

# DEFINING AND MAPPING BROADBAND COVERAGE IN AMERICA

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## HEARING BEFORE THE SUBCOMMITTEE ON COMMUNICATIONS AND TECHNOLOGY OF THE COMMITTEE ON ENERGY AND COMMERCE HOUSE OF REPRESENTATIVES ONE HUNDRED FIFTEENTH CONGRESS

FIRST SESSION

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## DEFINING AND MAPPING BROADBAND COVERAGE IN AMERICA

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WEDNESDAY, JUNE 21, 2017

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON COMMUNICATIONS AND TECHNOLOGY,  
COMMITTEE ON ENERGY AND COMMERCE,  
*Washington, DC.*

The subcommittee met, pursuant to notice, at 10:00 a.m., in room 2123, Rayburn House Office Building, Hon. Marsha Blackburn (chairman of the subcommittee) presiding.

Present: Representatives Blackburn, Lance, Shimkus, Latta, Guthrie, Olson, Kinzinger, Bilirakis, Johnson, Flores, Brooks, Collins, Walters, Costello, Walden (ex officio), Doyle, Welch, Clarke, Loeb sack, Ruiz, Eshoo, Butterfield, Matsui, McNerney, and Pallone (ex officio).

Staff Present: Elena Brennan, Legislative Clerk, Energy and Environment; Kelly Collins, Staff Assistant; Zachary Dareshori, Staff Assistant; Chuck Flint, Policy Coordinator, Communications and Technology; Adam Fromm, Director of Outreach and Coalitions; Gene Fullano, Detailee, Communications and Technology; Giulia Giannangeli, Legislative Clerk, Digital, Commerce, and Consumer Protection/Communications and Technology; Kelsey Guyselman, Counsel, Communications and Technology; Bijan Koohmaraie, Counsel, Digital, Commerce, and Consumer Protection; Tim Kurth, Senior Professional Staff, Communications and Technology; Lauren McCarty, Counsel, Communications and Technology; Drew McDowell, Executive Assistant; Katie McKeough, Press Assistant; Alex Miller, Video Production Side and Press Assistant; Paul Nagle, Chief Counsel, Digital, Commerce, and Consumer Protection; Dan Schneider, Press Secretary; Madeline Vey, Policy Coordinator, Digital, Commerce, and Consumer Protection; Evan Viau, Staff Assistant; Hamlin Wade, Special Advisor, External Affairs; Jeff Carroll, Minority Staff Director; Alex Debianchi, Minority Telecom Fellow; Evan Gilbert, Minority Press Assistant; David Goldman, Minority Chief Counsel, Communications and Technology; Jerry Leverich, Minority Counsel; Lori Maarbjerg, Minority FCC Detailee; and Dan Miller, Minority Policy Analyst.

### OPENING STATEMENT OF HON. MARSHA BLACKBURN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TENNESSEE

Mrs. BLACKBURN. The committee will come to order.

As we begin today, and before I recognize myself for an opening, I would like for us to remember Steve Scalise, a member of this

committee, and also those that were involved in the shooting last week. And I thank Mr. Doyle, who is the team manager, team leader for the Democrats' victorious baseball team, for the gesture of kindness last week in sharing the trophy.

And at this time, I recognize myself for 5 minutes for an opening. And welcome to all of you to our subcommittee hearing, which is titled "Defining and Mapping Broadband Coverage in America." Delighted to see the interest in this topic and delighted that you all are here. And I thank our witnesses for appearing as we examine the definition of broadband and existing challenges in updating the National Broadband Map which has not occurred since June 2014, if you can believe that.

Broadband is the infrastructure challenge of this decade, and the digital divide continues to plague rural America in particular. We must be good stewards of taxpayer money by ensuring that there is access to accurate data so that areas with the greatest need for broadband services are targeted by both public and private investments.

This hearing will be divided into two discussions: Defining broadband coverage and mapping broadband coverage. The FCC redefined minimum broadband download speeds at 25 megabits per second in 2015 as part of its broadband progress report. This represented a dramatic shift from the previous standard of 4 megabits per second and resulted in a significant change in the number of Americans considered covered by broadband. Broadband services and usage run the gamut from basic and light to advanced and high.

Americans utilize the internet for a variety of things, and we realize that there is increasing demand for higher speeds. However, we should examine whether a totality of the circumstances test is perhaps appropriate in determining how we define broadband connectivity. Particular weight should be given to factors such as the current level of coverage, or lack thereof, and the cost of deployment.

Mapping broadband coverage will be a second discussion point. Each administration has taken action to spur broadband deployment, beginning with the Clinton administration's efforts in 1995, when GSA tried to streamline the permitting process for wireless antennas. Approximately \$7.2 billion in Federal grants and loans were awarded through NTIA's BTOP and the RUS BIP as a part of the Obama administration's American Recovery and Reinvestment Act of 2009. \$293 million of this money went to the state broadband initiative, which numerous states used to create public/private partnerships to generate a map. NTIA had authority over the National Broadband Map, but it was transferred to the FCC when BTOP funding to update the map ran out in June 2014. More importantly, a GAO analysis of the ARRA's implementation revealed that data collection methods needed improvement in order to be more effective.

In short, billions in taxpayer money was spent on broadband deployment by the last administration but failed to achieve desired results as little more than 183,000 miles of network infrastructure was built. The economic, educational, and healthcare opportunities that come with unleashing broadband are undeniable.

I love this report. It is an essential report. And it notes that smart cities' growth could result in a \$500 billion impact on GDP over 10 years. However, accurately defining broadband and ensuring access to accurate mapping data is imperative so that hard-working taxpayer money targets areas most in need of broadband service.

Those who do not learn from the mistakes of the past are doomed to repeat them, so let's learn and let's not repeat the mistakes. We should proceed as expeditiously as possible but with caution and with wisdom from those learned mistakes.

At this time, I yield back my time, and I recognize the gentleman from Pennsylvania for his opening statement.

[The prepared statement of Mrs. Blackburn follows:]

#### PREPARED STATEMENT OF HON. MARSHA BLACKBURN

Welcome everyone to the Communications and Technology Subcommittee's hearing titled "Defining and Mapping Broadband Coverage in America". Also, thank you to the witnesses for appearing as we examine the definition of broadband and existing challenges in updating the National Broadband Map—which has not occurred since June 2014. Broadband is the infrastructure challenge of this decade and the "digital divide" continues to plague rural America in particular. We must be good stewards of taxpayer money by ensuring that there is access to accurate data so that areas with the greatest need for broadband services are targeted by public and private investments.

This hearing will be divided into two discussions: "Defining Broadband Coverage" and "Mapping Broadband Coverage". The FCC redefined minimum broadband download speeds at 25 megabits per second in 2015 as part of its Broadband Progress Report. This represented a dramatic shift from the previous standard of 4 megabits per second and resulted in a significant change in the number of Americans considered covered by broadband. Broadband services and usage run the gamut from basic and light to advanced and high. Americans utilize the Internet for a variety of things and we realize that there is increasing demand for higher speeds. However, we should whether a "totality of the circumstances" test is perhaps appropriate in determining how we define broadband connectivity. Particular weight should be given to factors such as the current level of coverage—or lack thereof, and cost of deployment.

Mapping broadband coverage will be a second discussion point. Each Administration has taken action to spur broadband deployment beginning with the Clinton Administration's efforts in 1995 when GSA tried to streamline the permitting process for wireless antennas. Approximately \$7.2 billion in Federal grants and loans were awarded through NTIA's Broadband Technology Opportunity Program or "BTOP" and the RUS Broadband Initiative Program or "BIP" as a part of the Obama Administration's American Recovery and Reinvestment Act (ARRA) of 2009. \$293 million dollars of this money went to the State Broadband Initiative, which numerous states used to create public-private partnerships to generate a map.

NTIA had authority over the National Broadband Map, but it was transferred to the FCC when BTOP funding to update the map ran out in June 2014. More importantly, a GAO analysis of the ARRA's implementation revealed that data collection methods needed improvement in order to be more effective. In short, billions in taxpayer money was spent on broadband deployment by the last Administration, but failed to achieve desired results as little more than 183,000 miles of network infrastructure was built.

The economic, educational and healthcare opportunities that come with unleashing broadband are undeniable. A recent Accenture report notes that smart cities growth could result in a \$500 billion impact on GDP over ten years. However, accurately defining broadband and ensuring access to accurate mapping data is imperative so that hard-working taxpayer money targets areas most in need of broadband service. Those who do not learn from the mistakes of the past are doomed to repeat them. We should proceed as expeditiously as possible, but with caution.

Thank you.

**OPENING STATEMENT OF HON. MICHAEL F. DOYLE, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF PENNSYLVANIA**

Mr. DOYLE. Thank you, Madam Chair. I want to thank you for holding this hearing and say thank you to the witnesses for being here. I also want to take a moment, in light of the events last week, to reiterate to my colleagues on the Republican side of the aisle and to the public that while Republicans and Democrats may disagree on a lot, we share many of the same goals and aspirations: We love our country, and we want to do well by the people who have sent us here to represent them.

We also agree that broadband deployment is critical for the future of our Nation and for our economy. And while much progress has been made to bridge the digital divide, we are still struggling to connect unserved and underserved communities across the country.

While the FCC continues to make critical investments in broadband deployment through the Universal Service Fund, we are still falling short in terms of meeting the needs of underserved Americans.

Ranking Member Pallone, myself, and the rest of our side of the committee have put forward an infrastructure proposal that would invest an additional \$40 billion in broadband deployment. This investment could significantly close the broadband deployment gap and bring high-speed internet service to 98 percent of the country. Representatives Loebsack and Ruiz also have bills that respectively seek to improve mobile coverage maps and expand and improve universal service funding on Tribal lands. And Representatives Welch and McKinley have a bipartisan bill that directs the FCC to establish standards for what constitutes reasonably comparable service in rural and urban areas. These bills all have merit, and I strongly urge the chairman to allow this subcommittee to consider these bills.

I would also, again, urge the chairman to call the FCC before this committee for an oversight hearing. The oversight hearing that was scheduled for March 8 has never been rescheduled. The commission has received roughly 5 million comments in their proceedings to eliminate net neutrality rules, and they have yet to come before this committee to address the public's concerns. I hope that we can work together and get a hearing scheduled with the commission as soon as possible.

With that, I would like to yield 1 minute to the gentlelady from California, Ms. Matsui, and then an additional minute to Representative McNerney.

Ms. MATSUI. Thank you very much, Mr. Doyle, for yielding me time.

I appreciate the subcommittee's continued focus on broadband infrastructure, but I am disappointed that we are having another hearing exploring the topic rather than a legislative hearing to advance the bills we have worked on. I hope that this committee takes action to ensure everyone has access to the tools they need to succeed in the digital economy.

Whether you live in an urban district, like my congressional district in Sacramento, or a rural area, there are many challenges to



broadband deployment. Affordable access to truly high-speed broadband for every American is going to require significant and sustained Federal investments. Those investments should include improving our Federal broadband data. The National Broadband Map has not been updated in 3 years, and the public is losing out without this important tool. That data was used by communities across the country whether it was connecting small businesses in New York or saving jobs in rural Utah.

We all want the United States to have world-class communications networks, and we should have the data that shows whether we are truly leading the global economy. This has been a bipartisan issue, and I urge my colleagues to work with us on real solutions.

Thank you, and I yield to my colleague.

Mr. MCNERNEY. I thank the ranking member for yielding time to me, and I thank the chair and the ranking member for holding the hearing today.

As we examine the issue of broadband access, I want to highlight the importance of this issue to our Nation's veterans. Access to broadband internet service is critical to the more than 20 million veterans across our Nation. Having broadband internet access helps veterans apply for jobs, obtain vocational training, communicate with friends and family, and access services at the VA.

Without broadband internet access, it is difficult to fully participate in today's society. Veterans face many challenges when they return home, and not having internet access makes what can be a tough transition process even harder. This is especially important for the more than 1.4 million veterans living below the Federal poverty level and the 5.3 million veterans living in rural areas.

Last Congress, I introduced bipartisan legislation that would put us on a path to helping more veterans get access to internet service. This bill passed the House. It is my hope that this year we can move this bill again and this time get the Senate to move on it, although, we don't have any control of that.

With that, I thank the ranking member and yield back.

Mr. DOYLE. And, Madam Chair, I would like to ask unanimous consent to enter into the record letters from the City of Westminster, the Consumer Council, and the Satellite Industry Association.

Mrs. BLACKBURN. So ordered.

[The information appears at the conclusion of the hearing.]

Mr. DOYLE. Thank you. I yield back.

Mrs. BLACKBURN. The gentleman yields back.

Mr. Johnson, we will yield to you. We are waiting for the chairman. I know he has an opening statement he wants to make.

So I yield to Mr. Johnson for 5 minutes.

#### **OPENING STATEMENT OF HON. BILL JOHNSON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OHIO**

Mr. JOHNSON. Well, thank you, Madam Chair. I won't use the entire 5 minutes, but let me just say how glad I am that we are having this hearing and others yet to follow in the coming weeks and months.

This is a tremendously important topic for people that live in rural America. I can tell you that in eastern and southeastern Ohio, I have young people that have to go to a neighboring town and drive some distance to be able to get access to do their homework and to do their school research projects.

I don't know about you, but I never had to go to Tim Hortons to do my homework, but that is where some of them have to go to a neighboring town where they can get a Wi-Fi connection, if they can get a Wi-Fi connection. And so it is really important.

I was in Youngstown, which is not so much rural, by the way, a very industrialized city, an island, an enclave of businesses just outside of Youngstown; yet, all they have is DSL capability, and the business is struggling. They want to grow. They are prepared to grow. They want to hire more people, but they can't advance their business because they can't get access to broadband internet capability.

So, Madam Chair, count me in, full speed ahead. Let's get this problem solved for America.

Mrs. BLACKBURN. I thank the gentleman for his leadership on this issue.

Is there any other member on the Republican side seeking time?

A couple of points, my Democratic colleagues have raised it, I just want to touch on. The reason we are doing this is because we do think this hearing is important to how we close the digital divide, and we are focusing on those infrastructure needs for broadband, the mapping issue, which is important.

The FCC commissioners, to my colleague from Pennsylvania, we have been working with them to reschedule a date. We anticipate having them before us in July. We will keep you posted on this.

On the concerns that I know Mr. Pallone has about net neutrality, you know that the FCC is dealing with that, and it would be premature for us to discuss those issues before or not to discuss but to take an action before the commission finishes their work.

And on the privacy issue, we had a very robust debate with this around the CRA process to set aside those FCC rules that had not yet been implemented and reserve the status quo on that issue. And I will say to my colleagues, I would be happy to discuss my BROWSER act with you on the privacy issue.

And we have reached out to all the Democratic offices in the House on this issue, and I will say this: It was disappointing to me to get a response from one Democratic office that suggested when I did the Dear Colleague, and I am quoting from that response, "Can you please remove the 200 other people who have expressed no interest in engaging in this topic."

So that was disappointing. I do hope that my colleagues do want to engage on privacy and that indeed we can move forward on this issue this year.

And the chairman has arrived and I will yield to Chairman Walden the balance of the time.

Mr. WALDEN. I thank the gentlelady. I thank the chairwoman for her leadership on these communications and privacy issues.

If you asked somebody in rural America, like in my giant district in eastern Oregon, whether they have broadband access that meets the speeds quota as defined by the FCC, they likely don't know.

But if you ask them whether they get internet access to match their needs, they can probably give you a quick yes or no answer.

That should be our primary objective as policymakers looking to allocate Federal resources, counting for consumer demand, putting the consumer first, and getting the most people the best access we can to a productive level of internet service.

People in the remote parts of our country, including in Oregon, and other unserved parts of our country probably would tell you they would be happy just to have a connection, because some of them don't have that today, as you all know.

And so that is the importance of, I think, this hearing and the work that we are doing going forward is figuring out how do you connect the unconnected. They should not be left behind in America, whether you are in Montana or Wyoming or Oregon or North Dakota or an urban setting where there are issues as well.

So I think this is really important that we have this discussion about mapping. We learned a lesson frankly the hard way from our experience with the rural utilities service and the 2009 Recovery Act. As outlined by an investigator with the nonpartisan Government Accountability Office, he said, "We are left with a program that spent 3 billion. We really don't know what became of it." And that is because at the time that went through the money went out before the maps were drawn.

And I hope this time when we look at infrastructure expansion in America to connect places that we hit the mapping first. We focused on the areas that are unserved first and connect this country to one of the most important economic and social tools in our history.

With that, Madam Chair, I yield back the balance of my time.  
[The prepared statement of Mr. Walden follows:]

#### PREPARED STATEMENT OF HON. GREG WALDEN

If you ask someone in rural America—like my district in Oregon—whether they have broadband access that meets the speeds 'as defined by the Federal Communications Commission,' they probably don't know. But if you ask them whether they get internet access to match their needs, they can probably give you a quick "yes" or "no" answer.

That should be our primary objective as policy makers looking to allocate federal resources—accounting for consumer demand, and getting the most people access to a productive level of internet service. People in the most remote parts of Oregon and other unserved parts of our country probably would tell you they'd be happy with just about any level of high-speed internet service, they just want to be connected. While we want to be sure that everyone can participate in the modern digital economy, we should also make sure that any definition of broadband is driven by what an average consumer needs, not just an arbitrary standard.

I think we all agree that there are places in our country where private investment would never go, but in order to identify those places, we must take the time to properly study where an infusion of infrastructure funding will be most effective. As we continue our discussions around broadband infrastructure, we must ensure we are prepared to offer effective solutions with the precious federal dollars that may be available, and that means starting with reliable data to identify those Americans that are most in need. Without the best data available, we will continue to leave rural areas behind. What we've unfortunately seen over the years of debate on how to deliver fast, reliable internet access to all Americans, is that the folks that need it most often get lost in the rush to dole out government funds. All we have at the end of such exercises is failed government intervention in the marketplace. If earlier efforts had been successful we wouldn't be having this conversation today.

We learned this lesson the hard way from our experience with the Rural Utilities Service and the 2009 Recovery Act. As outlined by an investigator with the non-

partisan Government Accountability Office, “we are left with a program that spent \$3 billion and we really don’t know what became of it.” This time around, we must remember what happened when policy makers didn’t take the time necessary to identify parts of the country that needed funds the most.

During the debate around the funding in 2009, I pushed for an amendment that would require mapping before funding and while my amendment was unfortunately not adopted then, I stand by this principle. If we intend to invest taxpayer dollars, we should target those resources carefully and thoughtfully. We owe nothing less to the hardworking people of this country.

Let’s do it right this time. Let’s not repeat mistakes of the past, let’s get the data, let’s use the data, and target those places that need help the most. Let’s connect rural America to new economic opportunities and increase the quality of life in these communities.

Mrs. BLACKBURN. The gentleman yields back.

Mr. Pallone, you are recognized for 5 minutes.

**OPENING STATEMENT OF HON. FRANK PALLONE, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY**

Mr. PALLONE. Thank you, Madam Chair.

Three months ago to this day, this subcommittee held a hearing on this same topic. We heard from witnesses how in these uncertain economic times deploying more secure high-speed internet means providing more opportunities for more people. Yet, here we are, 90 days later, reopening that same hearing while we still haven’t had a single hearing on important issues like net neutrality, privacy, or oversight of this administration.

And I listened, Madam Chair, to what you said as to why that wasn’t happening, but I don’t agree. Look, first of all, let me say that it is quite clear that this administration wants to get rid of both the privacy rules at the FCC as well as net neutrality.

And I have said before that on the day when we repealed the privacy rules in the Congress, I think the next day the President’s spokesperson Sean Spicer had a press conference, and he literally said, well, now we got rid of the FCC privacy rules, and we are going to get rid of net neutrality next. And then the next week the FCC started that process. So I am not going to be naive enough to assume that the FCC on a partisan vote isn’t going to get rid of net neutrality. I think that is clear. But regardless, there is no reason why we can’t have hearings on both of these issues.

Clearly, if you have a hearing, you are not necessarily deciding anything. You are basically having a discussion about the issue of net neutrality and privacy and what the FCC did and what the options would be moving forward. So I think that we should have those hearings, and, again, I will make a plea on behalf of the Democrats that we do that. And we also haven’t made progress on broadband deployment even though Democratic members of this committee have introduced a number of good bills that would help deployment.

One of our bills, called the LIFT America Act, would use a reverse auction to allocate \$40 billion on new broadband deployment across the entire country. Our proposal would not only create new opportunities for millions of Americans, it would prioritize schools, libraries, and 9-1-1 services.

Congressman Loeb sack has also introduced a commonsense bill that would direct the FCC to improve its broadband data. We

heard at the last hearing about all the problems with the FCC's data. We also heard unanimous support for Mr. Loeb'sack's proposal.

Congressman Ruiz has introduced legislation that would make sure people living in Indian country don't get left behind and aren't ignored when it comes to broadband deployment. We should follow Congressman Ruiz's example and do everything we can to help those who live on Tribal lands.

And finally, Congressman Welch and McKinley put forward a bill that would let us better compare the broadband services in rural areas to those in urban areas.

But for some reason, the Republican leadership on this committee refused to recognize any of these bills for our hearing today. In fact, this is the second week in a row in which this subcommittee is holding hearings on topics addressed by our bills with no acknowledgment of the significant benefits that these bills would bring to the American people. These democratic proposals address real problems faced by real people and will help improve our Nation's security, opportunity, and connectivity. I hope the Republicans will eventually recognize the importance of these bills and will begin to work with us in moving them forward.

And with that, I would yield the remainder of my time to Congressman Loeb'sack.

Mr. LOEB'SACK. Thank you, Mr. Pallone.

As has been mentioned already, 3 months ago when our committee had its last hearing on broadband development, we heard broad agreement that the FCC's data needed improvement. We heard members on both sides of the aisle comment on how these bad data shortchanged rural America. We can all agree on that in this committee. And that is why I did introduce H.R. 1546, the Rural Wireless Act. This bill directs the FCC to improve its data collection that feeds its broadband coverage map.

During our previous hearing, I was encouraged that even the Republican witnesses strongly supported my bill. They testified that my bill is necessary to give residents of rural areas a chance, and I am looking forward to hearing what some of you folks have to say about that bill as well.

And, folks, that is because in Iowa and many rural communities, and we can agree on this, I think, on a bipartisan basis, broadband means jobs. But in Iowa, access to broadband is even more than that; it is a manner of survival, literally survival.

If rural communities in Iowa cannot get access to broadband, they simply cannot survive. And as I have said many times before, in order to make that happen, we need both dollars and good data. And as heartened as I was at the last hearing, I am disappointed at where we are today.

Despite the strong expert support for my bill, this committee hasn't made any progress legislatively. This hearing is supposed to be about improving broadband data and mapping, but in 3 months since the last hearing, I have been disappointed at the lack of cooperation that we have seen within this committee.

And I am not normally one, publicly to go out and complain about such things. I try to do what I can to cooperate with the

other side and vice versa, but it is at a point now where we have really got to work together because this is that important.

And I thank you very much, Mr. Pallone, for the time. And I yield back.

Mrs. BLACKBURN. The gentleman yields back.

Anyone else seeking time?

No one else is seeking time. This concludes our opening statements. I will remind all members that pursuant to our committee rules you may enter that as a part of the record and put that opening statement in the record.

We do thank our witnesses for being here today and taking the time to testify before the subcommittee. Each of you will have the opportunity to give an opening statement. We will follow it with a round of questions from members.

Our witness panel for today's hearing includes Mr. Doug Brake, who is the senior Telecommunications Policy Analyst at the Information Technology and Innovation Foundation; Mr. Brent Legg, who is the Vice President of Government Affairs at Connected Nation; Dr. Robert Wack, who is the President of Westminster City Council in Westminster, Maryland; Ms. Carol Matthey, who is Principal at Matthey Consulting, LLC; and Mr. Bryan Darr, a good Tennessean, who is President and CEO of Mosaik.

Mr. Brake, we would begin with you. You are recognized for 5 minutes.

**STATEMENTS OF DOUG BRAKE, SENIOR ANALYST, TELECOM POLICY, INFORMATION TECHNOLOGY AND INNOVATION FOUNDATION; J. BRENT LEGG, VICE PRESIDENT OF GOVERNMENT AFFAIRS, CONNECTED NATION; DR. ROBERT WACK, PRESIDENT, WESTMINSTER CITY COUNCIL, WESTMINSTER, MARYLAND; CAROL MATTHEY, PRINCIPAL, MATTHEY CONSULTING, LLC; AND BRYAN DARR, PRESIDENT AND CEO, MOSAIK**

#### **STATEMENT OF DOUG BRAKE**

Mr. BRAKE. Thank you very much, Chairman Blackburn and Ranking Member Doyle and members of the subcommittee for the opportunity to testify before you today and share the views of the Information Technology and Innovation Foundation, or ITIF, on defining and mapping broadband in the United States. ITIF is a non-partisan think tank whose mission is to formulate and promote public policies to advance technological innovation and productivity growth, with broadband policy a core concern.

We all understand and respect the importance of broadband access. Broadband is necessary to participate in the 21st century economy. It underpins social opportunity, economic growth, and national competitiveness. Expanding the geographic footprint of the Nation's digital infrastructure should be a significant part of any infrastructure package.

Thankfully, the existing private investment framework for broadband has seen tremendous achievement attracting capital expenditures that make U.S. networks an international success story. The light touch oversight of increasingly competitive broadband has worked incredibly well, overseeing dramatic increases in net-

work coverage and capacity and supporting a flourishing U.S. digital ecosystem.

Generally speaking, innovation and investment are best encouraged when infrastructure deployment can be led by the private sector, especially in dynamic markets like broadband. However, in rural or otherwise high-cost areas, it is often impossible to achieve adequate return to see private companies invest.

A common metric for assessing the viability of a network build is the number of homes passed per mile of fiber. In rural areas, you can see that metric invert, where you are measuring miles of fiber per home passed, which begins to capture the economic challenge of covering rural America.

Considering the tremendous benefits of broadband, more can and should be done to ensure that virtually all U.S. residents have access to robust services. In addition to existing support through the Universal Service Fund, a potential infrastructure package offers a unique opportunity to considerably accelerate the deployment of both fixed and mobile networks.

But providing the funds to support more universal broadband is expensive, and public dollars should be targeted where they are most effective: In achieving our policy goals. Priorities should be given first to connecting the unconnected, the truly unserved, until costs grow untenable. Only after that task is completed should subsidies support increasing speeds in already served areas, aiming for cost-effective upgrades, not necessarily future proofing.

There is a misperception that the economic benefits of broadband require significantly higher speed networks. Contrary to those who insist that gigabit fiber networks are a national imperative, study after study repeatedly show that the economic benefits of broadband investment are greatest when adding additional users, even if at lower speeds. Additional download speed sees a clear and large diminishing marginal utility, and lawmakers should avoid tunnel vision on achieving ever higher speeds. Instead, as a general matter, we should allow our understanding of broadband to evolve with networks themselves over time.

When attempting to achieve cost-effective support policymakers are essentially faced with a price and quantity problem: How much coverage at what speed can be achieved at what price? Answering those questions, deciding where Federal support is most justified, and achieving the biggest return on necessarily limited investment requires well-defined policy goals, mapping of existing deployment, and modeling a projected cost, all of which the FCC has experience with.

The FCC's Form 477 data collection process should be the starting point for understanding existing broadband deployments. The institutional knowledge and expertise at the FCC should be relied upon rather than standing up an expensive one-off mapping program. However, the Form 477 collection or the related challenge process may have to be refined for particular purposes. We will always be able to imagine more perfect data. For example, the granularity of Form 477 data is a parental concern.

However—and this is an important point—while more information is generally better than less, if infrastructure funding is dis-

tributed through a market-based approach, such as reverse auctions, the need for highly detailed maps is greatly reduced.

To summarize, broadband support in an infrastructure package should go to where it is most effective, focusing first on the truly unserved before aiming to support reasonable speed increases by one provider in a legitimately unserved area through an auction mechanism. We must attempt to understand how much coverage at what speed can be achieved for what price, but highly granular maps are less necessary at the more bottom-up your approach is.

The FCC is experienced in both defining and mapping broadband. Form 477 data collection process as well as the streamline challenge process generally work well, and the FCC should be trusted to implement a broadband component of an infrastructure package.

Thank you very much for the opportunity to testify, and I look forward to your questions.

[The statement of Mr. Brake follows:]





**Testimony of  
Doug Brake  
Senior Analyst, Telecom Policy  
Information Technology and Innovation Foundation**

**Before the  
House Committee on Energy and Commerce Subcommittee  
on Communications and Technology**

**Hearing on  
“Defining and Mapping Broadband Coverage in America”**

June 21, 2017

2123 Rayburn House Office Building

Washington, DC

Chairman Blackburn, Ranking Member Doyle, and members of the Subcommittee, thank you for the opportunity to testify before you today and share the views of the Information Technology and Innovation Foundation (ITIF) on defining and mapping broadband in the United States. ITIF is a non-partisan think tank whose mission is to formulate and promote public policies to advance technological innovation and productivity internationally, in Washington, and in the states. Recognizing the vital role of technology in ensuring prosperity, ITIF focuses on innovation, productivity, and digital economy issues, with broadband policy a core concern.

#### **DEFINING AND MAPPING BROADBAND IS IMPORTANT**

Broadband access is necessary to participate in the 21st-century economy; it accelerates social opportunity and economic growth. Accelerated deployment of advanced broadband infrastructure understandably sees bipartisan appeal, and expanding the geographic footprint of the nation's digital infrastructure should be a significant part of any infrastructure plan.<sup>1</sup> Investment in broadband, as well as other smart infrastructures, will result in considerably greater economic returns to the national economy than simply throwing money at concrete.<sup>2</sup>

Thankfully, the existing private-investment framework for broadband has seen tremendous achievement, attracting capital expenditures that make U.S. broadband an international success story.<sup>3</sup> While users will probably always want more, faster, and cheaper access, the light-touch oversight of increasingly competitive broadband has worked incredibly well, overseeing dramatic increases in network coverage and capacity supporting a flourishing U.S. digital ecosystem.<sup>4</sup> The nation's networks and the services they enable are key tools in advancing U.S. competitiveness and productivity—getting these policies right matters.

