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To:	CA Broadband Council
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Subject:	Broadband Action Plan Comments - CENIC
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Attachments:	Home Broadband Requirements June 2020.pdf R 20-09-001 - Opening Comments - CENIC.pdf R 20-09-001 - Reply Comments - CENIC.pdf 201120 Letter re CBC Action Plan - Recommendations.pdf

Hi,

On behalf of CENIC, we are providing comments on the CA Broadband Council's draft Action Plan along with supporting documents that may be of interest. Please let us know if you have any comments regarding our submission and we would be happy to follow up with you.

Thank you in advance for your consideration of our suggestions.

Best,

Kim Lewis
Legislative Advocate
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[redacted]

Perspectives from CENIC: Home Broadband Requirements
What is necessary for students (and families) during COVID-19 and beyond?

June 14, 2020

Executive summary

Why is CENIC concerned about home broadband?

If we have learned anything during this pandemic, it is that *access to broadband is now a social determinant of health, education, work, and economic security*.

In 2003, the State of California awarded a grant to CENIC to focus on speeding one-gigabit broadband to all Californians by 2010, or, in California shorthand, *One Gigabit or Bust*.[1] Seventeen years later, most of the 12,000 institutions that connect to CENIC have a achieved gigabit status -- with many school districts, libraries, and community colleges connected at 10 Gbps (and a few at 100 Gbps); almost all universities and medical centers at 100 Gbps (or multiple 100 Gbps), with some preparing to connect at 400 Gbps over next 12-36 months.

Twenty million Californians have access to CENIC, one of the most robust broadband research and education networks on the planet, from their schools, libraries, colleges, and universities. But not all CENIC members have gigabit access and many of those who do not have access are in communities where no one has broadband access: not from their homes and business, or from hospitals and clinics, or from their schools and libraries. CENIC long ago recognized that joining in partnership with communities, with business and government leaders, and with our private sector telecommunications partners, was the only way to ensure that broadband access would be the rising tide that lifts all boats.

Now we find ourselves in the midst of a pandemic, where our homes have become our schools, our workplaces, and our clinics via remote education, work, and telehealth, with access to broadband the lifeline that ensures continuity in all of these arenas.

What do we hope that our legislative and government agency leaders will consider?

As one of the leading economies in the world, California's actions should be shaped by what we might call *Gretzky's Law*: "I skate to where the puck is going to be, not to where it has been."

Standards for what constitutes broadband were not created for the historical moment that we find ourselves in, and they were not created for the myriad dependencies that we have on the Internet, across the many facets of our lives. Our great California historian, the late Kevin Starr, paraphrasing the philosopher Josiah Royce (another great Californian), noted that one of the sustained qualities of our State is the "hope of a great community -- a place, a society, in which the best possibilities of the American experiment can be struggled for and sometimes achieved." Broadband is now a stepping stone on this path toward a future of quality education, healthcare, and prosperity. It is now time to renew and redouble our efforts towards "*One Gigabit or Bust,*" this time for all Californians at home, as well as at school and work.

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[1] www.cetfund.org/files/Cenic_gigabit_or_Bust_Gartner_Full.pdf

How do we get from here to there?

1. Level the playing field, so that low income households can access the highest quality services available to them in their communities. To do this, subsidies are critical.

2. Acknowledge that bandwidth standards for rural and urban settings will be unequal for the foreseeable future, and the way towards sustainability and equity will be through unequal steps. Initial standards for and approaches to remote learning will be divergent and based on regional broadband capacities.

3. Understand that it isn't just bandwidth. When making investments in networks to the home, consider other critical factors beyond download speeds: upload, latency and packet loss, and data caps are all critical considerations.

4. Assert that the household is the denominator. We cannot simply talk about a single use (e.g., remote learning) in a home as the basis for a bandwidth standard. If we have learned anything during this COVID-19 experience, it is that concurrent use of the network -- several family members involved in different online pursuits simultaneously -- is the baseline for determining how much bandwidth is necessary.

5. Start from where we are right now, leveraging our existing installed telecommunications base, incenting the many leading telecommunications companies who build and operate these networks.

6. Build in accountability. Too frequently the network performance that households receive is (often considerably) less than what providers claim and/or advertise. Broadband initiatives need to be designed so that funders (and households) get what is being paid for. The testing and network instrumentation needed to provide these assurances are easy to do, but to date few regulatory or legislative bodies have had the will to make it a requirement for subsidies or other incentives.

What do we know about the current status of students in California?[2]

- Overall, one in four K-12 households in California do not have a desktop or laptop computer and a high-speed Internet connection. These households (25% of all households) were already significantly disadvantaged pre-COVID and will continue to be post-COVID; COVID only exacerbates and illuminates inequities. This represents about 870,000 families whose child or children are likely to fall behind in educational attainment during the COVID-19 crisis. If households with mobile broadband service are included, the share of households lacking resources for distance learning falls to 17%, which represents about 610,000 families.
- Only about half of the K-12 families in the bottom 20% of the income distribution have a desktop or laptop computer and subscribe to high-speed Internet. This compares to over 90% of families in the top income quintile.
- Households in coastal metro areas are generally better equipped than those in the rural communities of the Central Valley, Southeast and Northern California. However, large concentrations of under-resourced households exist within metro areas. As an example, the availability of an Internet-enabled PC at home for students in South Los Angeles is only slightly above that for students in Tulare County, which has the lowest availability rate in the state.

[2] From the study, *COVID-19 and the Distance Learning Gap*, Professor Hernan Galperin, Director, Annenberg Research Network on International Communication, University of Southern California.

Are current benchmarks for what constitutes "broadband" adequate today?

In a word, "no." When creating standards for the requisite bandwidth for remote learning, it is essential to consider that all family members are impacted by stay-at-home orders, and thus our need to re-conceive of the home as a school or college, workplace, healthcare facility (for telehealth), library (for access to all media in digital form), and communications and entertainment hub, with several concurrent users who may be simultaneously using interactive applications.

In 2015, the Federal Communications Commission adopted a 25/3 Mbps benchmark,[3] capacity that would allow "basic or moderate use" in a household.[4] "Basic use" is defined as email, browsing, basic video, VoIP, and Internet radio for up to 4 users or devices at a time. "Moderate use" is defined as basic functions plus *one* high-demand application: streaming HD video, multiparty video conferencing, online gaming, telecommuting for up to three users (or devices) at a time. These benchmarks have remained unchanged since 2015. The FCC minimum threshold for "broadband" is 10/1 Mbps. The California Public Utilities Commission has a different benchmark of 6 Mbps/1.5 Mbps, which was later amended down to 6 Mbps/1 Mbps.[5]

These benchmarks are important as public policy measurers and, as such, because they shape decisions about how public funding is used to support federal and state broadband access, adoption, and subsidy programs for households.

