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S. HRG. 114–556

ENSURING INTERMODAL USF SUPPORT FOR RURAL AMERICA

HEARING

BEFORE THE

SUBCOMMITTEE ON COMMUNICATIONS, TECHNOLOGY, INNOVATION, AND THE INTERNET

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED FOURTEENTH CONGRESS

SECOND SESSION

FEBRUARY 4, 2016

Printed for the use of the Committee on Commerce, Science, and Transportation



U.S. GOVERNMENT PUBLISHING OFFICE
24–144 PDF WASHINGTON : 2017

For sale by the Superintendent of Documents, U.S. Government Publishing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
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ONE HUNDRED FOURTEENTH CONGRESS

SECOND SESSION

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ENSURING INTERMODAL USF SUPPORT FOR RURAL AMERICA

THURSDAY, FEBRUARY 4, 2016

U.S. SENATE,
SUBCOMMITTEE ON COMMUNICATIONS, TECHNOLOGY,
INNOVATION, AND THE INTERNET,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Subcommittee met, pursuant to notice, at 10:38 a.m. in room SR–253, Russell Senate Office Building, Hon. Roger Wicker, Chairman of the Subcommittee, presiding.

Present: Senators Wicker [presiding], Blunt, Ayotte, Fischer, Moran, Sullivan, Heller, Gardner, Daines, Schatz, Klobuchar, Blumenthal, Booker, and Manchin.

OPENING STATEMENT OF HON. BRIAN SCHATZ, U.S. SENATOR FROM HAWAII

Senator SCHATZ. Good morning. This hearing will come to order.

Senator Wicker is on his way back from the Prayer Breakfast, so he asked that I gavel in and get us started. Senator Wicker's opening statement will appear in the record.

[The prepared statement of Senator Wicker follows:]

PREPARED STATEMENT OF HON. ROGER F. WICKER, U.S. SENATOR FROM MISSISSIPPI

Alongside my good friend and colleague Ranking Member Schatz, I am glad to convene the first hearing of 2016 in the Subcommittee on Communications, Technology, Innovation and the Internet.

As we all know, consumer demand for broadband, across many different technological platforms, continues to grow. While positive strides have certainly been made across the country, deployment to rural and hard-to-reach areas still lags behind.

Applications such as precision agriculture, which we will hear about today, are revolutionizing crop production. Without wireless connectivity however, farmers aren't able to take advantage of new technologies in the field that not only speed up production, but can also reduce environmental impact.

I'm glad to have Mr. Darrington Seward, a 4th generation farmer from Louise, MS, with us here today to talk about the impact of wireless expansion in the Mississippi Delta. Mr. Seward was kind enough to meet with me yesterday to discuss all of the innovative work he and his team are doing in the Delta.

Ensuring rural America has the same access to technology as its urban counterparts has long been a priority of mine. While the state of Mississippi provides fertile ground for innovation in areas like telehealth and precision agriculture, without the connective services required to run such technology, Americans living in areas without advanced services continue to be left behind.

We are here today to talk about ways to close this gap. The goal in creating the Universal Service Fund (USF) as part of the 1996 Act was to ensure ubiquitous, reliable communications services for all Americans. A lot has changed in the past 20 years. We witnessed unparalleled advancements in technology and a new competitive landscape.

The era we live in today raises new questions about how the original goal of universal service is achieved. In recent years, the FCC has made a number of reforms to the USF aimed at transitioning the Fund to support broadband, but more needs to be done to reach rural areas.

The FCC's 2011 USF Transformation Order set up a two-phase process for both the Mobility Fund and Connect America Fund (CAF), but delays in implementing the plan set forth by the Commission stand in the way of continued deployment to areas that are uneconomical to serve.

Today, we want to hear from our witnesses about what they are doing to help close the digital divide and how best to target high-cost USF support to achieve Congress and the Commission's goal of universal service, regardless of the technology used.

I would like to welcome all of our witnesses and thank them for testifying this morning. Our panel today represents a number of technologies serving rural and urban areas alike and also those who rely on this technology every day.

I look forward to the testimony from our distinguished panel. I will now turn it over to my colleague, Mr. Schatz.

Senator SCHATZ. We will start with my opening statement and then the testimony.

On behalf of Senator Wicker, I want to thank Senator Manchin for drawing the Subcommittee's attention to these important issues.

The Universal Service program was created to make sure that all Americans have the security and the opportunities that come with being connected. Just like that landline phone was necessary in the past, everyone needs a broadband connection to fully participate in today's society to perform the most common tasks like applying for a job, doing homework, or accessing government services. It is no longer enough to ensure that every American has access to quality voice service. Being a citizen today means being connected to the Internet.

The Connect America Fund is the biggest program in the Universal Service system, investing nearly $4 billion across the country to support the build-out of broadband connectivity and voice service to high-cost areas. This fund makes up almost half of the USF program funding. It is, therefore, critical that we use it wisely to reach the most people possible. Like any USF program, we must ensure that we remain vigilant against waste, fraud, and abuse. The FCC must continue reforms that stress transparency and accountability.

Second, all stakeholders must work with the FCC to ensure that we have effective distribution mechanisms and that support only goes where no unsupported service is offered to ensure that money is being spent wisely. The Connect America Fund is especially important to enable rural connectivity where building out a network, especially last-mile connections, has always been a unique challenge. Rural areas often have low population density which makes it difficult for carriers to make a business case to invest the necessary capital. This, coupled with mountainous or difficult terrain, can make it challenging to provide voice or broadband services without government support. This high-cost CAF support is essential to ensure access to all Americans regardless of geography.

Unfortunately, the FCC's most recent broadband progress report finds that rural areas and especially tribal lands are being left behind. In fact, millions of Americans in rural areas lack access to high-speed mobile and fixed broadband services.

Considering these disparities, the FCC should be nimble in its approach in disbursing these funds. It is essential that Connect America consider all options to close the gap in our rural and native communities. That is why today's hearing is so important to hear from stakeholders and to discuss the advantages and disadvantages of potential solutions and technologies.

As the FCC moves forward with the CAF II reverse auction, it needs to weigh the costs and benefits of using different technologies, including fiber, mobile wireless, fixed wireless, and satellite services to reach everyone. And the Mobility Fund must remain a top priority as well to ensure dedicated funding for wireless-specific connectivity.

Finally, recognizing that some of the areas connected by CAF investments may never be financially viable enough purely through private means, we need to ensure that funds are available to build out new users but also to maintain the infrastructure once it is built. CAF must provide certainty. Without it, service providers will not invest in the most remote areas and those consumers living in those areas will lose out. Everyone must have reliable and robust voice and broadband services. However, our country is diverse and our policies must accommodate that diversity. If done well, the Universal Service program can continue to empower every American with the broadband access that they need to participate economically, socially, and politically in the 21st century.

And with that, we will introduce the testifiers and move on with the testimony. First, we have Darrington Seward, Managing Partner of Seward & Son Planting Company; Steven K. Berry, President and CEO of Competitive Carriers Association; Jimmy Carr, CEO, All Points Broadband testifying on behalf of Wireless Internet Service Providers Association, WISPA; Michael Rapelyea, Vice President of Government Affairs for ViaSat, Incorporated; and Ted Carlson, President and CEO of U.S. Cellular Corporation. And we will start with Mr. Seward.

STATEMENT OF DARRINGTON SEWARD, MANAGING PARTNER, SEWARD & SON PLANTING COMPANY

Mr. SEWARD. Ranking Member Schatz and members of the Subcommittee, my name is Darrington Seward. With my father Byron, I manage Seward & Son Planting Company and Seward & Harris Planting Company, our family farming business in and around Louise, Mississippi. We manage about 22,000 acres of cotton, corn, soybeans, and rice at the southern end of the Mississippi Delta. We could not do this productively or profitably without the extensive use of precision agricultural technologies.

Our main goal in precision agriculture is to farm as many acres as we can while minimizing inputs and increasing our yields in an environmentally sustainable way. We depend on reliable and speedy broadband connections. Without reliable broadband, our production practices would be completely compromised. We would suffer yield losses, decreased productivity, and reduced profitability in an industry with ever tighter profit margins.

As you know, farming operations in the U.S. today are substantial businesses that drive significant economic activity. If high-speed broadband services are not extended out to where agricul-

tural activity takes place on croplands and ranchlands, the full economic potential of precision agriculture will be missed.

We are an example of some of the progress that has been made, but the job is by no means finished. I would like to share some of the examples of what broadband can do when deployed in farming operations.

Managing the fertility of the soil is critical to any farming operation, and each soil type in the field may require a different amount of nutrients. A fixed rate application of fertilizer could lead to over-application and wasted nutrients. Precision Ag steps in with variable rate nutrient application to deliver in each part of the field the exact amount of nutrients called for. This process depends on high-speed broadband connections to upload fertilizer data, to transfer tailored prescriptions to the machine, and to build application maps from the machine.

Another example of the value of precision agriculture is in planting. The process of planting has changed dramatically in recent years. To maximize yields, planter technologies can vary the amount and spacing of planted seeds within a field based on prescriptions that recognize the different soil types within that field. Wireless broadband allows seeding prescriptions to be transferred to the planter and also allows real-time monitoring of each individual row on the planter to make sure it is planting correctly. This is critical for quality control, especially with new technologies that have dramatically increased our planting speeds.

Come harvest time, these same monitoring applications give us the ability to check a combine's performance in real time. We can analyze data while harvesting the crop and make decisions about grain drying and storage operations. We can get a real-time look at crop yields, which helps us determine the exact amount of grain we will have available to market and evaluate the current crop varieties planted on our farm. Since next year's seed has to be booked soon after this year's harvest, this data allows us to plan early and take advantage of seed pricing discounts.

The telematics information we receive wirelessly from our fleet of tractors, sprayers, combines, cotton pickers, and fuel trucks is essential to our day-to-day operations. With the amount of equipment and acreage that we farm, our efficiencies would be completely undermined if I could not track the location and performance of each machine at any time from anywhere on the farm.

Our machines also feature equipment diagnostics that detect problems and provide warnings, typically well before a breakdown occurs. With over $15 million of investment in farming equipment, these communications reduce machine down time and avoid costly delays in field activity.

These are all examples of what broadband can deliver to agriculture and to rural development. But they also show where opportunities will be lost if reliable broadband is not made available to all producers in Mississippi and across the country.

We do, in fact, have disruption in continuous monitoring of tractors, sprayers, irrigation pivots, and wells based on spotty service. For our equipment, I would estimate a minimum of 10 to 15 percent loss of operating efficiency when connections are disrupted. Lost coverage means the machines cannot send or receive data,

seeding prescriptions cannot be downloaded, quality control is lost, or planting has to be delayed. Our losses are measured in reduced crop yields. Any of these events could amount to a 5-bushel loss per acre, or $20,000 per day, of lost revenue to our business based on current prices.

Without wireless monitoring, we are unable to receive alerts of malfunctioning irrigation units. For a single pivot that irrigates 450 acres, one lost day in the growing season would cost our operation 30 bushels per acre in lost yield. That amounts to a $50,000 loss at current crop prices from a mere 2 percent of our total acreage. The failure of multiple irrigation pivots, if not detected quickly through wireless monitoring, would be catastrophic.

Loss of connections also impacts the amount of nutrients, herbicides, and pesticides we use. As noted, inputs are placed exactly where grid soil samples call for them to be in the field. This is for two good reasons. It leads to increased yield and uses less nutrients, pesticides, and herbicides. Chemical applications on the farm are tailored to optimize their effectiveness and minimize environmental impacts.

As a farmer and businessman, I can assure you that I am no expert on telecommunications policy, but in my view anything you can do to promote more rural investment in broadband infrastructure should be pursued. This should include keeping and improving programs like the Connect America Fund and the Mobility Fund to address the needs of agriculture. There are several steps you could take that would make a difference.

