

**Hearing on “Investing in America’s Broadband Infrastructure: Exploring Ways to Reduce
Barriers to Deployment”**

Before the Committee on Commerce, Science and Transportation

U.S. Senate

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May 3, 2017

Chairman Thune, Ranking Member Nelson and members of the Committee, thank you for this opportunity to testify on barriers to accelerated broadband deployment.

My name is Larry Downes. Based in Silicon Valley, I am Project Director at the Georgetown Center for Business and Public Policy and the author of several books on the information economy, innovation, and the impact of regulation on the speed and trajectory of technology innovation.

Summary

Let’s start with some good news. Twenty years into the Internet revolution, the U.S. continues to dominate a global market for disruptive innovation, in large part because of far-sighted bi-partisan policies. In particular, broadband-related legislation over the last two decades—including the 1996 Communications Act, Section 230 of the Communications Decency Act, the American Recovery and Reinvestment Act of 2009 and the Spectrum Act of 2012—have encapsulated some of the most successful technology policies ever adopted.

In response, U.S. network developers have built the world’s most extensive wired and wireless broadband infrastructure. Competing providers are now racing to build next-generation networks, including gigabit Internet over fiber, cable and hybrid networks and ultra-high speed

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5G mobile networks. And in keeping with recommendations of the visionary 2010 National Broadband Plan, almost all of this new investment has been privately funded.

Ubiquitous high-speed Internet has meant that every industry my colleagues and I have studied is in the midst of or about to be dramatically changed for the better.² If we stay the course, future investments will make possible a new wave of innovation in everything from autonomous vehicles to smart cities, virtual reality, on-demand manufacturing, and artificial intelligence, among many others.

But the broadband revolution has yet to reach some of our most at-risk communities and remote geographies. As science fiction writer William Gibson famously said, “The future is already here, it’s just not very evenly distributed.” Though we may disagree about the metrics for determining acceptable speeds, latency and technology platforms for what constitutes broadband service, no one can deny that a significant digital divide still exists in the U.S.

Driven by a combination of geographic, demographic and educational factors, today’s digital have-nots are characterized not by their race, sex, or income but by where they live. Americans living in rural and tribal lands, as well as seniors and those with less education, are now the groups disproportionately disconnected from our increasingly important digital conversation. And we are all worse off for their absence.³

Though our public and utility infrastructure, which just received an overall grade of “D+” from the American Society of Civil Engineers,⁴ should clearly be the focus of the most urgent and sustained attention, there is also broad agreement that targeted Congressional action can

²Larry Downes and Paul Nunes, “Big-Bang Disruption,” *Harvard Business Review* (March, 2013), pp. 44-56, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2709801.

³ Blair Levin and Larry Downes, *A New Digital Divide has Emerged—and Conventional Solutions Won’t Bridge the Gap*, THE WASHINGTON POST, Oct. 14, 2016, available at https://www.washingtonpost.com/news/innovations/wp/2016/10/14/a-new-digital-divide-has-emerged-and-conventional-solutions-wont-bridge-the-gap/?utm_term=.882707eba100. See also National Telecommunications and Information Administration, *Digitally Unconnected in the U.S. Who’s Not Online and Why?*, Sept. 28, 2016, available at www.ntia.doc.gov/blog/2016/digitally-unconnected-us-who-s-not-online-and-why; Monica Anderson and Andrew Perrin, *13% of Americans Don’t Use the Internet—Who are They?*, Pew Research Report, Sept. 7, 2016, available at <http://www.pewresearch.org/fact-tank/2016/09/07/some-americans-dont-use-the-internet-who-are-they/>; Larry Downes, *The Digital Revolution has not Reached All of Us*, THE WASHINGTON POST, Aug. 31, 2016, available at https://www.washingtonpost.com/news/innovations/wp/2016/08/31/the-internet-revolution-has-not-reached-all-of-us/?utm_term=.dd4ffcefd9d9.

⁴ See American Society of Civil Engineers, *2017 Infrastructure Report Card*, available at <http://www.infrastructurereportcard.org/>.

accelerate the continued deployment and adoption of broadband technologies, closing what remains of our digital divide.⁵

In the spirit of non-partisan cooperation, Blair Levin and I recently reviewed the history of U.S. broadband deployment and developed eight specific recommendations for future infrastructure legislation.⁶ Levin, as this Committee knows, directed the visionary National Broadband Plan—perhaps the most cost-effective investment of the entire stimulus bill—and now serves as a senior fellow at the Brookings Institution.