Despite this success, more can and should be done to ensure that virtually all U.S. residents have access to robust broadband services. But providing the infrastructure to support universal broadband is expensive, and public dollars should be targeted where they will be most cost-effective in achieving our policy goals. Deciding where federal support is justified, and achieving the biggest return on necessarily limited investment requires a firm grasp on what those policy goals should be, as well as the geographic state of existing broadband offerings. While more information is generally better than less, if infrastructure funding is provided through a market-based approach, for example through procurement or reverse auctions, the need for highly detailed maps is greatly reduced.

#### **Additional Efforts to Achieve Universal Broadband are Justified**

One of the core questions regarding any infrastructure system or project is the appropriate mix of public and private involvement. Some projects are designed, built, owned, and managed by government, others by the private sector. Most involve a mix. While it is not possible to say a priori which is better—public or private ownership—all else being equal, private-sector ownership and operation brings several advantages, including a greater incentive for efficiency and innovation.<sup>5</sup>

Public ownership or operation of infrastructure makes the most sense for true public goods: resources that are both non-excludable (meaning it's difficult to prevent access to those who have not paid) and non-rivalrous (meaning consumption by one doesn't prevent simultaneous use by another). Broadband falls into neither of these categories.

However, if we continue under the high-level principle that innovation and investment are best supported when infrastructure deployment is led by the private sector where it is possible to earn an adequate return on investment, there are circumstances other than public goods where the government should intervene: put simply, where it is impossible to achieve an adequate return because costs are too high compared to revenues. This is extremely relevant in the broadband context, especially in high-cost (often rural) areas where the cost-per-home passed is significantly higher than in more-densely populated urban areas and where revenues from customers simply cannot recoup those costs.

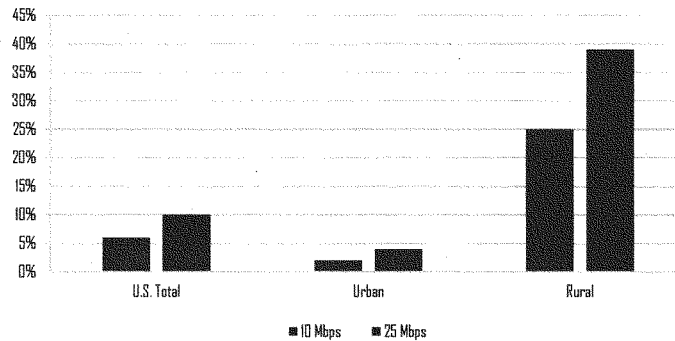
Government support for more universal broadband service is further justified, because of the tremendous benefits that reverberate throughout the economy and society at large. These spillover network effects—what economists call positive externalities—allow for a more productive and flourishing nation, and are not fully captured by the prices providers can charge for the service. While no technology is an unequivocal good, broadband, and the enhanced productivity, education, communication, and entertainment it provides, deserves government support.

Policymakers would be wise to continue to rely on a light-touch approach to seeing Internet infrastructure continue to evolve to meet shifting consumer demands, but step in where private provision is uneconomical. In addition to existing support through the Universal Service Fund, a potential infrastructure package offers a unique opportunity to considerably accelerate the deployment of both fixed and mobile networks that should be seized.

#### **Scarce Infrastructure Resources Should be Used Effectively**

Policymakers should work toward achieving universal usage of broadband—note this is both a demand and supply issue, and digital literacy and broadband adoption deserve more focus than they currently receive. Truly universal usage will allow society to organize itself with the assumption that the entire population has access to digital services. There are numerous policy challenges still confronting this transition, but availability of infrastructure remains one, especially in rural, high-cost areas.

Only about 6 percent of Americans lack access to fixed terrestrial broadband at 10 Mbps, but when looking at higher speeds or only looking at rural areas, its apparent more can be done.

Figure 1: Americans Without Access to Fixed Terrestrial Broadband by Download Speed<sup>6</sup>

Support is justified for high-cost areas, and should be made for both fixed as well as mobile broadband. This supplemental public investment should be directed to where it will be most effective. When faced with the question of where to direct federal support dollars, policymakers have three high-level options:

1. Give access to those who have none—connect the truly unserved.
2. Increase speeds of existing networks.
3. Support an additional competitor, giving consumers more choice.

Priority should be given in that order, focusing first on the truly unserved, until the incremental cost of connecting each additional premise becomes untenable. Only after that task is completed should infrastructure support should aim to increase speeds of existing networks—aiming for cost effective upgrades, not necessarily “future-proofing.”

The third option should generally be off the table. Government should not be in the business of actively funding additional competitors where the economics do not support further fragmentation of the market. This does not mean that governments should not enable new overbuilders to enter new markets; they should not, however, subsidize those competitors. Much work remains to be done to simply enable additional investment, by new entrants and incumbents alike, and the current FCC is examining some potential policy levers.

There is a misperception that the economic benefits of broadband require significantly higher speed networks. Contrary to those who insist that gigabit fiber networks are a national imperative, study after study repeatedly show that the economic benefits of broadband are greatest when adding additional users even if at lower speeds, not upgrading networks to supposedly “future-proofed” technologies.<sup>7</sup> There is a clear and extremely large diminishing marginal utility to additional network speed.<sup>8</sup>

If policymakers want to have the largest impact when subsidizing infrastructure investment, the research is clear: Focus first on those populations without any connection at all, rather than improving speeds. For example, a study in preparation for an infrastructure-subsidy program in the United Kingdom examined the relative effectiveness of each euro of subsidy. The study estimated a consumer surplus of €2.25 for each euro invested to achieve 100 percent coverage of 15 Mbps—a significant gain beyond what the market would otherwise bear for each subsidy dollar.<sup>9</sup> This €2.25 was compared with a €0.72 surplus per euro spent for 50 Mbps to 92 percent of the country, and a €0.34 surplus per euro spent for speeds over 50 Mbps for 64 percent coverage.<sup>10</sup>

These economic trade-offs are complicated, depending on variables such as the marginal externality to faster speeds, geographic cost structures, and existing infrastructure. But a focus on broadening coverage to truly unserved populations is clearly the most cost-effective improvement.

However, when attempting to bring coverage to the unconnected, costs quickly spiral out of control when looking at the last few percent. Using the FCC's cost models, Paul de Sa, former chief of the FCC's Office of Strategic Planning and Policy Analysis, analyzed the cost of achieving coverage of 98 percent of locations with "future-proof" networks—which he defines as cable or fiber.<sup>11</sup> He says this goal, which would be an increase of four percentage points, can be achieved for about \$40 billion.<sup>12</sup> Achieving the last two percent—going from 98 percent to 100 percent—would double the cost.<sup>13</sup>

While it's not clear de Sa's goal, especially in specifying particular technology, is the right approach, the cost analysis is relevant—the last few percent of highest cost regions and areas are unrealistic to serve with wired network technology, and should reasonably be expected to rely on satellite, fixed wireless, or other broadband systems.

Policymakers are essentially faced with a price and quantity problem—how much coverage can be achieved for what price. Here, defining the goals you hope to achieve, mapping existing deployments, and modelling projected costs are worthwhile endeavors—all of which the FCC has experience with.

#### **A BROADBAND DEFINITION SHOULD BE PRAGMATIC, BUT REFLECT REALITY**

As a technical matter, broadband refers to a communications network that uses wider channels of frequencies, as contrasted with narrowband communications. As a policy matter, it is a bit more complicated: What you consider to be broadband can have profound implications in the policy space. For the purposes of good policymaking, we do not need to agree on a universal definition of broadband, with all its characteristics enumerated. Instead, we should seek a holistic understanding of broadband performance, and recognize different elements shift in importance in different policy contexts and over time. Generally, the FCC does this well, with a few notable exceptions.

There are several different characteristics that shape a user's experience of broadband. The predominant measure of broadband offerings has been download speed, measured in megabits per second (Mbps), but other aspects of broadband can be important in the types of applications one can expect to support, or the policy objectives one hopes to achieve. For example, consider

the requirements for a broadband service to participate in the Connect America Fund. In addition to broadband speed (10 Mbps down and 1 up), the commission also considers the time delay for a response over the network, or “latency,” the usage allowance policies of an offering, as well as the pricing. Most of these would not be considered in a dictionary definition of broadband, but can be of relevance to policy decisions. Other technical considerations affect the quality of a user’s experience, or what sort of higher-order systems a network can reliably support.<sup>14</sup>

The focus on download speed historically made sense, as it was a significant limitation on the usability of the Internet, but this may not always be the case going forward. The growth in demand for broadband speeds has largely been tied to growing demand for video streaming services. We are reaching the point where mass-market consumer broadband offerings can support video resolution approaching the maximum perceptible by the human eye, and, as a general trend, device screens are getting smaller, not larger. While there are certainly technologies on the horizon that could use significant amounts of bandwidth, such as ultra-high definition 360 degree video, there is no reason to think that demand for download speed will continue upwards indefinitely.

Lawmakers should avoid locking in particular aspects of broadband, and instead allow definitions of broadband as well as networks themselves to evolve over time. As a general matter, the FCC tends to take a holistic, pragmatic approach to defining broadband. This flexible approach is generally the right track, even if at times the commission has strayed into unhelpful, untenable definitions.

**The FCC Generally Takes the Right Approach in Defining Broadband, with Some Notable Exceptions**

There are a few important areas where the FCC “defines” a broadband service for different purposes, most notably for its Broadband Progress Report, and for the purposes of distributing Connect America Fund subsidies.

What is considered to be broadband can have profound implications in the policy space. Definitions of broadband in law or regulation should be grounded in what is actually offered, not a prospective or aspirational goal, and should avoid getting too far ahead of trends, or risk unduly shaping the services offered.

Take for instance, the recent decision, as a component of the FCC’s 2015 Broadband Progress Report, to adjust their definition of “advanced telecommunications capability” upwards from 4 to 25 Mbps download, causing headlines to declare “The FCC Has Changed the Definition of Broadband.”<sup>15</sup> This decision was rightly controversial, as the 25 Mbps threshold seemed carefully chosen to paint a particular picture of industry, defining away competition and supporting a finding of slow progress to trigger the commission’s authority to regulate broadband providers under its recently expanded section 706 jurisdiction.

It is important to have reasonably ambitious broadband goals as a country, and there is certainly progress still to be made, especially in rural areas. But bringing even 25 Mbps wired broadband connections, let alone those measured in gigabits, to every corner of rural America will be considerably more expensive than bringing 10 Mbps service. Assuming funding is limited, this

means that if policymakers choose 25 Mbps service they will inevitably connect fewer households. The goal should be to deploy appropriate technologies at a reasonable subsidy level. Other countries recognize this fact: A competitive telecom industry is not going to provide ultra-high-speed broadband to where it is wildly uneconomical to do so. But telecom regulators in other countries typically take an objective analysis of the economics and look to where targeted subsidies make sense. In the recent “Broadband Progress” reports under former Chairman Wheeler, the commission focused instead on the lack of overbuilders in what are largely uneconomic areas.

#### **WE SHOULD CONTINUE TO MAP BROADBAND ACCESS**

The FCC collects broadband availability data, predominantly through its Form 477 information gathering process, to inform its policy analysis, create maps of coverage, and issue reports on the state of U.S. broadband. The FCC makes its data available, as well as various pre-made maps of coverage, availability, etc.<sup>16</sup> The FCC also summarizes this data in reports, most notably the Broadband Progress Report discussed above.

Some high-level data points are useful to get a sense of the remaining access challenge. According to the FCC’s 2016 Broadband Progress Report, there are approximately 34 million U.S. citizens (10 percent) without home access to a fixed terrestrial service of at least 25 Mbps down and 3 Mbps up as of December 2014.<sup>17</sup> Note, this is down from approximately 55 million (17 percent of the population) just a year before that.<sup>18</sup> As then Chairman Wheeler put it, “That’s a nearly 40 percent reduction in the number of unserved Americans in only one year.”<sup>19</sup> What is more, only 6 percent of Americans lack access to fixed terrestrial service at 10 Mbps, and 5 percent lack access to such services at 4 Mbps.<sup>20</sup>

While high-level numbers indicate continued progress, pockets of America remain unserved. It is important we continue to understand where broadband is available. However, if policymaker’s adopt a more market-based tool to allocate broadband infrastructure support, such as through procurement auctions, broadband availability maps need not be as detailed.

#### **Detailed, Expensive Mapping is Unnecessary, Especially if Grants are Allocated by Auction**

One of the more prominent attempts to map broadband access in the United States—the National Broadband Map—was led by the National Telecommunications and Information Administration and authorized by the American Recovery and Reinvestment Act.

The grants to various broadband grants made under the NTIA administered Broadband Technology Opportunities Program were subject to some criticism. Most notably, the grants were issued first, and then after the money was out the door, the NTIA followed up with an extensive broadband mapping initiative. It may have been better had these two projects been reversed. This criticism is partly justified, but it is important to remember these grants were made in effort to spur an economic recovery—time was of the essence, and the perfect the enemy of the good. Absolutely, it would be ideal to have up-to-date, highly granular maps when deciding where and how to support infrastructure projects. But these maps are expensive and difficult to produce (the National Broadband Map, which is now several years dated, was authorized to spend up to \$350 million).

However, for the purposes of allocating grants for broadband infrastructure, the less technocratic, top-down the approach, the less detailed mapping you need. Here the competitive auction process within the Connect America Fund shows the way toward a better way to allocate broadband infrastructure subsidies. Again, policymakers are faced with an information challenge of discovering how much coverage can be achieved for what price. In allocating scarce subsidy dollars, pushing some of that discovery into an auction process could considerably reduce the need for highly-detailed, expensive broadband mapping.

#### **Again, FCC Mapping is Generally on the Right Track**

The FCC has taken up the task of mapping broadband availability, picking up where NTIA's National Broadband Map left off. The FCC has transitioned away from data gathered as a part of NTIA's State Broadband Initiative (SBI), and now relies on data gathered primarily through Form 477. Form 477, which was established in 2000, has been revised and modernized several times over the years, generally to improve granularity and expand the data points collected.<sup>21</sup>

There will always be flaws and challenges with mapping data. The appropriate level of granularity can be hard to achieve (a constant point of criticism), and relying on data collected twice a year means we will always be somewhat behind the curve. Mapping wireless coverage is especially challenging. The FCC now relies on "shapefiles" filed by providers—these are complicated geospatial models of provider's coverage that rely on a variety of inputs. While challenging, the FCC is generally on the right track with its data collection, and can continue to refine its practice over time.

Furthermore, measurements of actual broadband performance can also supplement FCC data. Numerous online "speedtests" of varying methodological soundness are available, although it can be especially challenging to measure super-high speed broadband.<sup>22</sup> Such tests, as well as drive tests in the mobile context, and other forms of private-sector data can supplement or double check FCC data.

#### **CONCLUSION**

Thank you again for this opportunity to appear before you today.

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most important changes that occurs when gigabit broadband services are adopted is that the wired access links from users' homes to their access provider is far less likely to be the performance bottleneck").

Mrs. BLACKBURN. We thank you.

And before I yield to you, Mr. Legg, I just want to make everyone aware that the moving and shaking that you are hearing is not something adverse. It is construction that is taking place in the garage of this building. So we are going to hold to that.

Mr. Legg, you are recognized for 5 minutes.

#### **STATEMENT OF J. BRENT LEGG**

Mr. LEGG. Chairman Blackburn, Ranking Member Doyle, and members of the subcommittee, thank you for inviting me to share our insights in this important proceeding this morning.

My name is Brent Legg, and I am Vice President of Government Affairs for Connected Nation, a national nonprofit organization with a 16 year history of improving lives and strengthening communities through increased access to and adoption of broadband technologies.

Headquartered in Bowling Green, Kentucky, Connected Nation's work has impacted more than 30 states, and we served as the Nation's single largest grantee under NTIA's State Broadband Initiative Grant Program. Under SBI, we managed broadband mapping projects across 12 states and one territory, representing 42 percent of the U.S. land mass. And our techniques have widely been recognized as best practices by NTIA, the FCC, and others.

Today we look forward to discussing lessons learned from the SBI program and the current Form 477 process. Our intent is not to be critical but rather to foster an understanding of how we believe the process could be improved for the future.

The SBI program created by Congress in 2008 enabled states to establish broadband mapping programs and submit data to NTIA twice a year, starting in 2010 through 2014. This data was used to create the first National Broadband Map, which unfortunately has not been updated since the program ended.

In 12 states and Puerto Rico, we collected, analyzed, and mapped broadband data while also collecting feedback from the public on where revisions to the map should be made. We averaged provider participation rates of 95 percent, despite the fact that the program was largely voluntary because of the emphasis we placed on provider relationship building and our willingness to accept raw information in whatever format it was available, assisting providers that needed help.

We established relationships with more than 1,200 providers with NDAs in place with many of them to ensure protection of their proprietary information. While our mapping efforts were highly successful, the SBI program as a whole faced a number of challenges. Since every state had its own mapping agent, multiple methodologies were employed in collecting and analyzing provider information and mapping the results. This meant that providers, many of whom operate in more than one State, had to juggle not only multiple points of contact and data requests, but they had to report their information in varying ways to satisfy those requests.

Additionally, known best practices were not required to be adopted across all states. As the SBI program transitioned to the Form 477 filing process in October of 2014, we began mapping and refin-

ing this data for states that had chosen to continue their own mapping programs.

Unfortunately, a number of challenges remain. First, Form 477 requires providers to report census blocks where they provide service. Unfortunately, if one household in a given block is served, the entire block is considered as having service, resulting in a significant overstatement of availability. This is particularly problematic in rural areas where census blocks can be very large, some being larger than the entire State of Connecticut. Yet, these are the areas where broadband availability is most lacking and needs to be most accurately defined.

Secondly, many smaller providers lack the technical capability to visualize their Form 477 filings, often resulting in misreported data.

Thirdly, some known providers are simply missing from the 477 data, meaning that they are not even filing as required.

And fourthly, wireless coverage under Form 477 is reported by census block rather than from propagation modeling based on tower locations and signal penetration often resulting in significant overstatements of service.

With these lessons learned in mind, we would like to make a few recommendations for the future. First, Congress must prioritize the accuracy and granularity of the maps to ensure that coverage is fully understood at the street address or parcel level of detail. Census block data is not sufficiently granular to close the Nation's broadband gaps.

Second, such a level of granularity requires the protection of providers' proprietor and confidential information. The good news is that the public disclosure of that information isn't necessary to serve the public interest. Instead, it can be protected and analyzed by a neutral agent to derive broadband footprints and speed capabilities without revealing the more sensitive characteristics of any given network. We have proven that a neutral third-party aggregator of infrastructure data can both hold that information tightly and produce accurate and granular coverage from it.

As Congress considers incentivizing broadband deployment, we believe that it should establish a single independent third-party clearinghouse for broadband data collection and mapping that is accountable to Congress and the public, serve all 56 state and territorial jurisdictions, and having responsibility for carrying out four primary tasks: First, broadband data collection and analysis, working with the provider community through a rigorous nondisclosure agreement framework; secondly, GIS mapping of broadband availability and speeds produced from infrastructure and subscriber data submitted to the providers; third, field validation and audits of the maps once they are produced; and fourth, processing feedback submitted by consumers to ensure that continual refinement of the maps take place.

We hope that Congress will consider this independent clearinghouse as a path forward to informed decisionmaking on Federal investments, ensure accountability for those dollars as they are spent, and protect sensitive provider data all at the same time.

We look forward to answering your questions. Thank you, Madam Chairman.

[The prepared statement of Mr. Legg follows:]



**Testimony of J. Brent Legg**

**Vice President of Government Affairs  
Connected Nation**

**Before the**

**U.S. House of Representatives  
Committee on Energy and Commerce  
Subcommittee on Communications and Technology**

***Defining and Mapping Broadband Coverage in America***

**June 21, 2017**

### Summary of Key Points

- As the single largest grantee under the SBI program, Connected Nation (CN) managed broadband mapping and planning projects across 12 states and 1 territory (spanning 42% of the U.S. landmass).
- Accurate and granular broadband mapping is one of the most critical tools in developing sound broadband policy to close the digital divide.
- While our mapping efforts have been highly successful, the SBI program as a whole faced a number of challenges, and the current Form 477 data collection process is deficient in at least five significant ways.
- We believe any future broadband mapping effort must prioritize the accuracy and granularity of broadband maps at the street address or parcel level of detail, but must also prioritize the protection of providers' proprietary and confidential information than may be used to derive more granular coverage footprints.
- A viable and effective path forward would be for Congress to establish a single, independent, third party clearinghouse for broadband data collection and mapping. This clearinghouse would have responsibility for carrying out four (4) primary tasks:

- 1) **Broadband data collection and analysis**, working with the provider community through a rigorous non-disclosure agreement framework;
- 2) **GIS mapping of broadband availability and speeds**, produced from infrastructure and subscriber data submitted by the providers;
- 3) **Field validation and audits** of the maps once they are produced; and
- 4) **Processing feedback submitted by consumers** to ensure continual refinement of the maps.

## Introduction

Chairman Blackburn, Ranking Member Doyle, and members of the Subcommittee, thank you for inviting me to share Connected Nation's insights in this important proceeding this morning. My name is Brent Legg and I serve as Vice President of Government Affairs for Connected Nation, a national non-profit organization with a 16-year history of measurably improving lives and strengthening communities through increased access to, and adoption of, broadband and related technologies.

Headquartered in Bowling Green, Kentucky, Connected Nation's work has impacted more than 30 states, and we served as the nation's single largest grantee under NTIA's State Broadband Initiative (SBI) grant program. Under SBI, we managed broadband mapping and planning projects across 12 states and 1 territory, representing 42% of the U.S. landmass, and our mapping and data validation techniques have been widely recognized as "best practices" by NTIA, the FCC, and others. Connected Nation also has a long history working at the grassroots level in more than 600 communities through initiatives like our Connected<sup>sm</sup> Community Engagement Program, in which we help local leaders build comprehensive technology action plans for their communities.<sup>1</sup>

Our work on the ground in these communities has helped us develop an intimate understanding of the impact that broadband has on rural and urban areas alike, and there can be no doubt that accurate and granular broadband mapping is one of the most critical tools in developing sound broadband policy to close the digital divide.

Reliable broadband mapping is a matter of critical importance to residents, businesses, and community anchor institutions in areas where robust broadband is lacking, as any good map should give voice to those who find themselves on the other side of the

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<sup>1</sup> <http://www.connectednation.org/get-connected>

digital divide by prioritizing the closing of those gaps. Connected Nation believes strongly in the importance of accurate and granular broadband data collection and mapping for three reasons:

- 1) To inform better decision-making on where public resources should be invested to support broadband buildout,
- 2) To avoid potential overbuild situations where service may already be available at a comparable speed and cost, and
- 3) To ensure accountability for the ratepayer and taxpayer dollars once public investments have been made.

Today, we look forward to discussing the successes and lessons learned from the SBI Program, as well as the current Form 477 data collection process administered by the FCC. Our intent is not to be critical, but rather to foster an understanding of how we believe the process could be improved for the future, and that is where I'll focus the majority of my remarks today.

#### **Lessons Learned from the SBI Mapping Program and the Form 477 Process**

The SBI Program, which was created by the Broadband Data Improvement Act of 2008, gave states the opportunity to, among other things, establish a broadband mapping program and submit broadband data to NTIA twice a year from 2010 through 2014. This data was used to create the nation's first comprehensive national broadband map in 2011, which unfortunately has not been updated since the program ended in 2014.<sup>2</sup> Connected Nation was selected by 12 states and 1 territory to collect, process, analyze, and map

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<sup>2</sup> <https://www.broadbandmap.gov/>



broadband data, while also collecting feedback from the public on where revisions should be made.<sup>3</sup>

Throughout the SBI Program, Connected Nation averaged provider participation rates of 95% across our states, despite the fact that this program was largely voluntary. This was primarily due to the emphasis we placed on provider relationship-building, as well as our willingness to accept information in whatever format it was available and to assist providers who needed help. By 2014, we had established data-sharing relationships with more than 1,200 unique broadband service providers of all sizes, with non-disclosure agreements in place with many of them to ensure protection of their proprietary and confidential information.

While our mapping efforts were highly successful, the SBI program as a whole faced a number of challenges. Since every state had its own mapping agency or third-party partner, this meant that multiple methodologies were employed in collecting provider information, analyzing the data, and mapping the results. This also meant that providers, many of whom operate in more than one state, had to juggle not only multiple points of contact and data requests, but they had to report their information in varying ways to satisfy those requests.

Additionally, known best practices, such as those we developed to represent mobile and fixed wireless coverage propagation, were not required to be adopted across all states. For example, fixed wireless coverage in some states continued to be represented as full circles or drastic polygons that did not reflect the true coverage on the ground. Unfortunately, some of these inaccuracies persist even today in the Form 477 data being submitted to the FCC.

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<sup>3</sup>Alaska, Florida, Illinois, Iowa, Kansas, Michigan, Minnesota, Nevada, Ohio, Puerto Rico, South Carolina, Tennessee, and Texas

As the SBI program transitioned to the Form 477 filing process in October 2014, we began mapping and refining this data for state partners that have chosen to continue their mapping programs. Unfortunately, a number of challenges remain:

- 1) Form 477 requires providers to report census blocks where they provide service. Unfortunately, if even one household in a given block is served, the entire block is considered as having service, resulting in a significant overstatement of availability. This is particularly problematic in rural areas where census blocks can be very large—some being larger than the entire state of Connecticut. Yet these are the areas where broadband availability is most lacking and needs to be most accurately defined;
- 2) Since some providers rely on third-party vendors to compile Form 477 data and the filings are primarily in .csv (comma-separated values) format, providers that do not have GIS (geographic information system) capabilities have no way of visualizing their service territories to ensure accuracy, resulting in overstated or understated reporting;
- 3) Some known providers from the SBI years are simply missing from the Form 477 dataset, meaning that they are likely not filing as required;
- 4) Wireless coverage during the SBI years (when properly mapped) was developed from propagation modeling based on tower locations and signal penetration. Under Form 477, however, wireless coverage is reported by census block as any other type of service, indicating areas as served where there may actually be no service for miles.
- 5) Missing data and inaccurate filings also may have the effect of understating service capabilities, putting the providers themselves at risk for overbuild, since

Form 477 data is now used to direct federal subsidies toward areas lacking robust broadband.

### **A Path Forward**

Taking into consideration these lessons learned, Connected Nation would like to offer a few observations and recommendations regarding future of broadband mapping. First, any future mapping effort must prioritize the accuracy and granularity of the maps themselves to ensure that the nation's broadband landscape is fully understood at the street address or parcel level of detail. Census block data is not sufficiently granular as we look to solve the broadband gap in rural and other insular areas of the United States.

Second, that level of granularity requires the protection of providers' proprietary and confidential information. Such protection is needed to safeguard critical infrastructure from vandalism, sabotage, or worse, and to preserve the confidentiality of competitively sensitive infrastructure and subscriber information, which should remain closely held.

Third, any future mapping effort must be premised on a uniform reporting mechanism to eliminate inconsistencies in state-by-state reporting. That uniformity in reporting will provide decision-makers the high level of confidence needed to target federal funding to broadband deployment projects.

As Congress considers funding and other incentives to promote broadband deployment, we believe it should also consider establishing a single, independent, third party clearinghouse for broadband data collection and mapping that is accountable to Congress, the FCC, the public, and the provider community, and it should cover all 50 states, the 5 inhabited U.S. territories, and the District of Columbia. This clearinghouse would have responsibility for carrying out four (4) primary tasks:

- 1) **Broadband data collection and analysis**, working with the provider community through a rigorous non-disclosure agreement framework;
- 2) **GIS mapping of broadband availability and speeds**, produced from infrastructure and subscriber data submitted by the providers;
- 3) **Field validation and audits** of the maps once they are produced; and
- 4) **Processing feedback submitted by consumers** to ensure continual refinement of the maps.

To be clear, Connected Nation believes that broadband service providers have a reasonable expectation that their proprietary and competitively sensitive infrastructure and subscriber data should be protected from disclosure. The good news is that the public disclosure of such information isn't necessary to serve the public interest. Instead, that information could be protected and analyzed by a single non-government clearinghouse entity to derive broadband coverage and speed capabilities without revealing the more sensitive characteristics of any given network. Connected Nation has proven throughout its history that a neutral, third-party aggregator of infrastructure data can both hold that information tightly and produce accurate and granular coverage maps from it—maps that are much more accurate than the current Form 477 process yields.

Another important function that a clearinghouse entity should play is on-the-ground field validation of coverage in geographic areas that warrant additional scrutiny, as well as areas where federal dollars are being invested to build out new infrastructure. This should involve the deployment of network engineers to visit communities, visually inspect infrastructure assets, conduct drive-testing of wireless networks, and make coverage adjustments to the maps accordingly. The public should also play an important role in providing feedback on the map, and their feedback should be used to both engage providers

in refining coverage depictions, as well as helping to determine where field audits should take place.

We hope that Congress will consider a clearinghouse as a path forward to serve the public interest by informing federal decision-making on infrastructure investments, ensuring accountability for those dollars as they are spent, and protecting sensitive provider data all at the same time. We look forward to answering any questions that you may have. Thank you.

Mrs. BLACKBURN. The gentleman yields back.  
Sir, you are recognized.

#### STATEMENT OF ROBERT WACK

Mr. WACK. Thank you, Madam Chair. Thank you members of the committee, Congressman Doyle, for having me here today to testify about broadband infrastructure.