First, programs should be updated to directly support specifically to where farming occurs in areas of cropland and ranchland. These are areas of intense economic activity with growing demand for broadband services. Program eligibility, data collection, and other rules should be revised to account for underserved and unserved cropland and ranchland areas.

Senator SCHATZ. Mr. Seward, if you could begin to summarize your testimony so we can move along, that would be——

Mr. SEWARD. OK.

Senator SCHATZ. Thank you.

Mr. SEWARD. Well, pretty much everything is on file, and if you have any questions, I would be happy to answer them. Sorry I ran over.

Senator SCHATZ. Not at all. That was a quicker summary than I needed.

[Laughter.]

Mr. SEWARD. I appreciate the opportunity to speak as a man of few words.

[The prepared statement of Mr. Seward follows:]

PREPARED STATEMENT OF DARRINGTON SEWARD, MANAGING PARTNER, SEWARD & SON PLANTING COMPANY

Chairman Wicker, Ranking Member Schatz and members of the Subcommittee:

Thank you for the opportunity to speak with you today. My name is Darrington Seward. With my father Byron, I manage Seward & Son Planting Company and Seward & Harris Planting Company, our family farming business in and around Louise, Mississippi. Currently, we manage about 22,000 acres, mostly within a 10 mile radius of Louise in Humphreys, Yazoo, Sharkey, and Holmes counties at the southern end of the Mississippi Delta. We farm cotton, corn, soybeans, and rice. We

could not do this productively or profitably without extensive use of precision agricultural technologies.

Each year, we rotate the 12,000 sandier acres that are devoted to cotton and corn in a 50 percent cotton/50 percent corn rotation. Of the other 10,000 acres of heavier ground, which are dedicated to growing soybeans and rice, we rotate 1,000 acres of rice annually among the other 9,000 acres of soybeans production.

Our family began planting its roots in agriculture during the Great Depression, when land acquisition was very affordable. Early on, the land was farmed by sharecroppers, with two commissaries in the neighboring towns of Louise and Midnight providing the supplies needed for tenants to live on and farm the Seward family's land. As farming became more mechanized in the years following World War I, our family took over farming the land itself. Originally, Seward & Son was comprised of 2,000 acres and Seward & Harris encompassed 4,000 acres. It was about 25 years ago that we began expanding. Expansion came in waves as older farmers began to retire, and as absentee landowners sought to cash out by selling their farms.

With the expansion of our operation came growing pains. But as more precision ag technology became available, farming this larger acreage became more manageable. Our main goal in precision agriculture is to farm as many acres as we can, minimizing resources and inputs, while simultaneously increasing our yields. Much of the technology has evolved to depend on reliable and speedy rural broadband. Without the availability of reliable and fast broadband, our production practices and efficiencies in large-scale production agriculture would be completely compromised. We would suffer yield losses and decreased productivity that would greatly affect our profitability, in an industry that continues to see tighter and tighter profit margins.

As Chairman Wicker knows, agriculture is the major driving factor behind the State of Mississippi's economy. This is no doubt true for many rural states represented on this Subcommittee. It is certainly the driving factor for the economies of the counties where we farm. Without agriculture, these rural counties would dry up completely, and send already high poverty levels through the roof.

Our business has invested heavily in precision and data-enabled technologies to make our operations more productive, efficient, and profitable. They come into play in almost everything we do. But for these technologies to actually deliver, we have to be connected. We depend on reliable, high-speed broadband connections out in the field—where our machines and employees operate. We have been recognized for our embracement of precision agriculture technologies and the conservation of resources they allow on several occasions. We received the 2013 Precision Ag Award of Excellence from the Precision Ag Institute. We were recognized as the Precision Agriculture Farmers of 2011 by the National Conservation Systems Cotton & Rice Conference. And, my father, Byron Seward, was recognized by the Delta Council of Mississippi as The Conservation Farmer of the Year for 2009–10.

As you know, significant economic activity occurs every day on America's farm and ranchlands. Agriculture represents almost 5 percent of the Nation's annual GDP, much more than that in rural communities. Farming operations today are substantial businesses that drive significant commercial activity and rural prosperity. Broadband services that are provided to commercial businesses in urban and suburban areas must also be provided to support production agriculture in rural areas. If high-speed, wireless broadband services are not extended out to where agricultural activity takes place—on croplands and ranchlands—the full economic and commercial potential of precision agriculture will be missed. I'd like to share some real examples of how broadband can help meet this enormous potential.

Soil Management and Health

Managing the fertility of soil is critical to any farming operation. We may have upwards of 15 different soil types in any given field; each requires differing amounts of nutrients. If a blanket, fixed-rate application of fertilizer is programmed into a machine, nutrients will be wasted by over-application where they are not needed. Precision ag steps in with variable-rate application of nutrients that ensure each spot in the field receives exactly the proper amount of nutrients called for.

Our fields are sampled on a 3-year cycle by a local soil lab, Pettiet Agricultural Services, Inc. out of Leland, Mississippi. Samples are taken from every field in a referenced 2.5 acre grid—a very thorough and precise soil sampling by today's standards. Dr. Clinton Pettiet and his lab team then analyze these samples and provide all data on nutrient concentrations in the soil, and the recommended amount of nutrients to be added in order to produce a varying array of crops. We upload this data into the web-based software product of our seed and chemical retailer Sanders, Inc. This software tool, OptiGro, already contains the boundaries of all of our farms and fields. So the new, geo-referenced soil sample data is simply spatially

sorted into our farms and field data in OptiGro. Mind you, this data transfer is all taking place in either our office in Louise, Mississippi, or in our pick-up trucks in the field where our equipment and crops are continuously monitored. This cannot happen without reliable, mobile wireless broadband connections.

With the OptiGro tool, I can chose the farm and fields I want to fertilize, for any particular crop we want to plant there in that particular year. I then choose my macronutrients, phosphorus and potassium, that I need to apply. I also choose my micronutrients, sulfur and zinc, that might be called for. I write this tailored prescription, which can then be applied to the field through a host of machines that all have access to controller files from a simple drop down menu.

To apply these prescriptions, we utilize a GVM 4 bin ground machine, or an Air Tractor 802 airplane during rainy spells. The controller files are transferred directly to the GVM machine's controller via wireless broadband. Wireless broadband also provides the means to e-mail the controller files to my pilot who can quickly load them in his plane for application. Since all the data are geospatially referenced, the fertilizer application (whether by ground or air) is completely automated by the machine's mechanical controllers. It knows exactly where the machine is in the field, and exactly which products are called for and in what amounts. This process also generates application maps, which are key to understanding the effectiveness of a specific prescription on improving yields, and provides a check for quality control.

The same methods are employed for our application of nitrogen in the production of corn and cotton. Nitrogen is a crucial nutrient in the production of those crops. We apply nitrogen in a split-season application. This means we apply the first half of our soil sampling recommendation right at planting, and the second application, the variable rate portion, early in the growing season. We can also apply nitrogen either by ground machine or airplane variable rate.

I want to emphasize again that each of these critical steps, from uploading the fertilizer data, writing the fertilizer file, transferring it to the machine wirelessly, and collecting application maps from the machine, are dependent upon high speed rural broadband. Only with wireless connectivity are the benefits of reduced input costs, better land stewardship, and improved yields fully realized.

Planting

Another example of the value of precision agriculture is in planting. The process of planting has changed dramatically in recent years. Planters now include hydraulic drives and rate controllers that govern the amount and spacing of planted seeds in a field. The rate controller can be told exactly how much seed should be planted and where, based on a prescription that can be wirelessly transferred into an onboard computer in the machine. This allows, for example, more seed to be planted underneath a pivot circle where irrigation can maximize yield, and less in the field's corners where the pivot cannot not reach. Also, different seeding rates can be assigned to, and planted on, different soil types within a field to maximize yield. High speed broadband allows the transfer of these seeding prescriptions to the machine, and allows real-time monitoring of each individual row on the planter to make sure it is planting correctly. From the office or pick-up truck, we can see the exact seed monitor that our operator in the tractor sees, along with more comprehensive data—all in real time. This is imperative for quality control, especially with new technologies that have dramatically increased our planting speed. Today, we are easily planting 1,000 acres a day, and spending upwards of $50,000 an hour on planting and tillage applications.

Crop Harvesting

Come harvest time, these same monitoring applications hold true for our ability to check a combine's performance in real time through high-speed broadband. We are able to analyze the data in real time and make critical decisions about the speed and temperature at which we operate our Zimmerman corn tower dryer. We can make decisions about which bins to load into during the day, and which bins we may need to switch to in order to have capacity to store the entire night's supply of dried grain. In addition, we get a real time look at crop yields, which helps in determining the exact amount of grain we will have available to market—something that's always difficult to forecast going into a harvest. Real time yield data also allows us to evaluate the current crop varieties that planted on our farm. Since, next year's seed has to be booked soon after this year's harvest, this data allows us to plan early and take advantage of seed pricing discounts.

In our operations, none of these management decisions can be made without reliable, continuous access to high speed broadband. Otherwise, it would not be physically possible for me to drive out to each combine in the field, climb up on the machine, and ride each machine for 15 minutes or so to gather this data. With wireless

connectivity, I can receive data at the corn dryer as I am operating it and use the information received to maximize the efficiency of the dryer's operation. Access to high speed broadband in the field allows us to farm more acres more efficiently with larger machines, while lowering costs and increasing yields.

Broadband optimizes our operations in several other, important ways. Our management of grain storage capacity depends on transmission of real-time bin use and availability data. The bins have a plumb bob sensor system that drops a cable from the roof of the bin until it touches the grain. In this way, the system transmits how many bushels are currently in the bin, and how much storage capacity remains. Our corn dryer operates at 100,000 bushels dried per 24-hour period, which fills the bins to fill quickly. The sensor system allows one man to run the dryer from a central point, without having to step out to climb each bin, peer in, and guess how much grain is in it. Instead, he simply logs in to the web-based logistics platform that contains each numbered bin, prompts the desired bin to conduct a measurement, and uses the results to determine where to divert the grain coming out of the drier. Our bins also have sensors that measure the relative humidity outside versus inside the grain bin. Algorithms then calculate the relative moisture of the corn or soybeans in the bin and turn the exterior fans on or off, either to dry or rehydrate the grain to the optimal moisture for storage and sale. The bins that store our rice use exterior fans (equipped with heaters), combined with interior moisture cables, to dry the rice to a moisture level acceptable for sale and milling. All parameters and settings can be monitored and changed remotely. This data is all transferred via broadband, without which these systems would be useless. Broadband enables these systems to operate and maximize the efficiency of our operation.

Machine Communications

The telematics information we receive from our fleet of tractors, sprayers, combines, cotton pickers, and fuel truck is essential to the daily operation of our farm. With the amount of equipment and the broad acreage that we farm, our efficiencies would be completely undermined if I didn't know—at any given time, from anywhere on the farm—where each piece of machinery is and how it's performing at that moment. Operations would grind to a halt.

On our farm, we use almost all John Deere equipment because of its advanced precision ag systems and capabilities. None of the telematics systems on board our 22 tractors, 5 combines, 4 cotton pickers, 3 sprayers, and 1 fuel truck would provide anywhere close to the degree of operational value that they do without reliable broadband connections. Any one of the innumerable settings on any one of these machines can be monitored remotely, through online platforms such as JDLink® and MyJohnDeere.com.

Continuous monitoring of machine performance is extremely important. Improperly set machines or machines experiencing technical issues could result in any number of costly operational problems: an improperly planted crop; improperly applied fertilizer, herbicides, or pesticides; lost efficiencies in tillage operations; lost efficiencies in the general equipment operation; or even yield loss during harvest (imagine grain being blown out of the back of the combine due to incorrect settings). All John Deere machines feature equipment diagnostics that trigger real-time warnings, typically well before an operational problem occurs. With over $15 million of capital investment in farming equipment, it is imperative we maximize these assets and generate the highest returns on this investment. Machine communications—telemetry—drive significant reductions in machine downtime and avoid costly delays in field activity. Without reliable broadband connections in the field, the benefits of machine telemetry in our operation would be lost.