These recommendations are hardly original—well, they probably are to Blair. But in any event, they are not controversial. Some of them have already been presented to this Committee in response to your request for recommendations. Others have been offered in various forms by analysts across the political spectrum.⁷

Still more specific, common-sense reforms have now been proposed by the FCC in several infrastructure-related Notices approved without dissent at the Commission’s most recent meeting.⁸ Others, including freeing up critical radio spectrum currently licensed to the federal government, are part of the proposed MOBILE NOW Act.

⁵ As the White House and Congress develop an infrastructure plan promised during the campaign, many, including Senators, House Members and mayors, are urging that broadband be included. *See, e.g., Klobuchar, Capito, King, Heitkamp, Boozman Lead 48 Senators in Urging President Trump to Include Broadband in Any Infrastructure Initiative*, January 31, 2017, available at <https://www.klobuchar.senate.gov/public/index.cfm/news-releases?ID=A5F09FAD-1223-4B0C-A058-80DDDOA9AF09>; *Letter to President Donald Trump*, Jan. 30, 2017, available at

<http://welch.house.gov/sites/welch.house.gov/files/Telecom%202017.01.30%20Letter%20to%20Pres%20Trump%20re.%20broadband%200.pdf>; *Next Century Cities, Over 60 Mayors and Municipal Leaders Send Letter Calling on Congress to Include Broadband in Infrastructure Plans*, March 1, 2017, available at <http://nextcenturycities.org/2017/03/01/over-60-mayors-and-municipal-leaders-send-letter-calling-on-congress-to-include-broadband-in-infrastructure-plans/>.

⁶ Blair Levin and Larry Downes, *Should Broadband Be Included in the Trump Infrastructure Plan?*, THE WASHINGTON POST, April 5, 2017, available at https://www.washingtonpost.com/news/the-switch/wp/2017/04/05/should-broadband-be-included-in-the-trump-infrastructure-plan/?utm_term=.a1d904f5fcee.

⁷ *See, e.g.,* Doug Brake, *A Policymaker’s Guide to Rural Broadband Infrastructure*, Information Technology and Innovation Foundation (April 2017), available at http://www2.itif.org/2017-rural-broadband-infrastructure.pdf?mc_cid=4fb4705a17&mc_eid=98756dc702; Blair Levin and Carol Matthey *In Infrastructure Plan, a Big Opening for Rural Broadband*, Brookings Institution, Feb. 13, 2017, available at <https://www.brookings.edu/blog/the-avenue/2017/02/13/in-infrastructure-plan-a-big-opening-for-rural-broadband/>.

⁸ *See* FCC, *April, 2017 Open Commission Meeting*, April 20, 2017, available at <https://www.fcc.gov/news-events/events/2017/04/april-2017-open-commission-meeting>. (*Statements of Comm. Clyburn, concurring*)

Happily, many of the best ideas would cost little or nothing in taxpayer dollars. But they do require your leadership to break long-standing logjams across government.

In considering how best and most effectively to close the remaining availability and adoption gaps, my overall advice to this Committee is to learn from the successes and failures of previous federal and local efforts, notably the 2009 American Recovery and Reinvestment Act--the last major federal investment in infrastructure rebuilding and expansion.⁹

Many of the broadband-related initiatives in the stimulus bill significantly improved broadband availability for those living in rural, mountain and tribal areas, where competitive private investment for ultra-high speed wired infrastructure remains difficult to cost-justify. But there is also little argument that, due not to cost but to poor management and unfocused objectives, far too much of the billions in stimulus dollars committed to this effort failed to help anyone.¹⁰

The bottom line is simple: Accelerating deployment and adoption of broadband infrastructure for disconnected Americans will require some federal spending. But the spending needs to be done in a more focused and professional way than in the past to reach those who really need help.

And those efforts can be multiplied by encouraging the update of state and local processes, which in turn will provide incentives for private investors to reallocate their own capital in ways that ultimately benefit everyone.

Recommendations

- 1. Limit and carefully control direct investments.** Any direct infrastructure spending Congress approves should be targeted exclusively to the few remaining census tracts, mostly rural and tribal, where there is currently no competitive broadband service. Congress should consider setting aside a modest portion of its proposed infrastructure fund, say \$20 billion, for a one-time rural broadband acceleration program.