My name is Dr. Robert Wack, and I am the President of the Westminster City Council where we are building the Mid-Atlantic region's first community-wide gigabit fiber network. The Westminster fiber network was born out of decades of frustration waiting for our incumbent providers to upgrade their infrastructure and service levels. Although technically Westminster meets current standards for broadband service availability, the city's survey of businesses and residents revealed widespread discontent and dissatisfaction with the services available at that time.

One anecdote in particular is illustrative. A local graphic design business, a premium customer of one of the incumbents, needed to send a multi-gigabyte graphics file to a client in the Midwest for a rush job. Their business-class internet connection kept timing out because the file transfer was so slow. To get the client's files delivered before the deadline, the business had to put them on a memory stick and overnight them in a mailing envelope. This is unacceptable in the 21st century data-driven economy.

After extensive research and public input, Westminster settled on an innovative public/private partnership, or P3 model, to build the first community-wide gigabit fiber network in the Mid-Atlantic region. Successful P3 projects are at their core true partnerships where both parties achieve their goals while sharing in the risks and rewards of that partnership in ways they are comfortable with and can sustain over the life of the deal.

The city of Westminster entered our discussions with potential partners with three firmly held core principles: One, public ownership of the dark fibre network; two, a multitiered service model for the network to partition risks and responsibilities to separate operational layers; and three, a commitment to open access at the retail service level as the end state of the service environment. Each of these is important on their own but also closely interrelated.

Only with public ownership and control can current problems of red lining in the growing digital divide be comprehensively addressed and solved. A commitment to public ownership enables universal access, which in turn is a major source of public support for the resource commitment that network construction requires.

In other words, when a local government assures its citizens that all will benefit from an infrastructure project, including rural areas, public support for the necessary expenditures to implement that project become much easier to secure. That was certainly our experience in Westminster.

The multilayer service model lays the groundwork for the creation of a true open-access environment at the service level where customers can switch providers for any given service without barriers. They can try new services as they are developed and where there is better transparency on cost and quality between providers.

By lowering the barrier to entry for new providers, real competition can take place and service providers delivering better services at lower prices will be rewarded. In addition, there are no barriers to entry for new innovative services from any provider accelerating innovation and economic development. The consumer wins in all instances.

In summary, the Westminster model of public/private partnership provides a scaleable blueprint for any local government of any size to implement a community-wide broadband network in a financially sustainable manner. By dispensing with the assumption of service delivery by vertical integrated monopolies and focusing on public ownership of the infrastructure, partitioning of the network operations by layer, and a commitment to open access, any community in the country can realize the economic development potential of massive broadband.

The project positions Westminster to survive and prosper through the disruptive economic transitions created by the transformational information revolution and ensures that all our residents can participate in the economic growth and prosperity of decades to come.

Thank you very much.

[The prepared statement of Mr. Wack follows:]

Written Testimony for U.S. House Energy and Commerce Subcommittee on Communications and Technology, Hearing on Defining and Mapping Broadband coverage in America on 06/21/17

Dr. Robert Wack

President, Westminster City Council

Westminster, MD

**Summary**

- 1) Westminster MD was underserved by incumbent providers despite meeting criteria for adequate broadband coverage.
- 2) In response to overwhelming constituent dissatisfaction, the City undertook to construct a municipally owned dark fiber network.
- 3) The City uses an innovative Public Private Partnership to light the network and provide services.
- 4) The existence in Westminster of the first community wide gigabit fiber network in the mid-Atlantic region creates unique economic opportunities for the community and provides critical infrastructure for economic growth in the 21<sup>st</sup> century data economy.



The Westminster Fiber Network ( WFN) was born out of decades of frustration waiting for our incumbent providers to upgrade their infrastructure and service levels. Although technically Westminster meets current standards for broadband service availability, the City's survey of businesses and residents revealed widespread discontent and dissatisfaction with services at that time.

One anecdote in particular is illustrative. A local graphic design business, a "premium" customer of the one of the incumbents, needed to send a multi-gigabyte graphics file to a client in the Midwest for a rush job. Their business class internet connection kept timing out because the file transfer was so slow. To get the client's files delivered before the deadline, the business had to put them on a memory stick and overnight them in a mailing envelope. This is unacceptable in a 21<sup>st</sup> century data driven economy.

The WFN capitalized on the already completed Carroll County Public Network, a middle mile fiber network connecting all the schools, libraries, and government buildings across Carroll County, funded by County government. That network paid for itself within 5 years through cost avoidance from replaced leased lines across four government entities.

The BTOP broadband infrastructure grant program also enabled the construction of the WFN by creating backhaul connections between Carroll County and adjacent counties.

The existence of that public fiber infrastructure set the stage for the last mile fiber project connecting every home and business in Westminster that is now the WFN. The City conducted exhaustive research, business modeling, and public discussion exploring options, collecting data, and modelling various approaches to creating a municipal fiber network.

The City settled on an economic model, began construction of a pilot using reserve funds, released an RFP for business partners, and closed on a \$21 M construction loan from Sun Trust that will convert to a General Obligation bond.

The WFN uses an innovative public-private partnership (P3) model to build the first community wide gigabit fiber network in the Mid-Atlantic region. Given the wide array of possible P3 models to choose from, accurately describing the Westminster Model requires a deeper level of detail to fully appreciate the potential applicability to other communities around the U.S.

Public-private partnerships have a long, and by some accounts uneven, history in the world of public infrastructure. While recognizing some of the more spectacular P3 failures, it's important to note that no model is impervious to the universal human failings of incompetence and malfeasance, and that the success or failure of P3 projects is more a function of the specifics of each project, rather than anything inherent to the P3 model.

Successful P3 projects are at their core true partnerships, where both parties achieve their goals, while sharing in the risks and rewards of that partnership in ways they are comfortable with and can sustain over the life of the deal. Striking that balance requires a very clear idea on both sides of the table what the strategic goals are for both parties, and those goals will in turn drive the decision making during the crafting of terms for the P3.

For the City of Westminster, we entered our discussions with potential partners with three core principles firmly in mind: 1) public ownership of the fiber network; 2) a multitiered service model for the network to partition risks and responsibilities to separate operational layers; 3) a commitment to open access at the service level as the end state of the service environment. Each of these is important on their own, but also closely interrelated with the others.

Public ownership is the starting point. As with all business relationships, ownership equals control, and control is absolutely necessary for a community to ensure that it achieves the economic development goals of a fiber project. The unmet expectations of the 1996 Telecom Act were in part because the last mile infrastructure of the nation's telecom networks were never truly opened up to unfettered

competition. The best way to ensure open access going forward is for local government to own and control the local infrastructure.

But that's not the only reason for public ownership. As stewards of the public interest, local government has a duty to ensure that public goods, like essential infrastructure, are widely deployed, well-maintained, and open for use by all citizens. Is there any more essential infrastructure in the 21<sup>st</sup> century than the physical assets necessary for high capacity data services?

Only with public ownership and control can current problems of redlining and the growing digital divide be comprehensively addressed and solved. A commitment to public ownership enables universal access, which in turn is a major source of public support for the resource commitment that network construction requires. In other words, when a local government assures its citizens that all will benefit from an infrastructure project, public support for the necessary expenditures to implement that project become much easier to secure.

From a financial perspective, the construction, maintenance, and ownership of dark fiber are a perfect fit with the other infrastructure obligations of local government. Just as municipalities and counties are responsible for building and maintaining roads, pipelines, sidewalks, curbs, and gutters, so too should they be tasked with building the basic pipelines for 21<sup>st</sup> century data services.

But that doesn't mean local governments should all become ISPs. Some have chosen that path, in many cases quite successfully. Just as not all municipalities are well suited to operate electric utilities or water utilities, not all local governments need offer data services. However, all local governments build and maintain roads, and fiber networks are the roads of our future.

Local governments can confine their role to simply owning and maintaining what is called the Outside Plant (OSP), the inert components of the network comprised of the fiber itself, the boxes and enclosures

to make connections and house equipment, and the conduit through which the fiber travels. All other components of the system, anything that requires power or transmits data, can be delegated to the private sector partner.

This is an obvious partitioning of ownership and responsibilities within the network because of the major differences in the useful life, cost, and the different risk tolerance and expected return horizons of the partners. Public sector entities epitomize “patient capital”, able to make long term investments with no pressure to expect fast, high margin returns. Local governments routinely spend millions of dollars on infrastructure with the only expectation of return being the long term beneficial impact on the local economy and the consequent maintenance or improvement of the local assessable tax base, thereby maintaining tax revenues without rate increases.

Like most modern technology, network equipment has a useful life of between three and five years, after which it must be replaced with newer and faster equipment. In contrast, fiber has a useful life of at least 50 years, since the first fiber networks were built in the 1970's and are all still in operation. Fiber strands do not decay, corrode, rot, wear, or expire, and if left undisturbed, will continue transmitting data for decades without any maintenance or upgrades.

Compared to asphalt or concrete, fiber is the perfect asset for a local government to invest in to improve the local infrastructure for economic development, and can be financed over time frames that are comparable to other public infrastructure projects, and in ways that the private sector cannot contemplate. Unlike concrete and asphalt projects, a properly configured P3 can provide the revenue stream necessary to support the financing of a fiber project without unduly burdening the other capital project obligations of the local government. Fiber infrastructure can be self-supporting.

By taking responsibility for the OSP, the public sector also improves the economics of any given network project. Approximately two thirds of the capital expense of building a network resides in the OSP. The

rest of the capital expense is for networking equipment and software. In contrast, the operating expenses for the OSP are minimal, as opposed to the significant overhead of staffing network operations and the provision of services.

By removing the capital expense of OSP construction from the ROI equation of the private partner, the economics of a broadband project are radically transformed, enabling a private partner to contemplate services in markets they otherwise would never consider. With the right partner, the local government need not embark on the expensive and much riskier enterprise of staffing and operating a network to provide services.

The partitioning of the OSP to the public partner also opens the door to further segmentation of roles within network operations. To see how this is possible, and why it is important for network services going forward, it's important to describe the history of telecommunications technology and how it informs existing telecom business models.

In the early years of telecommunications networks, the infrastructure consisted of copper wires that carried one channel of data (an analog sound signal), and the configuration of the connection between any two points on the network required the actuation of mechanical switches to create a temporary physical circuit. At first, that mechanical switch was a human operator who physically pulled plugs and replaced them to create the circuit, a function which eventually was automated. To ensure maximum control of the customer service relationship, the service provider had to own and control every last bit of infrastructure down to the telephone at end of the circuit.

As automation gradually replaced each component, and as software and IP technologies gradually transformed networks, the need for control of the infrastructure to provide services gradually disappeared. Today, a service provider can be entirely virtual, riding on someone else's network, using

someone else's fiber, and yet maintain a very close, reliable, and high touch relationship with their customer.

For 21<sup>st</sup> century networks, this enables a further partitioning of network services into two levels, entirely operated by the private sector: a Network Operator providing utility bandwidth services, and one or several Service Providers, which interface with individual customers and maintain the customer service relationship.

This division of operations and services into a wholesale and retail level creates several advantages. Specialization further decreases the capital expense and operating expenses of the providers at each level. Specialization also enables competition at the service level with very low barriers to entry. The wholesale Network Operator is motivated to bring more retail Service Providers onto the network to maximize utilization of their network assets, and is also motivated to create new retail revenue streams by increasing the diversity, as well as number of services.

Retail Service Providers benefit from the drastically reduced capital expenditures necessary to compete. Consumers benefit from lower prices, better service, more kinds of service, and the relentless pressure to improve that healthy competition in a truly open market fosters.

The fundamental reason for the success of this model is the allocation of expenses, which is really a proxy for risk, to the levels at which it is most appropriately handled. Each role has peculiar responsibilities and risks, which are handled best by entities most comfortable and experienced to mitigate that risk. Local governments are very good at building and maintaining infrastructure with a very long useful life of many decades (roads, pipes, fiber).

Network management is a distinct problem requiring a particular skill set, with particular capital and operating expenses. Security, stability and reliability are the key attributes that generate risk in that

arena. The lifecycle of the services and infrastructure for network operations is measured in a few years.

Provision of services to residential and business customers requires significantly more investment in human capital, shorter product life cycles, higher risk of failure, but potentially much higher margins, especially when investments in OSP and network infrastructure are no longer needed. Timeframes in this arena are much shorter, in some instances as short as months. In a properly configured broadband ecosystem, this is where the innovation will occur to drive economic growth in the 21<sup>st</sup> century.

The multilayer service model lays the groundwork for the creation of a true open access environment at the service level, where customers can switch providers for any given service without barriers, they can try new services as they are developed, and where there is better transparency on cost and quality between providers. By lowering the barrier to entry for new providers, real competition can take place, and service providers delivering better services at lower prices will be rewarded. In addition, there are no barriers to entry for new, innovative services from any provider, accelerating innovation and economic development. The consumer wins in all instances.

The multilayer model also aligns the interests of all parties operating each layer of the network. More Service Providers increases revenues for the Network Operator, which in turn increases the incentive for the local government to continue expanding the physical network, as the Network Operator's financial success underwrites the expansion of the OSP. The larger the network footprint, the more potential customers, which in turn can support a larger ecosystem of competing Service Providers, which then incentivizes further growth, all while accomplishing the larger public interest goals of universal access, increasing utilization, competitive pricing, and more numerous and diverse services.

The Westminster Fiber Network is sufficiently overbuilt that other users of fiber infrastructure (wireless carriers, specialized business users, government agencies) may also lease fiber, separate from other users.

By the end of 2017, approximately 40% of the fiber construction will be complete, passing over 2600 serviceable addresses. The early phases are lit and customers signed up and installed, with more every day. Future phases will complete construction inside the City limits over the next 2-3 years. Depending on subscription take rates, construction will speed up or slow down to match the demand. Eventually, the network will reach over 7000 homes and businesses inside Westminster, and if sufficient demand warrants, will be extended to another 8000 just outside City limits.

In summary, the Westminster Model of Public Private Partnership provides a scalable blue print for any local government of any size to implement a community wide broadband network in a financially sustainable manner. By focusing on public ownership of the infrastructure, partitioning of the network operations by layer, and a commitment to open access, any community in the country can realize the economic development potential of massive broadband. The project positions Westminster to survive and prosper through the disruptive economic transitions created by the transformational information revolution, and ensures that all our residents can participate in the economic growth and prosperity of decades to come.



Mrs. BLACKBURN. And we thank you.  
Ms. Matthey, you are recognized.

#### STATEMENT OF CAROL MATTEY

Ms. MATTEY. Thank you very much, Chairman Blackburn and Ranking Member Doyle and members of the subcommittee. I am deeply honored to appear before you today.

I have worked on advancing broadband in rural areas through the Universal Service Fund for more than a decade as deputy bureau chief at the FCC and now in my business as a consultant. I bring personal knowledge of how the FCC has used fixed broadband coverage data in the course of implementing the Connect America Fund.

I commend you for recognizing the critical role of broadband infrastructure in our country. I am heartened that this issue is a priority for you. I am firmly convinced that broadband must be built in rural areas to improve education, healthcare, agriculture, commerce, and more. It is an investment worth making.

The definition of broadband matters because where you draw the line determines which areas are considered unserved. The FCC's current definition of broadband for purposes of the Connect America Fund is 10 megabits downstream, 1 megabit upstream.

To date, the FCC has focused its efforts on trying to get access to broadband service in the areas of the country that are lacking all together rather than upgrading networks in areas that have some level of service. If 25/3 megabits is set as the dividing line for unserved in any future infrastructure legislation, that would expand the geographic areas that are deemed unserved compared to what the FCC considers unserved today for purposes of the Connect America Fund.

If Congress provides additional funding to expand broadband infrastructure in rural areas, it is important to consider the implications if one governmental agency is potentially providing funding to overbuild a service provider that is currently receiving funding from another government agency.

It is critically important to coordinate and harmonize various programs administered by different Federal agencies to advance broadband so that the government as a whole is tackling the problem efficiently and not working across purposes.

Now I will turn to the issue of determining where broadband is available. In my view, any future infrastructure initiative should focus on improving the FCC's existing data collection rather than starting anew. While there may be a desire to map fixed broadband coverage in a more granular way at the sub census block level, there are practical difficulties in doing so.

I am not aware of any comprehensive current data set showing the geocoded location of every structure in the United States. Requiring all broadband providers in the country to report fixed deployment at the address level or by geocoded location would be a significantly more burdensome data collection than what exists today.

Reporting such detail for every census block in the country, which number over 11 million, is unnecessary given that most of

those census blocks are in urban and suburban areas that are served.

There are other ways to improve the existing FCC data for use in future infrastructure initiatives. For instance, one can treat a block as served only if the provider makes service available to all locations or nearly all locations rather than just one location in the census block.

In a challenge process, the FCC Form 477 data can be used as the starting point not the end point for determining which areas are served. I have firsthand experience with this, as I oversaw the team that conducted two challenge processes to determine areas that would be eligible for Connect America funding.

One key to success is defining in advance what information is relevant to the inquiry and how it is to be submitted. There are several advantages to using a challenge process to refine the data rather than a whole-scale revision of the FCC's Form 477 data collection.

First, participation in a challenge process is voluntary, so parties can make their own determination of whether the regulatory benefits outweigh the regulatory burdens of such participation.

Second, a challenge process is likely to focus on a much smaller set of rural census blocks that are likely candidates for new infrastructure deployment initiatives rather than the more numerous suburban and urban census blocks that are unquestionably served.

Third, a challenge process can take into account information that is not part of the Form 477 data collection that may be of policy interest.

To conclude, I appreciate the opportunity to appear before you today, and I will be happy to answer any questions you may have.

[The prepared statement of Ms. Matthey follows:]

Testimony of Carol Matthey

Principal

Matthey Consulting LLC

Before the

Subcommittee on Communications and Technology

of the Committee on Energy and Commerce

U.S. House of Representatives

Defining and Mapping Broadband Coverage in America

June 21, 2017

Thank you very much, Chairman Blackburn and members of the Subcommittee. I am deeply honored to appear before you today to share my perspective on defining and mapping broadband coverage in the United States.

I commend you for recognizing the critical role of broadband infrastructure in our country. I worked on advancing broadband in rural areas for more than a decade while Deputy Bureau Chief at the Federal Communications Commission (FCC), and I am heartened that this issue is a priority for you and this Administration.

When I was at the FCC, I developed the recommendations in the National Broadband Plan on how to address the “broadband availability gap.” I then implemented those recommendations over the next seven years. I supervised the FCC Division that transformed the traditional high-cost program in the FCC’s Universal Service Fund (USF) from supporting voice to supporting broadband networks in those areas of our nation where there is no private sector business case, beginning with the FCC’s 2011 USF-ICC Transformation Order and all subsequent decisions until I left the FCC in February 2017. I bring to you firsthand experience with designing a government program to address the lack of broadband in rural areas of the country and personal knowledge of how the FCC has used broadband coverage data in the course of implementing the Connect America Fund.

My statement addresses two topics: first, the definition of broadband, and second, the challenges of collecting good information about where broadband exists today.

#### **Defining Broadband**

Over the years, the definition of broadband has evolved, both at the FCC and in other federal agencies. The reason why definitions matter is because where you draw the line determines who is “unserved,” and who is served. And that, in turn, determines the geographic areas where the federal government should be targeting its energies to address market failure.

In 2011, the FCC defined broadband for purposes of the Connect America Fund as 4 megabits per second (Mbps) upstream/1 Mbps downstream. It concluded that high-cost recipients with broadband public interest obligations should provide a minimum of 4/1 Mbps service, and it would target the new Connect America Fund to those areas lacking an unsubsidized competitor offering 4/1 Mbps service. At the same time, the FCC recognized the definition of broadband should evolve over time, and it committed to initiating a proceeding no later than 2014 to review the minimum performance characteristics to ensure that the Connect America Fund would continue to support broadband service that is reasonably comparable to broadband service in urban areas. In late 2014, the FCC adjusted the minimum performance standard for Connect America Fund recipients upward to 10/1 Mbps. Meanwhile, in a separate proceeding, in early 2015, the FCC set 25/3 Mbps as the benchmark for purposes of its periodic assessment of whether “advanced telecommunications capability” is being deployed to all Americans on a reasonable and timely basis, as required by Congress pursuant to section 706.

More recently, in 2016, the FCC established four potential service tiers for bidders that will compete for subsidies in the upcoming Phase II Connect America Fund auction: 10/1 Mbps, 25/3 Mbps, 100/20 Mbps, and 1 Gigabit/500 Mbps. But – and this is an important point – funding in the FCC’s Phase II auction will only be made available in those census blocks that lack 10/1 Mbps broadband service. Similarly, with respect to the smaller telephone companies that receive USF, the FCC has set 10/1 Mbps as the minimum requirement, with some companies voluntarily accepting support with obligations to deploy 25/3 Mbps to a subset of locations. Thus, while 25/3 Mbps is frequently referred to as the FCC’s definition of broadband, that is not the definition that guides its decisions on public funding from USF. To date, the FCC has sought to focus universal service support on expanding access in areas lacking service rather than areas that have some level of broadband, while at the same time encouraging recipients of funding to build robust, future-proof networks.

If 25 Mbps/3 Mbps is set as the dividing line for “unserved” in any future infrastructure legislation, that would expand the geographic areas that are deemed unserved, compared to what the FCC considers unserved today for purposes of targeting funding through the Connect America Fund. If additional funding is provided to expand broadband infrastructure in rural areas, it is important to consider the potential implications of one governmental agency providing funding to overbuild a service provider that currently is receiving funding from another government agency to expand its broadband network. It is important to coordinate and harmonize various programs administered by different federal agencies, so that the federal government as a whole is efficiently tackling the problem and not potentially working at cross purposes.

#### **Mapping Broadband Coverage**

Before delving into some of the issues associated with mapping broadband coverage, it is useful to review some background on the history of gathering information on broadband deployment.

In 2009, the National Telecommunications & Information Administration, working with the states, began collecting data on broadband availability through the State Broadband Initiative (SBI), which was funded by the American Recovery and Reinvestment Act of 2009 (ARRA). The data were compiled into the so-called National Broadband Map. The actual production of the map was done by FCC through an interagency agreement with NTIA, with NTIA publishing the map. After the ARRA funding expired, the National Broadband Map was no longer updated. The most recent map contains data as of June 2014.

Meanwhile, since 2000, the FCC had been collecting information on broadband subscription through its Form 477 data collection. In 2013, recognizing that NTIA’s SBI program would soon be ending, the FCC modified its existing Form 477 data collection to begin collecting information on broadband deployment, commencing with data as of June 2014. After adoption of the new rule, it took

the FCC roughly 15 months to open an electronic interface to begin collecting the data, as it had to obtain approval to collect the new broadband deployment data from the Office of Management and Budget under the Paperwork Reduction Act and develop necessary information technology (IT) systems to accept the new information.

Data on fixed and mobile broadband deployment are now collected by the FCC twice a year. Broadband providers are required to submit information on speed and coverage through an FCC online filing system. The Form 477 broadband deployment data, with the exception of certain spectrum and speed information associated with the mobile coverage areas, are available online on the FCC's website. The public can download tables of information showing census blocks with reported coverage, indicating the speed and technology, either for individual states or for the entire nation. The most recent released FCC data are data for fixed broadband deployment as of June 2016; the FCC has indicated that shapefiles showing mobile coverage will be made available at a future date.

While the FCC has published maps using the data it collects from time to time, both in its periodic Broadband Progress Report and more generally on its website,<sup>1</sup> it has not published a map of the data in a format identical to the National Broadband Map. Publication of the data in a map in a format comparable to the National Broadband Map requires dedication of funding for additional IT resources. But it can be done – the FCC has the ongoing data collection program in place and is collecting a new set of data every six months.

Fixed broadband providers are required today to provide a list of census blocks where they can or do offer service to at least one location, with information provided about the speed of that service and the technology used to deliver the service. A provider that reports deployment of a particular

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<sup>1</sup> A map of fixed broadband can be found here: <https://www.fcc.gov/maps/fixed-broadband-deployment-data>. Information about mobile coverage can be found here: <https://www.fcc.gov/mobile-deployment-form-477-data>.

technology and bandwidth in a census block thus may not necessarily offer that service everywhere in the block. Mobile broadband providers file maps of their coverage areas for each broadband technology (e.g., EV-DO, HSPA, LTE).

In my view, the FCC's Form 477 data collection provides a solid foundation for mapping broadband coverage, and any future program should build on that existing data collection rather than starting anew. At the same time, I am aware that concerns have been raised regarding certain aspects of the FCC's current data collection program. For instance, on the fixed broadband side, there is a concern that reporting a block as served when there may be only one served location in that block significantly overstates the extent of coverage. There is a concern that mobile coverage maps may not accurately reflect the extent of coverage. And more broadly, some have questioned whether companies in fact are taking adequate measures to report the information correctly.

While there may be a desire to map broadband coverage in a more granular way at a sub-census block level, there are many practical difficulties to doing so. I am not aware of any comprehensive current dataset showing the geocoded location of every structure where one might want broadband to be available in the United States. Moreover, what I learned in the course of my work on the Connect America Fund is that most service providers – whether incumbents or non-incumbents – do not maintain records of service availability with geocoded locations. Requiring all broadband providers in the country to report fixed deployment at the address level, or by geocoded location, would be a significantly more burdensome data collection for affected broadband providers, both big and small, than what exists today.

Invariably, some companies would argue that they lack the resources to provide information as a more granular level, and if one were to exempt a subset of providers from more granular reporting requirements, the end result would be an inconsistent and incomplete picture of the actual extent of



coverage. Moreover, requiring such detailed reporting for every census block in the country – which number over 11 million – is unnecessary given that most of those census blocks are served, in urban areas, and presumably not the target of government efforts to expand broadband where there is market failure.

An alternative approach to address-level reporting would be change the current rules for what is deemed served. For the fixed broadband deployment collection, the current requirement is that a provider reports a census block if it can or does serve at least one location. For instance, one could report a census block as “served” only if a provider has actually deployed plant to serve one location – and eliminate the requirement that a block is reported as served if the provider “can” provision service within a reasonable time interval without extraordinary commitment of resources. Or, one could eliminate the current requirement to report a block as served if at least one location is served, and instead require that a block be reported as served only if broadband infrastructure is currently available to all locations in the block. Any changes along these lines would take time to implement, both for the FCC and reporting service providers.

At the end of the day, it’s a policy judgment of whether you want to treat a partially served census block as “served” or “unserved.” If you treat a partially served block as served, that eliminates the possibility of providing funding to one entity to overbuild, or compete against, another entity that is commercially providing service without benefit of government funding in part of the census block. On the other hand, that approach may leave unserved locations in the block potentially stranded without service forever.

Alternatively, in a challenge process, one could use the FCC Form 477 data as the starting point, not the end point, for determining which areas are served and not served. The FCC took that approach in implementing the Connect America Fund, in several instances using a challenge process regarding

broadband coverage data to determine where to target Connect America Fund support. And there currently is a pending FCC rulemaking regarding how to conduct a challenge process to finalize the areas that will be eligible for bidding in the Mobility Fund Phase II auction.

I have firsthand experience in this area, as I oversaw the team that conducted the challenge process for both the Connect America Fund Phase II offer of support to the larger incumbent telephone companies in 2015 and the Alternative Connect America Cost Model (A-CAM) offer of support to the smaller incumbent carriers in 2016. In each case, it was a monumental undertaking. For the Phase II challenge process, the Wireline Competition Bureau (Bureau) initially released an order providing guidance on how it would conduct the challenge process, and it adopted a standardized form for challengers and respondents to use. Subsequently, the Bureau determined based on the then-available SBI data that nearly 745,000 census blocks would be eligible for the offer of Phase II model-based support because there was no unsubsidized competitor reporting it served the block. More than 140 parties filed challenges regarding the classification of nearly 180,000 census blocks. Effectively, we conducted 140 mini-adjudications. After an initial review of those challenges, the Bureau determined that parties had made a prima facie case that the status of more than 95,000 census blocks should be changed, and invited parties to reply to the challenges for that subset of blocks. The Bureau then reviewed all of the arguments and evidence submitted. In particular, the team reviewed submissions that included customer records, customer invoices, plant and other facilities maps, employee statements and declarations, advertising materials, screenshots from websites, and test data. Ultimately, the Bureau resolved all of the challenges, changing the status of certain blocks from their initial classification as served or unserved. The net result of the process was to treat as "unserved" an additional 17,000 census blocks, on top of the 745,000 blocks initially classified as unserved, a two percent increase in the number of census blocks eligible for Phase II support. From start to finish, it took nine months.

For the A-CAM challenge process, the FCC directed the Bureau to incorporate newly released FCC Form 477 data into the cost model used to determine A-CAM support, subject to a streamlined challenge process. The FCC wanted to make sure that support would not be provided to overbuild areas where an unsubsidized provider already was providing voice and broadband service. The Bureau invited competitors that had made recent corrections or newly deployed broadband to file comments, and it also provided an opportunity to challenge the competitive coverage contained in the updated version of the model. The Bureau received 273 separate requests to change reported coverage data: some from competitors seeking to correct their coverage data; some from incumbents seeking to correct their own data; and some from incumbents seeking to challenge the reported coverage of a competitor. The Bureau ultimately granted 80 requests to change coverage data, denied 73 requests, and declined to act on the remainder for administrative reasons or as unnecessary to make. The streamlined challenge process took place over a three-month time period.

Notwithstanding the burdens that it places on those who actually have to review all of the information and make a decision, there are several advantages to using a challenge process to refine the understanding of which areas have broadband available, rather than a wholesale revision of the FCC's Form 477 data collection. First, participation in a challenge process is voluntary, so parties can make their own determination of whether the regulatory benefits outweigh the regulatory burdens of such participation. Second, a challenge process is likely to focus on a much smaller set of census blocks – specifically those in rural areas with some population – that are likely candidates for new deployment initiatives, rather than the many more numerous suburban and urban census blocks that are unquestionably served. Third, a challenge process can take into account additional information that is not part of the Form 477 data collection that may be of policy interest, including attributes of the desired broadband service other than speed. For instance, in the FCC challenge process, the Bureau required purported competitors to indicate whether they were offering service with usage allowances at

a price that met the FCC's requirements for recipients of Connect America support. That information is not collected through the Form 477 data collection.