Moreover, it is important to note that most discussions and subsequent definitions, as well as the way providers advertise their offerings, focus almost exclusively on download speeds. The assumption here is that the household is largely a consumer of content and, thus, what is most important is the speeds at which a consumer can access this content.[6] COVID-19 and stay-at-home orders have altered this situation dramatically, and these standards are inadequate to meet the critical needs of California's families for school, employment, and health care.

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[3] Mbps (Megabits per second) is the standard measure of broadband speed. It refers to the speed with which information packets are downloaded from, or uploaded to, the Internet.

[4] FCC Household Broadband Guide, 02/05/20.

[5] Assembly Bill No. 1665, Eduardo Garcia. Telecommunications: California Advanced Services Fund. Approved by Governor Brown, October 15, 2017. Filed with the Secretary of State, October 15, 2017.

[6] For organizations like CENIC – Research and Education Networks – the denominator is gigabit speeds (Gbps) rather than megabits (Mbps) for its members, whether they are schools, libraries, colleges, universities, health care organizations, or cultural and scientific organizations. Most of CENIC's 12,000 members connect at gigabit speeds or aspire to these speeds, and in these communities we are actively working towards this goal. As importantly, these organizations create, curate, and/or provide content to their constituents and, therefore, the upload speed is as important as the download speed and CENIC's requirement is for symmetrical connections – e.g., 1/1 Gbps, 10/10 Gbps, 100/100 Gbps, and so on.

What has changed with COVID-19 where bandwidth requirements are concerned?

1. Technical considerations:

Upload speeds matter. Interactive applications like video-conferencing, often with multiple participants; cloud-based applications where students are manipulating (in real time) documents or resources or scientific instruments; data-sharing applications where students are the source of data not just the passive recipient; educational simulations with students interacting with representations of real-world processes in a controlled environment -- all of these applications underscore that home broadband users ***produce*** content and ***interact*** with it and each other, and so upload speeds are a significant component in the broadband equation.

***Network latency matters*.** For our purposes, "latency" is defined by the time it takes for the data packet(s) triggered by a user's action (such as clicking on a link in a web browser) to travel across the network to their destination (such as a web server, in this case) combined with the time it takes for the resulting responses (data packets) to travel back. Latency is simply a measure of network delay (combining both directions is often referred to in networking terms as the round-trip delay). With time-sensitive streaming or interactive video, the higher the latency the worse the user experience.

In a multiple-participant Zoom classroom, for instance, low latency is essential. With high latency there are long pauses and overlapping noises or words, with speakers interrupting each other, unsure of when to stop or start speaking, resulting in an unsatisfactory, chaotic experience.

Latency is measured in milliseconds (ms) and there are a number of reasons it exists. It is something we can minimize, but not completely eliminate. While many application developers work toward ensuring that their applications are latency tolerant, assuming that users will be on a wide range of networks -- terrestrial, wireless, and satellite -- it is generally accepted that lower latency networks are preferable for the user's experience, with latencies <50 ms desirable (and lower latencies, even better).

Packet loss matters. On the Internet, small units of data called packets are sent and received. When one or more of these packets fails to reach its intended destination, this is called packet loss. Packet loss is often caused by network equipment dropping, mishandling, or the most common cause, discarding packets. With packet loss, a user might experience slow service, communications disruptions (frozen frames and stuttering behavior), and even total loss of network connectivity.[7]

[7] Experts differ on what acceptable packet loss is, but most agree that sustained packet loss over 2% is an indicator of problems. Most Internet protocols can correct for some packet loss, so problems are often invisible until that loss starts to approach 5% and higher and, at this level, the user experience is noticeably, and often significantly, degraded. Packet loss, like latency, is often a matter of "network hygiene," where network congestion, problems with network hardware such as misconfigurations, software bugs, overloaded devices, and security threats are present singularly or in some combination on a network.

Many experts agree that packet losses above 3% are problematic and the user experience is degraded.[8] The effects range for the inconvenience -- and for a student taking a test, the inequity -- of slowing down the application, through dropped connections, broken sessions, and lost work.

Data caps are a barrier. Data caps are a limit on the amount of data a user or household can use over an Internet connection. When the user hits that limit, Internet Service Providers have different responses, including charging overage fees, slowing data speeds and, even in some rarer cases, disconnecting a subscriber. Some plans are quite generous and either have no caps, or have caps from a paltry 40 GB to a generous 1 TB (or 1000 GB). The least expensive plans from some carriers also have the lowest data caps, thereby impacting low-income subscribers disproportionately. There are two prospective approaches -- a carrot or a stick: subsidies for low-income subscribers allowing bandwidth to be unfettered for remote learning and work; or removing those plans that have subsidies from any statewide systemic policy and funding initiatives.

2. Application requirements

Most current approaches to outlining the requirements for online activities focus on (a) download speeds for an application and (b) a single user. For instance, the FCC Broadband Speed Guide below, last updated February 2020, is based on running one application by one user at a time and notes "additional speed may enhance performance.[9]"

Minimum Download Speeds for Typical Activities

Activity	**Minimum Download Speeds (Mbps)**
General Browsing and Email	1 Mbps
Streaming Online Radio	Less than .5 Mbps
VoIP Calls	Less than .5 Mbps
On-line Learning	5-25 Mbps
Telecommuting	5-25 Mbps
File Downloading	10 Mbps
Social Media	1 Mbps
Streaming Standard Definition Video	3-4 Mbps
Streaming High Definition (HD) Video	5-8 Mbps
Streaming Ultra HD 4K Video	25 Mbps
Standard Personal Video Call (e.g., Skype)	1 Mbps
HD Personal Video Call (e.g., Skype)	1.5 Mbps
HD Video Teleconferencing	6 Mbps

[8] *Tutorial on Internet Monitoring & PingER at SLAC.* Authors: Less Cottrell, Warren Matthews, and Connie Logg, Created January 1996; last Update: December 1st, 2014. "More recently, we have refined the levels to 0-0.1% excellent, 0.1-1% = good, 1-2.5% = acceptable, 2.5-5% = poor, 5%-12% = very poor, and greater than 12% = bad. Changing the thresholds reflects changes in our emphasis, i.e. in 1995 we were primarily concerned with email and ftp. This quote from Vern Paxson sums up the main concern at the time: *Conventional wisdom among TCP researchers holds that a loss rate of 5% has a significant adverse effect on TCP performance, because it will greatly limit the size of the congestion window and hence the transfer rate, while 3% is often substantially less serious.* In other words, the complex behavior of the Internet results in a significant change when packet loss climbs above 3%".