⁹ H.R. 1 — 111th Congress: American Recovery and Reinvestment Act of 2009.

¹⁰ See, e.g., Testimony of Ann C. Eilers, Principal Assistant Inspector General, DOC OIG before the House Energy & Commerce Committee's Subcommittee on Communications and Technology, *Is the broadband stimulus working?*, Feb. 27, 2013, available at <https://www.oig.doc.gov/OIGPublications/OIG-13-017-T.pdf>; Government Accountability Office, *Recovery Act: USDA Should Include Broadband Programs Impact in Annual Performance Reports*, June, 2014 at page 22; Tony Romm, *Wired to Fail*, POLITICO, July 28, 2015, available at <http://www.politico.com/story/2015/07/broadband-coverage-rural-area-fund-mishandled-120601>.

Network operators would be offered subsidies to build out in these extremely high-cost areas, with a requirement to use technologies with sufficient bandwidth to support substantial future growth, perhaps up to 100 Mbps speeds. Calculation of specific subsidies should be made on a per-location basis, determining as precisely as possible how much is needed to overcome otherwise prohibitive build-out costs.

Funds for the acceleration program, moreover, should come from general appropriations rather than raising the already-unsustainable fees consumers pay into the Universal Service Fund, which today represents a 17.4% cost added to voice services.¹¹

To avoid problems that plagued the Recovery Act's scattered broadband initiatives, moreover, the acceleration program should be managed by one agency, with strict controls to help ensure troubled projects get attention (or cut off) sooner rather than later. Between the National Telecommunications and Information Administration, Rural Utilities Service, and the FCC, there is consensus that the FCC does the best job at maximizing its deployment-related funds, and should be the sole agency responsible for the acceleration fund, albeit with added controls to reduce waste and abuse.

- 2. Severely limit ongoing support.** To date, federal efforts to overcome the financial hurdles to deploying rural broadband infrastructure have suffered from a structural flaw. The FCC provides payments in the form of small ongoing annual subsidies, even in areas when all that was needed to overcome high infrastructure costs was an initial capital investment. Because of this approach, it can take years for providers to recoup their own capital investments, unintentionally encouraging operators to build piecemeal in rural areas, and to make decisions based on what providers believe the government will fund rather than on what consumers want.

Future investments should avoid this error by offering instead carefully-calculated one-time subsidies. This will save billions in ongoing costs. While some truly high-cost areas will continue to need both start-up capital and operating support, the emphasis for any new rural broadband infrastructure spending should be on those locations for which capital alone can overcome the need for further government subsidy. This will deliver the most bang for scarce taxpayer bucks.

¹¹ See FCC, *Contribution Factor and Quarterly Filings – Universal Service Fund Management Support*, available at <https://www.fcc.gov/general/contribution-factor-quarterly-filings-universal-service-fund-usf-management-support>.

After determining the optimal per-location subsidy needed, the government may find there are more providers willing to build in underserved rural and tribal areas than there are funds to support them. If so, the FCC should be authorized to run a reverse auction among competing providers to bid down the per-location cost.¹²

The FCC has already proposed such a solution to improve the efficiency of existing universal service programs, with the goal of letting market forces deliver “the best deal available” to maximize limited funds.¹³

- 3. Extend “Dig Once.”** Lack of coordination between broadband and other infrastructure projects wastes time and resources, particularly when roads are being built or maintained. It is essential that we fully embrace a “Dig Once” rule, requiring installation of conduits for broadband equipment whenever roads are being dug up for any reason. According to the Government Accountability Office, “Dig Once” can reduce the cost of deploying fiber under highways in urban areas up to 33 percent and up to 16 percent in rural areas.¹⁴

At least two bills circulating in Congress now would expand existing “Dig Once” policies.¹⁵ Dig Once should also be extended to state roads, and to all public rights of way adjoining roads.¹⁶

- 4. Address other unproductive barriers to mobile deployments.** On the mobile side, the good news for local authorities is that 5G networks will rely not on macro cell towers so much as small cell sites, with small, low-power antennae that can be attached to existing poles and on buildings.

¹² See Blair Levin and Carol Matthey *In Infrastructure Plan, a Big Opening for Rural Broadband*, Brookings Institution, Feb. 13, 2017, available at <https://www.brookings.edu/blog/the-avenue/2017/02/13/in-infrastructure-plan-a-big-opening-for-rural-broadband/>.