In any challenge process, it is critical for the agency that will conduct the challenge process to define in advance what information is relevant to the inquiry and how it is to be submitted, and to set firm deadlines for submission. In the two Connect America Fund challenge processes conducted by the FCC, the agency announced in advance that it would not consider evidence or arguments established outside of the specified time period for filing challenges and responses. The FCC also required parties to file "concrete and verifiable evidence" to support their claims. It's important to have an electronic system that can easily intake the data submitted, and the ability to manage the information so that there is consistent treatment across parties that are making similar claims and submitting similar types of evidence.

To conclude, the need to accelerate broadband deployment in unserved areas is compelling. But to further that objective, it is important for the federal government to identify accurately the areas where further government action is necessary. And it is equally important to ensure that various federal programs work effectively together.

I appreciate the opportunity to appear before you today. I will be happy to answer any questions you might have.

Mrs. BLACKBURN. I thank you.  
And, Mr. Darr, you are recognized for 5 minutes.

**STATEMENT OF BRYAN DARR**

Mr. DARR. Good morning. My name is Bryan Darr, and I am the President and Chief Executive Officer of Mosaik Solutions. I would like to thank Chairman Blackburn, Ranking Member Doyle, and the fellow members of the subcommittee for this opportunity to speak with you.

I appeared before this committee in March 2017 and appreciate the opportunity to return the focus on defining and mapping broadband coverage. Broadband deployment is a bipartisan national priority, but expanding and accelerating broadband deployment requires reliable information and data-driven decisionmaking.

Without trusted data about coverage gaps, underserved populations, network speeds, and other indicators, we will not stimulate private sector investment, advance universal service, expand broadband into more rural areas, or improve the broadband market.

Despite healthy competition and increasingly sophisticated data analysis among private sector companies, the FCC has sought to displace this industry by mandating use of its own data analytics tools. The Wireless Telecommunications Bureau recently stated that its Form 477 coverage data is the best available we have today. It is not.

The FCC's Form 477 mobile broadband coverage data is flawed. First, there are no defined specifications for what radio frequency conditions or methodologies are required. Second, the FCC's data is out of date almost as soon as it is filed. Form 477 data is too infrequently updated and has too large of a time gap between reporting date and release date. That is precisely why Mosaik's LTE coverage data sets are updated monthly.

In the map shown in figure 1 we overlay the latest available Form 477 data with the most recent coverage data from T-Mobile. In the 18 months between the vintage of the FCC's data and our own, T-Mobile has added more than 339,000 square miles, covering more than 5 million people, ensuring that broadband funds go to areas that meet the no-service criteria will be more successful with access to better, fresher data.

Better data can also help to minimize the number of objections brought forth during a challenge process. Higher quality coverage can also surgically identify unserved areas and enable operators to replicate these successes across the rest of the country.

Relying exclusively on antiquated or inferior datasets threaten to harm American consumers, and the exclusion of other types of data threatens to crowd out private investment from U.S. companies that compete to provide far superior products about network coverage and performance.

Just as important, private companies have long-term obligations to their clients. They provide a continuity of service and are less susceptible to the natural swings in priorities that affect governments.

In a rapidly changing industry, shutting down research for even a few months can create a backlog of issues. Approximately \$350

million was spent creating the original National Broadband Map. Once funding was discontinued, most states dropped the program. Three years after its release, the map is little more than a snapshot of a brief moment in the history of the broadband industry. We can do better.

The next image, figure 3, shows how overlaying coverage for available tower assets can speed the site acquisition process. Intelligence about the surrounding telecom landscape is critical to defining priorities and understanding where the taxpayer can get the most return for their considerable investment.

Some operators offer multiple levels of signal strength on their maps. The next map, figure 4, represents this type of depiction as good, better, best, which is sometimes referred to as on street, in car, in building.

There is no defined industry standard as to what specific signal level is used to represent the demarcation between each of these boundaries, and different spectrum blocks have different abilities to travel distances and penetrate buildings.

The map in figure 5 shows signal strength readings collected anonymously from consumer devices. This information is overlaid with the typical predictive RF model. No network can offer maximum signal quality everywhere, and frankly, that is not required to have a robust and high-performing network. Congestion can also impact the user's experience, so throughput speeds and latency also need to be considered.

We commend Congress and the FCC for recognizing the importance of data driven decisionmaking. When government agencies embrace the capabilities of private companies, instead of competing with them, taxpayers can spend less must be and policymakers can adopt more accurate and timely data decisions. Let's make sure we use the best of what the private sector has to offer.

Thank you. I look forward to answering your questions.  
[The prepared statement of Mr. Darr follows:]

One Page Summary of Bryan Darr's Testimony  
June 21, 2017

*"Defining and Mapping Broadband Coverage in America"*

Accelerating broadband deployment requires thorough and reliable network data. That data informs important policy decisions by the Federal Communications Commission ("FCC"), such as the best way to stimulate private investment, encourage rural deployment, provide universal service, and maintain a competitive broadband market.

Founded in 1988, at the dawn of the wireless era, Mosaik Solutions has been a trusted partner to the FCC and telecommunications companies in measuring the reliability of mobile networks across the United States. Today, Mosaik, along with numerous other companies, vigorously compete by using groundbreaking big-data techniques to produce the most complete and accurate information possible about the state of network deployment.

As Congress considers how best to increase the reach of broadband networks into unserved areas, it should require that the FCC rely on better and alternative data sources. Accurately mapping broadband network availability is vital to understanding market realities and directing funds to improve network experiences. However, exclusively using government-mandated data threatens to dampen private investment in the thriving network data analytics market where cutting-edge private-sector innovations are being created today.

By considering *all* data sources, policymakers can better fulfill mandates to conduct evidence-based decisioning, which in turn will help make faster and cheaper broadband a reality for all Americans.

Statement of

Bryan Darr  
President and Chief Executive Officer  
Mosaik Solutions

Before the

U.S. House of Representatives  
Committee on Energy and Commerce  
Subcommittee on Communications and Technology

*“Defining and Mapping Broadband Coverage in America”*

June 21, 2017



Good morning, my name is Bryan Darr, and I am the President and Chief Executive Officer of Mosaik Solutions. I want to thank Chairman Blackburn, Ranking Member Doyle, and the fellow members of the Subcommittee on Communications and Technology for this opportunity to speak with you.

I appeared before this committee in March 2017 and appreciate the opportunity to return to provide additional testimony, particularly with the focused interest on defining and mapping broadband coverage.

Broadband deployment is a bipartisan national priority. But expanding and accelerating broadband deployment requires reliable information and data-driven decision making. Without trusted data about coverage gaps, underserved populations, network speeds, and other indicators, we will not stimulate private-sector investment, advance toward the goal of universal service, expand broadband into more rural areas, or improve the competitive broadband market we see today.

Since I founded Mosaik in 1988, my company's sole mission has been to produce reliable data about wireless network coverage and performance. Almost thirty years later, we're still a small business—we have less than 50 employees and we're still based in Memphis, Tennessee, but we offer some of the most accurate insight into network coverage and performance available in the market. We like to describe Mosaik as a business intelligence company with deep telecommunications domain expertise. More simply put, we tell our clients where they can reasonably expect to have access to a variety of mobile networks, and how reliable wireless networks are at any given point in the United States and much of the rest of the world.

Having founded Mosaik during the infancy of the wireless industry, I continue to be impressed and often amazed by the advancements in network service quality and seemingly never-ending innovative uses for broadband services by consumers, enterprises, and entrepreneurs alike. I'm also proud of our longstanding and constructive relationship with the Federal Communications

Commission—we have supported part of the FCC’s recurring informational needs for many years. The FCC has used our CoverageRight datasets in its annual competition reports and other policy and regulatory decisions. Improving wireless customer experiences was the mission when I started Mosaik, and through near constant innovation and investment, Mosaik continues with the same mission today. During our almost three decades serving clients, we have developed competencies that span geospatial analytics, graphic design and data visualization, software engineering, cloud-based big-data management, and mobile application development.

Mosaik and its competitors stake our reputations on supporting the products and services we provide to our clients. Today, consumer devices collect millions of daily measurements providing granular information about the quality of mobile networks. This data is absolutely required to understand network quality in over eleven-million census blocks. It is equally important in rural, high-cost areas that remain underserved. Mosaik is currently leading a research and development effort with one of the largest fleets in the United States to radically expand available information about mobile network quality. I am confident other private companies are making similar investments.

Despite healthy competition and increasingly sophisticated data analysis among private sector network-analysis companies, the FCC has sought to displace this industry by mandating use of its own data analytics tools. In 2013, the FCC elected to expand its Form 477 with the *Modernizing the FCC Form 477 Data Program Order* to mandate that carriers provide information directly to the Commission. In some cases, the FCC uses its in-house data to the exclusion of all

other sources. The Wireless Telecommunications Bureau recently stated that its Form 477 coverage data is “the best available data we have today.”<sup>1</sup>

It’s not.

The Form 477 mobile broadband coverage data is flawed. First, there are no defined specifications for what radio-frequency conditions or methodologies are required. Second, the FCC’s data is out of date almost as soon as it is filed. Form 477 data is too infrequently updated and has too large of a time gap between reporting date and release date. For example, mobile network coverage data as of December 2015 was released in September 2016—a lifetime in this fast-moving industry. During this nine-month period alone, a national operator radically expanded the population served with its LTE network while another more established operator added thousands of square miles of rural LTE coverage. That’s precisely why Mosaik’s LTE network coverage datasets are updated monthly.

In the map shown in Figure 1, on the next page, we overlay the latest available Form 477 mobile broadband coverage data with the most recent coverage data from T-Mobile. It clearly shows how much has changed in a relatively short period. This additional coverage represents approximately 339,474 square miles and 583,820 census blocks representing 5,048,900 people (based on the 2010 census).

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<sup>1</sup> Jon Wilkins, *Mobility Fund II: Improving the Data We Use to Identify & Close Mobile Coverage Gaps*, FCC Blog (Sept. 30, 2016), <https://www.fcc.gov/news-events/blog/2016/09/30/mobility-fund-ii-improving-data-we-use-identify-close-mobile-coverage>.

Figure 1

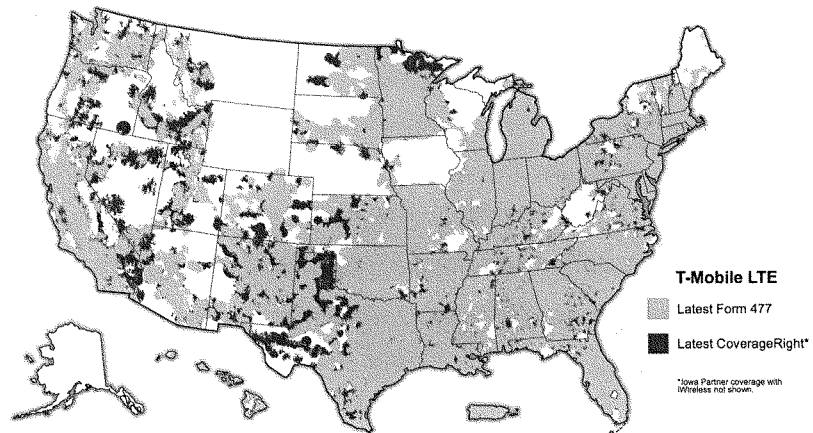
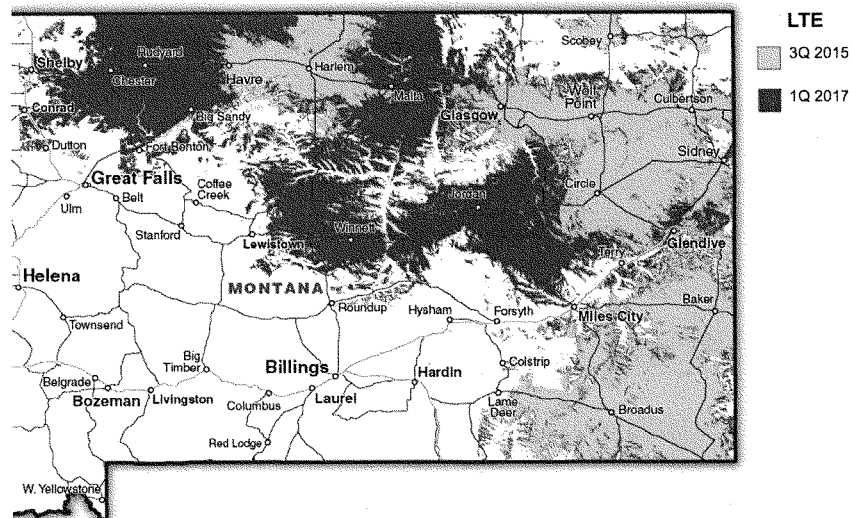


Figure 2



It's not just the big, national operators that have been investing in their networks. Many of the regional and rural operators have invested heavily in expanding both the size and depth of their networks. The map in Figure 2, on the previous page, shows the combined patterns of three neighboring rural operators in eastern Montana. They made great progress over a recent eighteen-month period to enhance their coverage footprint. Since the only area in which they can compete is within their limited license territory, all of their investment is highly targeted toward the territory and customers they serve. Higher quality coverage data can surgically identify unserved areas and enable operators to replicate the successes across the rest of the country.

Both large and small operators have shown a willingness to build new infrastructure and introduce service to new areas. But covering the last, least-populated or hard-to-service areas is economically impractical. Dedicating infrastructure spending in broadband networks holds the promise to extend these networks to many of the unserved areas that remain. Ensuring that the funds are directed toward areas that meet the "no service" criteria, as it will soon be defined, can be more successful with access to better and fresher data. It can also help to minimize the number of objections brought forth during a challenge process.

Relying exclusively on antiquated or inferior government-mandated data threatens to frustrate mobile broadband deployment and harm American consumers. And the exclusion of other types of data threatens to crowd out private investment from U.S. companies—including Mosaik—that compete to provide similar and, we believe, far superior products about network coverage and performance. These private companies are responsible for much of the innovation that has provided the gains in predicting and understanding network availability.

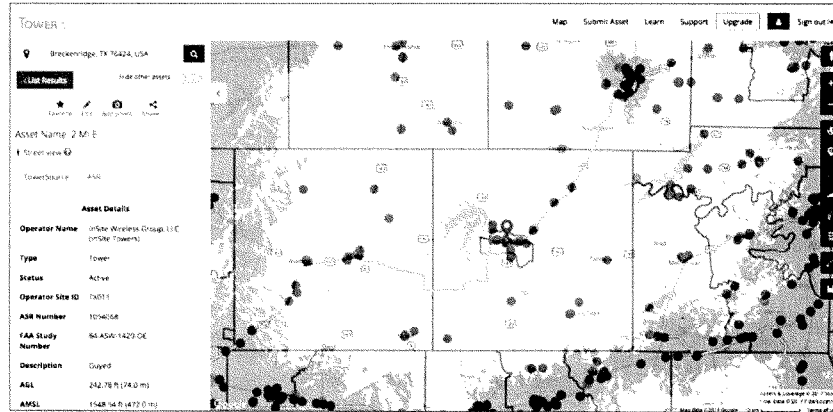
Just as importantly, private companies have long term obligations to their clients. They provide a continuity of service and, therefore, a continuity of expertise and care to the data sets they must maintain. Private industry is also less susceptible to the natural swings in priorities with which

governments must contend. Within an industry changing as rapidly as telecommunications, shutting down research for even a few months can create a backlog of issues. Approximately \$350 million was spent creating the original National Broadband Map. Once funding was discontinued, most states dropped the program. Three years after its release, the map is little more than a snapshot of a brief moment in the history of the broadband industry. Future endeavors to produce an improved mapping of fixed and mobile broadband networks should rely more on the private to ensure continuity.

We can do better. To assist policymakers in how they make broadband funding decisions, we should overlay traditional datasets with wireless infrastructure information, including tower assets and fiber optic availability, as well as on-the-ground network coverage and performance testing. We should also evaluate novel key performance indicators or derivatives, such as verified coverage, percentage of RAN utilization per network, and human and agricultural density data, among many others.

The next image (Figure 3) shows how overlaying coverage, tower assets and fiber routes can speed the site acquisition process to locate suitable tower or rooftop assets for network expansion. Identifying existing structures for infrastructure deployment can avoid much of the opposition to new tower sitings. Passing legislation to simplify approval of new sites and additional antennas could further accelerate relief to unserved and underserved areas. But LTE and future broadband services require fiber to deliver broadband speeds. Intelligence about the surrounding telecom landscape is critical to defining priorities and understanding where the taxpayer can get the most return for their considerable investment.

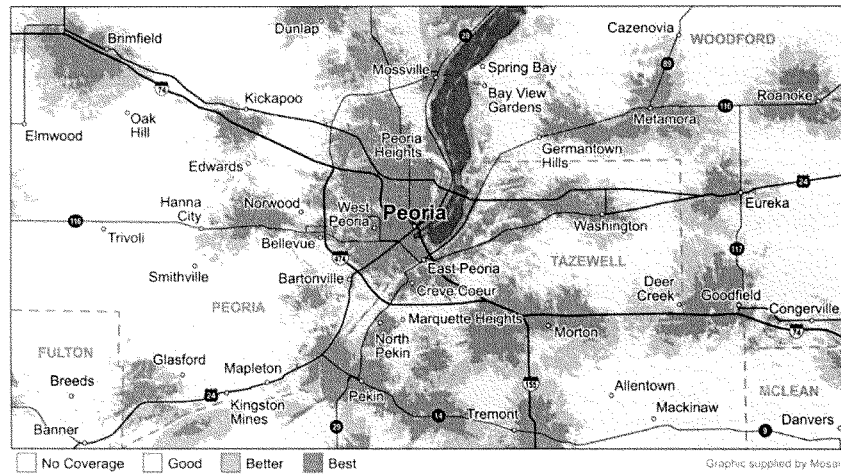
Figure 3



Our network performance measurement capabilities must keep pace with changing developments. Operators are testing innovative strategies to improve coverage in urban areas. As more households with landline telephone service continue to decline, improving indoor network availability and performance will prove a priority for municipalities and public safety organizations. New technologies present promising solutions to these issues. The amount of data needed by policymakers to make informed decisions will continue to increase—as will a better means by which to consume, analyze, and understand that data.

Some operators offer multiple levels of signal strength on their maps. These are still created by software-predicted RF coverage and they do not account for network congestion, but they do provide a greater insight into the first rule of network accessibility—can the device detect the network? The next map (Figure 4) represents this type of depiction as “Good, Better, Best.” Network engineers sometimes refer to these different levels as “On Street, In Car, In Building.”

Figure 4

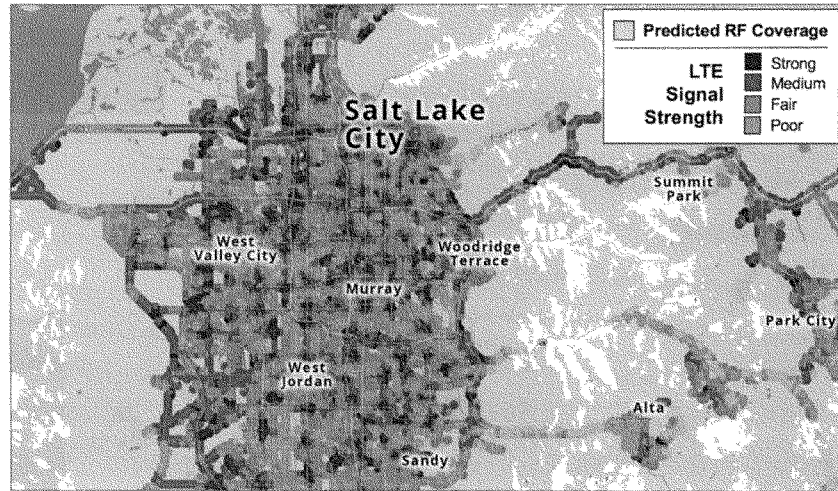


There is no defined industry standard as to what specific signal level is used to represent the demarcation between each of these boundaries. But it is also important to consider that different spectrum blocks have distinctive characteristics regarding effective distance and their ability to penetrate structures. If a specific signal strength level is used to define minimum requirements for broadband connectivity, it will have a very significant impact on the total square miles eligible for assistance. We do not endorse any given level but recognize the impact that this decision may have.

The map in Figure 5 shows signal strength readings collected anonymously from consumer devices. This information is overlaid with the typical predictive RF model that we have commonly seen. The RF model certainly shows areas of poor or no coverage in the rural areas, but does not indicate where the weak spots within the coverage patterns may exist. No network is going to be able to offer maximum signal quality everywhere — and frankly, that's not required to have a robust and performant network. Congestion levels on a network can have just as much impact on the user's experience so understanding throughput speeds and latency also need to be considered.



Figure 5



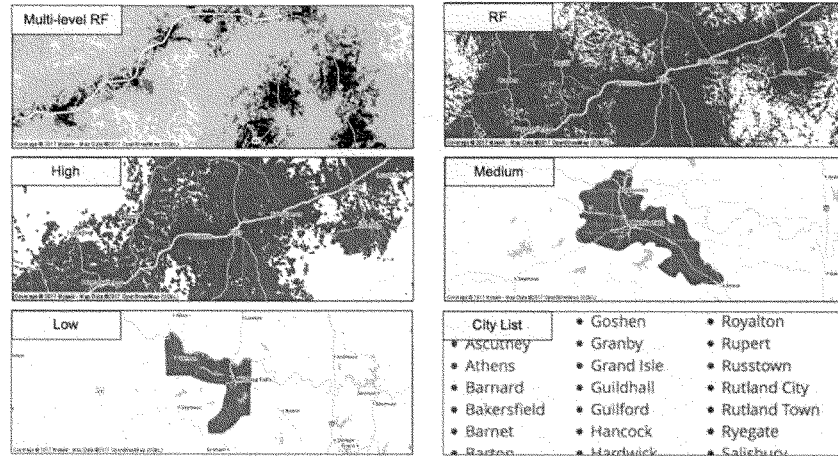
We commend Congress and the FCC for recognizing the importance of data-driven decision-making. When measuring the availability of broadband to consumers, the policymakers should take into account *all* sources—especially as providers embrace newer technologies to improve network quality. That holistic approach is consistent with longstanding executive-branch policy, which directs agencies to rely on the private sector whenever feasible. Here, policymakers can greatly augment the quality and depth of their data—and at a cost equivalent to a handful of cell sites. When government agencies embrace the capabilities of private companies instead of competing with them, taxpayers can spend less money and benefit from sound policymaking based on more accurate and timely data about network coverage and performance. Let's make sure we use the best of what the private sector has to offer.

Thank you and I look forward to answering your questions.

Figure 6

## Coverage Quality Examples

*Examples of multi-level, RF, high, medium, low and city list quality networks*



Mrs. BLACKBURN. The gentleman yields back. I thank each of you for your testimony, and we will now begin the question-and-answer portion of this hearing. And I yield myself 5 minutes for questions.

Mr. Legg, I want to start with you. In your testimony, you noted that pursuant to Form 477, if even one home on a block has service then the entire block is considered served. And then you talk about some of the rural census blocks can be larger than the State of Connecticut, so this shows you what a flaw there is in the data collection.

Why does this requirement exist, and how do we fix it? And how significant is the particular issue when it comes to comparing that to other flaws that are in the system? And each of you have mentioned different things that you have a flaw and the things we can change as we look at the mapping process.

Mr. LEGG. Certainly, Madam Chairman. Thank you for the question.

It is certainly true that measuring broadband connectivity by census block is a major challenge because oftentimes broadband coverage that we are trying to help foster in rural areas is actually in the areas where the blocks are the largest.

There are, in fact, 3,200 census blocks in the country that are larger than the entire District of Columbia. There are five in Alaska that are bigger than the State of Connecticut, the biggest one being about the size of the State of New Jersey.

So the unit of measure being the census block is really the most granular unit of measure that is available to the FCC to collect data. But we believe that the SBI program actually allowed for more granular representations of coverage in rural areas.

As I mentioned in my testimony, there were certainly issues with the SBI program, but granularity in rural census blocks greater than 2 square miles during the SBI program was measured at the road segment level of detail. And we think that that should at least be the minimum standard for census blocks that are larger than 2 square miles.

Mrs. BLACKBURN. Mr. Darr, do you want to weigh in on this?

Mr. DARR. There is no question that many of the rural census blocks are going to be problematic, to say the least, to try and cover. Looking at it differently within the rural areas than the urban areas should be considered.

Mrs. BLACKBURN. OK. And, Mr. Brake, let me come to you now, because you looked at the definition of broadband and the various elements that are in there. And you talk and touch on speed a factor that we need to give great weight, but there are other factors such as latency and pricing, and Ms. Matthey touched on this just a little bit too. So are you suggesting that we take a more holistic look?

Mr. BRAKE. Absolutely. I think a more holistic and pragmatic approach, depending on the particular policy objectives that you are trying to achieve, should be taken into account.

Mrs. BLACKBURN. OK. So how would you prioritize that?

Mr. BRAKE. I think speed remains the priority, but I worry that sometimes we can have something of a tunnel vision where we focus only on speed and don't take other characteristics into ac-

count. I would say speed and latency are probably the two most important.

Mrs. BLACKBURN. OK. Ms. Matthey.

Ms. MATTHEY. I also think the amount of usage that the consumer has at what price is very important. With the advent of unlimited wireless data plans, that has changed the dynamic in how people use their wireless phones, and I think it is important to keep in mind usage at what price.

Mrs. BLACKBURN. OK. Mr. Darr.

Mr. DARR. I would agree. The operators are certainly under significant price pressure right now as there has been a price war going on that has helped a lot of consumers but at the same time has also pulled away dollars necessary for additional infrastructure build.

Mrs. BLACKBURN. And then how would you prioritize the factors in the definition?

Mr. DARR. The areas with no service at all should certainly be looked at first. Understanding what level of service is feasible into these areas is also critical. In order for the American taxpayer to get the biggest bang for their buck, the more areas that can be covered, for the least number of dollars, to cover the most amount of people, and provide them with the speeds desired is going to be an important part of the analysis process moving forward.

Mrs. BLACKBURN. Mr. Legg, I see you shaking your head. Go ahead. I have got a couple of seconds left.

Mr. LEGG. Yes, I agree completely with Mr. Darr. I think focusing—as my colleague here, Mr. Brake, mentioned—on speed and latency is very important. And obviously, broadband mapping is critical to defining areas in the country that need investment.

So I think focusing on the areas where the greatest number of people can be served for the lowest possible cost should be priority, but we shouldn't forget that there are a lot of areas that are very remote in the United States where those people need access as well.

Mrs. BLACKBURN. Thank you. My time has expired.

Mr. Doyle, for 5 minutes.

Mr. DOYLE. Thank you, Madam Chair. And I know that you had stated that you thought it would be inappropriate to have hearings on net neutrality while the FCC has a pending proceeding, and I just want to remind everyone that the subcommittee held three hearings before the FCC adopted its net neutrality protections in 2015. Two of those hearings were specifically about the FCC's pending proceeding, and one of those hearings was an FCC oversight hearing where Republicans specifically raised the net neutrality proceedings in statements and questions.

Dr. Wack, as we are considering options for increasing broadband deployment, using direct and partial support payments as well as regulatory streamlining, you have come to represent a really interesting and promising approach using public/private partnerships.

For your broadband deployment in Westminster, you said that the major carriers just weren't interested in deploying sufficient service. What kind of service was available? What did you need? And ultimately, what are you building?

Mr. WACK. Thank you, Congressman Doyle.

The service available at the time when we were beginning to consider this project, which was in the 2010, 2011 timeframe, we had pretty fairly widespread 25 meg, down 5 meg up service through our incumbent cable provider. There was patchy DSL service and then satellite service out in the more rural areas. So the 25 meg service, even in 2010, 2011 was considered adequate coverage, and yet, our business community overwhelmingly said that this was insufficient for their needs for moving large files and was holding them back. They were suffocating because of inadequate access.

So that is what started us down this road, and we didn't want to just meet current standards or even sort of exceed them. We wanted to leapfrog the whole process and build something that is basically future proof, which meant a fiber network throughout the whole community. And we figured we might as well just go large and build for a gigabit.

I think the comments that you hear today about, oh, nobody needs a gigabit, there is certainly an element of truth to that, but that won't remain true forever. There is nothing that we use in technology that doesn't increase, whether it is process or speed, memory, bandwidth. So we know we are going to need a gigabit, and so we want to make sure Westminster has a gigabit when Westminster needs a gigabit.

Mr. DOYLE. I know that many states have restricted municipal networks. And if you had such a restriction in place, what would your community be left with in terms of service, and what options would you have had?

Mr. WACK. We would be continuing to suffocate under the current or what was the current service at that time. But I have got to tell you, we would be manning the barricades and storming the State House, storming Congress, because my constituents were not going to settle for the inadequate service that we were getting.

Mr. DOYLE. As you should.

Ms. Mattey, in your testimony, you talk about the process of updating the definition of broadband at FCC periodically. Tell us why that is necessary and what happens when we let these definitions languish.

Ms. MATTEY. Well, first of all, I think it is required by the statute. The statute says that universal service is an evolving concept, and therefore, it is important to reassess what we are aspiring for.

If the definitions remain stagnant, you run the risk of locking in the rural areas of the country at a level that is not reasonably comparable to what is available in urban areas. We started at the FCC with the definition of 4/1. The FCC moved it to 10/1. And the fact that that happened in just 3 years and what is on the horizon makes it very clear to me that the definition needs to go higher in the future.

Mr. DOYLE. Very good.

Ms. Mattey, do you think the current investment in the USF fund is sufficient to close the broadband gap? You know, some have said it would take an investment of \$40 billion to \$80 billion to fully serve our country with high-speed internet.

So if Congress acts on an infrastructure spending bill that includes broadband, it seems like tax incentives alone won't be sufficient to close the gap. What do you think about this?