[9] https://www.fcc.gov/reports-research/guides/broadband-speed-guide

Online Game Downloading	3 Mbps
Online Multiplayer	4 Mbps

Given the prevalence of interactive video in use by many schools, hospitals for a range of telehealth purposes, and in work-from-home, what follows is some application-specific data from providers of three of the most popular video applications:

Zoom: Bandwidth Requirements[10]

- 2.0 Mbps (up/down) for a single screen
- 800 Kbps/1.0 Mbps (up/down) for high quality video
- For gallery view and/or 720p HD video: 1.5 Mbps/1.5 Mbps (up/down)
- Receiving 1080p HD video requires 2.5 Mbps (up/down)
- Sending 1080p HD video requires 3.0 Mbps (up/down)
- 2.0 Mbps up 4.0 Mbps down for a dual screen
- 2.0 Mbps up 6.0 Mbps down for triple screen
- For screen sharing only: (150 – 300 Kbps up/down)
- For audio VoIP: 60-80 (Kbps up/down)

Google Hangouts: Bandwidth Requirements[11]

- Minimum bandwidth required[12]
  - Outbound: 300 Kbps
  - Inbound: 300 Kbps
- Ideal bandwidth for two-person video calls
  - Outbound 3.2 Mbps
  - Inbound: 2.6 Mbps
- Ideal bandwidth for group video calls
  - Outbound: 3.2 Mbps
  - Inbound (with 5 participants): 3.2 Mbps
  - Inbound (with 10+ participants): 4.0 Mpbs

Skype: Bandwidth Requirements[13]

Call type	Minimum download / upload speed	Recommended download / upload speed
Calling	30 Kbps / 30 Kbps	100 Kbps / 100 Kbps

[10] Source: Zoom https://support.zoom.us/hc/en-us/articles/204003179-System-Requirements-for-Zoom-Rooms and https://support.zoom.us/hc/en-us/articles/201362023-System-requirements-for-Windows-macOS-and-Linux

[11] Source: Google Hangouts support.google.com/meethardware/answer/4541234?hl=en
N.b. Hangouts changes how much bandwidth is needed based on the available network

[12] While meetings will operate with bandwidth speeds as low as 300 Kbps, video and audio quality might be poor.

[13] Source: Skype
support.zoom.us/hc/en-us/articles/201362023-System-requirements-for-Windows-macOS-and-Linux

Video calling / Screen sharing	128 Kbps / 128 Kbps	300 Kbps / 300 Kbps
Video calling (high-quality)	400 Kbps / 400 Kbps	500 Kbps / 500 Kbps
Video calling (HD)	1.2 Mbps / 1.2 Mbps	1.5 Mbps / 1.5 Mbps
Group video (3 people)	512 Kbps / 128 Kbps	2 Mbps / 512 Kbps
Group video (5 people)	2 Mbps / 128 Kbps	4 Mbps / 512 Kbps
Group video (7+ people)	4 Mbps / 128 Kbps	8 Mbps / 512 Kbps

Imagine a family of four with two K-12 students who are engaged in multiple online activities, while one parent is downloading files from the cloud for work while on a teleconference, and another parent, perhaps currently out of work, is looking online for employment, while pursuing a certificate program from a local university to advance his/her prospects. This could easily tally to 100 Mbps download capacity, with the interactivity necessary as well (and so a need for greater upload speeds), with upload speeds of 20-30/Mbps. For large file transfers and high-quality interaction from home, upload speeds that are symmetrical to the download speeds are highly desirable, with consumer-focused resources like Allconnect[14] suggesting symmetrical speeds of 40 Mbps for a single user. COVID-19 stay-at-home circumstances, with the prospect of a repeat in the fall/winter and potentially next spring, as well as the reshaping of education and the workplace, where new models of hybrid remote and in-school/workplace will likely characterize our future, have made previous benchmarks like the FCC's 25/3 Mbps an artifact of another, distant era.

3. Household composition matters

Many of our current conversations focus on one facet of the broadband divide: for instance, how much broadband capacity does a student need to conduct remote learning? But as we note above, remote learning in our current -- and likely, future -- circumstances does not occur in a vacuum, though there are providers who would argue that there is a particular bespoke technological approach that will solve the singular problem of K-12 remote learning. Given that lack of broadband access isolates not just a student, but the entire household, a focus on a singular solution for the student should only be part of any policy discussion or funding decision. Successful policy and funding decisions will focus on the household as the common denominator.

[14] www.allconnect.com

If the goal of new public policy and funding are to address broadband access and affordability among populations for whom access is either nonexistent, unaffordable, or both, then solutions need to focus on the family as the denominator. In so doing, there will likely need to be an acknowledgment that such support will enable the full panoply of applications that characterize the digital life of an analogous family with resources and access. Issues of affordability (and adoption) have been addressed persuasively and comprehensively by the California Emerging Technology Fund and others, so it will not be our focus here.

How have other states approached the issue of residential broadband?

California is somewhat aligned with four other states with our definition of 6/1 Mbps, though the standard in those states is higher at 10/1 Mbps, the FCC's starting point for "broadband." Twenty-eight states have definitions of 1.5 Mbps or less; eight states, 25/3 Mbps.[15] Only one state has higher and symmetrical bandwidths: Alabama, in its "Broadband Using Electric Easements Accessibility Act," states:

Broadband Services. The provision of connectivity to a high-speed, high-capacity transmission medium or to a technology supporting, in the provider-to-consumer (downstream) direction, a speed, in technical terms ("bandwidth"), with minimum download speeds of 25 Mbps and minimum upload speeds of 25 Mbps for either of the following: a. To provide access to the Internet. b. To provide computer processing, information sharing, information storage, information content, or protocol conversion, including any service application or information service over the electric delivery system of an electric provider, and includes any advanced communications capabilities that enable users to originate, send, and receive high-quality voice, data, graphics, video programming, and video communications using any technology including a broadband system.

Similar to California's numbers, Alabama has more than 840,000 persons, almost 20 percent of the state's population, with either no access or limited access to broadband Internet.[16]

Several states have aspirational language in statute or through state broadband office statements. Some examples:

Minnesota: *No later than 2026, all Minnesota businesses and homes have access to at least one provider of broadband, with download speeds of at least 100 Mbps and upload speeds of at least 20 Mbps.*[17]

New York: *The New NY Broadband Program seeks to drive statewide broadband access, at download speeds of 100 Mbps in most places and 25 Mbps in the most remote and rural areas.*[18]

Washington*: By 2028, all Washington businesses and residences have access to at least one provider of broadband with download speeds of at least 150 Mbps and upload speeds of at least 150 Mbps.*[19]

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[15] PEW Trusts State Broadband Policy Explorer https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2019/state-broadband-policy-explorer

[16] https://alabamaliving.coop/article/new-laws-to-help-electric-cooperatives-offer-broadband-service

[17] Minn. Stat. § 237.012

[18] https://nysbroadband.ny.gov/about

[19] Second Substitute Senate Bill 5511, Washington State 66th Legislature, 2019 Regular Session

Where are the examples, the most promising deployments, in California that may set the stage for the future?