¹³ FCC, *In the Matter of Connect America Fund Universal Service Reform – Mobility Fund*, WC Docket No. 10-90. March 7, 2017, available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-17-11A1.pdf.

¹⁴ See Letter from Government Accountability Office, June 27, 2013, available at <http://www.gao.gov/assets/600/591928.pdf>.

¹⁵ See, e.g., MOBILE NOW Act, S.19, 115th Congress (2017-2018); Broadband Conduit Deployment Act, H.R. [], 115th Congress (2017-2018). Similar provisions were proposed in the Streamlining and Investing in Broadband Infrastructure Act, S.2163, 114th Congress (2016-2017).

¹⁶ A coalition of public policy think tanks wisely recommended at a recent hearing that the policy be expanded to state roads, and to all public rights of way adjoining roads. Available at http://docs.techfreedom.org/Letter_EC_Hearing_on_Dig_Once.pdf?ct=t%28PR_LabMD_Amicus_January_20171_4_2017%29&mc_cid=87bf010f7a&mc_eid=fb2145b79f.

There will, however, be an explosion of such installations, significantly increasing the pressure on local authorities to review and approve applications. To ensure U.S. dominance in 5G deployment, network operators will need authorities to use predictable criteria, reasonable and consistent terms, and proportionately quick time frames for review.

Local authorities should of course retain the ability to ensure public safety of new equipment, but much of the sometimes permanent delay operators already experience in managing applications has little if anything to do with legitimate public policy concerns. As former FCC Commissioner Robert McDowell recently cataloged, investments are increasingly being held up by ad hoc or outdated processes, unrelated turf wars, and petty corruption.¹⁷

At a minimum, Congress should establish federal guidelines to eliminate unnecessary bickering over pole attachments, especially for poles that are municipally-owned or owned by regulated utilities. To avoid rent-seeking behavior that grinds the process to a halt, we need cost-based attachment fees, “climb-once” policies, and basic rules about notice and contractor qualifications. Network operators should not be penalized in either time or money for replacing or upgrading small cell equipment—applications that are often treated as full-scale installations of new towers.

The FCC has already begun the process of establishing more aggressive shot clocks and “deemed approved” rules, but Congressional action on these common-sense improvements would be easier to sustain over likely legal challenges.¹⁸

- 5. Re-engineer government processes that hinder private investment.** Beyond pole and building access issues, both wired and mobile deployment is being held back unnecessarily by unproductive costs associated with dealing with slow and overly bureaucratic local governments. The problem is not so much local regulations as it is local processes—or often, the lack thereof.

¹⁷ Robert McDowell, *Clearing the Barriers to Critical Communications Infrastructure*, Mobile Future (April 20, 2017), available at <http://mobilefuture.org/clearing-the-barriers-to-critical-communications-infrastructure/>

¹⁸ FCC, *In the Matter of Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, WT Docket 17-79 (April 27, 2017), available at [http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0330/DOC344160A1.pdf?ct=t\(PR_LabMD_Amicus_January_20171_4_2017\)&mc_cid=10c138d1f0&mc_eid=fb2145b79f](http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0330/DOC344160A1.pdf?ct=t(PR_LabMD_Amicus_January_20171_4_2017)&mc_cid=10c138d1f0&mc_eid=fb2145b79f); FCC, *In the Matter of Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment*, WT Docket 17-84 (April 27, 2017), available at [http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0330/DOC-344161A1.pdf?ct=t\(PR_LabMD_Amicus_January_20171_4_2017\)&mc_cid=10c138d1f0&mc_eid=fb2145b79f](http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0330/DOC-344161A1.pdf?ct=t(PR_LabMD_Amicus_January_20171_4_2017)&mc_cid=10c138d1f0&mc_eid=fb2145b79f); *City of Arlington v. FCC*, 133 S.Ct. 183 (2013).

As Google Fiber’s unique approach to selecting its markets has shown, commitment to efficient permitting and deployment strategies by local authorities can prove decisive in which cities get new private infrastructure investment and which ones do not.¹⁹ Simply providing a single point of contact within a local government can make a big difference in both speed and cost of deployment, along with access to city property and streamlined zoning processes. If inspectors don’t show up when promised, moreover, an entire project can be stalled at enormous expense.