Ms. MATTEY. I definitely think that the Universal Service Fund needs to be larger. The FCC set the budget in 2011, and it is time to reassess that budget.

Mr. DOYLE. Thank you very much.

Madam Chair, I yield back.

Mrs. BLACKBURN. The gentleman yields back at this time.

Mr. Lance, 5 minutes.

Mr. LANCE. Thank you very much, Madam Chair.

Mr. Brake, you have noted that Light Touch Regulation has allowed the U.S. digital ecosystem to flourish. Can you please discuss how government intervention has hurt the marketplace through heavy governmental regulation and government-owned competition to the private sector?

Mr. BRAKE. Sure. I think the most explicit example of that would be the recent decision to classify broadband internet access service as a telecommunications service under Title II, Communications Act.

Mr. LANCE. After Title II, yes.

Mr. BRAKE. Is that what you are getting at?

Mr. LANCE. Yes, it is. Yes, of course.

Mr. BRAKE. Right. So I think Title II has likely seen a drag on investment. There are conflicting reports on exactly how those numbers shake out. But the real question is a counterfactual one, which is much more difficult to answer, right? Now, whether investment is up or down, what it would be other than Title II. And I think the evidence is there are good reasons to believe that investment would be higher if it wasn't for that reclassification. I also think the Title II in the particular net neutrality rules that were implemented as part of that reclassification unnecessarily constrain broadband access ability to evolve to provide new services over time. So I think returning to a Title I Light Touch approach is the right answer.

Mr. LANCE. Thank you. Would anyone else on the panel like to comment?

Dr. Wack, you are a distinguished public servant. Mr. Brake has mentioned the private sector has an incentive for innovation efficiency. How do we also instill that in a governmental run provider?

Mr. WACK. Thank you, Congressman Lance. I guess the first thing to clarify is that our project is not a government run network. We own the infrastructure, just like we own the roads. We don't dictate how the network is operated. We have set some minimum service levels and minimum customer service requirements, but we want to create a competitive open access market so that the market dictates how that innovation unfolds and what the service levels are and the price points.

So we are in the process of doing that. I realize that is not the same as other municipal networks around the country, but that is the model we have chosen.

Mr. LANCE. And that was chosen by your local governmental body, is that how it worked, sir?

Mr. WACK. That is correct. We went through an exhaustive research process, looked at other municipal networks around the country and around the world, compared pros and cons, assessed what we were capable of in terms of our local municipal resources,

and frankly, the political environment. I live in a very conservative community, it is one of the most red counties in the State of Maryland.

Mr. LANCE. There are red counties in the State of Maryland?

Mr. WACK. Oh. Yes, sir. Yes, sir.

Mr. LANCE. I like your tie.

Mr. WACK. Thank you.

Mr. LANCE. I wish we in New Jersey had a similar tie.

Mr. WACK. Not everybody can have a State of Maryland flag, sir. So, anyway, we knew that having a municipal ISP like some other communities have would be politically unacceptable in our community. So I think we found a model that, as I said in my notes, is applicable across the country in any community.

Mr. LANCE. Thank you. Mr. Brake, would you like to comment on that? I see you were interested.

Mr. BRAKE. Yes. I think it is important to realize, even in these sort of dark fiber open access models, it fundamentally shifts the sort of nature of the investment, even the retail provider is looking at improving over time.

It shifts from what economists call dynamic efficiencies, trying to find new ways to compete in the marketplace, offer new products, improve through R & D, and improve through technology. It shifts instead toward what economists call static efficiencies, right? So these are just simply things like price or quality of service. While those are important to improve, in a broadband market, I worry that if we move toward this dark fiber model, this municipal model over time, it zaps the incentive to invest in the long term.

Mr. LANCE. And you believe that it is more likely that there will be dynamic efficiencies if this is controlled by the private sector?

Mr. BRAKE. Correct. Yes.

Mr. LANCE. Thank you very much. I yield back 32 seconds.

Mrs. BLACKBURN. I thank the gentleman. We will take that time back. And, Mr. Loeb sack, you are recognized for 5 minutes.

Mr. LOEBSACK. Thank you, Madam Chair. I have to apologize, I had to step out during a lot of the testimony and meet with constituents, so some of what I am going to ask may have already been answered, and if that is the case, if you don't mind repeating that, it would be wonderful. I appreciate that. It is sort of what happens on these committees sometimes, we have a lot of things we have to be doing at the same time.

But as I mentioned in my opening statement, I often mention at these hearings, I travel to all my counties. I have 24 counties. Chairman Walden likes to remind me that while I have a big district, it is not nearly as big as his, but it is a pretty big area. And I do consistently hear concerns about, obviously, the lack of access to good quality broadband in rural areas.

Yet, interestingly, if you look at the claims out there, from whether it be the FCC or whatever, the claims having to do with the existing data, apparently most of Iowa, if not all of Iowa, is pretty much served, and we know that that is just not the case. And so I do have my own bill that I mentioned. But without getting into the public/private controversy and all the rest, because no matter who is going to provide the service, they are going to have to

have good data in the first place to know where the service is and where it isn't.

And so what I want to deal with is first order questions having to do with the data that are available in the very first instance. No matter whether it is a missed for a utility or private sector or whatever that is going to end up laying the fiber and doing what we need to do to make sure that everybody has broadband.

And I just want to ask you, Dr. Wack, first have all, was the city of Westminster in the same situation like many communities in my district where they are theoretically served in the eyes of the FCC and service providers, but they are really not? And a lot of that has to do with the data issues. Is that the case?

Mr. WACK. Yes, sir. According to existing standards at the time, we were adequately served both in terms of service level and numbers of providers. The reality was that in terms of number of providers, the DSL service that was available in our community was very patchy, as it is in most communities, limited by distance from the central office.

So even in downtown Westminster there were areas where you could not get DSL service because of the proximity to the central office. And then in terms of the cable provider, the service level just wasn't adequate for what businesses needed today. And so, with all due respect to this data collection effort, it was irrelevant to us because functionally we were underserved. We were effectively underserved, even though technically we were adequately served.

Mr. LOEBSACK. And I find when I am traveling throughout my district, even along Interstate 80, one would think, that I should be OK along Interstate 80, a major thoroughfare and all the rest through our state, it is just simply not the case. So we have to make sure that we are all covered. And that is Interstate 80. Then we got, not to mention, the rural areas out there, right with county roads and all the rest. There is just a lot of areas that are pretty much not served at all.

I would like to ask Mr. Legg and Mr. Darr, can you speak to some of the challenges or deficiencies there currently are with the data collected by the FCC. And, again, if you already addressed those issues, I apologize, but I would like to hear from you.

Mr. LEGG. Sure. Congressman Loeb sack, thanks for the question. The biggest challenge with regard to the Form 477 process that the FCC administers right now is that the fact that the data is collected at the census block level of detail, which is fine in urban and perhaps even some suburban areas. But in rural areas like the areas that you represent in Iowa, census blocks are quite large.

I mentioned earlier that there are more than 3200 census blocks in the country that are larger than the District of Columbia and several that are larger even than the State of Connecticut. If reporting is happening at the census block level of detail and even one household in the given census block is served, then that entire census block is considered as having service, and that is a problem.

Mr. LOEBSACK. Thank you. Mr. Darr?

Mr. DARR. Thank you. As was illustrated in one of the maps I showed earlier, there is no standard as to exactly what is defined as the level of service necessary in order to meet these requirements. The different operators have challenges that are both eco-



nomic and technical, but largely economic, in order to be able to cover these areas.

There are certainly concerns with how this data is being collected at the FCC, in part because of the length of time that it takes to move from the carrier reporting it to when it is actually in place. But the fact that there are no standards associated with it is of significant concern as well. You may very well be able to get a text message out at the very edge of that network, but it is not good enough for a voice call. It is certainly not good enough to be able to download a video.

There are ways now, there are new technological capabilities today to understand more of what we call ground truth, which was on the last map that I had up on the screen earlier, that is collecting information directly from consumers, trying to utilize RF propagation maps to define exactly where you are going to get service or not get service is an inexact science.

We have all been in the underground parking lot in a building that, according to the coverage map, shows service. We don't really expect to be able to get it there. And so these types of issues and concerns are part of the difficulty in collecting this. The information that we have in our data sets that the FCC has used for many years is based upon the marketing maps. There is, in some cases, better data from operators, and in other cases, not.

There is a sixth slide. If I could ask Giulia to pull that one up, please, that shows the ways that we grade coverage information. And if we can see it on the screen here.

We started out with what we used to call amoeba maps, they were just rough drawings of where the coverage was. Or they would just fill in their license area, and say, this is your rate area. But things have gotten better and better, as you can see.

The multilevel RF is the highest that we consider very good. Not all carriers share this information publicly. We have some information from the operators at this level, and not from others. Where we have it, if they have asked us to keep it proprietary, we do. It is interesting Mr. Legg suggested a clearinghouse operation that would assist the Government in doing this. This is what we have done for over a quarter century. We are recognized as the clearinghouse by the wireless industry. And I think having something similar in place to take care of the other parts of broadband would be good as well.

Mr. LOEBSACK. Thank you, Mr. Darr.

Mrs. BLACKBURN. Great answers, and we like looking at your data. You got a good process. Mr. Loeb sack, I will recoup that 2 minutes at some point in time.

OK. Mr. Shimkus, you are recognized.

Mr. SHIMKUS. Thank you, Madam Chairman. Thanks for being here. Great testimony. Love to talk about technology, it just keeps moving faster and faster and there is just always a need for more.

So I have 33 counties, so the folks from the rural areas are always going to talk about how we are left behind and rural areas have co-ops to make sure that we can have phone connectivity. We have power co-ops. That is just the way rural areas have been able to—much like the city, they are on—the public demanded it, they got together, they started making sure that they had services.

This accuracy of information is really important. So I have got enough, the testimony, we went through it, understanding the 477 filing and the problems with that. But Ms. Matthey mentioned this challenge thing, that when someone says: It says I am covered, but we are not, we are going to challenge this census block? And then they may be able to get that revisited. Is that it?

Ms. MATTHEY. That is correct. That is what we did while I was at the FCC implementing the Connect American Fund.

Mr. SHIMKUS. Let me go to Mr. Legg, and actually, Mr. Darr. Because you don't talk about that process, you talk about there is other information available. So why doesn't that work?

Mr. LEGG. Congressman, I think as the Federal Government, the FCC, currently there are many agencies across the Federal Government that deal with broadband infrastructure spending, NTIA, the Rural Utility Service at USDA, as those agencies are making decisions about where to invest and support broadband infrastructure buildout, they need to know on the front end.

Mr. SHIMKUS. There is a big lag in time just to go through the process of filing and doing an appeal?

Mr. LEGG. That is right.

Mr. SHIMKUS. Mr. Darr?

Mr. DARR. The speed at which this takes place is important as well.

Mr. SHIMKUS. Right.

Mr. DARR. Because as decisions are being made, you are also holding up the private sector in making decisions to make their own investments. So once the decision is made and the operators know what is going to be funded and what is not, then they know how to better direct the other funds that they have to continue.

Mr. SHIMKUS. Let me go quickly, because I don't want to pull a Mr. Loeb sack and go 15 minutes past my time.

Mr. LOEBSACK. I didn't have the gavel.

Mr. SHIMKUS. But if this is kind of a national incented money to help, shouldn't there be a national broadband standard as far as speed that is accepted and then can change as the time changes? We would accept that proposition, wouldn't we?

Mr. LEGG. Congressman, yes, I would agree with that. I think the need for speed is going to always continue to increase. Some school districts across the country are seeing 30 to 60 percent year-over-year growth.

Mr. SHIMKUS. Mr. Brake, you wanted to say something?

Mr. BRAKE. Right. I would generally agree that we want to have sort of a national standard if we are looking at a nationwide infrastructure buildout. But I think the point that Ms. Matthey made earlier, to have that coordinated with the existing USF support, and make sure that you are not working in cross purposes is incredibly important.

Mr. SHIMKUS. Yes. And we will have that USF debate, too, as far as what are we are incenting and are we transferring it to something which brings up the issue, I don't think I want to address, because the telecommunication companies are talking about the requirement to continue to pay money to keep up a copper wire system, right? Is that money well spent, Mr. Brake?

Mr. BRAKE. I would argue, no. To the extent that that is preventing them from transitioning to more modern networks, toward fiber networks, that is an impediment that we should be working at getting away.

Mr. SHIMKUS. Because the reality in the ground and in the world is that people are cutting their own copper wire—they are not using the traditional copper wire anymore.

Mr. BRAKE. Right.

Mr. SHIMKUS. Although we still by law and regulation require the companies to pay money to keep that up while they could be using that money to deal with fiberoptic technology.

Mr. BRAKE. That is right. That is the gist of it. It is a big complex transition right to move wholesale from copper all the way to fiber. There are a number of legacy services that depends on copper networks, and so finding a way to make that transition is incredibly important, it is complicated. But to the extent that there are undue regulations that are preventing that from happening, that is a problem.

Mr. SHIMKUS. Madam Chairman, I will yield back my time, but I think that is something we should be discussing also in this debate.

Mrs. BLACKBURN. I agree. Good points. And let's see, Mr. McNerney, you are recognized for 5 minutes.

Mr. MCNERNEY. I thank the chair. I thank the witnesses. Even though I missed your testimony, I read it, and it is good to hear from you.

Dr. Wack, a significant portion of my district is rural, so I understand some of the challenges that we have talked about. In your view, is it sufficient for rural areas to have broadband speeds 10-1, 10 download and 1 upload, or is that going to leave a lot of rural areas without the services they really need?

Mr. WACK. 10-1 is inadequate for doing anything of use in the 21st century.

Mr. MCNERNEY. Thank you. Enough said. About the 5.3 million veterans we have in this country, many of them have that same 10-1 access, is that going to give them enough power to function?

Mr. WACK. No. It is not even close.

Mr. MCNERNEY. Thank you.

Mr. Legg, I am going to kind of go over some territory we already trotted over, but I am looking for specific answer. In your testimony you mentioned that reliable broadband mapping is a matter of critical importance to residents, businesses, and communities, anchor institutions, and there is where broadband is lacking. Can you expand on that point a little bit, please?

Mr. LEGG. Yes, absolutely. It is as Dr. Wack said, it is hard to do anything in the 21st century with inadequate broadband. It is just as important as roads, and perhaps even more so. I work a great deal on school connectivity for our organization.

School connectivity is largely lacking across the country. We are seeing that there are still many schools across the county that aren't on fiber, much less have the minimum standard of connectivity, which is regarded by the FCC at one gigabit per 1,000 student. As you can imagine, there are a lot of rural areas that

can't reach anywhere near that speed. So it is critically important for the future of learning and many other services.

Mr. MCNERNEY. OK. Concerning the Form 477 reporting and the idea that the census blocks may just take out one person and use that as an example for the entire block. Is that more likely to result in underreporting or overreporting in terms of 25 to 3, 25 upload and 3 download?

Mr. LEGG. Certainly that means that broadband services being significantly overreported in rural areas across the country.

Mr. MCNERNEY. So the 10 percent estimate by the FCC is probably a small number compared to the real number.

Mr. LEGG. If it is based on the Form 477 assessments, yes.

Mr. MCNERNEY. OK. Our estimates for the availability of baseline fixed broadband service in rural areas especially prone to being overstated? I am asking the same question over again.

Mr. LEGG. Yes. Yes, that is right.

Mr. MCNERNEY. Well, I understand that the data reported through Form 477 can be outdated quickly. Do you have any suggestions on how that can be remedied?

Mr. LEGG. Yes. During the SBI program years where we managed 13 different state and territorial mapping programs, we were effectively working with providers on a near realtime basis to update their information. We believe, as I suggest in my testimony, that a neutral third party clearinghouse, instead of updating data every 6 months to a year could be working in realtime with providers as known deployments are being made. And that is why establishing a relationship with the providers, that there is a back and forth between the two to know where new infrastructure is being built in realtime, that is incredibly important.

Mr. MCNERNEY. And you think that can be done?

Mr. LEGG. Yes.

Mr. MCNERNEY. Mr. Darr, do you have any comments on that?

Mr. DARR. I do. We provide this capability today for the wireless segment of the industry and we have close working relationships with almost every operator in the country, including the big four national operators, and almost every one of the rural operators, we are very engaged with RWA, CTIA, CCA, et cetera, to make sure that those relationships are maintained.

I do think that this can be done in away where the information can be collected more quickly, and that information can be provided to the Government in a way that allows them to make the best decision and direct the funds faster and more efficiently.

Mr. MCNERNEY. Whoever wants to answer this. Is there something that this panel could do—introduce legislation or create a statute—or is this a regulatory issue, to increase the frequency of reporting and accuracy of the 477?

Mr. DARR. That is a good question, Congressman, I am not sure I know how to answer that. It may be both.

Mr. LEGG. I believe, as we mentioned in our testimony, we do believe that there is a solution to solving this challenge. Creating a neutral independent third party clearinghouse that is responsible for mapping and data collecting and validation and consumer reporting across all 56 state and territorial jurisdictions, that is viable and that is something that Congress could address.

Mr. MCNERNEY. Thank you. I yield back.

Mrs. BLACKBURN. Mr. Latta, you are recognized 5 minutes.

Mr. LATTI. Thank you, Madam Chair. And thanks panel witnesses for being here. It is very, very informational and very, very important.

Mr. Legg, I know we have been talking and you had a lot of questions today about this. But broadband support programs aimed to increase broadband coverage in rural America where agricultural production generates significant value to the national economy and also are essential to the revenue and jobs in the rural communities.

In my area, I represent the largest farming and producing district in the State of Ohio, as well as having 60,000 manufacturing jobs. But today with modern high position farming operations, which requires the high speed broadband to support advanced operations and technologies that significantly increase crop years or decrease costs and improve the environment. A program that only seeks to measure broadband coverage based on population centers, households, and road miles, were overlooked coverage gaps in the agricultural communities.

Will you speak to the importance of ensuring that broadband mapping and coverage measurements are updated to adequately identify underserved and unserved crop land in other agricultural areas for the purposes of high speed broadband deployment?

Mr. LEGG. Certainly. Congressman Latta, thank you for the question. Rural areas across the country are the next explosion in terms of innovation of technology, is going to happen actually in rural America, we believe. And an example is the one that you cited, how farming in the United States is changing rapidly. And the only way that it can continue to change rapidly is for adequate infrastructure in those rural areas to exist.

And so, getting the mapping right is incredibly important for rural areas. That is why we have such a concern about collecting data at the census block level of detail because those are the areas that area most overrepresented in terms of current data collection processes, and yet those are the areas that we need the try to fix. Those are where the broadband coverage gaps exist.

Mr. LATTI. Well, and again, maybe you can go into a little more detail, how do we fix it and make sure we got it mapped correctly?

Mr. LEGG. Well, again, we believe that there is a viable path forward for creating a neutral, independent, non-government clearinghouse for broadband data, where there is a responsibility between the providers and this clearinghouse to collect data in real time, to map it, and to put it out there for public consumption and feedback, and then to do validation and auditing of that data to make sure that it is as accurate as possible.

This is effectually how we were so successful during the SBI mapping years, as we played that clearinghouse role on behalf of the 13 different states and territories.

Mr. LATTI. Thank you. Mr. Darr, it is well-known that the national demand for wireless services is growing rapidly as the usage of innovation wireless applications of the internet of things proliferates, and we know that from specifics right now, by the year

2025 there could be about 50 billion interconnected devices by that time.

Essential health applications, state-of-the-art agricultural tools, educational services, business operations all employ wireless methods to improve our daily lives. And, again, in rural America wireless is often the only reasonable economic means to providing high speed broadband coverage.

In what ways can Congress or the FCC improve data collection for wireless services to identify areas where access to high speed mobile broadband is lacking or nonexistent?

Mr. DARR. I think the first thing to do is consider not only population covered, but also area covered, and specifically, agricultural farmed areas covered. Your point about IoT is absolutely dead on. We have got the technology in the field now, that it is looking at moisture content, yield, and a number of hours of sunlight per day. This could all help us dramatically increase the efficiency of our crop land.

So as we are looking at the mapping aspect of this, taking into consideration not only where the people are that need access to broadband for education, entertainment, et cetera, but also from the standpoint of what level of service actually do these devices in the field need?

Where some devices are going to be very simple, they are simply going to spit a little bit of information out every hour every day, and run on batteries, and they have a limited life span. But you have opportunities for people in the field that may be driving a large piece of farming equipment to actually gain training and expertise and be able to communicate back and forth with the manufacturer of the vehicle.

And of course, the vehicle manufacturers are collecting telematics information off of these vehicles as well. It is important to make sure that they are maintained properly, understand how many hours they have been running, and also gather the information on the yield off of the crop land.

So this is a critical part of this moving forward. There are going to be more devices out there that are communicating with the networks than there are people in the very, very future.

Mr. LATTA. Well Thank you very much. And, Madam Chair, my time has expired.

Mrs. BLACKBURN. I thank the gentleman. Ms. Eshoo, you are recognized for 5 minutes.

Ms. ESHOO. Thank you, Madam Chairwoman. And thank you to all the witnesses. First, Madam Chairwoman, you said something at the beginning of the hearing, and I want to clear it up.

In terms of outreach from your office on the issue of privacy, there was an e-mail sent to our legislative director asking for co-sponsorship, but it wasn't a form of invitation to have a round table discussion about it, et cetera, et cetera. I would welcome that. You know that all of us on this side of the aisle were appalled that the Congress, like a bolt of lightning, eliminated all privacy protections on the internet.

So I am not so sure about everything that you have in your bill. I would be happy to sit down at a round table to discuss it. But the way you characterized a refusal of participation, it wasn't an

invitation to sit down and talk about it. It was just, “Legislative director, do you want to be a cosponsor or not?” So I just wanted to clear that up.

I would like to go to Mr. Brake first, given the question that was posed by Congressman Lance to you about Title II investment. You know, of course, that CEOs of publicly held companies are obligated under the law to put forward information that is factual and accurate relative to their forecast about investment.

Can you name any CEO of a major company in the country that stated to their shareholders that there was—they anticipated lack of investment or smaller investments because of Title II?

Mr. BRAKE. No, not off the top of my head.

Ms. ESHOO. No, not just off the top of your head.

Mr. BRAKE. No, I can’t.

Ms. ESHOO. That Title II has chilled investment, then give me the example of a publicly held company and their representative, their CEO, stating to their shareholders that Title II is responsible for a chilling investment of their company.

Mr. BRAKE. Part of my concern is that—

Ms. ESHOO. No. Not your concern. Answer my question. You stated something earlier, I am asking you to back it up.

Mr. BRAKE. I am happy to submit for the record a piece we have written on this analysis.

Ms. ESHOO. No, that is not what I am asking you for.

Mr. BRAKE. No.

Ms. ESHOO. I don’t think you have an answer. I just don’t think you have an answer. You can’t give me the name of one CEO or one company that has stated that to their shareholders.

Mr. BRAKE. That is correct. I am happy to discuss the issue further.

Ms. ESHOO. No, we don’t have to. You finally gave me the answer, which I thought would be the case anyway. People come in and make all these wild statements and they don’t have anything to back them up, and that is point that I wanted to make.

I would like to go to Dr. Wack. I served in local government, and I have a real reverence for it, so bravo to you and what you have accomplished.

We have a real problem in the country in that we are getting close to half of the states in our country now have put laws in place preventing or restricting local communities from building out their own networks, which I think helps constituents get the better broadband service that you came here and testified about, and it really concerns me. I think that we should be paying more attention to that.

In your experience in Westminster, did you encounter any kind of resistance from incumbent ISPs when you went down the path of building your own fiber networks?

Mr. WACK. Thank you, Congresswoman. We did not. Our networks, for whatever reason, was either too small or they just didn’t believe we were going to do or it would work or something.

Ms. ESHOO. What is the population?

Mr. WACK. Eighteen thousand inside the city limits and then 38,000 in the greater Westminster area. And so we have been ig-

nored for the most part. I suspect that is probably not going to last very much longer.

Ms. ESHOO. I would like to go to, is it Mr. Darr that spoke about—no I don't think it was Mr. Darr, I think it was Mr. Legg—an independent clearinghouse. What would the cost of that be?

Mr. LEGG. That is a good question, Congresswoman. I don't know the answer to that question off the top of my head, but that is certainly something we could calculate.

Ms. ESHOO. Good. Thank you. My time is expired. I have some more questions for the other witnesses, but I will submit them in writing. Thank you.

Mrs. BLACKBURN. The gentlelady yields back. Mr. Guthrie, you are recognized for 5 minutes.

Mr. GUTHRIE. Thank you, Madam Chairwoman. I appreciate it very much. I appreciate the opportunity to be here. Mr. Legg thanks for coming up from home. I appreciate you being here.

I remember when your organization first came to pass. President Ransdell of Western Kentucky University convened. I was in the state legislature at the time. Some of us together with professors like Linda Johnson Vitale, and we were going to go figure out how to do broadband throughout the Commonwealth, I think we then became Connected Kentucky and then Connected Nation. And I appreciate all the hard work and the things and the difference that you guys have made.

But we just want to talk about something. The other day we had somebody call our office who lives about a 20 minute drive from Bowling Green. So I explained to the people who don't understand the Chamber of Commerce picture of Bowling Green, is one of the fastest growing cities in Kentucky, an hour from Nashville. A lot of the development going forward. It is like Spartanburg, South Carolina, a new south growing town, not a rural community, at about 165,000 in the immediate area and serves about 250,000.

We got a phone call for someone that said—a university there, and all the great things, about 20 minutes away, and say, they don't have access to broadband. And you know my district, if you were three or four counties away, it is extremely rural, it is as rural as probably anywhere in the country.

But Bowling Green is really not that close. Is that a matter of mapping? Is that a census tract? I know you talked about that quite a bit. And just where those holes are within our community, which as you get outside of our immediate area it gets even bigger?

Mr. LEGG. Absolutely. Congressman Guthrie, it is good to see you again, and thank you for your question.

Yes, I believe that it is an issue of inaccurate mapping. I don't know exactly where the household or business is that you are referring to, but I can imagine, knowing the Bowling Green area and that part of Kentucky north of Nashville, that there are census blocks that are considered as having service, according to the FCC's Form 477 data, where service doesn't actually exist to every household within that block.

And that points to the issue that I was referring to earlier, that the size of the block and the way the information is reported and collected, naturally lends itself to overstatement in rural areas.



And so I would guess that the Federal Government views that area as served, when in fact it is not.

Mr. GUTHRIE. I think it is an entire neighborhood. So you have talked about in your testimony earlier, I believe, the need to send deployment network engineers. So how can you do that in these kinds of communities within a reasonable amount of time, and quite honestly, with a reasonable amount of resources?

Mr. LEGG. Sure. We believe as part of any clearinghouse role that there should be a validation and audit process, and that those areas where consumers provide feedback to the clearinghouse, that, hey, this mapping information doesn't quite look correct, we need you to check it out. Then there should be a process for actually deploying field engineers on the ground to check whether the data represented on the map is correct. And this is a constant or a continual refinement process that would need to happen over time.

No map is going to be absolutely, 100 percent accurate from day one, but there should be a validation audit and refinement process involved. And we believe, based on our experience under the SBI program, where we did deploy field engineers to check provider submitted data, that that process is viable if the country is divided up into regions of jurisdiction for the purposes of mapping data collection and audit.

Mr. GUTHRIE. Thank you. And, Mr. Darr, I know you specialize in wireless. Can you explain briefly how technology itself has been able to broaden the coverage amount? Just the wireless. Not just fiber broadband, but wireless and all the others been able to expand the map?

Mr. DARR. If you look back at the beginnings of the industry we all just had car phones early on, we didn't have these wonderful little computers in our pockets.

Mr. GUTHRIE. Bag phones.

Mr. DARR. Bag phones. Eventually portables. And the systems were engineered for us to use the phones in our vehicles or outside. I think it comes from mapping overall, has to do with the fact that people are now using these devices in their homes, in their offices, in the library, in this building here.

There is an expectation that these devices are going to work inside. There are new technologies that are coming along today that have been out for a number of years, distributed antenna systems, small cells, picocells that are even suitable for residential homes, that can assist boosting that signal indoors. And that is going to be a critical part of the mixture going forward.

It can play a role within the rural areas as well. The maps show what you should expect outside, the type of construction on the structure is going to have a significant impact on whether or not the signal can penetrate.

Mr. GUTHRIE. Thanks. My time has expired and I yield back. I appreciate it. Appreciate it.

Mrs. BLACKBURN. Mr. Pallone for 5 minutes.

Mr. PALLONE. I am sorry. Thank you. OK. The Democratic members of the Energy and Commerce Committee recently introduced the Leading Infrastructure for Tomorrow's America Act for the LIFT America Act, I mentioned it in my opening. And that bill fo-

cuses on areas within the committee's jurisdiction where we can work on solving our country's infrastructure problems.

Part of the LIFT America Act includes \$40 billion for broadband deployment, and recent reports suggest that is how much it will cost to build out to 98 percent of the country. And as part of our initial draft we used a competitive bidding system to award this \$40 billion.

So I wanted to ask initially, Mr. Brake, do you think this is the right mechanism to disburse funding for broadband deployment?

Mr. BRAKE. Thank you, Representative Pallone. The devil is always in the details, but absolutely, the general framework and the competitive bidding mechanism laid out in the LIFT America Act is the right place to start, yes.

Mr. PALLONE. OK. Thanks. Now, of course, many here in Washington are talking about using tax cuts as a way to improve broadband deployment. So I wanted to ask you, do you think using tax cuts or certainly using tax cuts alone in lieu of direct spending is sufficient to bridge the urban/rural divide?

Mr. BRAKE. I would say no. I think the tax incentives as well as looking at ways in which localities can reduce barriers or in upgrading existing networks that are important for steps, but alone they are not sufficient, we should be looking at direct grant and Federal spending to accelerate deployment.

