investment in technologies that cannot

meet schools' growing needs. In addition, the longer we preserve the status quo, the longer that

schools and libraries will continue to overpay for bandwidth and equipment, which represents the

biggest source of waste in the current E-rate program and which could cost billions of dollars in

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[49] *See* Comments of Verizon and Verizon Wireless at 10-11.
[50] *See supra* Section I.
[51] *See Initial Comments* at 8, fig. 3.

universal service funds if we were to wait to reform the system. On a broader level, we risk

having our students fall further behind by delaying putting in place the infrastructure they need.

As explained above, it is certainly true that additional data collection may inform funding

and upgrade priorities. To the extent that the Commission concludes that such data is needed

before actually implementing E-rate funding reforms, it will have the option of putting a hold on

E-rate disbursements until sufficient information about threshold connectivity levels has been

collected. Any other delay in formulating changes to the E-rate program, however, is both

unnecessary and unwise.

IV.   EDUCATIONSUPERHIGHWAY SUPPORTS OTHER PROPOSALS FOR REFORM, BUT SOME PROPOSED REFORMS WILL DO MORE HARM THAN GOOD WITHOUT COMPREHENSIVE CHANGES.

Just as it would be unwise to delay reform until we have perfect information about each

schools' bandwidth capacity, so too would implementing piecemeal changes to the E-rate

program be ineffective without a comprehensive vision for reform. For example, many

commenters have proposed collapsing the distinction between Priority 1 and Priority 2 services

on the Eligible Services List.[52] But eliminating the priority system without first re-focusing the

program on broadband and closing the connectivity gap could inadvertently prevent the program

from achieving the important goals the President and others have laid out. Under a combined-

priority scenario, there would be no way to focus on achieving high-speed bandwidth and Wi-Fi-

network goals or to prevent schools with broadband networks that exceed threshold connectivity

speeds from "jumping the line" and obtaining funding for internal connection upgrades before

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[52] *See, e.g.*, Comments of Qualcomm, Inc. at 13; Comments of Amplify Education, Inc. at 4; Comments of E-Rate Provider Services at 3; Comments of SETDA at 19; Comments of the Minority Media & Telecommunications Council, the Rainbow Push Coalition, and the League of United Latin American Citizens at 15-18.

under-connected schools have had a chance to upgrade their infrastructure to meet those threshold speeds.

On the other hand, the Commission should give close consideration to proposals to fund middle mile connections that will facilitate better access to broadband for underserved areas. One example is General Communication, Inc.'s proposal that E-rate funds be allocated to support backhaul transport that can connect rural communities to fiber connections in urban centers.[53] Such a proposal would further the Commission's core goal of ensuring that rural and remote schools and libraries have equal access to broadband services, and would do so in a cost-effective way.[54]

More broadly, the Commission must keep in mind that the E-rate program has not, does not, and will never have sufficient resources to subsidize all of a school or library's technology needs. Just as E-rate funding should be increased as necessary to reflect the President's ConnectED Initiative and the Commission's goals, the program's limited resources should be focused on broadband and on meeting the growing bandwidth demands of America's classrooms. Other outdated services, such as voice and paging services, should be deprioritized until we succeed in dramatically lowering the cost of broadband connectivity and infrastructure. Once those goals are met, then the Commission can determine whether and how to revisit shifting support to services other than broadband.

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[53] *See* Comments of General Communication Inc. at 8-11.

[54] EducationSuperHighway's analysis of Form 471 Item 21 filings shows that the median school pays approximately $19 per megabit per month for commercial Internet access. In contrast, the cost for Internet access at an Internet exchange point is as low as $1.25 per megabit. *See* TeleGeography, IP Transit Pricing Service, http://www.telegeography.com/research-services/ip-transit-pricing-service/index.html (information available in subscription-based database). By providing funding to connect school districts into research and education networks or other middle mile networks that connect to Internet exchange points, E-rate can dramatically lower the cost of commercial Internet access for schools and libraries.