Urban – Rural Divides

First, we must state that there is a bifurcation between the advanced approaches to current broadband deployments in dense urban areas (and adjacent communities) and those being deployed in sparsely populated rural communities in California, communities that often lack access to critical middle mile infrastructures.[20]

In our previous paper,[21] we focused on the cost of Fiber to the Home (FTTH) deployments in dense, low-income urban areas in California. The economics and technology of FTTH are designed for urban density and a rural adaptation would pose unique challenges in both arenas. While there are alternatives[22] to urban FTTH deployments being explored in rural areas, the fiber needs to cover great distances, as well as presume access to requisite middle mile and long-haul infrastructures, something we know is uneven in many of California's underserved communities. Distance makes the cost per home expensive and necessitates high subscriber "take rates" for such deployments to provide both incentive and a return on this investment.

There are, however, very promising efforts in fixed wireless deployments in rural communities that lack access to middle mile infrastructures, offering respectable download and upload speeds, and low latency. The best plans and, therefore the most compelling ones from a household point of view, would require subsidies to make them affordable to low-income, rural California households.

The Temporal Element

To reach low-income homes with affordable broadband, we need to turn to what is the best of breed in our already installed base, if we want to reach these households, by leveraging what exists, rather than what we hope will, eventually, be deployed. Otherwise, we risk part of a generation of students passing through our schools, along with their families, missing opportunities. While grand plans for massive fiber deployments are admirable aspirations, even if the funding appears from federal sources (along with state components) such projects take many years to plan, permit, build, and light -- and all of this needs to transpire before the first customer can avail themselves of this new service. The focus on the near-term and longer-term aspiration can co-exist, but there is an urgency now, given the need for continuity of education, health care, workforce, and economic security, to name, but a few fundamental societal needs.

Fortunately, for Californians, there are many pockets of leading-edge broadband efforts, both in urban and rural settings, led by a wide range of Internet Service Providers, large and small, incumbents, and newer entrants to the marketplace. The following examples are intended to be illustrative and not exhaustive.

Urban

In several urban communities, FTTH is available at symmetrical 1 Gbps (1000 Mbps) speeds, with plans starting at $40/month. For example, Sonic, with their "Gigabit Fiber" plan in many Bay Area counties

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[20] "Middle mile is a term most often referring to the network connection between the last mile and greater Internet. For instance, in a rural area, the middle mile would likely connect the town's network to a larger metropolitan area where it interconnects with major carriers." Community Networks: https://muninetworks.org/glossary#letterm

[21] CENIC & Private Sector Partners*: Fiber to the Home Estimates – 21 May 2020*

[22] https://www.isemag.com/2019/11/telecom-ftth-tap-network-architecture/

offers these speeds at this price. Other ISPs have similar gigabit offerings, some at higher price points, others with introductory rates that are at or near the $40/month. Most of these networks are low latency, have no data caps, and offer symmetrical gigabit services.

Frontier, with its Fios offering in California, has a 940/880 Mbps plan currently advertised at $74.99 where available, and with no data caps.[23] AT&T Fiber has a similar 940/880 Mbps plan at $49.99 a month, with no data caps. Both have lower bitrate offerings, e.g., 500/500 Mbps at lower monthly rates.

CenturyLink Internet, Cox Internet, Spectrum Internet, Suddenlink, Xfinity Internet all have 940 Mbps to 1 Gbps plans, with varying download speeds, some with monthly caps, some without, and at monthly rates that vary from $50 to $100, and most have lower bitrate plans, as well, at lower monthly rates.

It is also important to note some other extant technologies and those that are in the process of being deployed, in particular 4G and 5G technologies.

- 4G technologies (4G, 4G LTE, and 4G LTE-A). Depending on a variety of factors including your location, the network you are on and how busy it is, and the device you are using, 4G technologies can ***theoretically*** provide maximum download speeds of up to 1 Gbps and maximum upload speeds of up to 50 Mbps. Reported actual download speeds range from 10-50 Mbps and average upload speeds of 2-15 Mbps,[24] with latencies of circa 50 ms.[25]

- 5G technologies, once fully deployed, promise much faster download and upload speeds, with much lower latency.

Rural

The largest California recipient of the Connect America Fund Phase II (CAF II) is GeoLinks, who will offer rural residents speeds of 100/20 Mbps, with 40ms latency, with no data caps at $106/month. While these speeds are lower than what is available in urban communities, for many in rural communities, who have had little or no broadband service, and where there is little or no terrestrial infrastructure, this residential service is a game changer. Moreover, there are 80,000 households that are adjacent to communities where these CAFF II deployments are either in process or planned, so there is potential to leverage some of these deployments.

For low-income households, as noted before, for students studying remotely, or adults working from home, state or federal subsidies will be a necessary component of access. There are other, similarly, remarkable and heroic broadband efforts underway in pockets of rural California, and within reach of rural households, though none on the scale of GeoLinks CAF II project.[26] Many need additional access to

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[23] https://www.verizon.com/home/fios-fastest-internet/

[24] See www.digitaltrends.com/mobile/5g-vs-4g/ and www.lifewire.com/how-fast-is-4g-wireless-service-577566 Carriers also provide some of this data, for example www.verizon.com/articles/4g-lte-speeds-vs-your-home-network/

[25] datamakespossible.westerndigital.com/5g-vs-4g-side-by-side-comparison/ and www.statista.com/statistics/818205/4g-and-3g-network-latency-in-the-united-states-2017-by-provider/

[26] To view the GeoLinks (aka "California Internet, L.P.") project, see the FCC's map of Connect America Fund Phase II: Auction 903 Results at https://www.fcc.gov/reports-research/maps/caf2-auction903-results/

fiber middle mile and backhaul to urban Internet centers. This topic has been an area of on-going conversation and public policy efforts.

Another useful framework for evaluating rural infrastructure projects is the Federal Communications Commission's Rural Digital Opportunity Fund (RDOF).[27]

RDOF Technology-Neutral Service Tiers

Performance Tier	Speed	Usage Allowance
Minimum	≥ 25/3 Mbps	≥ 250 GB or U.S. average, whichever is higher
Baseline	≥ 50/5 Mbps	≥ 250 GB or U.S. median, whichever is higher
Above Baseline	≥ 100/20 Mbps	≥ 2 TB
Gigabit	≥ 1 Gbps/500 Mbps	≥ 2 TB

"Above Baseline" and "Gigabit" performance tiers would enable the multiplicative impact, on both downloads and uploads, of concurrent videoconference use in family congregate situations. These performance tiers are identical to those in the recent CAF II auction.[28]

For performance at or below the minimum, it should be noted that no vendors are actively selling equipment that supports such a low standard as 25/3 Mbps, or anything similar to the outdated, but still current, FCC national standard. For locations that are not yet served or that haven't been refreshed in decades, any new standard should necessarily be much higher. This is explicit in the RDOF standards above. Moreover, recognizing that for places that are not well served, it will be another long cycle before broadband to these communities is revisited and refreshed. That implies a higher standard, even the highest, is appropriate. In urban areas, this means fiber deployments. In a number of rural areas, particularly in the extreme geographies of the West, wireless may make sense, but it is essential that there is extra effort to get the towers and backhaul prioritized to sustain radio technology upgrades.