Mr. PALLONE. All right. Thank you.

I wanted to now move to Dr. Wack. Earlier this year I had the opportunity to speak to small businesses in Asbury Park, which is a community in my district, about how a free and open internet can be a boost to the local economy and create jobs, which it certainly has in Asbury Park.

So, Dr. Wack, has the deployment of broadband with open access have similar effect on the economy in Westminster in terms of boosting the local economy and creating jobs?

Mr. WACK. Thank you, Congressman Pallone. I would love to tell you a big story today that that is exactly the case, but it is too early yet. Our network has only really been operational for less than 2 years, and we are only about 40 percent of the way through our construction. However, there are anecdotal instances where businesses have either hired additional staff or expanded their capabilities because of the gigabit service that they now have access to at very affordable prices.

We see early signs of this, but I can't really tell you definitively that the economic development question has been answered in Westminster because of our broadband project, but stay tuned.

Mr. PALLONE. OK. Now, what about your model. Do you think the model you used to deploy broadband could work in other communities?

Mr. WACK. I do. I do.

Mr. PALLONE. OK. Then I wanted to ask you a little bit about the data. We have heard a general consensus on this committee that the data the FCC uses to determine broadband deployment is flawed, and I am concerned that the FCC is nonetheless basing many of its current policy decisions on this flawed data.

So, Dr. Wack, in your experience in Westminster, do you think this data is a reliable source for policymaking?

Mr. WACK. Short answer, no. I think not only is the data possibly corrupt, but the underlying premise of the data collection exercise is probably off as well. What the data collection exercise is really doing is ratifying the status quo of vertically integrated incumbent monopolies.

There are other models that can work, which make the data collection exercise irrelevant. So it is a policy question for you all, but I don't think, as we demonstrated in Westminster, it is irrelevant for us. We are looking to the future, and so current service levels are irrelevant to our policy decisions. We are looking 20 years to the future.

Mr. PALLONE. Well I was going to ask the next question, but I think you have already answered it.

But let me just say, how helpful do you think it would be for small communities like yours or mine in New Jersey if the FCC spent more time figuring out how to correct this data before rushing into larger projects.

Mr. WACK. Again, I think it is going to be irrelevant. It is like assessing your future water capacity based on drinking straws or your road capacity based on bicycles. That may work today, but in 10, 15, 20 years, all those numbers are going to be irrelevant. And these are long term investments. Fiber projects are or expensive, they are difficult, they take a long time. So this is a long game here. And talking about current service levels, it is a waste of time. Sorry.

Mr. PALLONE. That is all right. You don't have to be sorry. That is my question. Thank you for answering it. Thank you, Madam Chair.

Mrs. BLACKBURN. The gentleman yields back. Mr. Bilirakis, you are recognized.

Mr. BILIRAKIS. Thank you, Madam Chair. I appreciate it so much, and I appreciate the panel being here. Thank you for your testimony. My first question, it is clear that we must have the most up-to-date and complete information to avoid wasting taxpayer dollars. I am particularly interested in ensuring that funds are distributed efficiently and effectively to Americans with no broadband access.

Each of you identified the need for continually updated maps to show where broadband has been deployed. Considering the rapid changes in broadband data, it may be also advisable to include information where there has been a commitment under a federal or state subsidy program to deploy broadband to an area.

Mr. Darr and Mr. Brake, what are your thoughts on including committed broadband subsidies in future maps as opposed to ongoing deployment efforts? We will start with Mr. Darr, please.

Mr. DARR. The challenge with the mapping, if I could get you to please repeat the last two sentences.

Mr. BILIRAKIS. Yes, let me go on to do that. What are your thoughts on including committed broadband subsidies in future maps as opposed to just ongoing deployment efforts?

Mr. DARR. If I understand the question correctly, yes. Serving these areas is not just a matter of getting over an initial hump. Many of these areas are going to continue to be more expensive to serve than the revenues that can be generated from them.

You have got to have continuous mapping going on and understanding how the landscape overall is changing because the needs, as has been discussed on the panel already, what we may need 10 years from now could be very, very different. The opportunity to present this type of service to the rural areas, what meets their needs today may not meet their needs in 2, 3, 5 years.

Mr. BILIRAKIS. OK. Mr. Brake, do you want to comment on that?

Mr. BRAKE. Right. There has been a lot of talk about the challenges with 477 process. I think, again, as I stated in my testimony, if you work towards a more bottom up distribution method, as well as incorporating a more market-based approach as was outlined with the challenge process. There are ways in which we can improve this data collection process.

We are already collecting data twice a year, right? So the need to move to a wholesale different system in order to find more accurate data you can either go to a more granular 477 reporting or there are other ways in which we can really solve this information problem, rather than throwing hundreds of millions of dollars at a one-off mapping project.

Mr. BILIRAKIS. OK. Let me get on to the next question. Mr. Brake, you discussed the definition of broadband and various elements of how it is defined. If I understand your testimony correctly, speed is a factor we should give great weight, but other factors as well, such as latency and pricing are also relevant.

Are you suggesting that we take a holistic approach to defining broadband? And how should we prioritize factors other than speed?

Mr. BRAKE. I think that is right. So obviously the speed is the predominant metric by which we define different service levels of broadband and how we define underserved areas, right? But my primary concern is much more long term. Right? I worry that broadband networks will continue to evolve to support different services over a multi-decade timeframe.

So if in legislation we lock in a particular very narrow understanding of what broadband is, it doesn't give room for these programs to change over time. And so, absolutely, speed is most important. But I think we have to be holistic and pragmatic, and here the FCC, again, has lead the way, at least within the USF program.

Mr. BILIRAKIS. Very good. Again, for you, Mr. Brake, you referenced the FCC's 2016 broadband progress report, and statements by then Chairman Wheeler about the marked reduction of unserved Americans over the course of the year. Do you or does anyone else on the panel know how much of that progress was actually connected to nonserved areas, meaning zero coverage?

And how much was simply bumping up speeds of those who already had the 4-1 or 10-1 download or upload speeds? Why don't you comment on that?

Mr. BRAKE. I am not sure I know the exact answer to your question. So to be clear, the definition for the purposes of the broadband progress report is different from the definition for the purpose of Universal Service Funding. So this definition of Advanced Telecommunications Service is 25 megabits per second, I have criticized that decision under former Chairman Wheeler, as being seemingly designed to paint a particular picture of competition choosing the

25 megabits per second rather than, say, a 20 megabits per second standard, which would paint a much different picture.

Mr. BILIRAKIS. Thank you very much. Madam Chair, I am over. If anyone would like to respond in writing to that particular question, we would welcome that. Thank you very much. I yield back.

Mrs. BLACKBURN. The gentleman yields back. Mr. Welch for 5 minutes.

Mr. WELCH. I thank Madam Chair for having a hearing and Ranking Member Mr. Doyle. And I thank the panel. I just want to make a few comments.

Everybody has agreed that this challenge of getting rural broadband is absolutely essential to tackle. Seventy of us wrote to President Trump, and we heard from Secretary Ross who said that broadband is an essential part of our nation's infrastructure and vital component of economic policy.

In February we met with Chairman Pai and we urged him to have a targeted goal of what successful broadband deployment would look like. Chairman Pai came to the rural telecom working group and said that this was going to be a priority.

There is a number of bills that have been introduced that would start to address the challenge, some of them bipartisan, and the frustration I am having, quite frankly, is we haven't had a markup. It is 6 months into this, there is a consensus on what the challenge is, because it affects all of our districts, and even folks from really urban districts have rural components that need this help.

In the broadband report of 2016 from FCC talked about what that divide is, 39 percent of rural Americans lack access to advanced broadband.

In Vermont over a quarter of our population lacks access to advanced broadband, and it is a brutal problem for us. Rural America is getting left behind. So this is really a plea to our committee, Madam Chair, for all of us to start having markups and doing the tough work of having legislation that can actually concretely move us ahead.

We have got to, one, define what broadband deployment success in rural America is. We are getting some information on that now. Second, we are going to have to make some decisions about what is necessary to reach the goal. Does it mean public investment? That is a tough environment around here. But these broadband infrastructure deployments don't build themselves, they take money, and maybe it is a combination of direct investment in perhaps some loans. But that is a bottom line question, that unless we are willing to address, we are not going to be able to have a realistic plan to move ahead.

So this is just, from a representative who serves a rural district, a plea that we start having markups on some of the bills that are before us.

I will just ask a few questions because I have taken my time with this statement. But, Mr. Brake, if you were to recommend two things to start accelerating the deployment of broadband into rural areas, what would they be?

Mr. BRAKE. Well, I do think the FCC is taking a good start at evaluating potential legacy regulation developing model code that can help reduce the barriers to investment. So that is one area to

start. But I do think that, at the end of the day, if we really want to see a real acceleration in deployment, a greater investment at the Federal level is required.

Mr. WELCH. Ms. Matthey, do you have any comments?

Ms. MATTEY. Yes, two things. You need money and you need more money. And you have to decide to spend it.

Mr. WELCH. If we have money and more money, how do we have confidence that it will be wisely deployed?

Ms. MATTEY. Well, as I said in my opening remarks, I think it is very important if the committee decides to have money disbursed by an entity other than the FCC, that it be carefully coordinated with the FCC, to ensure that different Federal programs are working in harmony.

Mr. WELCH. Dr. Wack.

Mr. WACK. Yes, sir.

Mr. WELCH. Yes. Same thing. Same question.

Mr. WACK. I would say I am biased. I would say, give it to the municipalities with lots of strings attached. Require certain things, open access, certain project management oversight. But local problems are best solved locally.

Mr. WELCH. What about rural areas?

Mr. WACK. Rural areas, I think there are some great models on the ground today. I would suggest you look at RS Fiber in Minnesota, it is a cooperative venture between a couple dozen municipalities and cooperatives rural Minnesota that are solving their local access and broadband problems through a public private partnership.

Mr. WELCH. Thank you. I yield back.

Mrs. BLACKBURN. All right. Mr. Johnson, you are recognized for 5 minutes.

Mr. JOHNSON. Thank you, Madam Chairman. And, again, I thank the panelists for being here today, a very, very important topic.

Mr. Brake, you noted in your testimony that of the 6 percent of Americans that lack access to 10 megabits per second, close to a quarter of that number come from rural areas. And I can tell you, from personal experience, that that number is probably a lot higher in Appalachia, in eastern and southeastern Ohio along the Ohio River.

How is it that we keep missing large swaths of our nation in this otherwise well-intentioned effort to advance broadband access?

Mr. BRAKE. It is a very good question. I think it legitimately is a very hard challenge to get broadband into these very rural areas. When the homes are so widely dispersed, the revenue base is very wide and the cost per home is much higher. It is a real economic challenge.

If we do not define the goals very specifically in geography, I worry that sometimes money that is disbursed ends up inevitably pooling in the areas where the opportunity to see revenue return is greatest. I think this is more a concern when you are talking about broadband or loans rather than grants.

So, I mean, it is just a continuing challenge. But, as I said, the potential infrastructure package is a real opportunity to take another crack at it.

Mr. JOHNSON. Thank you. Ms. Matthey, do I have that right? Am I pronouncing that right?

Ms. MATTEY. Yes.

Mr. JOHNSON. In your opinion, how has the accuracy of our broadband maps improved since the responsibility for mapping shifted from NTIA to the FCC?

Ms. MATTEY. That is a complicated question. I think that the FCC has been working hard and has the advantage of requiring the information to be provided. But I have to be perfectly candid, I am aware of inaccuracies in the information. I am aware that some entities have made mistakes. I have heard that there are concerns that some overreport. I think, and I actually agree with several of the panelists today that have talked about the importance of validation and even auditing the data to ensure that the data are accurate.

Data collection companies are required to provide the information, but I will be candid and say, they don't necessarily have the strongest incentive to make sure that they are taking good care in submitting that information, and that is a problem.

Mr. JOHNSON. OK. All right. We will continue with you, Ms. Matthey. In rural areas, how significant is it that a rural census block is considered served as long as part of the block is served. Isn't a census block based approach to broadband mapping very grandular?

Ms. MATTEY. The issue, obviously, is if you require something more detailed than a census block, that imposes a greater burden on the parties that are submitting the information. Whether they are submitting it to the government or an independent clearinghouse or a private sector entity that is collecting the information, either way, that is burdensome.

A different approach is to just shift the presumption rather than saying you are going to deem the block served. If there is one location you can say the block is unserved unless all locations are served. That is a simple fix.

Mr. JOHNSON. Yes. That strikes me as problematic, though, because aren't there just a few homes in those census blocks? That is part and parcel to the question that I asked Mr. Brake earlier, when you are working on simply a census block, you miss folks.

Ms. MATTEY. Well, that is the issue. It is just a question of which way. Do you want to presume something is served or unserved, and obviously, the issue is to make sure that you aren't declaring a block unserved, and then having a situation where you potentially are funding somebody to compete against another provider that serves a corner of the block.

I have seen that in rural areas where, in the course of the challenge process, folks submitted maps, and you could see that there was a cable plant that was crossing perhaps a corner of a census block, but not touching all of the homes within. That is the policy dilemma, which way do you push the lever.

Mr. JOHNSON. And I think you are highlighting the problem and making the case about why it is so important that these maps be accurate, because that is one of the reasons why we continue to miss swaths of rural America is because of the way we are mapping it out and the detail we are going down to. OK.

Madam Chair, I yield back.

Mrs. BLACKBURN. Ms. Matsui, for 5 minutes.

Ms. MATSUI. Thank you very much, Madam Chair.

And I want to thank the panelists for being here today.

I think we all agree that good broadband data is essential to determining the public policies that we need to help facilitate broadband buildout. Now, I represent the city of Sacramento, the state capital of California. But I also believe, because we are the hub of the region, that it is really important to relate to the rural areas. And as Mr. Johnson and Mr. Loeb sack and others, Mr. Welch will attest, I do attend the rural-urban kind of coalition because I believe we need to work together.

Now, I believe that, for a region to succeed, you really have to look at both the urban and rural areas being unserved and underserved. And there are areas outside of my district that I work with really well, and there are very successful farming operations that I believe will be going on the longest time. There are other areas close to me that are farming now, but I can see the changeover to development and housing. And the region that I represent, the city and the suburbs, there are areas in Sacramento which were successful suburbs like in the 1960s and 1970s and no longer are that successful. And we see young people there not being able to have broadband to access their homework and all that.

So I am looking at this thinking that, for economic benefits, looking at urban and rural together, because, quite frankly, what is happening now is we are having sort of a leapfrog type of situation where the developers are doing something in the rural areas, and a suburban area that used to be successful no longer is.

And I am really wondering what we can do to tackle this. Is there different data we need to address that type of situation? We have a city area, which we are now getting a partnership with Verizon there for 5G. But then we have a suburban area, and then we also have the area that is developing from rural to suburban now.

I would think that there could be more harmonizing there. And I don't know whether the data even looks at something like that because you are looking, I think, Ms. Matthey said, we need to have more dynamic data. So I would like some comments on that, Ms. Matthey.

Ms. MATTEY. Well, obviously, there are multiple ways one can try to improve the quality of the data. One of the questions is, whether the government does it or the private sector does it, who is going to pay? Whoever is doing the work.

Ms. MATSUI. It is always that. Right.

Ms. MATTEY. Yes.

Ms. MATSUI. Can I just say this? Our subcommittee has discussed legislative proposals to create an inventory of Federal infrastructure and property which could be used for broadband. Local and municipal governments would be permitted to add their existing facilities to the inventory so they might be better utilized by broadband providers.

I am also looking at utilities and as we build transit, laying fiber and all that. And is there this type of coordination of data sharing now between the Federal, state, local governments? And have we



also invited some of the utilities and transit people to be a part of this? Anyone?

Mr. LEGG. Congresswoman Matsui, I think you are highlighting a very important issue that access to conduit, access to pole attachments, access to public rights-of-way, permitting through Federal lands, BLM, forestry, all of that, all of those are challenges to broadband deployment. Frankly, there is quite poor coordination on all of the things that I just mentioned, and there is much room for improvement.

Ms. MATSUI. So that would mean that you would have another type of cooperation agreement, in a sense, other than we are talking about today?

Mr. LEGG. That is right. I think so. I think the participation of state, Federal, and local entities in a common framework that would allow for the sharing of information on how to get access to those things is very, very important.

Ms. MATSUI. Well, I would think that would benefit both rural and urban areas.

Mr. DARR. Yes, absolutely. One of the significant hurdles right now within the urban areas particularly has to do with the need to streamline zoning and permitting for small mobile and Wi-Fi antennas. And this is going to impact the rural areas as well.

I was having a conversation with an operator last week who has a lot of coverage in rural Mississippi, and they are using small cells on a telephone pole that are the size of Coca-Cola cans. And as long as you can get fiber to that point, then you can provide very high-speed directed service to an area that is relatively nearby. You don't always have to have the 200-foot tower.

Ms. MATSUI. Sure.

Mr. DARR. But it is also important to understand that that fiber has to be there. If you don't have the fiber there, it is extraordinarily difficult to provide a high-speed signal.

Ms. MATSUI. Thank you.

I have been urged to wind up here. So thank you very much, and I will submit the rest of my questions.

Mrs. BLACKBURN. The gentlelady yields back.

Ms. MATSUI. I yield back.

Mrs. BLACKBURN. Ms. Walters, you are recognized for 5 minutes.

Mrs. WALTERS. Thank you.

I would like to thank the chair for holding this hearing this morning and for our witnesses for appearing.

Unfortunately, as we have been discussing, there are significant portions of this country that don't have access to broadband, which limits economic potential but, far more troubling, increases the digital divide. And in order to get there, it is clear that we need to find a way to properly and appropriately identify the areas that need coverage, and that starts with accurate and up-to-date data. That being said, as we look to improve this data, we must ensure that taxpayer dollars are spent wisely and efficiently.

Mr. Brake, you mentioned in your testimony that Federal support dollars should be given first to areas that are truly unserved. You state that priority should be given to these communities until the cost of connecting each additional premises becomes untenable. What cost should policymakers consider untenable?

Mr. BRAKE. I am not sure I can give you an exact number. I worry that that is, to some extent, a political question, what amount of money we are willing to spend to advance truly universal coverage. The real challenge is, as you approach the very last few percent, the cost of connecting each additional user really takes off like a hockey stick. And so I would assume that we have to draw the line at the last 2, last 1 percent. And at that point, it becomes reasonable to be looking at other technologies, such as satellite.

Mrs. WALTERS. So, if public investment does not reach these remote areas, that very last section you were talking about, will these communities ever be served?

Mr. BRAKE. They are served now by satellite, except for some extremely far north regions of Alaska, is my understanding, so perhaps not with as robust a technology; perhaps the coverage would be less reliable or the latency higher. But the very final last percent satellite remains an option.

Mrs. WALTERS. OK. Switching gears, Mr. Brake, I have got another question for you. In regard to smart infrastructure, can you touch upon the advancements we have seen in the networks themselves?

Mr. BRAKE. I can talk for a while about that. There are all sorts of ways in which the underlying technology that underpins these broadband networks is continually changing. I do worry, especially with the conversation about dark fiber, that there is a sense that these are simply dumb pipes, that if we put the infrastructure in the ground, then nothing has to change. That is simply not the case.

While a lot of the innovation, to be fair, is happening at higher layers of the stack, if you will, there are ways in which a lot of the routing and the real smarts of the network is being developed within software rather than hardware.

That is a very important transition that, while pretty obscure and technologically advanced, is an important transition, and so finding ways in which private sector can continue to drive those innovations. And I think the real balance is providing Federal funding to continue to see this, networks built out into rural areas, but leaving a lot of the actual innovation in the core of the network to the private sector is the answer.

Mrs. WALTERS. OK. I yield back the balance of my time.

Mrs. BLACKBURN. Ms. Clarke, you are recognized for 5 minutes.

Ms. CLARKE. Thank you very much, Madam Chair.

And I thank our panelists for their expert witness testimony this morning.

Dr. Wack, just following Ms. Matsui's line of questioning, rural and urban areas often experience similar socioeconomic dynamics. I represent an urban area. So, while we would not be defined as unserved, that doesn't mean that there aren't issues that also need to be addressed, such as maximum available speeds that aren't sufficient to support business needs or limited competitive and affordable options.

Can you speak to the conditions that preceded the city of Westminster's decision to explore building its own dark fiber network,

and why are quality broadband speeds essential to businesses in your city?

Mr. WACK. Thank you, Congressman Clarke.

As I mentioned before, we went through an exhaustive planning process looking at our current levels of service, what the satisfaction with those levels of service were in our business community and in a residential population. And the resounding answer was that they were unsatisfied.

And I did not mention before, there was also a parallel effort working with our incumbent providers to get them to upgrade their infrastructure and their service levels, which took the better part of a decade, that conversation unfolded, and it was all for naught. There was no movement. Lots of promises, lots of talk, but no action. So we finally took matters into our own hands and started pursuing this project.

Ms. CLARKE. I am also very concerned about redlining and the digital divide that seems to continue to grow. While many urban areas are defined as served, using the most recent definition of broadband from the FCC, I am concerned that there could be pockets within these areas that are still ignored by service providers. What can be done to address these concerning issues to ensure that everyone can have the opportunity to have access to broadband services? Dr. Wack.

Mr. WACK. Thank you. So this is a very important question, and I am glad you asked it. One of the things that we hear a lot today is an unfortunate conflation of service levels with the existence of the infrastructure. And we are debating a lot about service levels and the prevalence of service levels, but that sort of is making the service tail wag the infrastructure dog. And you can't have service at all until you have infrastructure.

And what we have pledged in the city of Westminster is that the city is going to extend just the infrastructure but make it available to every single person in our community regardless of the neighborhood, their economic situation, et cetera, so that everybody has access to the infrastructure, which then allows service providers to provide whatever level of service they think they can make a dollar off of, because we believe in the power of the free market to solve these problems.

It is kind of a waste of time debating what features you are going to have on a car when you don't have any roads. We want to build the road first, and then we can have that conversation about big car, small car, red car, blue car, air-conditioning, CD. That is later. First, we need to build the roads, just as we first need to build the infrastructure and make sure that every citizen in our community has access to it.

Ms. CLARKE. So, Dr. Wack, I wholeheartedly agree with your statement in your testimony that high-capacity data services and the infrastructure to provide them are essential in 21st century. I also agree that there is a duty for government to ensure that the infrastructure is in place.

What can the Federal Government do to help local municipalities like the city of Westminster achieve wide deployment of quality high-capacity data service? I think you went into that a bit in your last answer, but if you could just drill down a little bit deeper.

Mr. WACK. Sure. So the city of Westminster ship has sailed. We have already committed \$21 million to that project, and we are going to see it through to the end.

The barriers for other municipalities to do this really boils down to three things. One is their finances. Some municipalities unfortunately have a lot of debt, and that is a problem. So, to the extent that the Federal Government can help them with that, that would lower the barrier for them to do these kinds of projects.

The second thing is they have competing infrastructure projects: bad roads, bridges, water systems, et cetera. So, again, to the extent that the Federal Government can help relieve those problems, it would help.

The third is political will. They just have to be able to feel like they can see this project through, because as I said before, these are hard projects. They are taking many years. They are expensive. But our model shows that the infrastructure can end up paying for itself so that it doesn't unduly burden the rest of the municipal finances and still provide open-access infrastructure to allow the market to develop services and pricing levels that are suitable for that opportunity.

Ms. CLARKE. Very well. Just in time.

I yield back, Madam Chair.

Mrs. BLACKBURN. You always do a good job, Ms. Clarke, and we appreciate that.

Mrs. Brooks, you are recognized.

Mrs. BROOKS. Thank you, Madam Chairman.

Just a couple months ago, the State of Indiana passed legislation that empowered the deployment of small cell devices to bring 5G technology, similar to what my colleague from Sacramento was talking about, to Indianapolis. And our city is currently a test site for 5G evolution buildout.

And while these are incredibly important, much of my district is also rural and may not necessarily be experiencing the same high-speed broadband access, and, in fact, one out of six Hoosiers live in an area of the state without any broadband access at all. And so I very much appreciate these discussions, particularly for those of us who are in both urban, suburban, rural, small-town districts.

One of the things that I would like to delve into a little bit more, and I haven't heard about it talked about enough probably, but, Dr. Wack, you talked about the importance of public/private partnerships, and I don't think we have really talked much about that. And you just talked about barriers in response to my colleague from New York's question.

What would you say are the keys to success, or is it overcoming these barriers that you just talked about with respect to public/private partnership in this space? Can you expand on what you—and I might ask some of the others for what they think keys to success could be to have successful public/private partnerships in this space?

Mr. WACK. Thank you, Congresswoman. I am sorry.

The public/private partnerships are all about allocating risk appropriately between the partners and making sure that the incentives for pursuing the partnership are aligned so that both parties get something out of it.

That is hard to do between the public sector and the private sector for a variety of reasons, but it is not impossible. And there are many examples of successful public/private partnerships in a variety of industries. There is no one-size-fits-all. Every community is unique. The private partners that come to the table are going to have unique skills and assets.

But I guess the key factors for success are appropriate risk sharing, that it is not one party is taking all the risk, not one party is footing all the bills, not one party is accruing all the benefits. Both sides have to have skin in the game. Both sides have to be able to gain something from it. But what they need from it are very, very different from the public sector and the private sector. The public sector doesn't need to make money. They just need to solve problems for their community. The private sector needs to make money. And there is nothing wrong with that.

And those are some of the challenges that need to be overcome sort of culturally between the two partners, getting both sides to understand that solving a policy problem really doesn't have anything to do necessarily with the bottom line, but the private partner has got a bottom line, and the public partner has to be cognizant of that.

Mrs. BROOKS. And thank you for that.

I am curious if any other panelists have any other ideas, because I think we need to think very creatively here in trying to bring broadband to everyone in the country. Anyone else like to add as to what you would like to see if we were to promote concepts of public/private partnerships? Yes.

Mr. BRAKE. So one thing I agree with Dr. Wack on is there is no one model of public/private partnerships. So there are different ways in which private industry and local governments can work together to try to find ways to accelerate deployment.

I would say, as a general rule, advancing a public/private partnership of this sort of type where the local government actually publicly owns the infrastructure itself should be off the table when there are already two existing providers in a particular area.

Part of my concern is that, especially when these are dynamic markets and two existing providers can be competing on other terms other than broadband access itself, if we come in with a simple fiber model and you are not competing on video or potential wireless play, it can become financially difficult for the public offering.

And I worry that then you see the public fiber model looking to pick off the highest revenue entities, such as the local government or businesses, and ultimately sees it more difficult to serve the overall area outside of where the municipal network itself is provided.

Mrs. BROOKS. And very briefly, Ms. Matthey, do you have any comments or any thoughts, briefly?

Ms. MATTEY. I think it is very important at the state and local level to find providers that actually want to serve the area. If it is a provider that doesn't want to serve the area, you are not going to get anywhere. And so it is really important at the grassroots level, whether it is through something that we have heard about today or other methods trying to find folks in the community, pro-

viders in the community, folks that are actually committed to actually making this happen.

Mrs. BROOKS. Thank you.

I yield back.

Mrs. BLACKBURN. The gentlelady yields back.

Mr. Olson, you are recognized for 5 minutes.

Mr. OLSON. I thank the chair.

And welcome to our five witnesses. You are 5 minutes away from lunchtime.

Mr. Brake, my first question is for you, sir. You talked about the need to have reasonable broadband goals and the policy implications of defining broadband as 25 megabits per second versus 10 megabits per second. When I talk about broadband speed, I get my guidance from my sweet daughter Kate. She is 20 years old, a sophomore in college.

My question is, what type of a service can a consumer, like my Kate, expect with a 10/1 connection?

Mr. BRAKE. So it is a very good question. So part of the context of putting out those sorts of questions is ultimately there are trade-offs involved, right? What kind of service can you achieve for 10? You can do a lot of things that are economically productive. You might not be able to stream the highest definition resolution of video, right.

And so, when you are looking at providing funds to build broadband out to the entire country, I would say we should look at providing that sort of level of service, where you can participate in the economy, you can do productive activities online, but you might not have access to the highest bandwidth applications. We should get those out to as many people as possible before then turning to the higher bandwidth possibilities.

Mr. OLSON. My daughter Kate wants to stream video at the highest speed. So it sounds like that is a challenge for Kate.

Does the average consumer—and I doubt this is my Kate—use more than 10/1 on a regular basis?

Mr. BRAKE. I am sorry. Can you repeat the question?

Mr. OLSON. Does the average consumer use more than 10/1 on a regular basis? Is it normal? Higher than that? Lower?

Mr. BRAKE. I would say lower. It depends on what you are trying to use it for. If you are doing a large file transfer or something like that, over time, you could use up as much bandwidth as you have available.

But for most purposes, no, it would be much less than that. You can stream 4k video or at least encode 4k video at 15 megabits per second. So it is like, we are talking, you can easily do probably 720p—you can still do high-definition video but not the very highest.

Mr. OLSON. Thank you.

Ms. Matthey, ma'am, I realize I would be maybe playing with you by making you the judge, the jury, the executioner. But what suggestion do you have as the Federal Government looks to exploit broadband deployment when we have multiple programs at the Federal level doing the same jobs? So basically, where will you terminate? Cut? What will you restructure? What is your vision if you

could make the government do what you want us to do? Judge, jury, executioner.

Ms. MATTEY. I can't answer that question in 2 minutes.

Mr. OLSON. How about the number one?

Ms. MATTEY. As I said earlier, if Congress chooses to appropriate funds and direct those funds to a Federal agency, I presume it will be separate from the FCC because those are appropriated funds. And I would absolutely mandate that there be coordination with the FCC so as to ensure that the Universal Service Fund funding is not working at cross purposes with the additional infrastructure funding that Congress mandates.

And I will also say one thing: I too have a sweet Kate, and it takes more than 10 when you have got three kids in the house.

Mr. OLSON. Oh, boy, probably way more than 10.