Irrigation

Our irrigation systems today include 25 pivots, all of which are monitored telemetrically. Each irrigation unit is able to report its position and the amount of water being applied in real time. These pivots can be sped up or slowed down remotely, allowing adjustments in the total volume of applied water from anywhere across our operation. They also can be shut off remotely, and will send out an alert if they shut down for any unexpected reason.

In addition, the majority of our irrigation wells are powered by units with telematics monitoring systems, which can record the exact amounts of water being applied using flow meters. Each monitoring unit has its own modem that transmits the data to a web based management platform, which helps us to fulfill USDA/NRCS and local water management district requirements. Alerts will also be issued if wells shut down for unexpected reasons. All these capabilities on both pivots and irrigation wells allow us to efficiently manage large acreages with fewer men. Pro-

ductivity is greatly improved through more rapid alert, diagnosis, and repair of irrigation unit problems.

Problems with Connectivity

Given our reliance on precision ag technologies, our farming operations are susceptible to broadband coverage disruptions and connectivity problems. In areas where we have experienced poor broadband coverage, we have experienced costly disruptions in continuous monitoring of tractors, sprayers, irrigation pivots, and wells. This translates directly to less efficient operations and lost productivity.

For our machines alone, I would estimate a minimum 10–15 percent loss of operating efficiency when connections are disrupted. Lost coverage means the machines cannot send or receive data during operations. Our inability to download seeding prescriptions in a timely manner results in a suboptimal crop. Or planting could be delayed, causing us to miss the optimum planting window. Or the quality control from continuous monitoring is lost, which could result in erratic seed placement and depth. *Our losses are measured in reduced crop yields. For our operation alone, any of these events could amount to 5 bushels lost per acre, or $20,000 per day of lost revenue, based on current prices.*

Poor coverage has also meant temporary loss of connections to irrigation pivots and wells. In these instances, we have been unable to receive alerts of malfunctioning irrigation systems. Because of the size of our farmed acreage, we cannot monitor these systems by simply riding from pivot to pivot and well to well each day during irrigation season. For a single pivot that irrigates 450 acres, *one lost day at a crucial time in the growing season would cost our operation 30 bushels per acre in yield loss. That amounts to a $50,000 loss at current crop prices, from a mere 2 percent of our total acreage.* The failure of multiple irrigation pivots, if not detected quickly through wireless monitoring, would be catastrophic.

The same is true with the inability to detect malfunctions of rice irrigation wells. An irrigation well typically irrigates 150 acres. *At a rate of 30 rice bushels per acre lost, the loss would be roughly $22,500 at current prices.*

Loss of connections also impacts the amounts of nutrients, herbicides and pesticides we use. Instead of broadcasting nutrients, technologies allow us to place them exactly where grid soil sampling calls for them to be in the field. This is good for two reasons: it leads to increased yields and decreased use of nutrients. The same is true for pesticide and herbicide applications, which can be tailored to optimal effect and minimal environmental impact. Technology allows us to write and use prescriptions for the exact amount of herbicide to use, based on the clay content of the soil. With aerial imaging, we also can create zones for pesticide applications to target those areas with greatest insect populations.

From these examples, I hope that you can see just how important reliable broadband connections are to our operations, and how even a temporary loss of coverage can hurt crop yields, increase operating costs, and undermine environmental improvements.

Policies to Support Broadband for Agriculture

From my perspective as a business consumer, any policies that will promote more rural investment in broadband infrastructure—including where farming takes place—should be pursued. Without this support, our ability to keep up with and take advantage of coming technological advancements will be limited, especially as the competition for resources to expand broadband deployment is likely to increase. This makes the rural broadband funding programs managed by the Federal Communications Commission, such as the Connect America Fund and the Mobility Fund, all the more important to the future of production agriculture. I would encourage you take a fresh look at these support programs and consider changes that will directly foster, and eliminate barriers to, expanded high speed broadband deployment that agricultural needs today and into the future. To that end, there are several steps to improve these programs that would make a difference:

First, as I have mentioned, support programs should be updated to direct support specifically to where most farming operations occur—areas of cropland and ranchland. These are areas of intense economic activity with growing demand for broadband services. Yet, they are largely overlooked in today's funding programs that look only at residential population and community centers to determine whether an area is "unserved" or "underserved" and thus worthy of broadband funding support. Program eligibility, data collection, and other rules should be revised to account for underserved and unserved cropland and ranchland areas—areas with low population density but with highly intense economic activities vital to rural communities.

Second, support programs should not favor, either directly or inadvertently, one broadband delivery technology over another. Ag producers need access to all technology options to address potential uses that may vary depending on ag equipment used, crops, livestock, terrain, climate, proximity to broadband interconnection points and population centers, and barriers to local land acquisition and access. Wireline broadband, fixed wireless, or mobile—all these technologies will be needed for individual carriers to design appropriate solutions to meet the needs of particular agricultural operations. To this end, it makes sense to continue and even expand the Mobility Fund to provide specific and predictable funding for mobile broadband operations. And the equal opportunity that carriers currently have to bid on Connect America Funds should be maintained, regardless of whether they are proposing wireline, fixed wireless or mobile broadband coverage.

Third, these support programs should also make funds available for "standalone" broadband. Precision Agriculture technology is data-intensive by nature. Many farming enterprises place a higher priority on obtaining broadband services rather than conventional voice services. My understanding of the rules is that carriers that might otherwise be able to provide broadband in rural communities cannot access these programs unless they also provide voice services. This either forces inflexible service packages onto rural consumers, including ag producers, or it unnecessarily limits broadband deployment.

Finally, the so-called "middle mile" facilities are just as critical to expanding rural broadband deployment as last mile connections. The wireless connections needed across croplands rely on these "middle mile" facilities to tie into the wired networks and the Internet. To be sure that all the needed rural infrastructure can be deployed, support programs should allow the smaller providers to obtain support for middle such facilities. And support for middle mile facilities should be allowed for connecting to facilities that link to wireless broadband, not only to the last wired mile connections.

Conclusion

I want to thank the Subcommittee again for allowing me to appear this morning. My message is simple: precision agriculture is fully integrated with our operations in Mississippi, and with agricultural operations across the U.S. and globally. The benefits from these technologies are well-known and will grow significantly in the years ahead. To fully capture the value these technologies can deliver, policies and programs that will drive investments in rural infrastructure must be a priority for policy makers.

Senator SCHATZ. Thank you. I appreciate it. Thank you.

Mr. Berry?

STATEMENT OF STEVEN K. BERRY, PRESIDENT AND CHIEF EXECUTIVE OFFICER, COMPETITIVE CARRIERS ASSOCIATION

Mr. BERRY. Thank you, Acting Chairman Schatz and members of the Subcommittee. Thank you for the opportunity and inviting me to testify about supporting mobile broadband in rural America. The job is not done. I am here today on behalf of the Competitive carriers Association representing almost 100 wireless carriers and nearly 200 vendors and suppliers that support the competitive wireless ecosystem. My membership includes innovative, competitive carriers of all sizes, with CCA members in every state you represent.

Most CCA members serve rural areas and have invested private capital, along with Universal Service support, to deploy mobile wireless services in some of the most difficult-to-serve parts of our Nation.

Congress mandated that the FCC administer the Universal Service Fund to provide, and I quote, "sufficient and predictable support for reasonably comparable services in urban and rural areas." And to meet this statutory charge, "reasonably comparable" services must include mobile broadband.

The Committee, the FCC, and Chairman Wheeler himself have all recognized the importance of mobile broadband services. The most recent Mobile Competition Report, submitted to Congress just a few weeks ago, begins by noting "mobile wireless services are an essential part of Americans' daily lives." We totally agree.

Access to wireless services has evolved well beyond making and receiving voice calls. And failure to support mobile broadband coverage will leave rural America behind, behind in the dust of a new generation of innovation. Mobile broadband coverage impacts public safety, education, telehealth, economic opportunity, accessibilities, social inclusion, and yes, farming and agriculture.

But we also can be jeopardized in other ways. By being behind this mobile digital divide, you will jeopardize the economic investment, productivity, jobs, and yes, even endanger those who live in and travel through rural America.

While access to mobile broadband is critically important today, it is absolutely vital to participate in growing the economy of tomorrow. The Internet of Things, the all-connected world is just around the corner. It is time to ensure that the Universal Service Fund reflects this reality. Congress should make it clear to every commissioner at the FCC that this means providing adequate support to both preserve existing services in rural areas while incentivizing deployment of the latest mobile broadband services in areas that remain unserved or underserved. Support is needed for both preservation and expansion. Anything less will result in an economic loss for rural America.

There are three things the FCC can do right now to support mobile broadband in rural America.

First, disburse immediately the Mobility Fund Phase I support to winning bidders that have built networks and met the requirements in their bids. I have members that have, in good faith, spent their funds, built the networks, and have not been reimbursed. We cannot undo mistakes of the past, but we should prevent new mistakes.

Second, do not reduce existing support until an adequate replacement mechanism is operational. And while the FCC stated in its USF Transformation Order that subsequent FCC proposals would be created, some of those have raised great uncertainty and great concern. So I commend Congress for reaffirming the ongoing need for support in the Consolidated Appropriations Act in December—thank you—directing the FCC to preserve legacy support as prescribed. We do not need more examples of entire communities losing wireless service due to the lack of USF support.

Third and finally, implement the ongoing Mobility Fund Phase II that preserves existing services in rural areas and supports continued expansion of 4G and ultimately 5G mobile broadband. CCA has advanced a proposal that meets the FCC's overarching goals. It ensures universal availability of high-speed mobile broadband where it is otherwise uneconomical. It puts the program on a budget, and it bases funding decisions on real data. I hope we can further explore ways to successfully implement Mobility Fund Phase II during this hearing.

And as I said at the beginning, the job is not done. I know that you are acutely aware of communities in your areas in your states

that lack sufficient coverage. Every carrier wants to provide a robust service to the customers. However, inadequate support for legacy investments will lead to reduced coverage and rusty towers.

Now, I know there is strong bipartisan support in this committee for rural America. I look forward to working with you and the FCC on a bipartisan solution to preserve and expand mobile broadband in rural America. And I look forward to your questions. Thank you.

Welcome, Chairman Wicker.

[The prepared statement of Mr. Berry follows:]

PREPARED STATEMENT OF STEVEN K. BERRY, PRESIDENT AND CHIEF EXECUTIVE OFFICER, COMPETITIVE CARRIERS ASSOCIATION

Chairman Wicker, Ranking Member Schatz, and members of the Subcommittee, thank you for inviting me to testify about supporting mobile broadband in rural America. I appreciate the opportunity to speak on an issue so critical to life in rural America, and welcome the Committee's continued focus on ensuring ubiquitous mobile broadband and the Universal Service Fund (USF). I am here today on behalf of Competitive Carriers Association (CCA), the Nation's leading association for competitive wireless providers and stakeholders. CCA membership comprises about 100 carrier members including small, rural providers serving fewer than 5,000 customers as well as regional and national providers serving millions of Americans. CCA also represents nearly 200 Associate Members—small businesses, vendors, and suppliers that serve carriers of all sizes. Most CCA members serve areas that are primarily rural in nature, and have invested significant amounts of private capital, along with USF support, to deploy mobile wireless services in some of the hardest to serve parts of our Nation. Whether directly or through partnerships and other strategic alliances, all CCA members have an interest in ensuring that Americans have access to the latest mobile broadband services, including those in rural and high cost areas.