[27] https://www.fcc.gov/auction/904/factsheet
[28] https://www.fcc.gov/auction/904/factsheet

Satellite Internet constellations, referred to as low-Earth orbit (LEO) satellites, are designed to provide low latency Internet to homes, businesses, and enterprises. According to one of the companies, service will begin sometime in 2020.[29] Where this service will be initially available and the cost for consumers are unknown, as are the precise bandwidths available and the latency of the service.

Conclusion: Policy and funding considerations

1. ***Subsidies are critical.*** In order to reach low-income homes with high-quality broadband access essential for equally high-quality learning applications, subsidies to defray monthly recurring costs for households are an important consideration, with rural monthly subsidies necessarily higher than those for urban households.
2. ***Bandwidth standards for rural and urban settings will be unequal for the foreseeable future.*** What is currently possible in urban and rural communities is divergent. Consider separate standards and aspirational goals for each, which means that standards for remote learning will be divergent as well (as well as standards for other engagements from home).
    a. For ***urban areas***, there are multiple deployments of fiber, some to the home/premise (apartments), some interconnect with older technologies – to DSL, twisted pair cable, coaxial cable, etc. Leverage the installed base where possible, creating incentives for FTTH deployments. Aspire to ***1 Gbps symmetrical*** services to every home, with no data caps.
    b. For ***rural areas***, with low population densities, and little or no terrestrial infrastructure, look to the standard of ***100/20 Mbps***, low latency and packet loss, with no data caps. This aligns with the FCC's "above baseline" service tier and is a step on the way toward the "gigabit" tier.
3. ***It isn't just bandwidth***. When making investments in networks to the home, consider other critical factors beyond download speeds: upload, latency and packet loss, and data caps.
4. ***The household is the denominator***. We cannot simply talk about a single use (e.g., remote learning) in a home as the basis for a bandwidth standard. If we have learned anything during this COVID-19 experience, it is that concurrent use of the network -- several family members involved in different online pursuits simultaneously -- is the baseline for determining how much bandwidth is necessary.
5. ***Begin with what we have***. Consider ways to leverage the existing installed telecommunications base (or funded projects in construction and deployment) in each region throughout the state. Bandwidth to the home will likely shape the kinds of remote learning applications possible for a given school district or districts, for colleges, and for other home applications (telehealth, work-from-home).
6. ***Build in accountability.*** Ensure we get what we are paying for. Require independent network performance testing.

June 14, 2020

Louis Fox
President & CEO, CENIC

[29] www.starlink.com and spacenews.com/spacex-plans-to-start-offering-starlink-broadband-services-in-2020/

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California.	R. 20-09-001

OPENING COMMENTS OF THE CORPORATION FOR EDUCATION NETWORK INITIATIVES IN CALIFORNIA (CENIC) TO THE ORDER INSTITUTING RULEMAKING 20-09-001

Louis Fox
President & CEO
CENIC
[redacted]

October 12, 2020

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California.	R. 20-09-001

OPENING COMMENTS OF THE CORPORATION FOR EDUCATION NETWORK INITIATIVES IN CALIFORNIA (CENIC) TO THE ORDER INSTITUTING RULEMAKING 20-09-001

I. Introduction

The Corporation for Education Network Initiatives in California ("CENIC") respectfully submits these opening comments in the California Public Utilities Commission ("Commission" or "CPUC"), Order to Institute Rulemaking ("OIR") regarding broadband infrastructure deployment and to support service providers in the State of California in the above-referenced proceeding. The rulemaking seeks to explore short- and medium-term actions to accelerate the deployment of and access to quality, affordable internet for all Californians. CENIC is appreciative of the opportunity to provide Opening Comments and at this time, will primarily focus these comments on addressing some of the questions posed in the OIR, and respectfully reserve the right to comment on other questions after reviewing comments by other parties in the proceeding. As such, we respectfully submit these Opening Comments.

II. Discussion

A. Question A. 1. Implementing E.O. N-73-20, OP #8. What business models could the California energy Investor-Owned Utilities ("IOUs") employ to make their existing and future fiber infrastructure more available in rural, urban and Tribal areas? What are the critical requirements and incentives for these models to be effective?

Since Ordering Paragraph 8 of the Governor's Executive Order is not limited strictly to the energy IOUs, we suggest that the CPUC consider a broader scope. One possibility would be for the CPUC to further leverage their public purpose programs. For example, SB 909 (Escutia, 2006) permitted the CPUC to use $2 million of unencumbered funds from the California Teleconnect Fund ("CTF") to cover the one-time installation costs for CTF-eligible community-based organizations. The CPUC could consider revisiting this approach for all underserved CTF-eligible entities that do not have fiber connectivity and fund one-time installation costs not covered by other federal or state programs.

B. Question A. 2. What strategies, incentives or standards can improve open access in deploying fiber and wireless infrastructure to be utilized by multiple carriers, particularly in rural and Tribal areas? Specifically, how can communication providers better share their assets and build planning (e.g. points of presence, carrier hotels, trenches, conduit, towers, poles, etc.)?

The prohibition for supporting middle-mile only projects under CASF pursuant to Public Utilities Code Section 281(f)(5)(B) creates challenges to new strategies to improve open access in deploying fiber and wireless infrastructure. Middle-mile infrastructure is often overlooked, yet critical, infrastructure in providing last-mile service. The CPUC could work with the

Administration and Legislature to waive this statutory restriction for middle-mile projects that meet open access requirements, as well as expand the pool of eligible applicants for these projects to include non-profit industry associations of ISPs or carrier-neutral non-profit organizations.

Similarly, the CPUC could consider funding a pilot program to develop Internet Exchange Points ("IXPs") in areas that are underserved today. IXPs are a vital part of the design that has made the Internet so successful: a "network of networks" where many different networks owned by different entities interconnect and exchange traffic with each other. IXPs are carrier-neutral: that is, they encourage all providers to use their facilities to serve an area by offering an impartial, shared environment for colocation of network equipment and interconnecting with other providers. This results in more cost-effective, efficient delivery of service for the providers and, by extension, for their customers. There are many operational models for building, operating, and managing IXPs, among them: (1) a non-profit industry association of ISPs; (2) a carrier-neutral for-profit company; (3) a carrier-neutral non-profit organization; or, (4) a public agency.

C. Question B. 2. How can the Commission partner with other state agencies to effectively address the infrastructure and affordability gap for communications services in California? How can the Commission assist in the implementation of E.O. N-73-20, OP #7?