I asked you that question about the judge, jury, executioner. What would you do? Mr. Brake, I see a smile on your face.

Mr. BRAKE. I would agree. I think that one of the most important things is coordination with the Universal Service Fund, Connect America. But, yes, I think there is widespread agreement that money needs to be spent to see additional buildout in rural areas. I think getting over that hump is challenging enough.

Mr. OLSON. Mr. Wack, you have a chance to file your last statement. Anything you want to take out from the Federal Government? I know it is not quite your bailiwick, but being a local operator, are you concerned about what D.C. is doing to the State of Maryland, your business there?

Mr. WACK. That is also too much for 28 seconds. I would just say build a lot of fiber, open it up, refer it to as many users as possible and make a commitment to reach every citizen of the United States regardless of where they live.

Mr. OLSON. Mr. Darr, Mr. Legg, 15 seconds. Any comments or too short of time?

Mr. LEGG. I would say, Congressman, that the need for speed is only going to increase. What is available or should be considered a minimum standard today will not be the minimum standard in a very short period of time: Applications, video, things we do over the internet constantly evolving, and we want that to be the case. So shoot for as much infrastructure, as much fiber as possible, especially with the advent of 5G on the horizon.

Mr. OLSON. As a naval aviator, the need for speed is very dear to my heart. So thank you.

I yield back.

Mrs. BLACKBURN. The gentleman yields back.

And we will UC Mr. Tonko and Mr. Griffith to the committee to ask questions.

Mr. Tonko, you are recognized for 5 minutes.

Mr. TONKO. Thank you, Madam Chair. Thank you for the hearing.

And thank you to our witnesses.

In the digital age of the 21st century, broadband is essential to how we communicate and exchange information, conduct business, and engage in the democratic process. From young children working on school assignments to college students studying for exams to adults working from home or running a small business, easy and

affordable internet access has become an integral part of our daily lives.

I hear from my constituents all the time about the lack of access to broadband internet throughout the region I represent. Some of these areas are rural and mostly unserved or underserved, and other areas are underserved with a few houses having access while many others are left without affordable options in sight.

I have heard from doctors who depend on the internet to read X-rays when they are on call, from librarians who see students sitting in the parking lot after hours so they can finish homework, from workers who are forced to leave their home to find high enough speeds so that they can upload or download large files. They all ask, when will we have access to broadband?

As a committee, we owe all of these people an answer. I appreciate that we are holding this hearing today, but we must take action. A lack of access to broadband internet in the capital region is one of many reasons why I made it a priority to join this very committee.

Let's work together to invest where we need to so that we can give these communities the service they deserve. These communities have been asking for help for a very long time, and as we heard, it is only going to become exacerbated from this point forward.

I am especially proud that New York State is helping to lead the way on expanding broadband, especially in upstate New York. This year, the New York congressional delegation helped to secure more than \$170 million in funding to expand high-speed internet access in upstate New York.

This will be added to \$500 million that has already been set aside by the state. The program has raised the goals for internet access speeds with an aim of 100 megabits per second across New York and 25 in the most remote and rural areas.

I hope that, by partnering with states like New York that are dedicating their own funds to broadband deployment, we will create a positive incentive, encourage other states to create their own broadband funding programs.

I am concerned that some of the census block data that are relied upon to determine if communities are served might show a misleading picture, especially in communities that may be partially served.

With all that being said earlier, Dr. Wack, you had discussed how Westminster was underserved despite meeting criteria for adequate broadband coverage. I would like to drill down a little deeper on that. Just how did this affect the people and businesses of your great community?

Mr. WACK. In short, it just slows them down. So the anecdote I related, that company almost lost that contract because they couldn't deliver their product on time, which relied on their internet connection. And as I related, they ended up mailing it. And again, this was just a few years ago. This is the 21st century. That is not acceptable.

And that is the constraint on future growth. So, sure, some of these businesses may be able to get by today, but if we are talking about growth, we are talking about growing the economy, creating



jobs, and creating opportunities for our constituents, we have to plan for future capacity. And existing capacity is already inadequate.

Mr. TONKO. What would this mean for home values or funding for schools and for students?

Mr. WACK. For home values, there is data that is out there that says that just having a dark fiber connection to the house increases the value of the home 3 to 5 percent. We are going to test that proposition in Westminster, and we were already seeing increased interest in some of the residential communities that are already lit. The realty community is excited about this. They are starting to market it. And they are seeing people coming saying: I want to go to a neighborhood that has the fiber service.

Our schools were already connected because of a Middle Mile Project that actually enabled our project. So we have already seen the benefit there. But I would imagine that, as the whole community gets connected and those kids are able to connect back to the school, there will be all sorts of opportunities for distance learning enabled by that as well.

Mr. TONKO. Why don't I just ask the entire team here, what progress would you suggest has been made at expanding broadband access? What would you cite as the progress for broadband, Mr. Legg?

Mr. LEGG. Congressman Tonko, thank you for the question. I think that we have seen a rapid expansion of gigabit service in urban and suburban areas across the country just in the last few years.

I think that highlights the fact that there is actually a growing digital divide in the country where urban and suburban areas have gigabit service and rural areas are still struggling on dialup or low-grade DSL services. So I think the divide is actually increasing.

It is great for urban and suburban areas. I think that there is a need for that speed. Our concern as a nonprofit organization is what is happening in some suburban and rural areas where they are simply not able to keep up.

Mr. TONKO. And that is of a great concern.

Anyone else?

Mr. DARR. I would like to add that, capturing a picture of how the networks are behaving today, we need to keep in mind that even though we have accomplished bringing a specific level of service to a given point at a given time, that doesn't mean that that will be maintained.

If you take a look at a two-lane, a four-lane freeway and it was designed for perhaps 40,000 cars, this is the same concept. If you put 70,000 cars on that highway, everything slows down. As you attract more people to the network and they learn they can do new things, then it is going to create further congestion on the network.

And so, if you are able to provide service to an area at 10/1 or 25/3, whatever that is defined by, then that can degrade over time if you continue to put more and more people and more and more load and stress on that network.

Mr. TONKO. OK.

Madam Chair, you have been most kind and generous. I have exceeded my time, and I yield back.

Mrs. BLACKBURN. The gentleman did exceed his time, but that is perfectly OK.

Mr. Griffith, you are recognized for 5 minutes.

Mr. GRIFFITH. Thank you very much, Madam Chair, and appreciate all the members of the committee being here.

We have been monitoring it, the testimony that you all have been giving, and so a lot of the things that I am going to ask or talk about, you all have already touched upon. But I did mention to the chair lady how much I appreciated her holding this hearing.

We have got to have accurate maps, as you all have all said. My district, for those of you who aren't familiar with it, is the rural corner of Virginia that stretches from Kentucky and Tennessee and North Carolina and West Virginia up to, I call it the cornucopia of the State, up to the edge of Roanoke.

In it, we have Virginia Tech, a highly wired community. And, yet, I have professors outside of Virginia Tech who do not have any service at all. It is not a matter of speed; they don't have anything. If they want something, HughesNet is their only option. Also, in Montgomery County, a few more miles, that is about 5 or 6 miles outside of Blacksburg, that we have that. Now, part of that has to do with the fact that the district does have a lot of mountains and a lot of nooks and crannies. But still, in Montgomery County, I have an area where the laid wire gets to within about 2 miles of the edge of the county, and the people out there have nothing.

I have got huge sections geographically, maybe not huge population, but huge sections geographically that the FCC thinks they are serving, and it appears they might. They aren't. It is not there. I have looked at their maps, and there are lots of areas I know are white with no service that they don't seem to understand there is no service.

Public-private partnerships that you all touched on, I think, are very important. We are not going to lay wire to every one of those nooks and crannies, but we have got to get them some service. And while it may not be as fast as they can get it in downtown Blacksburg, it ought to be at least serviceable for kids doing their homework.

And I think all of you agree with that. The question is how we do it. And I don't know how we can craft it at the Federal level. So, if you all sleep on this and come up with an idea, let me know.

But I happened to stop by a couple weeks ago to see some folks in Bland County in their administrative offices. They started talking to me, and they had a fellow there from GigaBeam, which is a local startup that started in 1994, just a computer service company. And they saw that nobody was providing internet service so they started doing it where they could. It is expensive.

Bland County has been bartering with all kinds of folks. So when they needed to get a tower put up in one location, they were telling me they happened to know that a power company needed a little easement from them. So they said: We will give you the easement if you help us put the tower up. They already had all the equipment there.

Now, I don't know how you put that into a piece of legislation, Madam Chairman, because that is just good commonsense. The equipment was all sitting there. They said: All right, we need your

help. We will give you the easement you need; you get your guys to put the tower up.

And, you know, there they made a deal.

That is the kind of stuff we need if we are going to get it out into a lot of the rural areas like mine where it is not easy. Bland has got two tunnels so the interstate can get through the county. So it is not an easy terrain, but there are a lot of good folks there, and they need their kids to be educated, and they need the ability maybe to bring in some jobs to the areas that aren't flat enough to build buildings on.

So you all have all touched on that. I want to work with you, as I know the chair lady does and the rest of us do, to try to solve these problems. And I think the first step is to get the mapping done, because if you don't know you have got a problem and you are building up the speeds in certain areas of the country because you think that is the problem and I have got people that don't have—and a fair number have no service at all. That is something that we need to be looking at to fix.

So I am happy to give whatever time I have remaining to if anybody wants to respond or make any comments. But, frankly, you all have done a great job of getting the information out there already. And I am aware of that. So thank you.

Anybody want to respond?

Mr. WACK. Congressman Griffith, thank you.

Mr. LEGG. Congressman Griffith, thank you for your comments. I grew up just across the Kentucky-Virginia line. I understand some of the areas that you are dealing with there.

I think one of the things that Congress can do is look at ways of incentivizing ease of pole attachment, ease of locating facilities and easements on public right-of-way within other easements that are granted to railroads and to power companies.

I think there is a lot that can be done. We talked a little bit earlier. I think it was Congressman Matsui that raised the comment that conduit easements, pole attachments, those are all things that actually either inhibit or promote the growth of broadband service, and that is certainly something that Congress could help with.

Mrs. BLACKBURN. The gentleman yields back.

And seeing no further members wishing to ask questions of this panel—and you all have done a wonderful job, and we thank you, that you have been here today.

Before we conclude, I do ask unanimous consent that we can submit a letter from the Satellite Industry Association.

[The information appears at the conclusion of the hearing.]

Mrs. BLACKBURN. And then I know that the minority has two articles to submit regarding the exchange between Mr. Brake and Ms. Eshoo, and one relates to chairman—they are both from Free Press and one relates to Chairman Pai and his investment numbers and the other two AT&T CEO regarding “Net Neutrality Rules Haven’t Harmed Investment.” And I have one article from The Verge that cites statements from the CEOs and the deputy counsel from Verizon, the CEO from Charter, the CEO from Comcast, and AT&T discussing how it did inhibit or slow investment.

Mr. TONKO. If I could just clarify, the minority is asking simply for the one Free Press article to be introduced into the record.

Mrs. BLACKBURN. The one, OK.

Mrs. BLACKBURN. Amended. So ordered. Without objection.

[The information appears at the conclusion of the hearing.]

Mr. TONKO. Thank you.

Mrs. BLACKBURN. Pursuant to committee rules, I remind members that they have 10 business days to submit additional questions for the record.

And I ask that each of you, upon receiving those questions, answer within 10 business days.

Seeing no further business to come before the subcommittee today, we are adjourned.

[Whereupon, at 12:38 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

## The Westminster P3 Model

The city of Westminster, Md., chose a three-layer, public-private partnership model for its fiber-to-the-home network. Here's why.

By Robert Wack / *Common Council of Westminster, Md.*

**L**ook at a map of Maryland, and, right in the middle of the state, you'll see a town at the center of a spiderweb of secondary roads that radiate toward all points of the compass. A hundred years ago, before the interstate highway system was built, this web of roads put Westminster, Md., in the thick of all commercial traffic between Harrisburg, York, Gettysburg, Frederick, Baltimore and Washington, D.C.

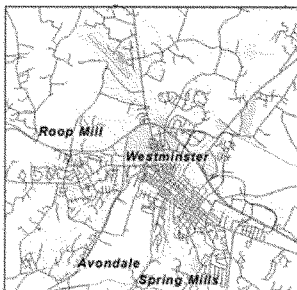
Westminster is once again going to be at the central node of a network, but this time it's a network of fiber optic lines that will connect every home and business in the city to deliver gigabit data service and more. The Westminster

Fiber Network is using an innovative public-private partnership (P3) model to build one of the first gigabit networks in the Mid-Atlantic region. To fully appreciate how the Westminster model might be applied to other U.S. cities requires an understanding of how it differs from the many other possible P3 models.

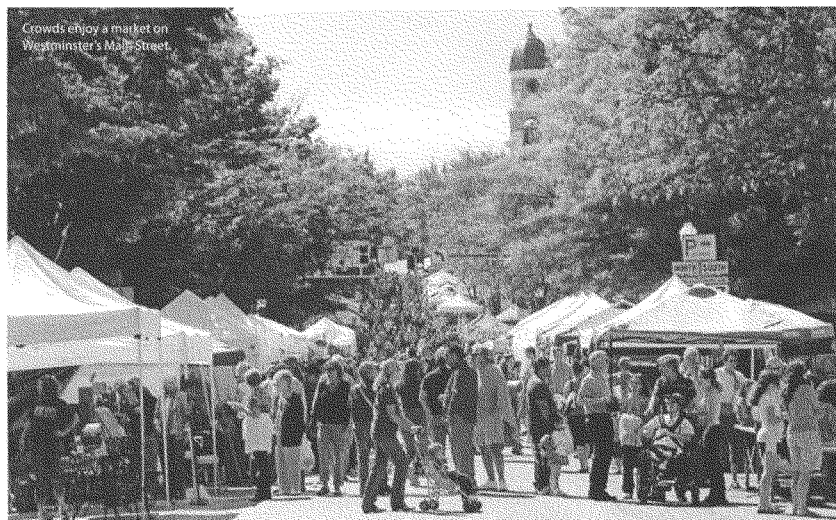
Public-private partnerships have a long, and by some accounts uneven, history in the world of public infrastructure. There have been some spectacular P3 failures, but no model is impervious to the universal human failings of incompetence and malfeasance. The success or failure of a P3 project is a function of that project's specific circumstances rather than of anything inherent to the P3 model.

A successful P3 project is at its core a true partnership in which both parties achieve their goals while sharing the risks and rewards in ways they are comfortable with and can sustain over the life of the deal. Striking that balance requires each party to have a very clear idea of its strategic goals. Those goals will, in turn, drive the decision making as the terms for the P3 are crafted.

The city of Westminster entered discussions with potential partners with three core principles: (1) public ownership of the fiber network; (2) a multitiered service model that would partition risks and responsibilities to separate operational layers; and (3) a commitment to open access at the service level as the end state of the service environment. Each of these is important on its own and closely interrelated with the others.



Westminster sits at the center of a spiderweb of roads.



#### PUBLIC OWNERSHIP OF FIBER

Public ownership is the starting point. As in all business relationships, ownership equals control, and control is absolutely necessary for a community to ensure that it achieves the economic development goals of a fiber project. The expectations of the 1996 Telecom Act were unmet in part because the last-mile infrastructures of the nation's telecom networks were never truly opened up to unfettered competition. The best way to ensure open access going forward is for local government to own and control the local infrastructure.

However, that's not the only reason for public ownership. As a steward of the public interest, local government has a duty to ensure that public goods, such as essential infrastructure, are widely deployed, well-maintained and open for use by all citizens. Is there any more essential infrastructure in the 21st century than the physical assets necessary for high-capacity data services?

Only with public ownership and control can the current problems of

redlining and the growing digital divide be comprehensively addressed and solved. A commitment to public ownership enables universal access to broadband, which in turn is a major source of public support for committing the resources that network construction requires.

In other words, when a local government assures its citizens that they all will benefit from an infrastructure project, public support for the necessary expenditures to implement that project becomes much easier to secure.

From a financial perspective, the construction, maintenance and ownership of dark fiber fit perfectly with the other infrastructure obligations of local government. Just as municipalities and counties are responsible for building and maintaining roads, pipelines, sidewalks, curbs and gutters, so too should they be tasked with building the basic pipelines for 21st-century data services.

But that doesn't mean local governments should all become ISPs. Some have chosen that path, in many cases quite successfully. Just as not all municipalities are well-suited to operate

electric utilities or water utilities, not all local governments need to offer data services. However, all local governments build and maintain roads, and fiber networks are the roads of our future.

Local governments can confine their roles to simply owning and maintaining the outside plant (OSP), the inert components of the network that comprise the fiber itself, the boxes and enclosures used to make connections and house equipment, and the conduit through which the fiber travels. All other components of the system — anything that requires power or transmits data — can be delegated to the private-sector partner.

This is an obvious partitioning of ownership and responsibilities because of the major differences in the useful life and cost of the system components and the different risk tolerances and expected return horizons of the partners. Public-sector entities epitomize "patient capital." They are able to make long-term investments with no pressure to expect fast, high-margin returns. Local governments routinely spend millions of dollars on infrastructure with the only expectation

## FTTH DEPLOYMENT

**Fiber can be financed over time frames that are comparable to other public infrastructure projects and can provide revenue that will pay the debt. Fiber can be self-supporting.**

of return being the long-term beneficial impact on the local economy and the consequent maintenance or improvement of the local assessable tax base, which allows them to maintain tax revenues without rate increases.

Like most modern technology, network equipment has a useful life of between three and five years, after which it must be replaced with newer, faster equipment. In contrast, fiber has a useful life of at least 40 years, as the first fiber networks were built in the 1970s and are all still in operation. Fiber strands do not decay, corrode, rot, wear or expire. If left undisturbed, they will continue transmitting data for decades without any maintenance or upgrades.

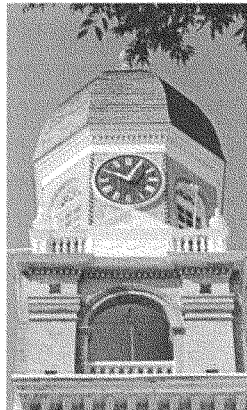
Fiber is the perfect asset for a local government to invest in to improve the local infrastructure for economic development. Fiber can be financed over time frames that are comparable to other public infrastructure projects, such as asphalt or concrete, and in ways the private sector cannot contemplate. What's more, unlike concrete and asphalt, fiber can provide the revenue stream necessary to repay debt without unduly burdening the other capital obligations of the local government. Fiber infrastructure can be self-supporting.

By taking responsibility for the OSP, the public sector improves the economics of any given network project. Approximately two-thirds of the capital expense of building a network resides in the OSP. The rest of the capital expense is for networking equipment and software. In contrast, operating expenses for the OSP are minimal compared with the significant overhead of staffing network operations and service provision.

Removing the capital expense of OSP construction from the ROI equation of the private partner radically transforms the economics of a broadband project, enabling a private partner to contemplate services in markets it otherwise would never consider. With the right partner, the local government need not embark on the expensive and much riskier enterprise of staffing and operating a network to provide services.

#### A MULTITIERED MODEL

Assigning ownership of the OSP to the public partner opens the door to further segmentation of roles within network operations. To see how this is possible and why it is important for network services going forward



The Westminster clock tower

requires understanding the history of telecommunications technology and how that history informs existing telecom business models.

In the early years of telecommunications networks, the infrastructure consisted of copper wires that carried one channel of data (an analog sound signal). Configuring a connection between any two points on a network required actuating mechanical switches to create a temporary physical circuit. At first, that mechanical switch was a human operator who physically pulled plugs and replaced them to create the circuit; eventually, that function was automated. To ensure maximum control of the customer service relationship, a service provider had to own and control every last bit of infrastructure down to the telephone at the end of the circuit.

As automation gradually replaced each component and as software and IP technologies gradually transformed networks, the need for control of the infrastructure to provide services gradually disappeared. Today, a service provider can be entirely virtual, riding on someone else's network and using someone else's fiber, yet maintain very close, reliable, high-touch relationships with customers.

For 21st-century networks, this enables a further partitioning of network services into two levels, both entirely operated by the private sector: utility bandwidth services provided by a network operator and customer-facing services provided by one or several service providers.

This division of operations and services into wholesale and retail levels has several advantages. Specialization further decreases the capital and operating expenses of the providers at each level. Specialization also enables competition at the service level because there are very low barriers to entry. A wholesale network operator is motivated to bring more retail service providers onto the network and to create new retail revenue streams by increasing the diversity, as well as the number, of services.

Retail service providers benefit

from the drastically reduced capital expenditures necessary for them to compete. Consumers benefit from lower prices, better service, more kinds of service and the relentless pressure to improve that healthy competition fosters in a truly open market.

The fundamental advantage of this model is the allocation of expenses (and therefore of risk) to the levels at which they are most appropriately handled. Each role has responsibilities and risks peculiar to it, which are handled best by entities most comfortable and experienced with mitigating that risk.

Local governments are very good at building and maintaining infrastructure with a useful life of many decades (roads, pipes, fiber). Network management is a distinct problem requiring particular skills and particular capital and operating expenses. Security, stability and reliability are the key attributes that affect risk in that arena. The life cycle of the services and infrastructure for network operations is measured in a few years.

Provision of services to residential and business customers, compared with network management, requires significantly more investment in human capital, shorter product life cycles and higher risk of failure but generates potentially much higher margins. Time frames in this arena are much shorter – in some instances as short as months. In a properly configured broadband ecosystem, this is where the innovation will occur to drive economic growth in the 21st century.

#### OPEN ACCESS

The multilayer service model lays the groundwork for the creation of a true open-access environment at the service level. In such an environment, customers can switch providers without barriers, try new services as they are developed and enjoy greater transparency into the cost and quality of providers' offerings.

Lowering the barriers to entry for new providers allows real competition to take place and rewards service providers that deliver better services at lower prices. In addition, there are no

The fundamental advantage of this model is the allocation of expenses, and therefore risk, to the levels at which they are best handled.

barriers to entry for any provider that wants to offer new, innovative services, thus accelerating innovation and economic development. The consumer wins in all instances.

The multilayer model also aligns the interests of all parties. Having more service providers increases revenues for the network operator, which in turn increases the incentive for the local government to continue expanding the physical network, as the network operator's financial success underwrites the expansion of the OSP. The larger the network footprint, the more potential customers, who in turn can support a larger ecosystem of competing service providers, which then incentivizes further growth, all while accomplishing the larger public interest goals of universal access, increased utilization, competitive pricing and numerous diverse services.

#### THE WESTMINSTER MODEL

Westminster's current contract with Ting captures these elements. Initially, Ting is both network operator and sole service provider while it installs equipment, ramps up staffing and develops its service capabilities. When it achieves various negotiated milestones, it will be contractually obligated to structurally separate its wholesale and retail services and begin admitting additional service providers to the network. Ting's wholesale arm is required to treat each new service provider in exactly the same manner as its own service provider arm.

The exact manner in which a service provider accesses the network, and the specific equipment responsibilities that may entail, will depend on the business relationship between Ting and the service provider and the specifics of the service offering. Westminster did not want to unnecessarily encumber its

network operator partners with unduly specific requirements because the types of services and the technologies required to deliver them are changing too fast to prudently enshrine in a contract.

The Westminster Fiber Network is sufficiently overbuilt that other users of fiber infrastructure (for example, wireless carriers, specialized business users and government agencies) may also lease fiber from the city, separate from other users.

The first phase of construction is complete, lit and providing services to an area that has several hundred serviceable business and residential addresses plus several large MDUs in a retirement community. The next phase, currently in engineering, will add approximately 2,000 serviceable addresses. Construction of the second phase will begin in early 2016 and, depending on subscription take rates, will speed up or slow down to match the demand. Eventually, the network will reach more than 7,000 homes and businesses inside Westminster; if demand warrants, it can be extended to another 8,000 just outside city limits.

In summary, the Westminster model of public-private partnership provides a scalable blueprint for any local government of any size to implement a communitywide broadband network in a financially sustainable manner. Through public ownership of the infrastructure, partitioning of the network operations by layer and a commitment to open access, any community in the country can realize the economic development potential of massive broadband. ♦

*Robert Wack is the president of the Common Council of Westminster, Md. He can be reached at [rwack@westgov.com](mailto:rwack@westgov.com).*







Written Testimony of Elin Swanson Katz

Connecticut Consumer Counsel

Submitted To

U.S. House of Representatives  
Committee on Energy and Commerce

*Defining and Mapping Broadband Coverage in America*

June 21, 2017

Chairman Blackburn, Ranking Member Doyle, and members of the Subcommittee, thank you for allowing me to submit testimony and share my perspective on this important topic. As Consumer Counsel for the State of Connecticut, I serve as the consumer advocate on issues relating to energy, water, natural gas, and telecommunications, and lead the Office of Consumer Counsel (OCC), a small, independent state agency. I am also the agency head of the State Broadband Office, housed within the OCC. In this role, I have worked with many individual consumers, businesses, state and municipal officials, community-based advocacy groups, and industry stakeholders on identifying challenges and opportunities around broadband deployment in the State of Connecticut.

Our work in the state, and more particularly with municipal leaders, has highlighted the challenges faced by rural communities *as well as urban communities* in obtaining affordable broadband internet services for our citizens. While the challenges to rural communities are more widely documented and understood, the inability of many consumers in low-income urban centers, many of which have predominantly minority populations, to access affordable broadband internet service is less well-known or acknowledged, but is just as intractable a problem. National broadband policies and even the National Broadband Plan have discounted the importance of urban areas of low-income residents as being actually on a par with many rural areas for being restricted to low speeds at exorbitant prices. If there is a perceived “competition” for government funding between urban low income areas and rural areas of the US, in light of the obvious digital divide between persons of wealth or based on considerations of race, government support is equally important in urban areas because the high population density of cities has the potential to produce greater returns per dollar (i.e., “more bang for the

buck”). This higher proportional benefit to federal, state, and local governments should be seriously considered by this Committee in balancing the financial returns to the federal government and the social and economic effects on urban lower-income earners. Combined with the far greater proportion of persons of racial and ethnic differences found in many urban low-income areas, US government policy must not overlook the entire range of returns on investment that a focus on urban areas will yield.

For consumers without affordable broadband internet service, be they rural or urban, the lack of access impacts their lives in innumerable ways: it impedes their children’s ability to complete schoolwork and communicate with their teachers; prevents consumers from applying for jobs with the ever-growing number of companies that require online applications; serves as a barrier for critical governmental services that require online enrollment, such as Medicaid, Medicare, and unemployment benefits; and thwarts small businesses’ ability to develop websites, engage in online “e-commerce” and even provide basic services such as credit card processing, just to name a few impacts.

To document some of the challenges faced by our consumers, we commissioned the report, “A Brief Overview of Broadband Deficiencies in Connecticut,” published in January 2016 and linked [here](#). Specifically, we commissioned CTC Technologies of Kensington, Maryland, to conduct site visits at business locations in Connecticut and test available speeds to provide a small sample of broadband customer experiences. As detailed in the report, in Hartford, the state’s capital city, we received reports from city officials that many businesses and institutions within the city were limited to only low levels of service; hence, that was one of our focuses.

As just one example, Scotts' Jamaican Bakery is a commercial bakery with multiple locations in Hartford for food preparation and retail sales. At their central office located on Windsor Street in Hartford, speed tests found a download speed of 1.44 Mbps, an upload speed of 1.0 Mbps, a round-trip latency of 340 ms, and jitter of 364 ms. With these speeds and service quality – which are equivalent to dial-up internet service – the owner, Gordon Scott, reported that he does all but the most rudimentary Internet tasks from his house. He stated that it is frequently impossible to send or receive email at that location if the phones are in use.

The report also details other small businesses and a community-based organization in Hartford that faced similar challenges obtaining affordable broadband internet service, and were attempting to conduct their businesses on what amounted to dial-up speeds. These businesses are all located in low-income areas with predominantly minority populations.

Our report is not a comprehensive overview of rural and urban challenges with broadband access in Connecticut, but rather was intended to provide a “snapshot” of some small business experiences in select urban and rural areas, intended to spur dialogue about solutions. However, through my position as Consumer Counsel, both I and members of my office have interacted with over 100 municipal officials from the majority of our 169 cities and towns on the challenges faced by their consumers – individuals, businesses, community health care providers, community service providers, schools, libraries, and other stakeholders – in obtaining affordable broadband internet service.

The stories and anecdotes from the myriad of consumers demonstrates irrefutably that there is much work to be done to ensure that every citizen, including citizens in urban areas, has access to the digital economy. I commend the work of this Subcommittee, and thank you

for your attention to the topic of defining and mapping broadband coverage in America. We cannot solve this problem until we understand and acknowledge the full extent of the digital divide in our country and recognize that there are unique but distinct challenges for both rural and urban communities.



June 20, 2017

The Honorable Marsha Blackburn  
Chairman  
Subcommittee on Communications and Technology  
House Committee on Energy and Commerce

The Honorable Michael Doyle  
Ranking Member  
Subcommittee on Communications and Technology  
House Committee on Energy and Commerce

Re: Defining and Mapping Broadband Coverage in America

Dear Chairman Blackburn and Ranking Member Doyle:

The Satellite Industry Association (SIA)<sup>1</sup> applauds the House Subcommittee on Communications and Technology of the Committee on Energy and Commerce for continuing to address important elements of broadband availability for all Americans. Satellite broadband is an important platform that brings connectivity across the United States and its territories. Ensuring that all competitive broadband platforms are included in broadband mapping will improve the accuracy of the data and help all consumers, regardless of location, know all the competitive options that are available in selecting a broadband provider.