Congress created the USF high-cost program to provide Americans in rural areas with "reasonably comparable" services as those in urban areas with the help of sufficient and predictable support. In today's world, "reasonably comparable" services must include fast, affordable mobile broadband services. It is clear that the Federal Communications Commission (FCC) agrees. Just last week, as per Congressional mandate, the FCC released its 2016 Broadband Progress Report (Broadband Progress Report), which assesses the deployment of advanced telecommunications services in the United States. In its Broadband Progress Report, the Commission found that "Americans increasingly rely on mobile devices as indispensable tools of daily life" and therefore, "the availability of advanced telecommunications capability requires access to both fixed and mobile services." FCC Chairman Tom Wheeler summed it up: "consumers need access to both fixed and mobile broadband in today's world." Indeed, the opening paragraph of the FCC's most recent Mobile Competition Report, released late last year, begins by stating that "[m]obile wireless services are an essential part of Americans' daily lives" and notes that the mobile wireless ecosystem is "one of the most important sectors in the national economy." The FCC's Universal Service policies, particularly as they relate to High-Cost Program funds, must reflect this reality.

Background

Wireless service has evolved well beyond making and receiving voice calls. In 2016, Americans use mobile broadband services in almost every aspect of their daily lives. Americans rely on their mobile network to quickly access information on healthcare, education, and public safety, to manage their finances, to connect with their personal and professional communities through social media, and to download the latest season of House of Cards. All are necessary and desirable uses of the powerful technology enabled by modern mobile broadband access. Failure to support mobile broadband services in rural America will perpetuate the continuing digital divide between those who can use the latest technology to improve their lives and economic welfare, and those who are left behind.

Leaving rural America on the wrong side of the digital divide can jeopardize economic investment, productivity, jobs, and even put lives in danger. The FCC has acknowledged that, "[i]n emergency situations, Americans often use mobile devices to contact first-responders when a fixed connection is not readily available, whether at home, at work, or when traveling." Access to mobile broadband has spurred innovation in some of the most important economies in rural America, like precision agri-

culture advances that make farming more efficient and effective. In a pilot project with 2,000 farmers who have employed precision agricultural technology into their work, Accenture found a 56 percent year-over-year increase in sales and an average increase in crop productivity of 15 percent, including an increase of up to 30 percent for some cash crops.

Mobile broadband is required for access to distance medicine and telehealth, which IHS, a market analyst firm, has projected to grow from $240 million in 2013 to $1.9 billion in 2018. This is a 56 percent increase in just five years. Mobile service also powers wearable devices. Cisco estimates this burgeoning market will grow from 109 million in 2014, to 578 million in 2019.

While access to mobile broadband is critically important today, it is absolutely vital to growing the economy through next generation, or 5G, services and the Internet of Things (IoT). In fact, Gartner, an IT market research firm, projects this market will grow 30 percent over the next year alone, and to 21 billion devices by 2020, compared to 6.4 billion in 2016. Rural communities should not be left out of this coming tide of innovation. Qualcomm estimates that there will be 5 billion non-handset connected devices by 2018. IDC, another IT market research firm, says the IoT market will nearly triple worldwide from $655 billion in 2014 to $1.7 trillion in 2020. Additionally, Chetan Sharma, a technology and strategy consultant, estimated in his "First Quarter 2015 Report" that United States consumers used an average of 2.5 GB of cellular data per month. Following this trend, Ericsson predicts that smartphones in the United States and Canada will average 25 GB of mobile data traffic per month by 2021—a ten-fold increase just five years from now.

According to the Pew Research Center, 88 percent of rural Americans have a cell phone and over 42 percent of rural adults live in a wireless-only household. Over half of all rural Americans now own smartphones, and of this group, 15 percent report their only form of home broadband Internet access is with a smartphone. It's clear that all consumers, including rural consumers, are cutting the cord.

It is time for USF policies to reflect this reality. Rural America should not be excluded from meaningfully participating in a world increasingly powered by affordable access to rapid mobile broadband. This means providing adequate support to both preserve existing service in rural areas while incentivizing expansion of latest mobile broadband deployment in places that remain unserved and underserved. USF support is needed for both preservation and expansion—anything less will impede investment and keep rural Americans on the wrong side of the digital divide. The FCC has reported that 97 percent of rural Americans have LTE service. Anyone who has driven outside the city and urban centers knows that coverage estimate is exaggerated. If lack of coverage is not addressed, and support is not provided to preserve service available today, rural America will not have the mobile broadband infrastructure that it needs to support indispensable tools of daily life.

Since establishment of the FCC by the Communications Act of 1934, Universal Service has been a core policy. In 1996, Congress codified specific principles for USF in the Telecommunications Act. Under FCC rules allowing competitive eligible telecommunications carriers (CETCs)—including wireless carriers and competitive local exchange (LECs)—to receive USF support, carriers including many CCA members, leveraged that support with their own investment to deploy and expand mobile wireless services in rural America. As the industry grew, the total number of cell sites nationwide nearly tripled, from 127,000 to nearly 300,000 over a ten-year period.

In 2008, the FCC adopted the "CETC Interim Cap Order," freezing support for wireless carriers in each state at the level that wireless carriers were eligible to receive as of March 2008. This blunt instrument capped overall wireless support at approximately $1.2 billion nationwide. Despite the cap, the wireless industry continued to grow as a result of an increasing consumer demand for wireless service. Total support for wireless services through the High-Cost fund peaked in 2008 long before the mobile data explosion we are experiencing today. Despite massive growth of wireless use since 2008 and increasing consumer demand, support to mobile networks through the High-Cost fund has only decreased.

In 2011, the FCC adopted the "USF/ICC Transformation Order," (Transformation Order) which created the Connect America Fund (CAF) within the High-Cost Program, and the Mobility Fund, which is specifically dedicated to support mobile service in unserved and underserved areas. With this step, the FCC recognized that while mobile networks might be able to provide coverage to fixed locations under limited circumstances, a fixed network cannot provide true mobile service with the functional benefits mobility provides consumers. While the FCC's goals for the Mobility Fund were laudable—to support and close gaps in mobile coverage and broadband capacity—the total amount budgeted for wireless carriers through CAF

and the Mobility Fund was significantly smaller than the amount wireless carriers received under previous capped High-Cost Program support.

Under the Transformation Order, Mobility Fund support was to be distributed in two phases: Phase I provided $300 million in one-time support to expand mobile networks; and, Phase II was designed to provide $500 million in ongoing support to sustain and expand mobile voice and broadband. In the Transformation Order, the FCC explicitly recognized that there are areas in this country in which mobile service cannot be maintained or upgraded without ongoing universal service support. Despite the Commission's efforts to support mobility in rural America, the allocated funding under the Mobility Fund Phase I was not sufficient to accomplish the FCC's goals. By way of comparison, the National Broadband Plan estimated requiring at least $6.3 billion, if leveraging incentive-based partnerships, to $15.7 billion to buildout a nationwide mobile broadband network for public safety users. Demand far exceeded the resources made available under Mobility Fund Phase I, with bids exceeding the $300 million available. Further, the $500 million budget dedicated for ongoing support in the originally proposed Mobility Fund Phase II represents less than half of the approximately $1.2 billion wireless carriers received prior to the Transformation Order and one-eighth of the approximately $4 billion that wireless carriers contribute annually to the fund.

The Transformation Order also began phasing down legacy support for wireless carriers, reducing support over five years through annual 20 percent reductions. Fortunately, the FCC ordered that the phase down would be suspended if Mobility Fund Phase II, including Tribal Mobility Fund Phase II, was not operational by June 30, 2014. With no Mobility Fund Phase II in place, the legacy High-Cost Program fund continues to provide approximately $600 million per year for wireless services—60 percent of previous levels. In this regard, it is very important that the Congress made clear that the FCC cannot, for the balance of this appropriations year, resume the phase down of legacy support to without an operational Phase II Mobility Fund. Thank you for taking this step, which we urge you to continue beyond September 30, 2016.

While it is important that there are no further reductions in support until adequate replacement mechanisms are operational, there are steps that the FCC can take immediately to support mobile broadband in rural America through USF.

Complete Disbursements for Mobility Fund Phase I

The FCC announced winning bidders for the Mobility Fund reverse auction in October 2012, with bids and proposed builds surpassing the amount of resources available. While CCA urged the FCC to make greater resources available through the auction, the awarded funding represents an important part of the overall investment made by winning bidders. Unfortunately, there are CCA members today that have built out and certified completion of projects, yet have not received the USF funding they were promised. As a result, precious capital is tied up in projects that may not otherwise have been economical, and carriers are discouraged from improving and expanding services. This is not what the FCC intended. I strongly encourage the FCC to release these funds to carriers who in good faith invested and spent their resources in accordance with Mobility Fund Phase I awards, but have not yet been reimbursed. To date, only $66.08 million has been disbursed.

Additionally, over $70 million of Mobility Fund I awards have been returned to the Commission as a result of consolidation and/or defaults. These resources should be reinvested in expanding mobile access in rural areas.

No Further Reductions in Support until a Replacement Mechanism is Operational

Next, it is important for carriers to have the certainty that even reduced amounts of support will be predictable. Despite the Transformation Order's requirements to stop the phase down of legacy support absent an operational Mobility Fund Phase II, subsequent questions in the FCC's 2014 Further Notice of Proposed Rulemaking have caused significant concern in the industry that additional cuts may be made without providing for new support. This has a chilling effect on investment in upgrading existing and deploying new service, as carriers cannot confidently rely on FCC funds as they budget for maintenance and deployment plans.

While not sufficient, the reduced amount of support available at today's 60 percent paused phase-down amount provides important resources to maintain services built with USF investment. Unfortunately, there are CCA members that have sold part or all of their network operations, or simply exited the market, as a result of already reduced support and uncertainty on what support may be available in the future. For example, in Ruby Valley, Montana, reductions in USF contributed to Cellular One exiting the market. As a direct result, on July 31, 2014, almost 2,000

customers in Ruby Valley lost all wireless service despite promises to the contrary. This impacts not only Cellular One customers, but all residents of Ruby Valley and any others that might be passing through, as customers using other service providers would need to roam onto Cellular One's network. Not only does this impact rural Montanans' quality of life but also safety and security—local Sheriff Dave Schenk has noted his "major concerns about this in terms of public safety."

I commend Congress for providing some degree of certainty on this issue through a rider in the Consolidated Appropriations Act late last year. While carriers must plan network investment on longer time frames than a budget year, reaffirming that there will be no further reductions in support absent an operational replacement mechanism helps to provide certainty while also encouraging the FCC to focus on creating a sufficient Mobility Fund Phase II.

Mobility Fund Phase II Must Provide Sufficient and Predictable Support for Mobile Broadband

Looking forward, the ongoing Mobility Fund Phase II must adequately support both preserving existing service and expanding service to areas currently unserved by 4G LTE service. CCA has advanced a proposal that meets the FCC's overarching goals of ensuring universal high speed mobile broadband availability where it is otherwise uneconomical to continue or expand service, and supports putting the program on a budget, basing funding decisions on real world data. This proposal has two components: providing support to preserve existing mobile services, and supporting further upgrades and expansion of services.

It is critical to recognize that the job of building out mobile broadband service in rural America is not yet done. The FCC itself acknowledges in its latest Mobile Competition Report that the way it calculates mobile service coverage overstates actual coverage. Describing the FCC's methodology, when the so-called "centroid" of a census block has a particular level of service, the FCC counts each and every person in the census block as having that service, even when coverage is inconsistent or weakens over distance. In rural areas, where census blocks are geographically much larger than in urban areas, it is much more frequently the case that people are counted as having a high level of service, when in fact they are unserved or underserved. Focusing on all wireless coverage (not just LTE), Dr. Raúl L. Katz, Director of Business Strategy Research at the Columbia Institute for Tele-Information, Adjunct Professor in the Division of Economics and Finance at Columbia Business School, and President of Telecom Advisory Services, LLC, declared that wireless coverage in rural counties can range as low as 76.7 percent of the population in West Virginia, or 86.3 percent in New Hampshire.