The CPUC's effort to work with CalTrans and others to identify strategic transportation corridors for broadband deployment serves as a good example of how the CPUC could partner with other state agencies to effectively address the infrastructure and affordability gap for communications services in California. Unfortunately, this effort was thwarted by the limitations

of transportation funding. Specifically, CalTrans noted that SB 1 funds could not be used to support telecommunications infrastructure, even for the purposes of dropping conduit within a roadway. Stakeholders suggested that, as new roads or significant upgrades/modifications were being built to bridges and roadways, CalTrans consider adding conduit, manhole covers, and access points along the route for telecommunications purposes. The challenge for providers in coordinating the deployment of telecommunications infrastructure within major transportation infrastructure projects is that the timelines for development do not align. CalTrans tends to have much longer deployment timelines. One potential solution would be to broaden the allowable uses of transportation project funds, which would likely require a statutory change. Another would be for the CPUC to work with the Administration to identify potential funding sources to pay for the upfront costs of deploying broadband infrastructure within bridges and roadways. It would seem prudent for these changes to trickle down to regional and local transportation agencies as well to allow other transportation planning agencies to consider broadband infrastructure within their transportation projects.

D. Question B. 3. How should the Commission address access to existing infrastructure for those communities where there is infrastructure going through a community but they are not served by it?

The CPUC asks how it should address access to existing infrastructure for those communities where there is infrastructure going through a community, but they are not served by it. While fiber may run through or adjacent to a community needing broadband, the challenge of serving that community has to take into account various scenarios of why the fiber isn't broken out or additional equipment provisioned to serve that community. On a fundamental level, an assumption the CPUC could make is that the costs of serving that community is not profitable or

that the fiber is part of a long-haul route, where breaking out the fiber would diminish the network's design. A targeted grant program, similar to the concept of the California Advanced Services Fund ("CASF") line extension program, could be created to specifically target these communities, and would need to consider including support for the central office facilities and resources required to serve these communities.

E. Question C. 1. What further strategies, if any, should the Commission utilize to facilitate broadband internet access service for low-income, high fire threat, and/or low adoption communities, primary school students and institutions, libraries, and public safety communications?

The CPUC could work with the Department of General Services ("DGS") to make state-owned telecommunications facilities and vault space available in low-income, high fire threat, and/or low-adoption (particularly in rural) communities available for providers. CASF funds could reimburse DGS for lost revenue from the provider as part of a CASF application. Although past experience with DGS on accessing state property has been traditionally very challenging for providers, additional efficiencies within DGS processes will be necessary to make this attractive and a useful option for providers.

III. Conclusion

CENIC is grateful to have the opportunity to provide these opening comments and looks forward to responding to the comments provided by the other parties. CENIC is supportive of the CPUC's interest in identifying areas in the short- and medium-term to improve broadband connectivity for Californians.

Respectfully submitted,

/s/ *Louis Fox*

Louis Fox
President & CEO
CENIC
[redacted]

October 12, 2020

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California.	R. 20-09-001

REPLY COMMENTS OF THE CORPORATION FOR EDUCATION NETWORK INITIATIVES IN CALIFORNIA (CENIC) TO THE ORDER INSTITUTING RULEMAKING 20-09-001

Louis Fox
President & CEO
CENIC
[redacted]

October 27, 2020

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California.	R. 20-09-001

REPLY COMMENTS OF THE CORPORATION FOR EDUCATION NETWORK INITIATIVES IN CALIFORNIA (CENIC) TO THE ORDER INSTITUTING RULEMAKING 20-09-001

I. Introduction

Pursuant to Rule 6.2 of the Rules and Practice of Procedures of the California Public Utilities Commission ("Commission"), the Corporation for Education Network Initiatives in California ("CENIC") respectfully submits these reply comments in the Order to Institute Rulemaking ("OIR") regarding broadband infrastructure deployment and to support service providers in the State of California in the above-referenced proceeding. CENIC will continue to respond to those opening comments where we believe we can continue to provide useful information to the Commission for consideration.

II. Discussion

A. Question B. 2.

Parties in the proceeding noted that service restoration after a disaster, such as a fire, is typically limited to meeting a community's immediate needs as expeditiously as possible.[1] CENIC agrees with this approach as long-term outages can pose communications network challenges in addition to the obvious public health and safety challenges. Communities would benefit greatly if the Commission were to focus on replacement or construction of new underground facilities that might be performed at a later time. The addition of building out fiber, including indispensable access points, to underground energy facilities should be pursued and encouraged, regardless of whether a communications provider can be identified to participate in a joint trench.

While CENIC recognizes the concerns that other parties raise with respect to preventing electric ratepayer funds from subsidizing broadband infrastructure efforts,[2] the potential public benefit is too significant to ignore. We encourage the Commission to consider how best to fund this idea, which could be further discussed in a future workshop; a need for workshops was echoed by other parties' opening comments.[3] Such a workshop should also address the broader construction issues around permitting, rights-of-way access and easements, which add to the complexity of the endeavor. The workshop might explore innovative ideas such as approving current and future broadband related permits within 90 days or "regional master permit" strategies.[4]

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[1] *See* AT&T Opening Comments, p. 6; CCTA Opening Comments, p. 9; Comcast Opening Comments, p. 28; Consolidated Communications of California Opening Comments, p. 5; Frontier California Opening Comments, p. 7; Pacific Gas and Electric Opening Comments, p. 4; San Diego Gas & Electric Opening Comments, p. 7

[2] *See* CCTA Opening Comments, p. 4; Cox California Opening Comments, p.5; Joint Consumers Opening Comments, p. 6-8; Southern California Edison's Opening Comments, p. 3

[3] *See* CCTA Opening Comments, p. 6; Comcast Opening Comments, p. 26; Cox California Opening Comments, p.7; San Diego Gas & Electric Opening Comments, p. 4

[4] *See* California Emerging Technology Fund Opening Comments, p. 6; Crown Castle Opening Comments, p. 2

The ability to co-locate facilities is important and cost-effective. Southern California Edison ("SCE") provides an ample example of how excess and/or new capacity on its fiber network is able to be leveraged as "middle mile" fiber. It is a model which should be applauded and encouraged for use by all the IOUs.[5] Over the past two decades CENIC has successfully engaged in a number of non-traditional partnerships, including with one of the largest energy IOUs in California, in order to obtain the most cost-effective fiber-based connectivity solutions for member sites.

B. Question B. 2.

Comments by some parties highlight that the CPUC could look at collaborating with other agencies' low-income assistance programs.[6] One such collaboration could be with the California Health and Human Services Agency, particularly with the Department of Health Care Services and Department of Social Services, on creating synergies with programs such as Medi-Cal, CalFresh, CalWORKs, etc, and through local partners (county welfare departments and human services non-profits). Cross-pollination of programs would be helpful in addressing awareness, affordability and adoption efforts. Trusted local community partners are key to increasing awareness of available offerings[7] and helping folks navigate the application process. We have seen this occur through our public library members and as highlighted by the Public Advocates Office.[8]

If there are school districts that are not participating in the federal E-rate and California Teleconnect Fund, as implied by one of the parties, CENIC would encourage all parties to let

[5] *See* San Diego Gas & Electric Opening Comments, p. 4; Southern California Edison's Opening Comments, p. 2
[6] *See* Consolidated Communications of California Opening Comments, p. 5; Greenlining Institute Opening Comments, p. 8-9
[7] *See* UCAN Opening Comments, p. 8
[8] *See* Public Advocates Office Opening Comments, p. 18

CENIC know so we can work with the appropriate entities to explore the matter further.[9] The Administration has endeavored to ensure resources were made available for schools to obtain broadband connectivity to their sites. By extension, we encourage the "last-mile" providers to leverage these investments to better serve the surrounding community.