CONCLUSION

EducationSuperHighway appreciates the continued opportunity to participate in the

Commission's important efforts to modernize the E-rate program and provide enhanced support

for the digital learning needs of America's students and teachers. Nowhere is the opportunity so

vast, the need so urgent, and the appropriate policy so vital for advancing a brighter more

connected educational future. EducationSuperHighway urges the Commission to adopt its

proposals to fund needed upgrades to network infrastructure, create a sustainable, long-term

model for the E-rate program, and increase transparency to ensure that all E-rate stakeholders act

as good stewards to the public funds that support the program.

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REPLY COMMENTS OF EDUCATIONSUPERHIGHWAY

APPENDIX A

K-12 Internet Infrastructure Inventory Database
Recommended Data Elements

The following is an overview of the data that should be collected as part of a National K-12 Internet Infrastructure Database. This information will provide the FCC, the U.S. Department of Education, state departments of education and other policy makers with the information they need to:

- Assess the current state of broadband infrastructure in America's K-12 schools
- Identify what gaps exist in each school, district and state to support digital learning and next generation assessments
- Allocate E-rate and other funding more effectively by directing funds to schools based on what is needed to close infrastructure gaps

EducationSuperHighway proposes that the FCC require school districts to update this information annually as part of the E-rate process. Collection of the data should be integrated with the Form 470 and 471 (including Item 21) data collection process. The following data should be collected for each of the major components of district's Internet infrastructure:

Internet Access
For each connection to the commercial Internet, Internet2, state research & education network or any other means that a district accesses the Internet:

1. District end point location name (usually a district office or data center)
2. District end point location address
3. Vendor end point location address (where the connection enters the vendor's network)
4. Fiber connection (Y/N)
5. Type of service (transport only, Internet access only, bundled transport and Internet access)
6. Committed Bandwidth
7. Burst Bandwidth
8. Vendor Name
9. Vendor SPIN #
10. Contract start date
11. Contract end date
12. Non-recurring cost included in contract
13. Monthly recurring cost
14. Funded with E-Rate (Y/N)

Note that it is quite possible that a district will have more than one connection to the Internet. This could be a result of using multiple vendors or having connections from multiple locations.

Wide Area Network
For each location that is part of a district's wide area network (typically schools, administrative offices and other non-educational buildings):

1. Start location name
2. Start location address
3. WAN endpoint location name (where the location connects to on the WAN)
4. WAN endpoint location address
5. Fiber connection (Y/N)

6. Switch/Router Model #
7. # SFP ports in switch/router (indicates if switch is 1 Gbps capable)
8. # SFP+ ports in switch/router (indicates if switch is 10 Gbps capable)
9. Type of service (T1, DS3, Metro Ethernet, dark fiber etc.)
10. Committed Bandwidth
11. Vendor name
12. Vendor SPIN #
13. Contract start date
14. Contract end date
15. Non-recurring cost included in contract
16. Monthly recurring cost
17. Funded with E-Rate (Y/N)

LAN / Wi-Fi
For each school or education location in a district:

1. Location name
2. Location address
3. # of classrooms
4. # of students
5. # of LAN switches
6. # of LAN switch ports
7. # of gigabit LAN switch ports
8. # of gigabit LAN POE (power over Ethernet) switch ports
9. # of Wi-Fi access points

For the Wi-Fi Access Points the following additional detail should be collected for each 802.11 standard:

1. Standard (802.11a/b/g; 802.11n; 802.11ac)
2. Total # of access points for the standard
3. Vendor, Model # and # of access points for each model of Wi-Fi access points for the standard

Firewall / Content Filter
For each firewall and content filter in a district's network:

1. Type of device (Firewall, Content Filter, Combined Firewall & Content Filter)
2. Location name
3. Location address
4. Vendor
5. Model
6. Throughput rating in megabits (for firewalls this will be the Secure Throughput rating and for content filters or combined devices this will be the Filtered Throughput rating)

To the extent that the FCC adds other network elements to the eligible services list they should also be included in the K-12 Internet Infrastructure Inventory Database.