And, of course, one of the great benefits of mobile service is that you can use it in places other than where you live or work—whether on or off road, or away from population centers. By the FCC's own data in the latest Mobile Competition Report, only 78 percent of the U.S. land mass is covered by any mobile wireless provider. As this Committee is keenly aware, 42 percent of U.S. land can contain only 1 percent of the population. The job is not finished, and claiming otherwise leaves rural Americans on the wrong side of the digital divide and outside of all the innovations and economic opportunities provided by mobile broadband coverage. And simply because an area is served today does not mean that it will remain served in the future without sufficient USF support—look no further than Ruby Valley for an unfortunate real world example.

I commend several Members of this Committee and FCC Commissioners that have supported increased support for wireless carriers through the Mobility Fund. To protect scarce USF resources already invested in mobile broadband, the FCC should provide sufficient support so that towers constructed with both private and public investments remain operational. Congress and the FCC must preserve network diversity that exists in rural America, and to ensure that competitive carriers have access to a variety of roaming partners, regardless of the technology used. Anything less will leave behind rusty towers and unused infrastructure, reducing consumer choice and carrier innovation. Further, relying on a single network alone will not preserve widespread roaming, and will not protect against potentially high, anticompetitive monthly fees. This does not mean providing carriers with blank checks. Carriers must prove need for USF support. To appropriately guard USF investment, preservation funding should be based on the facts of real and projected expenses and revenue.

The FCC also should provide funding for expanding mobile broadband services to unserved and underserved areas of the country. Understanding that there will not be enough resources to build mobile broadband services where needed all at one time, the FCC should offer several rounds of expansion support, disbursing re-

sources in conjunction with the overall Mobility Fund Phase II budget every two to four years.

Other Factors Can Also Support Mobile Broadband in Rural Areas

In addition to USF support, there are additional operational inputs that are critical to providing mobile broadband in rural America. Spectrum, for instance, is the lifeblood of the wireless industry and the invisible infrastructure on which networks are built. All carriers need access to spectrum to meet their customers' growing demands. Low band spectrum, with excellent propagation characteristics, is particularly important for expanding coverage in rural areas. Spectrum must be available in ways that carriers seeking to serve rural America can utilize this finite resource, such as through small geographic license sizes and with interoperable devices. I am pleased that the upcoming 600 MHz incentive auction will utilize Partial Economic Areas and require interoperability, and I thank the Committee for their support of these issues. And CCA will continue to urge use of smaller geographic license sizes, even with higher band spectrum now being contemplated.

The 600 MHz auction is just the beginning of unleashing access to additional spectrum. As mobile broadband use continues to grow, additional spectrum will be required to maintain existing coverage and advance new technologies that promise faster, more efficient access. For example, deploying LTE-Advanced and LTE–U will require maximized use of licensed and unlicensed frequencies. We also must consider new ways to make unused spectrum in rural areas available for carriers willing to provide coverage. This is why CCA supports bills like the Rural Spectrum Accessibility Act, championed by Senators Fischer and Klobuchar, and appreciate the bipartisan support for the bill from other members of the Committee, including Senators Wicker, Sullivan, and Manchin.

Additionally, carriers must be able to deploy physical infrastructure—the towers, base stations, and wires that transmit and carry wireless service in a timely manner to keep pace with consumer and network demands. Service in underserved and unserved rural areas is often dependent on the ability to site on Federal lands and facilities, yet unfortunately carriers face delays and other obstacles while working through the siting process. Meaningful shot clocks, established points-of-contact, and inventories are critical. CCA supports the concepts in the MOBILE NOW Act that will help carriers of all sizes maintain and expand mobile broadband services, through both access to spectrum and easing barriers to deployment, and thanks Chairman Thune and several members of the Committee for their leadership on these issues.

All carriers must be able to provide both the devices consumers demand and nationwide services, regardless of their local footprint. For competitive carriers, that means access to the latest devices and reasonable roaming for voice and data services. On both fronts, CCA members are working hard to help themselves, and we appreciate Congress's and the FCC's support for these important policies where intervention is necessary to ensure competition in the industry.

Finally, carriers must be able to cost effectively serve their customers as well as connect with each other. Like roaming, this means Congress and the FCC should implement policies that support reasonable interconnection, and ensure carriers have access to backhaul and special access at competitive terms and conditions. CCA is hopeful that the FCC will finally conclude, during Chairman Wheeler's tenure, the decade-long special access proceeding, providing regulatory certainty to carriers over these critical network components and direct benefits to consumers.

Conclusion

CCA members work hard to maintain and expand mobile broadband service throughout the country while providing important competition and innovation within the industry. Despite significant efforts to deploy mobile broadband in rural areas, including through significant private investment paired with USF support, Congress and the FCC have a long way to go before the goal of ubiquitous mobile broadband service is realized. It is essential for all Americans to participate in the latest technological innovations and compete in the modern mobile economy. Universal Service policies must match this goal to fulfill Congress's mandate to provide reasonably comparable services in urban and rural areas, and USF support must be available to preserve and sustain service where available today and to expand networks nationwide.

Thank you for your interest in these issues and holding today's important hearing. I look forward to continuing to work with you and the FCC to make these policies a reality, and welcome any questions you may have.

STATEMENT OF HON. ROGER F. WICKER, U.S. SENATOR FROM MISSISSIPPI

Senator WICKER [presiding]. Thank you very much.

And I want to express my appreciation to Senator Schatz for beginning the hearing in my absence. The National Prayer Breakfast ran long, and I probably needed every bit of it, but it did run long and I just got back. So thank you very much, my colleague and teammate, for getting us started.

We will now hear the testimony from Mr. Carr. Thank you.

STATEMENT OF JAMES G. CARR, CEO, ALL POINTS BROADBAND, ON BEHALF OF THE WIRELESS INTERNET SERVICE PROVIDERS ASSOCIATION (WISPA)

Mr. CARR. Good morning. Thank you, Chairman Wicker, Ranking Member Schatz, and members of the Committee. My name is Jimmy Carr, and I am the State Outreach Chairman for WISPA, the trade association that represents wireless Internet service providers, or the so-called WISPs. We represent more than 800 providers in all 50 States. I am also the CEO of All Points Broadband, a hybrid-fiber-wireless Internet service provider that serves customers in Virginia, Maryland, and West Virginia. I am honored to be here today to present WISPA's thoughts on the future of the Connect America Fund.

The WISP industry provides fixed Internet service to approximately 3 million Americans. The vast majority of WISPs operate in rural communities that wireline providers have chosen not to serve. Where there is no access, a WISP can provide it, and where there is no competition, a WISP can create it.

Our industry is one that the members of this committee and policymakers more generally need to know more about. In a nutshell, we are small businesses investing private capital deploying innovative technology to solve what just about everyone agrees is one of the most important issues facing our Nation, which is connecting rural America.

Over the past few years, there have been exponential improvements in the fixed wireless equipment we deploy, and the global equipment ecosystem has never been more robust. Fixed wireless can, should, and with a smart regulatory framework will be an extremely important component of any strategy to connect rural America in a cost-effective way. Indeed, the vast majority of WISPs have built their network without the benefit of any Federal subsidies primarily because of the structure of the Communications Act. WISP networks are typically designed so that the so-called last mile between a customer's home and the global Internet is made wirelessly over transmitters at fixed locations. WISPs provide this connectivity primarily over unlicensed and lightly licensed spectrum. Taking advantage of available unlicensed spectrum, substantially reduces our costs of deployment and the timeline on which we can deploy.

Unlike mobile wireless networks, the fixed wireless networks that WISPs build can offer our customers virtually unlimited data, enabling rural Americans to enjoy data-intensive services such as telemedicine, teleworking, online education, and streaming video.

Last year, the FCC implemented the Rural Broadband Experiment Program to gather real-world data on how to deploy next generation networks in rural areas. WISPs successfully competed for funding through this program, and WISPA believes there are several conclusions from the program that should be taken into account as the CAF Phase II framework is finalized. The most important conclusion from this process is that fixed wireless broadband delivered over unlicensed spectrum is a cost-effective way of providing universal service in rural America.

Another important conclusion is that by working with industry, the FCC can develop reasonable gating and financial eligibility requirements that will promote greater competition in the auction from small providers without increasing the risk to the taxpayer. Our specific recommendations on gating requirements are described in my written testimony.

WISPA believes that the principal objective of the Connect America Fund should be connecting as many rural Americans as possible in the most cost-effective way possible. To achieve this goal, the program should not prioritize fiber to the home over other technologies and it should not regulate bidders using unlicensed or lightly licensed spectrum to the last funding category. Rather, the FCC should adopt uniform speed, latency, and data requirements and award support to bidders who can meet those requirements in the most cost-effective way. Fiber is an excellent technology. It is also relatively expensive, especially in rural America, and in an environment where support funds are limited, the objectives of serving as many Americans as possible and doing as much fiber-to-the-home build as possible are simply mutually exclusive. That is a matter of plain arithmetic.

With regard to unlicensed and lightly licensed spectrum, WISPs have been successfully deploying in this spectrum to provide service to millions of Americans for many years. It is a public resource that is already available to connect rural America and should not be excluded from the CAF toolkit.

For the auction itself, the areas available for bid should be determined by the most recent information available to prevent subsidies from being used to overbuild privately funded networks. To this end, the FCC should also commence a proceeding to consider whether CAF support provided to price cap carriers should be scaled back based on post-election service by an unsubsidized competitor.

Finally, WISPA urges Congress to rewrite the Communications Act so that functionally equivalent services are treated in the same way. Consider that almost half of American households choose not to subscribe to a fixed voice service, and yet we are allocating billions of dollars of subsidies on the basis of whether or not fixed voice and broadband are available on the same bill from the same provider in a particular Census block. This makes no sense.

In the short term, WISPA asks this committee and the Congress to establish a standalone broadband fund that allows all providers and all technologies to compete on an equal footing.

Thank you and I look forward to your questions.

[The prepared statement of Mr. Carr follows:]

PREPARED STATEMENT OF JAMES G. CARR, CEO, ALL POINTS BROADBAND, ON BEHALF OF THE WIRELESS INTERNET SERVICE PROVIDERS ASSOCIATION (WISPA)

Chairman Wicker, Ranking Member Schatz, and Members of the Committee: My name is Jimmy Carr, and I am the State Outreach Chair of WISPA, the Wireless Internet Service Providers Association. WISPA is the trade association for wireless Internet service providers, or "WISPs." WISPA represents more than 800 providers of fixed wireless Internet service operating in every state in the Nation. I am also the Chief Executive Officer of All Points Broadband, a hybrid-fiber-wireless ISP based in Ashburn, Virginia, serving customers in Virginia, Maryland and West Virginia. I am honored to be here today to share with you WISPA's views on the future of the Connect America Fund (CAF).[1]

Background

Some 2,500 WISPs provide fixed Internet access to approximately 3,000,000 Americans. The vast majority of WISPs operate in rural communities and other sparsely populated areas that wireline providers have declined to serve. In many rural areas, WISPs provide the only source of terrestrial Internet access. Of the 48 percent of rural Americans that have only one option for fixed "advanced telecommunications capability," the local WISP may well be that sole provider.[2] Where there is no Internet connectivity, a WISP can provide it, and where there is no competition, a WISP can create it. We compete with Fortune 100 companies and other subsidized incumbents on the basis of customer service and price. Unlike the vast majority of large ISPs that bundle Internet access with video and entertainment services, most WISPs provide standalone Internet service. We provide the connectivity that enables rural customers to take advantage of teleworking, telemedicine, online education, and services like Netflix that are having a disruptive and consumer-friendly impact in the content marketplace. The principal value proposition WISPs offer customers is virtually unlimited data. For example, the median user on my company's most popular residential package downloads more than 100 GB of data each month. This volume of data is unavailable on satellite services and would cost in excess of $700 per month on a mobile hotspot offered by a large wireless carrier.