C. Question B. 3.

We agree with the comments of the Public Advocates Office regarding the California Advanced Services Fund line extension program.[10] Their suggestions are similar to ours, and we would be supportive of providers being the grant applicants to serve a community where infrastructure runs through or adjacent to it. Additional enhancements to the line extension program seem timely and necessary if only one application has been made since the inception of the program.[11]

D. Other Issues.

Several parties' opening comments raise concern that the Commission, through this OIR, is exceeding its scope and jurisdiction and suggest the Commission should maintain focus on broadband facilities and deployment.[12] CENIC shares the concern that, by potentially venturing into regulating broadband service, the Commission may risk diverting attention away from deployment, possibly impeding the directives and timelines of the Executive Order and OIR, the end goal of which is how to improve broadband deployment in the state of California.

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[9] *See* Cox California Opening Comments, p. 11
[10] *See* Public Advocates Office Opening Comments, p. 12
[11] *See* Ibid.
[12] *See* AT&T Opening Comments, p. 3; CCTA Opening Comments, p. 3; Charter Fiberlink CA-CCO Opening Comments, p. 22-25; Comcast Opening Comments, p. 17-19; Consolidated Communications of California Opening Comments, p. 1-3; Cox California Opening Comments, p.4, 18; CTIA Opening Comments, p. 6-7; Frontier California Opening Comments, p. 2; Independent Small LECs Opening Comments, p. 3, 6-8

Joint Consumers raise the notion that upload speeds are as important as download speeds for consumers and should be addressed by the Commission.[13] CENIC agrees that the Internet is increasingly seen as a two-way street. That is, people used to use the Internet primarily to obtain content; now, those people are also the providers of content, including video images required for distance learning and telemedicine applications. If the goal of public policy, and subsequent use of public funds, is to address broadband access and affordability, then the solutions need to ensure sufficient upload speeds, as well as calculate minimum bandwidth requirements per person within a household rather than per household without regard for the number of people in the home. In thinking about minimum bandwidth needs, we caution against setting the minimum at the lowest possible speed to get online. Rather, as noted above, considerations such as the number of simultaneous users in the household and types of use (e.g., videoconferencing for distance learning, streaming video content, and telemedicine applications) should be taken into account. When establishing minimum speeds per household, both upload and download, CENIC recommends using the average household size of 2.52 people per residence or higher (the average family size is 3.14).[14]

Another consideration is the distinction between obstacles to fiber deployment in rural communities versus urban settings. While there tends to be ubiquitous fiber infrastructure that requires only equipment upgrades to serve urban areas, the lack of fiber access and the multiple barriers to fiber build-out in rural areas will take more time and significantly greater funding to address. Until both last-mile fiber and additional middle-mile fiber are available in these areas, the state needs to consider alternative options. One approach that warrants further discussion is to establish differentiated bandwidth goals for rural vs urban areas initially while retaining higher

[13] *See* Joint Consumers Opening Comments, p. 31
[14] *See* U.S. Census Bureau Statistics, https://www.census.gov/data/tables/time-series/demo/families/households.html, accessed Oct. 19, 2020

bandwidth as an aspirational goal. By establishing different benchmarks, this approach offers a balance that acknowledges the challenges faced in rural California without leaving these areas out.

III. Conclusion

CENIC is appreciative of the opportunity to submit these reply comments. We hope the Commission will look favorably on the idea of scheduling a workshop to delve into the issues around rights-of-way, easements, permitting, and more. CENIC remains supportive of the CPUC's interest in identifying areas in the short and medium term to improve broadband connectivity for Californians.

Respectfully submitted,

/s/ *Louis Fox*

Louis Fox
President & CEO
CENIC
[redacted]

October 27, 2020

CENIC Connecting California

November 20, 2020

Director Amy Tong
Chair, California Broadband Council
1325 J Street, Suite 1600
Sacramento, CA 95814

Re: California Broadband Council Action Plan - Recommendations

Dear Director Tong and Members of the Council:

On behalf of the Corporation for Education Network Initiatives in California (CENIC), I am writing to provide recommendations to the California Broadband Council's (CBC) Action Plan created as a result of Governor Newsom's Executive Order N-73-20. If we have learned anything during this pandemic, it is that access to broadband is now a social determinant of health, education, work, and economic security.

CENIC connects California to the world – advancing education and research statewide by providing the world-class network essential for innovation, collaboration and economic growth. This nonprofit organization operates the California Research and Education Network (CalREN), a high-capacity network designed to meet the unique requirements of over 20 million Californians, including the vast majority of K-20 students together with educators, researchers and others at vital public-serving institutions. CENIC's Charter Associates are part of the world's largest education system; they include the California K-12 system, California Community Colleges, the California State University system, California's Public Libraries, the University of California system, Stanford, Caltech, USC and the Naval Postgraduate School. CENIC also provides connectivity to leading-edge institutions and industry research organizations around the world, serving the public as a catalyst for a vibrant California.

CENIC has partnered with the state on various broadband initiatives over the years, starting with the Digital California Project and subsequent K12 High Speed Network project, and including both the Broadband Infrastructure Improvement Grant and Broadband Infrastructure Grant programs to address broadband needs for underserved K12 schools, as well as embarking on a multi-year project to deliver High-Speed Broadband to Public Libraries. Ensuring robust, reliable, high-speed broadband availability to Californians at public schools, colleges, universities, and libraries, has mitigated the inequities of the Digital Divide in many communities. Unfortunately, the COVID-19 pandemic has exacerbated all issues of equity, including digital access. We urge the state to strike a balance between the investments that are made to address immediate need with those required to achieve longer-term broadband goals.