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<sup>1</sup> SIA is a U.S.-based trade association representing the leading satellite operators, manufacturers, launch providers, and ground equipment suppliers who serve commercial, civil, and military markets, including broadband services. Since its creation almost twenty years ago, SIA has been the unified voice of the U.S. satellite industry on policy, regulatory, and legislative issues affecting the satellite business. SIA Executive Members include: The Boeing Company; AT&T Services, Inc.; EchoStar Corporation; Intelsat S.A.; Iridium Communications Inc.; Kratos Defense & Security Solutions; Ligado Networks; Lockheed Martin Corporation; Northrop Grumman Corporation; OneWeb; SES Americom, Inc.; Space Exploration Technologies Corp.; SSL; and ViaSat, Inc. SIA Associate Members include: ABS US Corp.; Artel, LLC; Blue Origin; DigitalGlobe Inc.; DRS Technologies, Inc.; Eutelsat America Corp.; Global Eagle Entertainment; Glowlink Communications Technology, Inc.; Hughes; Inmarsat, Inc.; Kymeta Corporation; L-3 Electron Technologies, Inc.; O3b Limited; Panasonic Avionics Corporation; Planet; Semper Fortis Solutions; Spire Global Inc.; TeleCommunication Systems, Inc.; Telesat Canada; TrustComm, Inc.; Ultisat, Inc.; and XTAR, LLC.

Accurate data regarding broadband availability across the nation is also important to inform future public policy aimed to address broadband gaps in unserved areas across the nation. SIA supports funding to improve broadband mapping, however, such activities should not delay the prompt implementation of Universal Service Fund or other federal funding programs aimed to get broadband service to unserved citizens across the nation.

Because of wide coverage of satellite broadband services today, all of the continental United States, including millions of consumers without terrestrial broadband, have an available high-speed broadband service<sup>2</sup>. Satellite broadband consumers are able to receive speeds that meet and exceed FCC-defined broadband speed of 25 Mbps download/3 Mbps upload (25 Mbps/3 Mbps). Today, approximately 1.7 million consumers in the United States and its territories, in both rural and populated areas, subscribe to satellite-delivered broadband services.

Satellite broadband is also available at speeds at or above 25/3 Mbps on mobile platforms, to enterprise and government customers, and as internet back-haul services. With the launch and deployment of two new multiple high throughput, high speed broadband satellites this year with more underway, plus future plans for non-geostationary satellite ("NGSO") constellations for low-latency broadband, U.S. consumers will have ever-increasing choice in receiving satellite broadband services, no matter where they are. Accordingly, it is critical that satellite be included in any mapping of broadband services available in the United States today and in the future.

#### **The Benefits of Satellite Broadband Services**

As Congress develops its broadband mapping, it should consider the many positive attributes of satellite broadband. These include, but are not limited to:

1. **Competition:** Just as it has with radio and television services in the past, satellite broadband provides market-based competition to terrestrial services. When provided with a level playing field, satellite broadband brings additional package options, pricing, and innovative services to consumers in the United States, often in areas with only a single or low number of providers.
2. **Wide Geographic Coverage:** To address the digital divide, broadband services need to be available for the most rural and remote areas of the country. The nature of satellite's wide coverage ensures that all communities within the satellite's footprint receive the same quality of service, whether they are remote communities or big cities, when given the same incentives as terrestrial

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<sup>2</sup> 2016 Broadband Progress Report, FCC. <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2016-broadband-progress-report>

providers. Further, satellite coverage has the advantage of having a geographically independent cost structure, when incentivized, making it particularly well suited to serve a large number of high-cost, low-density areas, where the build out of terrestrial infrastructure would not make economic sense.

3. **Availability:** Unlike terrestrial broadband, satellite broadband is available today across a significant portion of the United States without the build out of additional infrastructure. When incentives are provided on a technology neutral basis, a customer can obtain satellite broadband services by simply ordering and awaiting at-home installation. Accordingly, unlike with respect to terrestrial broadband, no long-term build out is required of satellite broadband.
4. **Cost-efficiency:** Because satellite systems have inherently wide-area coverage, when technology neutral incentives are made to encourage capacity redirection, there is no additional cost to build out to rural and remote areas, only lost opportunity costs in more lucrative service areas. This is unlike terrestrial services, where the low density of rural and remote areas makes it costlier and in most cases, not economically viable, to build out and cover these areas.
5. **Reliability:** Natural and manmade disasters can result in the interruption of terrestrial broadband services. Satellites, however, are less affected by these events where satellite ground systems or satellite-enabled airborne equipment can be quickly deployed to restore connectivity. Additionally, some satellites serve as a router in the sky, independently switching to provide connectivity to the end user without additional deployed equipment. This level of reliability is often sought by government and businesses alike to ensure continuity and a rapid response.

#### **Defining Broadband and Ensuring an Accurate National Broadband Map**

There are no real limitations on what broadband can become and, therefore, it is better to avoid rigid definitions. Rather, it is more appropriate to define broadband in terms of evolving performance characteristics, based on the technologies and applications that consumers want and use, not fixed “top down” performance definitions. In the past, there has been a singular focus on “speed” as the sole factor that should define broadband (e.g., Gigabit service). While this may be important for some applications, it may not be necessary at arbitrary levels for all essential applications or on all devices. Different speeds may be more suitable to different types of applications.

Other factors such as differentiated service or pricing models, data caps, service availability, jitter, bursting, symmetry, latency, mobility and portability may emerge to play a role in consumer broadband choice and requirements. Given a competitive market, those



solutions that are most responsive to consumer needs and preferences should succeed, while those that do not respond to such needs and preferences are likely to fail. Technology neutrality is especially important in addressing today's expectation of being connected everywhere. Satellite mobility applications now reach Americans not just in underserved areas, but allow them to stay connected while on airplanes, on vessels, and in transit to remote locations.

SIA supports continued funding to keep up to date the National Broadband Map. SIA urges that any such mapping include all platforms for broadband connectivity to ensure accuracy and consumer understanding of available options, particularly in unserved and underserved areas. A technology neutral approach to the National Broadband Map is needed to ensure that government is not tipping the scale in favor of one service over another, thereby limiting consumer choice of all broadband options.

#### **Conclusion**

Satellite broadband services are and will continue to be a critical piece of the competitive broadband services competitive landscape. As Congress considers how to best develop its National Broadband Mapping system, it must capture satellite broadband in its analysis. Failure to do so will deny American systems access to the high-quality, advanced, cost-available broadband services that are available via satellite today without waiting years to build out, and underrepresent the advances already underway in ongoing satellite broadband technology innovation.

The Satellite Industry Association stands ready to provide additional information as necessary and thanks the Subcommittee for advancing the topic of broadband connectivity and the National Broadband Map through this hearing.

Sincerely,

/s/  
Tom Stroup  
President  
Satellite Industry Association



## Sorry, Chairman Pai: Your Investment Numbers Don't Add Up

Dana Floberg | May 17, 2017

Broadband Mobile Net Neutrality Fighting Media Consolidation The FCC and Media Policy

When FCC Chairman Ajit Pai claims that Net Neutrality rules have stifled broadband investment, he's wrong on every level.

On Monday, Free Press released the thorough and comprehensive report *It's Working: How the Internet Access and Online Video Markets Are Thriving in the Title II Era*. Relying on publicly available data and robust, transparent methodology, Research Director S. Derek Turner breaks down investment data on a granular level and conclusively proves that Pai's investment claims are flat-out wrong, no matter how he spins them.

In fact, Pai's claims are so deeply flawed that one post isn't enough to fully debunk them. Over the next few weeks, we'll be publishing a four-part series to expose his investment lies one layer at a time.

First up: Chairman Pai is wrong on the numbers.

Pai has insisted on numerous occasions that aggregate broadband-industry investment has "declined" or "flatlined" since the Net Neutrality vote. As the report explains in depth, aggregate capital-spending data is a poor measure of the industry's reaction to Title II. Even short-term changes in investment can be misleading since investment follows company-specific deployment cycles — and as the companies themselves have noted, it's getting cheaper to deploy services. Investigating individual-company results and explanations, which the Free Press report does extensively, is a much more accurate way to measure deployment.

Despite that, Pai still wants to talk about aggregate expenditures. We'll bite: As poor a metric as it may be, Pai's claim of a decline in aggregate capital spending is also *not true*.

The FCC's 2015 Open Internet Order correctly applied the law that Congress wrote, and reclassified broadband-internet access as a Title II telecom service. That's the only foundation the FCC could

have used for strong Net Neutrality rules that prevent blocking and unreasonable discrimination. It's also the law that undergirds the FCC's broadband competition, affordability and privacy oversight.

It's a framework the FCC has used successfully for the past several decades — for wireless voice and business broadband services — in a light-touch, deregulatory manner that does nothing to dampen investment.

Figure 1 shows the capital spending of all publicly traded ISPs during the two years before and the two years after the FCC restored Title II for broadband-internet access:

**Figure 1: Capital Expenditures by Publicly Traded Broadband Providers (2013–2016)**

Altogether, publicly traded ISPs **spent approximately 5 percent more** on capital investment during the two years after the FCC's decision than they did in the two years prior. Far from declining or flatlining, aggregate industry investment has been growing.

More importantly, this growth isn't the result of a few outliers making major investments. As we can see in Figure 1, **two-thirds of publicly reported ISPs increased their capital spending** after the FCC correctly reclassified broadband under Title II.

Some ISPs (including a few big ones like Cox) don't publicly disclose their investment data. To include those companies in his analysis, Free Press' Turner drew from an annual U.S. Census Bureau survey.

**Figure 2: Capital Expenditures by All U.S. Telecommunications Firms  
(U.S. Census Bureau Annual Capital Expenditures Survey, 2008–2015)**

Total capital spending across the three survey categories of broadband providers was \$87.184 billion — **more than \$553 million higher** than it was in 2014.

If we break it down by category, we see that wired broadband providers such as cable companies spent \$2.7 billion more after the FCC vote than they did before it — a bump of nearly 6 percent. Resale and satellite carriers also saw investment growth from 2014–2015.

Wireless capital expenditures did decline in 2015, but that decline can be attributed almost entirely to AT&T's ramping down of investment after the completion of its nationwide 4G-deployment project. AT&T's temporary decline came at the end of a massive upgrade cycle the company had planned in 2012, years before the Title II vote. So that dip had nothing to do with Title II's impact on wireless. In fact, the remaining three of the nation's four largest wireless providers (Sprint, T-Mobile and Verizon Wireless) all *increased* their capital investment in 2015.

We can also go deeper by examining core network investment. Most cable companies report their capital expenditures in categories that allow us to separate broadband-network investment from non-network spending. Figure 3 shows the total annual core network investments for cable operators in the two years before and after the FCC's Open Internet Order:

**Figure 3: Cable ISP Network Investment, Publicly Reported and Estimated Totals  
(2013–2016)**

The data reveal a **48 percent increase** in the cable industry's core network spending during the two years after the FCC's Net Neutrality decision. In fact, 2016 represents the industry's **highest single-year jump** in network investment since 1999. This historic growth came after cable companies had a *full year* to digest the potential impacts of Title II restoration.

It seems the cable industry never got Pai's hand-wringing memo about how terribly it's doing under Title II.

Wireless telcos don't release specific data on their core network spending, but recent industry analysts still provide reliable markers of telco broadband-network investment. According to their data, telecom spending on DSL ports declined by 20 percent in 2016, continuing a longstanding trend. However, telco ISPs increased their spending on fiber terminals and terminal ports by nearly 50 percent in the same year.

Sorry, Chairman Pai: Broadband-industry investment has actually *risen* since the FCC protected Net Neutrality under Title II.

How did Pai get his numbers so wrong? By relying on demonstrably false analysis from the USTelecom Association (USTA) and industry consultant Hal Singer.

USTA's analysis is both inexcusably opaque and openly manipulated. The lobbying group never explains its methodology for estimating investment by companies that don't publicly release their spending data. Instead, the group presents its mysterious final estimates with nothing but a wink and an unspoken plea to "just trust us" by way of justification.

USTA also admits to artificially reducing the reported investment numbers of both Sprint and AT&T — something the group hadn't done before to any company in the entire history of its annual investment report. Sprint's reported capital spending rose sharply in 2015 as the company invested in purchasing smartphones to lease to its subscribers — but USTA argues that such expenses shouldn't count. That's nonsense. Sprint purchasing and leasing smartphones is no different from cable companies purchasing and leasing set-top boxes, which USTA *does* count as investment.

USTA also subtracted approximately \$2 billion from AT&T's reported capital spending to account for the company's merger with DirecTV. That's utterly disingenuous. It's impossible to know how much DirecTV *would have* invested if it hadn't merged with AT&T, or vice versa, so how did USTA decide how much to subtract?

AT&T's merger came with "synergies", which allowed it to avoid certain duplicative investments. AT&T actually touted these potential savings as a major justification for the merger. And in 2015, AT&T's CEO crowed about how his company was spending less but building *more* thanks to the efficiencies that earlier upgrades provided.

Mergers are complicated beasts. Would AT&T and DirecTV have individually spent more or less if their merger had been rejected? There's no way to know for certain. USTA not only assumes the answer but arbitrarily decides exactly *how much* the companies would have spent in this alternate reality. As a result, the trade group's biased and manipulated conclusions are analytically suspect.

Even if we accept USTA's crystal-ball math, a decline in AT&T's investment is hardly shocking — the company predicted it. In 2012, AT&T forecast that a massive deployment project would lead to increased capital spending for a maximum of three years, followed by a temporary decline upon the project's completion. That's exactly what happened.

Singer repeats the same disqualifying manipulations found in USTA's analysis. He also takes the alternate-reality prophesying one step further by claiming that while most ISPs' investment has risen since the FCC's vote, it would have risen *even more* without Title II.

How does Singer support such fairy-tale claims? He can't. How could a company like Mediacom, which upgraded its entire footprint to gigabit service in less than a year, invest *even more, even faster*? Singer can't say.

These industry-funded analyses fly in the face of reason, logic and basic common sense. Chairman Pai's unquestioning adherence to these "alternative numbers" is equivalent to this administration's love of "alternative facts." In both cases they're completely wrong.

For more details, click here to read the full Free Press report *It's Working: How the Internet Access and Online Video Markets Are Thriving in the Title II Era*.

*Original photo by Flickr user Reyner Media*

**Read the other posts in this series:**

FCC Chairman Pai Doesn't Know How to Measure Investment:

<https://www.freepress.net/blog/2017/05/24/fcc-chairman-pai-doesnt-know-how-measure-investment>

The Trump FCC's Opposition to Net Neutrality Rests on a Weak Foundation:

<https://www.freepress.net/blog/2017/06/05/trump-fccs-opposition-net-neutrality-rests-weak-foundation>

FCC Chairman Ajit Pai Doesn't Want to Admit How Enormous the Internet Economy Really Is:

<https://www.freepress.net/blog/2017/06/13/fcc-chairman-ajit-pai-doesnt-want-admit-how-enormous-internet-economy-is>

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May 30, 2018

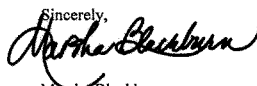
Mr. Doug Brake  
Senior Telecommunications Policy Analyst  
Information Technology and Innovation Foundation  
1101 K Street, N.W.  
Washington, DC 20005

Dear Mr. Brake:

Thank you for appearing before the Subcommittee on Communications and Technology on Wednesday, June 21, 2017, to testify at the hearing entitled "Defining and Mapping Broadband Coverage in America."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Wednesday, June 13, 2018. Your responses should be mailed to Evan Viau, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed to [Evan.Viau@mail.house.gov](mailto:Evan.Viau@mail.house.gov).

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,  
  
Marsha Blackburn  
Chairman  
Subcommittee on Communications and Technology

cc: The Honorable Michael F. Doyle, Ranking Member, Subcommittee on Communications and Technology

Attachment

**Responses of Doug Brake to Questions for the Record  
Subcommittee on Communications and Technology  
U.S. House Committee on Energy and Commerce  
Hearing Entitled, "Defining and Mapping Broadband Coverage in America"  
June 21, 2017**

**The Honorable Eliot Engel**

1. There seems to be consensus that we should expand broadband access in the United States, but of course it is expensive to build the necessary infrastructure. In New York, we have an aggressive broadband expansion plan that offsets high costs through a reverse auction process. We use data from the FCC to identify both unserved and underserved areas. Then we auction off grant money for each area, awarding financing to the private company that seeks the lowest state subsidy. The system has attracted many different providers, including major telecommunication companies like Fairpoint and Frontier, as well as small utilities like Middleburgh Telephone Company and Margaretville Telephone Company

- a. Can you comment on New York's plan and whether you think we should adopt certain aspects of it on the federal level?

*There is much to admire in the "New NY Broadband" expansion program. It is certainly one of the, if not the number one, most ambitious state-level investments to expand broadband to rural areas. The funding allocation model, pioneered by the FCC's Connect America Fund, utilizes a reverse procurement action, with bids weighted by the performance criteria a proposed build can be expected to achieve. This model has many advantageous and is the design we urged policymakers to support within our recent report, "A Policymaker's Guide to Rural Broadband Infrastructure."<sup>1</sup>*

*This grant allocation mechanism is technology neutral, without giving up the ability to target desired goals, such as a specific throughput (New York targets 100 Mbps in most areas, and 25 Mbps in the least economical areas) or latency. It has low barriers to entry, and has solicited and awarded grants to a wide variety of providers. But the reverse auction also allows for the fact that often in rural areas upgrading existing DSL lines is the most economical way to hit a higher speed target.*

*The design and execution of New York's broadband expansion program are admirable, but it is simply too early to determine if the program has been a success. Time will tell. But the main limiting factor in replicating this model elsewhere is the funding. New York utilized money from the FCC's Connect America Fund, essentially implementing the procurement auction the FCC otherwise would have, but also injected additional funds secured through various settlements with the state. Additional funding for a one-off acceleration of rural broadband should be advanced in Congress.*

*One of the most important lessons from New York's program is the importance of working closely with the FCC's Connect America Fund. New York relied on funding, data, modelling, and auction design principles from the FCC. Furthermore, this program was done in lieu of a CAF II auction in New York. I can appreciate that as a political matter, a new, federal, acceleration of broadband infrastructure might be implemented by an authority other than the FCC. But it is incredibly important that the two programs be tightly coordinated. Not only does the FCC's CAF program have by far the most experience and the best track record in deploying economically efficient grants that do not overbuild existing networks, it is*

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<sup>1</sup> Doug Brake, "A Policymaker's Guide to Rural Broadband Infrastructure," ITIF (April, 2017), <https://itif.org/publications/2017/04/10/policymakers-guide-rural-broadband-infrastructure>.

*also important that the two programs not work at cross purposes, by, for example, targeting different speed goals in the same areas.*

*Thank you for your question and please feel free to contact me if you would like to discuss further.*



GREG WALDEN, OREGON  
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY  
RANKING MEMBER

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**House of Representatives**  
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Minority (202) 225-3641  
May 30, 2018

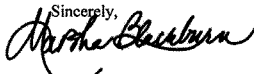
Dr. Robert Wack  
President  
Westminster City Council  
1838 Emerald Hill Lane  
Westminster, MD 21157

Dear Dr. Wack:

Thank you for appearing before the Subcommittee on Communications and Technology on Wednesday, June 21, 2017, to testify at the hearing entitled "Defining and Mapping Broadband Coverage in America."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Wednesday, June 13, 2018. Your responses should be mailed to Evan Viau, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed to [Evan.Viau@mail.house.gov](mailto:Evan.Viau@mail.house.gov).

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,  
  
Marsha Blackburn  
Chairman  
Subcommittee on Communications and Technology

cc: The Honorable Michael F. Doyle, Ranking Member, Subcommittee on Communications and Technology

Attachment

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June 1, 2018

Evan Viau  
Legislative Clerk  
Committee on Energy and Commerce  
2125 Rayburn House Office Building  
Washington D.C. 20515

Please find enclosed my responses to Honorable Frank Pallone's follow up question to my testimony before the Committee on June 21<sup>st</sup>, 2017.

Similar to those voiced at the hearing, criticisms of the Westminster Fiber Network (WFN) project generally fall into four categories. Keep in mind, however, that these criticisms usually have no bearing on the specifics of our project, but are typically only industry talking points applied to all public broadband projects. These attacks are either poorly informed, or deliberately misleading, with the thinly concealed agenda of derailing reasoned deliberation to maintain incumbent monopolies at the expense of the public good.

The first category of criticism is that public broadband projects "compete with the private sector". This is a canard borne out of reflexive belief that anything government does is inefficient, incompetent, or unnecessary, and the fantasy that unfettered free markets solve all problems. The reality is that where the private sector is performing well in a competitive market place, public broadband projects don't exist or are of very modest scale. For example, in cities like Austin, TX, or Kansas City, MO, where there are multiple providers offering high level services at reasonable prices, there is very little interest, or need, for a public broadband project. That was not the case in our community, as well as many others around the country, where local market failure compelled elected officials to action.

In Westminster, the innovative Public Private Partnership creates a division of labor that precludes the need for the City to compete with any private provider of broadband services. In fact, the WFN specifically enables multiple providers to compete using shared, publicly owned infrastructure due to the planned open access nature of Westminster fiber. Rather than compete with the private sector, the WFN enables competition between private sector providers for the benefit of the community.

Most importantly, because the Westminster model dramatically reduces the capital expense for new providers to enter a market, service providers can make a reasonable profit with far fewer customers, further enabling competition. This is because the majority of the capital expense of a new network deployment is in the Outside Plant elements (fiber, conduit, handholes, and enclosures), which have an expected useful life measured in multiple decades, as opposed to 3-5 years for most other network elements. This makes the OSP portion of the network ideal for local government investment, comparable to other locally financed and owned, long-lived, durable public infrastructure assets.

Unfortunately, in too many communities across the country, the market failures rooted in telecom regulations and monopolistic industry practices preclude access to abundant and reasonably priced broadband services. In short, in communities where incumbent providers have stable, and especially majority, market share, there is zero incentive to invest in infrastructure upgrades to provide faster service, especially technology upgrades that have short replacement cycles. It makes far more economic sense for those providers to harvest as much profit from existing infrastructure for as long as possible, as long as they do not face market share erosion from competitive pressure. Those incumbents tend to spend far more time and resources defending their incumbency rather than extending or upgrading their infrastructure, because in the short term, preserving incumbent monopoly is a far more profitable use of resources.

The second criticism from incumbents about public broadband projects is that they "lose money". In the case of the WFN, criticisms note purported discrepancies in media coverage about the cost of

construction, the amounts borrowed to finance the project, and the reported revenues and take rates. These criticisms in every case either misrepresent, or misunderstand the finances of the project.

The WFN is just over 50% complete, and construction is on schedule and under budget. The financing tool used is a General Obligation construction loan, with a variety of features that significantly mitigate the financial risk of such a large project. The lender allows the City to borrow in tranches as phases of construction are completed, with the option for the City to stop borrowing at any point. So, although the total approved loan amount is up to \$21 million (the number often misstated as the total cost of the project), to date the City has only borrowed a little more than \$8 million, with a revised projected total project cost of around \$16 million upon completion in 2019. If for some reason the City decides to stop construction short of completion, it can do so without penalty or obligation to borrow the remaining balance of the loan.

In terms of revenue, the nature of broadband projects is that it takes many years for "occupancy" of the network (typically referred to as the take rate) to reach a stable state, typically 3-5 years. This is not unique to public broadband: these are exactly the time frames that incumbent providers give to their investors to set expectations for when their networks reach break even or begin generating positive cash flow. Just like any other capital intensive projects that have incremental revenue generation (hotels, retail shopping malls, office buildings) a certain amount of "ramp up" is built into financial projections to set expectations for when a project will break even. In those projections, provisions are made to fund the shortfall in the early years when fixed startup capital and ongoing operating expenses exceed variable revenues.

In the case of the WFN, our financial model projects a 20% take rate within the first year of completion of a phase of the project, which has been achieved for the pilot, first, and second phases. Longer term, we aim for a 40% take rate within 5 years of completion of a phase, which should put the project near break-even, defined in our case as revenues sufficient to cover debt service. We still have a long way to go before those metrics will be ready for analysis given the relatively early stage of the project.

The third category of criticisms are that local government "doesn't know how" to build and operate broadband networks. Of all the criticisms leveled by the incumbents and their paid advocates, this one has some truth to it. However, even a cursory review of the preposterous record of waste and failure in the telecommunications industry shows that miscalculation, corruption, incompetence, and bad luck are hardly unique to public sector projects.

It is true that local government in many cases does not generally "do" telecom, and local governments, in general, are not the most nimble organizations. However, there are ample examples of local governments taking on the challenge, whether out of necessity or ambition, and mastering the complexities and expertise of fiber and outside plant construction, network operations, service upgrades, and customer service. Some do it better than others. Some have failed spectacularly, others more quietly. But in no case is the record of public telecommunications failure anywhere nearly as astonishing as the waste and inefficiency of the bad actors in the private sector.

All complicated and expensive projects, whether public or private, are prone to the same universal liabilities of human nature: incompetence, malfeasance, and bad luck. There are public broadband projects that have failed due to poor planning, bad advice, bungled execution, or misguided assumptions. There are also projects which failed due to the too common human habits of greed and corruption. Timing, weather, supply shortages, accidents, and market changes all bedevil public broadband projects the same as private ones.

But let's look at the track record of the private sector. An exhaustive analysis of the waste, fraud, corruption, failure, and inefficiency in the private telecommunications industry over the last 20 years

would require a multi-volume book series. In no particular order, here is a brief list of private sector telecom failures in recent decades, which squandered billions of dollars in shareholder value:

MCI/Worldcom/Enron  
 Failed mergers and acquisitions  
 Entry and withdrawal from cloud services (Verizon, CenturyLink, Windstream)  
 Botched hardware deployments (Microsoft phone, Samsung, Google/Motorola)  
 Content distribution catastrophes (sports, media)  
 Hyped wireless panaceas (WiMax, LightSquared)  
 Verizon/Fairpoint debacle in the Northeast  
 Numerous bankruptcies

Last, public broadband projects are criticized as being "too risky" for the public sector. Let's leave the cowardice inherent in that opinion for last. First, nothing is risk free, and there are many functions of local government that possess substantial risk that no one bats an eyelash about. Ask the public works employees down in trenches or paving roads about risk, or the law enforcement officers on traffic stops or knocking on doors. Local government takes on large, complex, and expensive construction projects, whether new buildings, pipelines, highways, or water treatment facilities and generally manages those projects the same way and with comparable results as the private sector.

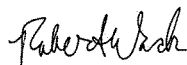
Unlike private industry, local government cannot easily resort to the expedient of declaring bankruptcy when things go poorly, for whatever reason. As a result, local governments tend to be very risk averse in any case, and are often slow to change and take on new challenges, or new ways of solving problems for their communities. In this way, the incumbent critique of broadband projects as being "too risky" plays to public sector anxiety about risk and failure. In the public sector, there are few rewards for taking risks, and lots of punishments, especially when the risk results in failure.

However, innovation requires risk taking, and innovation is inherent in the American way of life and government. The greatest achievements of our country, in both the public sector and private, have come from risky innovations. There is no progress without risk. The Founding Fathers knew that.

That is why the criticism that public broadband projects are "too risky" for local government is in some ways the most despicable. It is inherently un-American, a cowardly, small potatoes, narrow, short-term perspective that guarantees relegating future generations of Americans to mediocrity and second-rate status.

Thank you for the opportunity to share the Westminster experience, and please feel free to contact me with any further questions for feedback.

Regards,



Robert Wack  
 President, Westminster Common Council

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May 30, 2018

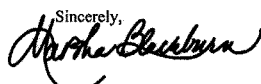
Mr. Bryan Darr  
CEO  
Mosaik Solutions  
6423 Shelby View Drive  
Memphis, TN 38134

Dear Mr. Darr:

Thank you for appearing before the Subcommittee on Communications and Technology on Wednesday, June 21, 2017, to testify at the hearing entitled "Defining and Mapping Broadband Coverage in America."

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Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,  


Marsha Blackburn  
Chairman  
Subcommittee on Communications and Technology

cc: The Honorable Michael F. Doyle, Ranking Member, Subcommittee on Communications and Technology

Attachment

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**The Honorable Eliot Engel**

1. There seems to be a consensus that we should expand broadband access in the United States, but of course it is expensive to build the necessary infrastructure. In New York, we have an aggressive broadband expansion plan that offsets high costs through a reverse auction process. We use data from the FCC to identify both unserved and underserved areas. Then we auction off grant money for each area, awarding financing to the privacy company that seeks the lowest state subsidy. The system has attracted many different providers, including major telecommunications companies like Fairpoint and Frontier, as well as small utilities like Middleburgh Telephone Company and Margaretville Telephone Company.
- a. Can you comment on New York's plan and whether you think we should adopt certain aspects of it at the Federal level?

While I am not an expert on New York's plan, it sounds like it is analogous to the FCC's Mobility Fund II process, in which reverse auctions will be employed to make Universal Service Fund support available to bring mobile LTE service to unserved areas across the United States.

There are two key elements to making efforts such as MF-II and the New York program work effectively. First, there must be upfront agreement on the definition of broadband and what constitutes an unserved or underserved area. Second, regulators or program administrators need access to meaningful data to evaluate and make determinations regarding which areas fit these definitions and are thus eligible for either Federal or state support. It is on this latter point that Mosaik can provide substantial input to inform better decision-making by policymakers.

Mosaik has built and maintains the largest coverage database offering visibility into the reach and performance of U.S. mobile networks. These datasets are more robust, and updated more frequently, than those managed by the FCC or by any state. Furthermore, on June 19, 2018, Mosaik was acquired by Ookla, the company behind Speedtest® network performance testing platform. The combination of Ookla and Mosaik opens up exciting new data and visualization capabilities and further strengthens the company's position as the global leader in both fixed and mobile network analysis.

By providing regulators and other broadband program administrators with the budgetary resources to access commercial datasets such as those collected and managed by Mosaik and Ookla, Congress and state governments can accurately identify areas where broadband services are either non-existent or substandard so that appropriate steps can be taken to provide or improve service. A modest investment in better data can render improved outcomes and ensure that outlays

from either the Federal Universal Service Fund or other relevant Federal or state support programs are appropriately targeted.