WISP networks are typically designed with a hub-and-spoke architecture, in which the spoke, or "last-mile" connection between a customer's home and a fiber-optic connection to a major data center is made wirelessly between transmitters at fixed locations. Though a number of WISPs are now deploying in licensed spectrum where it is available, necessary to provide quality service, and cost-efficient for their business, WISPs transmit primarily over unlicensed spectrum in various bands, including 900 MHz, 2.4 GHz, and 5 GHz, as well as the "lightly-licensed" 3.65 GHz band. Using unlicensed and lightly-licensed spectrum substantially reduces our costs of deployment and enables us to expand rapidly to meet consumer demand. Significantly, WISPs are able to provide affordable broadband service to rural and remote areas that cannot be cost-effectively served by wired technologies because the relatively low population density does not support the capital expense of fiber-to-the-home, cable, and other wireline platforms.

Over the past few years, manufacturers of fixed wireless technology have dramatically increased the speed and capacity of equipment, while improving unit economics. The global equipment ecosystem is stronger and more dynamic than it has ever been. Companies like Cambium, Ubiquiti, Mimosa, and Adaptrum are revolutionizing the space. They are targeting a huge market—the 2/3rds or so of the global population who have never been served by a wire, and never will. Fixed wireless operators in America are the beneficiaries of massive global R&D spending on improved fixed wireless capabilities.

Under any definition, nearly all of WISPA's members—including my company—are small businesses. Our smallest members are individual owner/operators that are providing connectivity to their friends and neighbors in a previously unserved rural area. America's largest WISP is Rise Broadband, with 800 employees serving approximately 200,000 customers in sixteen states. My company, All Points Broadband, is somewhere in the middle, with twenty employees serving approximately 3,500 customers.

In many ways, my company is also an example of the evolution that is taking place in the fixed wireless industry. As a result of the continuous and exponential

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[1] My testimony does not address the Federal Communications Commission's Mobility Fund, which subsidizes mobile wireless service.

[2] *See 2016 Broadband Progress Report,* FCC 16–6, GN Docket No. 15–191 (rel. Jan. 29, 2016) at 38. The *2016 Broadband Progress Report* also found that 13 percent of rural Americans have multiple options for fixed "advanced telecommunications capability."

improvements in the capability of fixed wireless equipment over the past few years, operators can now realize significant economies of scale, which in turn enables us to expand our coverage areas and continuously reinvest in our networks. More than ever before, WISPs of all sizes are attracting private capital to address what policymakers at every level and across the political spectrum agree is a critical need for our nation—closing the digital divide.

All Points Broadband commenced operations in the mid-Atlantic in November of 2014, and has invested more than $6.5 million to upgrade and expand our network in our first 14 months of operations. We have built our subscriber base through acquisitions, organic growth and better service, such as faster speeds that support our customers' desire to stream video through over-the-top services such as Netflix and Hulu. We serve fixed wireless customers from several hundred access points that are located on large commercial towers, municipal water tanks, commercial buildings, grain silos, and other vertical infrastructure. While fixed wireless is our primary access technology, before we make any major capital investment, All Points Broadband considers whether another technology, such as fiber-to-the-home will be cost-effective over the deployment lifetime, and we are beginning to install fiber in more suburban areas where our existing customer base and market projections justify the investment The same trend is occurring throughout our industry. The number of WISPs that are investing to convert wireless customers to fiber is growing every day.

The vast majority of WISPs, including All Points Broadband and the companies we acquired, have built their networks without the benefit of any Federal subsidies—no Universal Service Fund (USF) support from the FCC, no broadband stimulus funding from NTIA or USDA, no Rural Utilities Service support. The primary reasons for this are three-fold. First, with respect to USF, the FCC has interpreted the Communications Act to limit eligibility to providers of "telecommunications"—in other words, providers of voice service that met certain Federal and state requirements. Second, until recently, the FCC has made the policy choice to favor incumbent carriers for billions of dollars in funding. Third, the reporting obligations and administrative burdens associated with government programs have a disproportionate impact on smaller, entrepreneurial companies, many of which simply do not have the resources to participate in, and comply with, regulatory and subsidy schemes with origins in a bygone era when the only service was voice, which was only provided by wireline monopolies.

In November 2011, the FCC transformed its USF rules. In the four years since those rules became effective, the FCC has pledged and provided billions of dollars of support to a single class of "telecommunications" providers—the price cap carriers, the largest of the large telephone companies. The FCC's stated rationale for this decision was that "[m]ore than 83 percent of the approximately 18 million Americans that lack access to residential fixed broadband at or above the Commission's broadband speed benchmark [of 4 Mbps down/1 Mbps up] live in areas served by price cap carriers." [3]

At first glance, there is logic to directing support to areas where upgrades were most needed; but consider the signal this sends to decision-makers and to the capital markets. In effect, the program is rewarding those multi-billion dollar, legacy monopolies for their unwillingness or inability to deploy fixed broadband in the very areas where they already have plant and customers, giving them a huge advantage over potential competitors. Meanwhile, smaller telephone companies, cooperatives, WISPs and others were left on the sidelines and at an even greater competitive disadvantage. The program is subsidizing and entrenching incumbent monopolies at the expense of innovation and competition.

The Rural Broadband Experiment Program

Last year, the FCC implemented the Rural Broadband Experiment program that made up to $100 million in support available to broadband providers pledging to provide voice and broadband services to unserved areas of the country.[4] The support was awarded to those companies that pledged to meet prescribed voice and broadband speed, latency, usage and pricing criteria, in the most cost-effective manner, and without regard to the specific access technology to be used. Of the nine companies that have been authorized to receive support through this one-time program, two were WISPs that will be deploying networks that use *unlicensed* or light-

[3] *Connect America Fund,* 26 FCC Rcd 17663, 17673 (2011) ("*USF/ICC Transformation Order*"). In the *2016 Broadband Progress Report,* the FCC found that 34 million Americans lack access to fixed broadband speeds of at least 25 Mbps down/3 Mbps up. *See 2016 Broadband Progress Report* at 33.

[4] *See Connect America Fund,* 29 FCC Rcd 8769 (2014) ("*Rural Broadband Experiment Order*").

ly-licensed spectrum to serve customers. One of these, a company called Skybeam that is part of Rise Broadband, has been designated to receive almost $17 million to support 10 projects in rural, unserved areas of Illinois, Iowa, Kansas, Nebraska and Texas. Skybeam committed to offer voice and broadband at speeds of 25 Mbps down/5 Mbps up over a network capable of 100 Mbps down/25 Mbps up. The other WISP is First Step Internet, which was awarded more than $400,000 to provide 10 Mbps down/1 Mbps up service in portions of rural Washington state and Idaho. WISPs account for more than half of the funds that have thus far been allocated to program recipients.[5] Other recipients include small telephone companies, cooperatives and electric utilities.

In addition to having their technical proposals fully vetted by the FCC's engineers, winning bidders also had to submit letters of credit from an insured, investment-grade top-100 bank for the full amount of the support level received to date. A number of bidders were unable to obtain letters of credit and the FCC did not approve waivers seeking additional time to provide the letter of credit or to relax the requirements. Winning bidders also were required to apply for and be designated as eligible telecommunications carriers (ETCs) through a state approval process. By requiring only winning bidders to become ETCs—and thus "telecommunications" providers eligible for Rural Broadband Experiment support—unsuccessful bidders were rightly spared from having to spend time and money to become ETCs, and state public utility commissions did not have to waste administrative resources processing applications from unsuccessful bidders.

The FCC intended the Rural Broadband Experiment program to provide real-world data that would inform future policy decisions,[6] and despite some problems with eligibility requirements, the program has so far been a success. There are indeed several lessons from the program that WISPA believes should be taken into account as the FCC finalizes the Connect America Fund Phase II competitive bidding process. The most important conclusion is that fixed wireless broadband delivered over unlicensed and lightly licensed spectrum is a cost-effective way to provide universal broadband service at the FCC's thresholds. Another important conclusion is that by working with industry, the FCC can develop reasonable gating and financial eligibility requirements that will promote greater competition in the auction without increasing the risk to the American taxpayer.

The CAF Program—Recommendations

Before explaining our specific recommendations, I first want to acknowledge the FCC's Wireline Competition Bureau for their transparency in briefing stakeholders about their suggestions for the CAF auction and their willingness to work with WISPA in considering changes to the framework that will benefit small businesses and encourage greater competition. We also appreciate the engagement WISPA has had with the FCC Commissioners and their staff.[7]

The CAF competitive bidding process will award up to $175 million per year to eligible bidders to support broadband deployment in areas where price cap carriers have declined support, and WISPA's members have expressed interest in participating. We understand the FCC is working on an order that will establish the framework for the auction and will, later this year, open a proceeding to establish auction rules and procedures. WISPA has been engaged in the process and will continue to do so on behalf of our members. In considering our recommendations, we hope the FCC will honor the promise it made in the 2011 *USF/ICC Transformation Order:* "If the incumbent [price cap carrier] declines that opportunity in a particular state, support to serve the unserved areas located within the incumbent's service area will be awarded by competitive bidding, *and all providers will have an equal opportunity to seek USF support."*[8]

Cost-Effective and Technology-Agnostic

The principal objective of the Connect America Fund should be connecting as many unserved Americans as possible in the most cost-effective way possible. That is, the limited resources available to the FCC should be allocated in a way that will

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[5] *See 2016 Broadband Progress Report* at 55 (noting that as of December 11, 2015, the FCC had authorized approximately $34 million in Rural Broadband Experiment support).

[6] *See Rural Broadband Experiment Order* at 8770 ("We will use these rural broadband experiments to explore how to structure the Phase II competitive bidding process in price cap areas and to gather valuable information about interest in deploying next generation networks in high-cost areas").

[7] *See, e.g.,* Letter from Stephen E. Coran, Counsel to WISPA, to Marlene H. Dortch, FCC Secretary, WC Docket No. 10–90 (filed Nov. 23, 2015) ("WISPA Ex Parte Letter"). A copy of this letter is included with my testimony.

[8] *USF/ICC Transformation Order* at 17731 (emphasis added).

provide a threshold level of broadband service to as many end users as possible that currently do not have access. According to the *2016 Broadband Progress Report* that the FCC released less than a week ago, "[t]here is also a significant disparity between rural and urban areas, with more than 39 percent of Americans living in rural areas lacking access to 25 Mbps/3 Mbps advanced telecommunications capability, as compared to 4 percent of Americans living in urban areas."[9] Further, "25 percent of rural Americans lack access to 10 Mbps/1 Mbps fixed terrestrial broadband services compared to 2 percent of urban Americans, and 19 percent of rural Americans lack access to 4 Mbps/1 Mbps fixed terrestrial broadband service compared to 2 percent of urban Americans."[10] With a well-conceived framework for CAF Phase II, WISPs and other competitive providers can do more to help bridge this urban-rural divide.

WISPA's primary concern is that the FCC's framework must not favor one technology over another, but rather encourage maximum competition among all bidders that can meet uniform thresholds for broadband speed, latency, usage and pricing, without regard to the specific technology that the bidder plans to deploy. Anything less would be inconsistent with the FCC's promise that all bidders will have an "equal opportunity."