CENIC believes the Governor's Executive Order N-73-20, and resultant Action Plan, can make immediate improvements to accelerate the deployment and adoption of broadband by state and local agencies. We offer the following recommendations for the Council's consideration:

- Revise minimum standards to reflect household size. We appreciate the examples included in the draft Action Plan, which illustrate the residential bandwidth needs for typical households. We agree that when establishing a minimum connectivity speed per household, the assumption should be that there is more than one user per household, and that the connection is being used in multiple ways at the same time. For both upload and download speeds, CENIC recommends using an average household size of 2.52 people per residence or higher (the

average family size is 3.14) and increasing minimum standards by that factor. (page 5 of CENIC Reply Comments)

- Goals for download and upload speeds. To further demonstrate the need for more robust download and upload speeds, as the Council has demonstrated in their latest Action Plan draft, one could start by looking at the bandwidth requirements Zoom shares on their website. For group sessions, in gallery view and 1080p HD video, speed requirements are symmetrical - 3.0 Mbps down, 3.0 Mbps up per user, and increases as the quality of video being shared increases.[1] The excellent examples provided by the CBC miss a few key points. While younger children engaged in distance learning may only use lower resolution video conferencing (e.g., the Zoom meeting platform), older students and remote workers are likely to use multiple simultaneous applications, in some cases across multiple monitors. When participating in telehealth sessions, patients may need to review medical records, research issues in a Web browser, and view x-rays or other images, all while communicating with their physicians. The advent of electronic medical monitoring devices, coupled with telehealth, has stimulated advances in many areas of healthcare including, chronic disease management for cardiovascular disease and diabetes, or with prenatal care. For example, it has been shown that the advent of comprehensive telehealth interventions significantly improved diet quality and sodium intake for those with chronic diseases affected by diet.[2] Improved health outcomes for rural communities that lack access to specialists or those with mobility challenges can greatly benefit from these telehealth applications. The advances in prenatal care have the potential to realize significant benefits for patients in rural and black and brown communities, which have higher rates of maternal morbidity/mortality.[3] All of these exemplify the importance of higher bandwidth speeds for residential use. We would highlight that in networking, as greater capacity becomes available and more affordable, new and innovative ways to use the additional bandwidth are developed and propagated.

  Additionally, we suggest maintaining an aspirational goal for symmetrical download and upload speeds, while recognizing the current realities. That is, current circumstances may merit adjustments to program eligibility requirements for public funding in order to recognize the challenges of delivering broadband into rural communities. Different requirements for rural communities would allow them to continue to be targeted for investment in the interim, allowing time for additional infrastructure, including critical middle mile fiber, to be built. The Action Plan can continue to monitor and adjust these goals through its annual review process.

- Provide subsidies on monthly recurring costs to ensure ongoing affordability. Subsidies to defray the monthly recurring costs for households are an important consideration, with rural monthly subsidies potentially higher than those for urban households. These subsidies need not be mandatory for all providers; it only takes one provider to participate, and acquire new business as a result, for the industry to see the potential benefit of such a program.

- Address the need for digital devices (e.g., computers or digital tablets) and digital skills training. Ancillary costs (whether for computers or training) remain a barrier for low-income families and

[1] https://support.zoom.us/hc/en-us/articles/201362023-System-requirements-for-Windows-macOS-and-Linux
[2] https://www.thecommunityguide.org/sites/default/files/assets/OnePager-HealthIT-Telehealth.pdf
[3] https://www.kff.org/womens-health-policy/issue-brief/telemedicine-and-pregnancy-care/

students. The state surplus property program may offer a venue to assist with addressing the lack of devices, and could include local government participation. Additional partnerships may be needed to prepare the surplus equipment and make it readily available to low-income families. Libraries could be an ideal distribution mechanism for digital devices as the lending and loaning program is a core function of their operations. Libraries pose low or no barriers for community members to check out materials, without the need for credit cards or deposits. Funding for training programs, whether through libraries, schools or community-based organizations, require sufficient investment in order to address the need to develop the digital skills necessary in the 21st century work world.

- Foster and facilitate broadband deployment. There are specific areas of broadband deployment where prioritization and collaboration would greatly improve the rate of success. Foremost among these is permitting, which can span federal, state and local agencies, tribal governments and local private landowners. This issue can be elevated and highlighted through the Governor's announcement of a Shared Stewardship Agreement with the U.S. Forest Service.[4] Of the approximately 33 million acres of forest in California, federal agencies (including the USDA Forest Service and USDI Bureau of Land Management and National Park Service) own and manage 19 million acres (57%). State and local agencies including CalFire, local open space, park and water districts and land trusts own another 3%. The remaining 40% of California's forestland is owned by families, Native American tribes, or companies. Industrial timber companies own 5 million acres (14%). 9 million acres are owned by individuals with nearly 90% of these owners having less than 50 acres of forest land.[5] In addition to forest management and wildfire prevention, this new partnership has the potential to benefit broadband deployment and the evolution of technology, which in turn, will be beneficial to forest health and public safety.

  Expediting the permitting process and aligning state and local governmental policies and processes regarding broadband can go a long way to help. For example, the Department of General Services controls the process for leasing eligible state-owned property. The current process is lengthy and burdensome and has led to the unintended consequence of discouraging telecommunication companies from leasing property from the state. We believe AB 1131 (Lara, 2011) was the last legislative attempt to address this problem and could be revisited by the Council.

- Support building additional middle-mile. The prohibition in AB 1665 (Garcia, E., 2017) to only fund middle-mile projects that are indispensable for accessing last-mile infrastructure likely has further challenged deployment across the state. The Digital 395, CVIN and Central Coast Connected projects were all successful broadband fiber deployments that spurred additional last-mile investments in unserved and underserved communities. In the Central Coast Connected Project, CENIC partnered with Sunesys (dba Crown Castle, today) to build middle-mile infrastructure over the Santa Cruz mountains, leveraging state funds and spurring even more investments in the region to build out last-mile infrastructure in the surrounding region. This middle-mile infrastructure has been a game changer for community anchor institutions in the region and has been a catalyst for a more competitive ISP environment, thereby bringing better

[4] https://www.gov.ca.gov/wp-content/uploads/2020/08/8.12.20-CA-Shared-Stewardship-MOU.pdf
[5] https://ucanr.edu/sites/forestry/files/248435.pdf

and less expensive service to many households. Without robust middle-mile infrastructure, it will continue to be a challenge to serve last-mile locations.

- Build in accountability. Too frequently, the network performance that households receive can be less than what providers claim and/or advertise. As such, broadband initiatives need to be designed so that funders (and households) can confirm that they are getting what is being paid for. The concerns around customer privacy and sharing of data could be addressed by anonymizing the information. Accountability measures should include network latency and packet loss. (Page 4 of CENIC Home Broadband Requirements) The testing and network instrumentation tools needed to provide these assurances are readily available and could be included as a requirement for subsidies or other incentives as contemplated by the Council.

Enclosed please find copies of our submitted comments to the California Public Utilities Commission as part of their Rulemaking (R. 20-09-001) regarding broadband infrastructure deployment and to support service providers in the state of California and policy white papers that we have published during the pandemic. These papers contain ideas worth further consideration by the Council as part of its Action Plan development.

Thank you for your consideration of our recommendations. Please feel free to reach out to Kim Lewis, our legislative advocate, at [redacted] or me at [redacted] should you have any further questions.

Sincerely,

Louis B. Fox
President & CEO

cc: Stephanie Tom, Deputy Director of Broadband and Digital Literacy

Enclosure: As indicated above