Both municipal employees and installers would also save a great deal of time by moving from individualized permits to a single project-based permit. The individual permits repeat much of the same information, putting a strain on resource-challenged planning departments to evaluate redundant information, slowing down reviews with no benefit.

Local governments must be cured of the bad habit of holding approvals hostage until broadband providers agree to pay for unrelated public works, such as repairing streets even where no work is being performed. This is an inefficient solution to local funding problems, one that disproportionately impacts costs for broadband consumers.

Especially given the coming explosion of small cell deployments, there is widely-held consensus that outdated and overly bureaucratic local processes are particularly holding up deployment of mobile infrastructure, a problem that is guaranteed to get much worse if positive steps are not taken soon.

A few years ago, I discovered first-hand just how chaotic and ad hoc local approaches can be. A mobile provider applied for permission to install a handful of new low-power antennae on existing utility poles in my small unincorporated Bay Area town—equipment needed to improve 4G LTE service in the hills just north of Berkeley.

Though county officials were ready and able to review and decide on the applications on a professional basis, doing so took over a year, held up by free-for-all hearings of unrelated committees and local advisory groups. These meetings were regularly derailed by the

¹⁹ See Larry Downes, *U.S. Digital Infrastructure Needs More Private Investment*, HARVARD BUSINESS REVIEW, Oct. 14, 2016, available at <https://hbr.org/2016/10/u-s-digital-infrastructure-needs-more-private-investment>.

misrepresentations of outsiders who characterized the applications as being for new, full-size cell towers, upsetting and misleading residents for no good reason.²⁰

These are especially frustrating and counterproductive inefficiencies, ones that represent some of the most unnecessary obstacles to accelerated broadband deployment. They must be resolved quickly. 5G networks, once deployed, will be truly competitive with very high speed and highly-reliable wired networks. They will not only provide underserved areas of the country with faster and cheaper broadband options, but will take the mobile computing revolution to the next level for all Americans, and at increasingly attractive prices.

Best practices distilled from a long history of good and bad examples should be established at the federal level and included in the infrastructure bill as conditions for local jurisdictions to receive federal assistance.

- 6. Make investments technology-neutral.** For the most sparsely populated and geologically challenging parts of the United States, the economics of laying fiber-optic cable are unlikely to make sense any time soon, even with subsidies. So the question becomes not only what alternative broadband technologies are best suited to rural and mountainous regions, but how to encourage providers to continue developing and deploying them.

In many rural areas, for example, fixed wireless technologies have proven themselves capable of providing high-speed last-mile connections to homes and businesses, with the promise of even better performance going forward. Satellite-based solutions have also matured, as have hybrid fiber/copper technologies using existing telephone lines.²¹

But up until now, Universal Service programs have either explicitly or implicitly favored wired technologies, for example by defining minimum broadband speeds above what is reasonably necessary or by setting latency standards in a way that intentionally excludes satellite-based solutions.²²

²⁰ See Rick Radin, *Kensington Gives Partial Approval to AT&T Antennas*, THE MERCURY NEWS, July 31, 2013, available at <http://www.mercurynews.com/2013/07/31/kensington-gives-partial-approval-to-att-antennas/>.

²¹ Richard Bennett, *Wireless First: A Winning Strategy for Rural Broadband*, High-Tech Forum, April 11, 2017, available at <http://hightechforum.org/wireless-first-a-winning-strategy-for-rural-broadband/>.

²² See Doug Brake, *A Policymaker's Guide to Rural Broadband Infrastructure*, Information Technology and Innovation Foundation (April 2017), available at http://www2.itif.org/2017-rural-broadband-infrastructure.pdf?mc_cid=4fb4705a17&mc_eid=98756dc702.

No matter how the infrastructure bill provides for broadband in the remaining unserved locations, it should do so on a technology-neutral basis to encourage continued development of new options.

- 7. Address nonfinancial causes of the digital divide.** Though the focus of this hearing is on obstacles to deployment, I want to say a little about the equally important problem of adoption. Again, there is broad consensus on both the problems and common-sense solutions.