Based on information that the Wireline Competition Bureau has shared with WISPA and other stakeholders, we understand that FCC staff has recommended that CAF Phase II support be divided into three categories. *Category 1* would be reserved exclusively for bidders proposing to deploy fiber-to-the-home. *Category 2* would be for bidders whose deployments will meet, in general terms, each of the following three criteria: speeds of at least 25 Mbps down and 3 Mbps up, round-trip latency of 100 milliseconds or better and high data caps, *and* whose deployments will use licensed spectrum. In the unlikely event there is any funding remaining from the first two categories, *Category 3* would be for bidders who use unlicensed spectrum, or who meet only two of three requirements for speed, latency and data set out in Category 2.

WISPA has two significant concerns regarding the proposed structure of the reverse auction, which will be shared by anyone who believes that limited resources should be allocated as efficiently as possible.

First, the proposed requirement that Category 2 bidders use licensed spectrum will exclude the vast majority of fixed wireless providers from competing in the auction and will foreclose participation by those who can deploy in the most cost-effective manner, meaning that the limited number of other bidders will receive more support to serve fewer unserved locations. For many years, WISPs have successfully used unlicensed and lightly licensed spectrum to provide service to millions of Americans. Most operate in rural areas where there is sufficient and uncongested unlicensed spectrum that can be used to connect Americans to the Internet. What better use of this public resource is there than connecting rural and unserved Americans in a cost-effective manner? Unlicensed spectrum is a public resource that is already available, and is already being used to achieve this public purpose. What sense does it make to exclude from the toolkit for the CAF auction? The funding provided by the FCC to Skybeam and First Step Internet in the Rural Broadband Experiment program is an excellent case in point. Both of these companies' technology platforms were vetted by FCC technical staff who concluded that unlicensed spectrum could be used to meet the requirement of providing 100 percent coverage in the relevant service areas. In fact, price cap carriers that have accepted CAF funds are not bound to any particular technology—they can deploy cost-effective unlicensed fixed wireless technology if they want, so long as they provide 10 Mbps down/1 Mbps up and meet other technology-agnostic performance criteria.[11]

WISPA's second concern is the possibility that the FCC will adopt a "waterfall" funding structure, in which all Category 1 bids are awarded before any funds are made available to Category 2 bidders, and then all Category 2 bids are awarded before any funds are made available to Category 3 bidders.

The purpose of the CAF auction should not be promoting one access technology over another, but rather advancing the objective of ensuring that all Americans have access to adequate service. Fiber is indeed an excellent access technology—All Points Broadband and many other WISPs rely on fiber to serve their customers, and are accelerating their fiber-to-the-home deployments. However, relatively speaking, fiber is a very expensive technology, and in an environment where resources are finite, the goal of providing service that meets the FCC's definition of "advanced telecommunications capability" to as many Americans as possible, on the one hand, and

[9] *2016 Broadband Progress Report* at 33–34.
[10] *Id.* at 34 n.242.
[11] *See Connect America Fund,* 29 FCC Rcd 15644, 15649 (2014).

of providing fiber-to-the-home to as many locations as possible, on the other, are mutually exclusive—this is an undeniable economic reality. Further, a structure that prioritizes fiber-to-the-home may disadvantage the most rural locations and communities, where the economics of this technology are frequently the most challenging. Where "advanced telecommunications" as interpreted by the FCC can be delivered via fixed wireless or another technology at a lower cost than fiber, the auction structure should not stack the deck before bidding has even begun. Rather, the auction should provide support for the group of bidders that can meet the FCC's performance criteria and serve the most Americans in the most cost-effective manner. The FCC successfully used this approach in the Rural Broadband Experiment program, and there is no reason to deviate from that practice.

Auction Eligibility

Another key aspect of the competitive bidding framework is the pre-auction eligibility criteria. The FCC staff explained that it would be recommending that bidders must submit audited financial statements as a pre-condition to participating in the auction. But, as WISPA has pointed out, many small businesses do not have audited financial statements, and should not be required to spend $25,000 or more for an audit on a speculative basis *before* the auction, just to participate. To address this problem, WISPA and others believe the FCC should establish a means by which small providers with fewer than 25,000 broadband connections will be permitted to certify before the auction that they will provide audited financial statements within a certain period *if and after* being selected for support. This is similar to the approach that the FCC took with regard to ETC designation in the Rural Broadband Experiment program. WISPA agrees that winning bidders that are unable to provide the audited financials within a reasonable period of time after being selected for support should be subject to reasonable monetary forfeitures.

Post-Auction Financial Requirements

The FCC required Rural Broadband Experiment recipients to submit a letter of credit from a federally insured top-100 bank with a BBB- credit rating. If a bidder defaults on a build-out or other program requirements, the FCC can suspend support and draw on the letter of credit to cover the amount of disbursed support. As a threshold matter, the requirement to maintain a letter of credit to protect the taxpayer is certainly reasonable. However, applying lessons from the Rural Broadband Experiment, WISPA is urging the FCC to modify the specifics of the letter of credit requirement for the CAF II reverse auctions.

Letters of credit have annual carrying costs (around four percent) and appear as liabilities on a company's balance sheet—essentially, they are viewed as a loan that limits a support recipient's borrowing capacity on a dollar-for-dollar basis, although the winning bidder never receives the letter of credit proceeds. In the Rural Broadband Experiment program, a recipient is required to maintain a letter of credit for the entire amount of support it received and for the entire term of the support, regardless of progress towards build-out. This structure increases the recipient's expenses and reduces its debt capacity for the entire life of the funded project—despite the fact that the risk to the taxpayer decreases as the recipient draws support and satisfies its build-out requirements. Once build-out is complete, there is no benefit to the taxpayer by continuing to increase expenses and limit the borrowing capacity of a support recipient that has satisfied its obligations to the fund. We believe the letter-of-credit requirements for the CAF process should be modified to address this unnecessary constraint on support recipients.

Here are WISPA's specific proposals with respect to the letter of credit requirement:

First, the FCC should expand the list of eligible banks to enable greater participation by smaller broadband providers in a manner that does not compromise the integrity of the CAF program. WISPA and the American Cable Association have developed a detailed proposal and look forward to discussing it with the FCC in the very near future.

Second, the FCC should give winning bidders at least six months to obtain and submit the letter of credit.

Third, the amount required to be covered by the letter of credit should decline over time as the amount of remaining support declines. This will reduce the recipient's liabilities and increase its borrowing power to invest in network expansion and upgrades.

Fourth, the letter of credit should not be required to be maintained beyond the date on which build-out requirements have been met.

Adopting these recommendations will assure the FCC's interest in recovering support funds in the unlikely event of a default and will increase participation in the auction, especially among small providers.

Auction Design

WISPA's detailed views on the design of the auction are not yet fully formed, but there are a few high-level principles that should apply. First, the selection criteria should prioritize cost-effectiveness—which bidder can serve the greatest number of unserved locations in the geographic area at the lowest cost. Second, the areas available for bid should be determined by information reported on the FCC Form 477 that is as close to the beginning of the auction as possible. This will mitigate the problem that arises when old information is used and support is provided to areas that are already served by unsubsidized providers. If there is one thing that policymakers, taxpayers, and investors of private capital should agree on, it is that Federal subsidies should not be awarded to fund overbuilding of privately funded networks that are already providing service. Third, the bidding process should be simple and short. A complicated process requiring an army of economists, lawyers and game theorists to navigate will not promote participation by entrepreneurial providers, and will expose bidders to a long anti-collusion period that will chill transactional activity. And fourth, geographic areas should be right-sized—no smaller than a census block, no larger than a county.

WISPA looks forward to providing its further and more specific input to the FCC when staff engages stakeholders to share and discuss their ideas and suggestions for a successful reverse auction.

Ongoing Support for Price Cap Carriers

In August 2015, the price cap carriers made their elections to accept $1.5 billion annually in CAF Phase II support over the next six years—$9 billion in total. The areas where that support is available are mostly set, and the FCC generally will not alter the support over the six-year term even if unsubsidized carriers subsequently serve the areas identified for funding. This acts as a disincentive to private investment, network expansion and competition in the broadband market. Unsubsidized providers will be reluctant to expand service into areas designated for support, even though the subsidized incumbent may not intend to build out to the area for several years. And in cases where the unsubsidized provider does expand into funded areas, they will be competing with a large carrier that has the benefit of Federal support. The CAF program has created enough perverse incentives—it should not continue to perpetuate monopolies and discourage competition.

To address these anti-competitive market effects, WISPA suggests that the FCC commence a proceeding to consider whether CAF support provided to price cap carriers should be scaled back based on post-election service by an unsubsidized competitor. The FCC could rely on FCC Form 477 and re-visit its initial support determination at regular intervals. In lieu of funding served areas, the FCC would reclaim the allocated support and restore those funds to the universal service fund for later distribution through the Remote Areas Fund or another program.[12]

Remote Areas Fund

Regarding the Remote Areas Fund, in November 2011 the FCC allocated up to $100 million for fixed broadband deployment to "extremely high cost" areas. The FCC has taken no action to implement rules for this fund, which would support broadband deployment to those areas that are deemed to be the most expensive to serve. Through fixed wireless technology, WISPs are well-equipped to deploy to these areas. We urge the FCC to propose rules for the Remote Areas Fund at the earliest opportunity.

Bringing the Communications Act into the 21st Century

Finally, the most important and effective step that could be taken to improve availability and competition in the broadband market, and to foster greater innovation, is within Congress' power. The Communications Act is long overdue for an

[12] In 2014, the FCC acknowledged that there may be variances between the number of unserved locations its model predicted and the actual number of unserved locations in a given area. *See Connect America Fund,* 29 FCC Rcd 15644, 15659 n.88 (2014). The FCC asked price cap carriers to inform FCC staff if it discovered any differences. WISPA notes and appreciates Frontier's recent letter to the FCC identifying supported areas where there are fewer unserved locations than the FCC's model, which will result in adjustment of Frontier's service targets and a pro rata reduction in funding. *See* Letter from Michael Golob, Frontier Senior Vice President, Network and Engineering Integration, to Marlene H. Dortch, FCC Secretary, WC Docket No. 10–90 (filed Dec. 30, 2015).

overhaul. The current framework draws distinctions on the basis of which access technology is used to provide the service. In an all-IP world, these distinctions make no sense and create ripples in the regulatory environment that have unintended and illogical results, many of which are playing out in the Connect America Fund process.

For example, almost half of American households choose not to subscribe to a landline phone service, and yet, as a society we are using a requirement that voice and broadband service be available on the same bill from the same provider to determine where to allocate billions of dollars of subsidies, and who will receive them. This makes no sense. As everyone knows, if you have an Internet connection, you can have phone service. What's more, if you don't like the phone service your ISP offers, you can use Vonage, Magic Jack, or dozens of other providers who are competing with one another to earn your business every day.

It is time to re-write the Communications Act to eliminate these accidents of history and treat functionally equivalent services in the same way. And if rewriting the Communications Act is too much to achieve in the near term, WISPA asks this Committee and the Congress to eliminate the voice requirement or to establish a standalone broadband fund that does not have a voice requirement and allows all providers and technologies to participate on an equal footing. We stand ready to work with you to craft appropriate legislation.

Thank you, and I look forward to your questions.

LERMAN SENTER PLLC
Washington, DC, November 23, 2015

MARLENE H. DORTCH, Secretary
Federal Communications Commission
Washington, DC.

RE: NOTICE OF ORAL EX PARTE PRESENTATION WC DOCKET NO. 10–90

Dear Ms. Dortch:

On November 20, 2015, Alex Phillips, President of the Wireless Internet Service Providers Association ("WISPA") and CEO of Highspeedlink, Jeff Kohler, Co-Founder and Chief Development Officer of JAB Wireless, Inc. dba Rise Broadband, Jimmy Carr, CEO of All Points Broadband, Jonathan Allen of Rini O'Neil, PC and undersigned counsel to WISPA, met with Carol Mattey, Deputy Chief of the Wireline Competition Bureau, and Claude Aiken, Associate General Counsel. The purpose of the meeting was to present WISPA's views and concerns about the proposed order on circulation that would establish the framework for competitive bidding in Phase II of the Connect America Fund ("CAF") program.