As the most recent data from the Pew Research Project shows, we are winning the battle to reduce broadband cost for those least able to afford it. In addition to expanded Universal Service programs and the shift from voice to broadband for Lifeline and other programs, leading Internet providers, including Comcast, AT&T and, recently, Sprint, have expanded programs aimed at low-income families, signing up millions of new Internet users for roughly \$10 a month.²³

As the adoption gap narrows, however, we need new strategies that target different problems. Availability and price are no longer the most significant factors holding back the 13% of Americans who remain offline. Consistent with finding over the last decade, the Pew Research Center noted recently that only 19% of offline adults cite the expense of internet service or owning a computer as a barrier.

Instead, “[a] third of non-internet users (34%) did not go online because they had no interest in doing so or did not think the internet was relevant to their lives.” Researchers reported. “Another 32% of non-internet users said the internet was too difficult to use, including 8% of this group who said they were ‘too old to learn.’”²⁴

While income undoubtedly continues to play a significant role in non-adoption, in other words, many who remain offline wouldn’t use the Internet even if it were free. This conclusion was also reached by a recent NTIA survey, which found that over half of those

²³ Larry Downes, *The Digital Revolution Has Not Reached All of Us*, THE WASHINGTON POST, August 31, 2016, available at <https://www.washingtonpost.com/news/innovations/wp/2016/08/31/the-internet-revolution-has-not-reached-all-of-us/>.

²⁴ Monica Anderson and Andrew Perrin, *13% of Americans Don’t Use the Internet—Who are They?*, Pew Research Report, Sept. 7, 2016, available at <http://www.pewresearch.org/fact-tank/2016/09/07/some-americans-dont-use-the-internet-who-are-they/>

who don't have Internet service at home—again, largely rural and older Americans, and those with less education-- say they just don't want or need it.²⁵

Part of this resistance comes from the fact that unconnected Americans don't know how to use a computer or even a smartphone, let alone how to install and maintain networking equipment inside or outside their home. So whatever funding the infrastructure law provides for broadband will be wasted if some of that support isn't directed to providing hands-on education and on-going support. Community groups and senior centers are natural conduits for these essential services.

- 8. Use the bully pulpit to encourage digital want-nots.** Given the Internet's growing importance for education, health care, jobs, and civic engagement, there is also agreement that non-adopters are simply and tragically wrong in thinking broadband isn't relevant to their lives.

It is, therefore, incumbent on those of us already enjoying the benefits of the digital revolution to employ creative new approaches to convincing them to join us. Solving the training and support issues of the least tech-savvy users will go a long way to overcoming potent inertia, but it won't fully answer the relevance problem. Digital want-nots also need to understand the value of getting online.

These include the obvious benefits of connecting to family and friends and expanding entertainment options. But there are more fundamental ways emerging technologies, including the Internet of Things and smart homes and communities in particular can improve quality of life, especially for seniors hoping to age in place in their homes.

Many of these benefits were vividly described in the later chapters of the National Broadband Plan, but neither the FCC nor the White House used the Plan effectively to promote a vision of tomorrow that would make getting online today irresistible.²⁶

Public education about why the infrastructure bill is spending money on broadband will be critical to getting maximum value from any new investment. That effort should include, at a

²⁵ National Telecommunications and Information Administration, *Digitally Unconnected in the U.S. Who's Not Online and Why?*, Sept. 28, 2016, available at www.ntia.doc.gov/blog/2016/digitally-unconnected-us-who-s-not-online-and-why.

²⁶ Following the Plan's publication, the focus for policy leaders in and out of the FCC was on the spectrum crisis the Plan identified—alarms that Congress, the FCC, and network operators have so far responded to admirably.

minimum, the White House and related Departments including those dealing with commerce, housing, health, energy and education.

The FCC should be tasked with coordinating the public outreach, and for working with start-ups and established companies developing the most exciting and relevant applications and their respective trade groups in public-private partnerships.

Much as organizations such as the Consumer Technology Association put on local trade shows for government officials, the FCC should develop visionary presentations about our broadband future. Then, the Commission should take it on the road, in the form of high-impact mini-trade shows, helping those who don't believe in the value of connectivity see and hear first-hand what it is they are missing already and what's ahead in the near-future.

Following these basic recommendations will maximize the value of any taxpayer money spent on broadband infrastructure. Even more, these simple steps will help multiply government spending with continued private investment, accelerating efforts to close the digital divide and bring the least-connected parts of the country into our growing digital conversation.

In Silicon Valley, that's we call a win-win-win.

I am happy to expand on any of these points, and look forward to your questions. Thank-you.