The WISPA representatives explained that there is significant interest among fixed wireless Internet service providers ("WISPs") in participating in the competitive bidding process. Mr. Kohler of JAB Wireless, the parent of Skybeam, LLC ("Skybeam"), noted that Skybeam had been selected to receive $16.9 million for 10 rural broadband experiment projects, all of which would use unlicensed spectrum to meet the coverage requirements. Mr. Kohler stated that Skybeam relies on competitive and upgradable technology and unlicensed spectrum that can be quickly deployed, which had been thoroughly vetted by Commission staff prior to Skybeam's selection. Messrs. Carr and Phillips, who operate smaller companies, indicated their strong interest in bidding for CAF support.

The WISPA representatives identified several specific concerns with the proposed framework. If not properly addressed, these issues would effectively preclude WISPs from competing in the competitive bidding process, a result that would limit participation, limit the areas subject to support and result in an inefficient allocation of limited resources to deployments of access technologies that are far less cost-effective than unlicensed fixed wireless technology. These concerns are as follows:

First, the WISPA representatives opposed any technology-specific funding categories and strongly objected to a requirement for Category 2 that bidders use only licensed spectrum for their deployments. WISPs have a track record of successfully building fixed broadband networks with unlicensed spectrum in a cost-effective way—roughly one-fifth the cost of wireline technologies, as Mr. Kohler explained. The WISPA representatives explained that it would be inconsistent for the framework to relegate to Category 3 those service providers that deploy networks using unlicensed spectrum when those providers can meet all of Category 2's speed, usage allowance and latency criteria. Mr. Kohler noted that interference would be much less of an issue in rural areas where there is little to no contention for spectrum,

and that a variety of technology solutions, including small cells, could be deployed to meet the coverage requirement, as Skybeam's rural broadband experiment projects demonstrated.

Second, the WISPA representatives object to a "waterfall" competitive bidding process that would award funds first to all Category 1 (fiber-to-the-premises) proposals, then would award any remaining funds to Category 2 proposals, then would award any remaining funds to Category 3 proposals. Instead, the WISPA representatives support a technology-neutral approach that is based on cost-effectiveness—priority should be given to the proposals that provide broadband meeting the speed, usage allowance and latency requirements to the most locations using the least Federal support.

Third, the WISPA representatives asked the Commission to expand eligibility for banks issuing letters of credit to those that are outside the top-100 banks.[1] Mr. Phillips explained that small WISPs have strong relationships with smaller, community banks that understand the WISP business and are familiar with their business and financial models. Mr. Kohler noted that some top-100 banks did not want to participate in the rural broadband experiment program. The WISPA representatives pointed out that requiring a top-100 bank to provide letters of support would foreclose participation from smaller companies.

Fourth, consistent with a proposal advanced in the ACA Letter, WISPA suggested that the framework include a third alternative for pre-auction financial qualification that would allow bidders with three-year broadband track record to post a reasonable upfront amount of money in lieu of audited financial statements. The upfront amount would be refunded if the bidder was unsuccessful; for successful bidders using this option, the money would be refunded and applied to funding a post-auction audit. Mr. Phillips explained that small broadband providers do not typically have audited financial statements. Mr. Carr explained that the cost to prepare an audit can be in the $50,000 range and that smaller ISPs with a three-year track record should not be required to pay for audits on a speculative basis as a precondition for competing in the auction.

Fifth, the WISPA representatives urged the Commission to rely on the most current FCC Form 477 information available at the time competitive bidding begins to establish the final list of available census blocks. Doing so would encourage continued build-out by "unsubsidized competitors" and obviate the need for a time-intensive challenge process.

In conclusion, the WISPA representatives emphasized that the proposed framework would preclude participation by small broadband providers. In particular, any one of the first four concerns would be extremely problematic; collectively, the impact would be far worse for both WISPs that want to participate and the American public that would benefit from greater auction participation and cost-effective broadband service.

Pursuant to Section 1.1206 of the Commission's Rules, this letter is being filed electronically via the Electronic Comment Filing System in the above-captioned proceeding.

Respectfully submitted,

STEPHEN E. CORAN,
Counsel to WISPA.

cc: Carol Mattey
Claude Aiken

Senator WICKER. Thank you very, very much.
Mr. Rapelyea?

STATEMENT OF MICHAEL RAPELYEA, VICE PRESIDENT FOR GOVERNMENT AFFAIRS, VIASAT, INC.

Mr. RAPELYEA. Chairman Wicker, Ranking Member Schatz, and the other members of the Subcommittee, I am Michael Rapelyea, Vice President of Government Affairs at ViaSat. I am pleased to testify about how competition can help extend broadband service to the 500,000 rural Americans left behind by the FCC's Connect America Fund. A "fiber everywhere" approach is not realistic or af-

[1] *See* Letter from Thomas Cohen, Counsel to the American Cable Association ("ACA"), to Marlene H. Dortch, FCC Secretary, WC Docket No. 10–90 (filed Nov. 13, 2015) ("ACA Letter").

fordable. I am focusing here on the highlights of written testimony in the record.

ViaSat is an American success story. We started in a garage 30 years ago. We now employ over 3,000. We invested billions in broadband technology. We believe in disruption. We believe in better before cheaper. We believe in competition. Our satellite broadband technology has disrupted the broadband industry by driving down the cost per bit and driving up service quality to customers. We deliver bandwidth speeds to anyone anywhere. Here are three examples.

First, in the airline WiFi sector, our service is on board hundreds of JetBlue, Virgin, and United jets. JetBlue passengers live stream Amazon Prime video for free. Virgin passengers live stream Netflix for free. With ViaSat service, 100 passengers connect simultaneously. Before ViaSat, five passengers connected.

Second, ViaSat has 700,000 home broadband subscribers. One-third came from terrestrial solutions. These folks had choices. They joined us because we were better, not because we were the only option. We deliver high definition video streaming speeds of up to 25 megabits per second in some areas of the country today, and we will do it across the country by next year.

Third, we deliver broadband satellite to government and military users. Our special operations forces rely on ViaSat. During Hurricane Sandy, we provided connectivity to the National Guard and the American Red Cross. When everything was down, we were up. Like most communications companies, ViaSat home subscribers follow U.S. population distribution. Most of our customer are exurbs or in heavily populated areas. Some are rural. In other words, we serve a blend.

Economies of scale apply to us well. In Mississippi, for example, our customers cluster around Jackson, Tupelo, Oxford, and Hattiesburg versus rural parts of the state.

We currently use four spacecraft and are launching more to keep up with demand. ViaSat's first generation of satellites compete well against DSL and legacy cable. Our second generation design competes against cable offering speeds of 25 to 100 megabits per second. Our third generation features speeds approaching fiber with highly flexible bandwidth that we can allocate to customer demand.

America's largest airlines, the Department of Defense, and almost a million Americans have given ViaSat a shot. Today we are asking regulators to give multiple technologies, including those on this panel, a shot at competing for the 500,000 homes simply left behind by current CAF policies. It is hard to see how we get there from here. It is a real head-scratcher. There does not seem to be enough money, and the budget shortfall could be as much as $750 million.

Satellite broadband can solve this problem for three main reasons. Today we are competing directly with terrestrial technologies, and we are winning. Today we are delivering what customers want: speed. Today we are far more cost-effective than fiber.

On top of this, we have submitted a proposal to the FCC that features 50 megabits per second speeds. That is double the 25 megabit per second speeds of the FCC's benchmark.

Despite all of this, we may not have a chance to compete for most of those households. The current proposals limit us to the costliest and hardest-to-reach households. It is really hard to make a business case out of that. We would like to compete to solve all of the problem, not just part of it. Like other communications companies, if we do not get critical mass of customers or a blend of customers, we cannot make the long-term capital commitments needed to address all of the problem.

Our ask is simple. Promote competition. Avoid picking winners and losers. Allow all broadband providers the chance to compete for all of those left-behind households.

Thank you.

[The prepared statement of Mr. Rapelyea follows:]

PREPARED STATEMENT OF MICHAEL RAPELYEA, VICE PRESIDENT FOR GOVERNMENT AFFAIRS, VIASAT, INC.

Chairman Wicker, Ranking Member Schatz, and other Members of the Subcommittee, I am Michael Rapelyea, Vice President for Government Affairs of ViaSat, Inc. ("ViaSat"). I am pleased to have the opportunity to testify before you today on ViaSat's views about how policymakers can harness competition among service providers and communications technologies to ensure that limited universal service support is used efficiently and effectively to extend the benefits of broadband to rural America.

ViaSat is a U.S.-based company started by its three founders in a garage in San Diego nearly 30 years ago. From those humble beginnings, ViaSat has grown into a global broadband services and technology company with over 3,000 employees. ViaSat also is a leading provider of communications solutions to U.S. consumers, the U.S. government, and the U.S. military. Simply stated, we invent, design, and build telecommunications networks and systems—with a particular focus on satellite technologies.

We use a fleet of spacecraft to provide our Exede broadband service to fixed and mobile terminals. Our advanced technology has revolutionized the industry by reducing the "cost per bit" of delivering broadband service, providing a high-quality service to end users, and affording millions of Americans an effective competitive alternative to wired and wireless terrestrial services. We turn electrons into bandwidth and bandwidth into quality broadband service.

Our satellite broadband customers include individual consumers, small and large businesses, government and military users, and major airlines such as United, JetBlue and Virgin America. ViaSat serves nearly 700,000 customers in their homes and offices, and provides in-flight broadband on approximately 419 commercial, 300 business, and 400 government aircraft.[1] Nearly one million personal electronic devices connect each month to the Wi-Fi service provided through these broadband connections to aircraft. For example, today ViaSat technology can power my 10 year old son Teddy's iPad on a JetBlue flight heading to Disney and Netflix on my iPad on a Virgin America flight heading to ViaSat's California headquarters.

ViaSat also provides satellite broadband service to government and military users for their essential missions and communications needs. Among other things, we provide the Department of Defense with critical communications capabilities providing situational awareness to America's warfighters on the ground, at sea and in the air. For example, in connection with Project Liberty we delivered secure communications channels to U.S. Special Forces in Afghanistan. We also provide critical public safety connectivity, including to the National Guard and the American Red Cross during Hurricane Sandy, and to law enforcement apprehending the Arizona sniper.

It may surprise some, but ViaSat's customers are distributed across the United States in a manner that roughly follows the U.S. population distribution, as depicted below. So our strongest markets are more heavily populated areas, not just rural.

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[1] *See Press Release: ViaSat Announces Second Quarter Fiscal Year 2016 Results* (Nov. 9, 2015), available at *http://investors.viasat.com/releasedetail.cfm?ReleaseID=941679.*

Figure 1. ViaSat Broadband Subscriber Density



We currently use four spacecraft to provide service, and are launching more to keep up with growing customer demand, expand capacity, and provide even better service. ViaSat-1, launched in 2011, supports speeds to individual users of up to 25/3 Mbps and has a total capacity of approximately 150 Gbps. When it was launched, ViaSat-1 had more than 10 times the throughput of the other Ka-band satellites in orbit.[2] ViaSat's second-generation high-capacity satellite, to be launched within the next year, will double this throughput to over 300 Gbps, and will support speeds well over 100 Mbps.[3] The third-generation ViaSat high-capacity satellites under development each will provide over 1 Terabit per second (1,000 Gbps) of throughput and even higher speeds.[4] Our newest and most advanced satellite designs are highly flexible, allowing us to allocate bandwidth where it is most needed.[5]

Today, in addressing the current state of the universal service fund ("USF"), efforts to implement the Connect America Fund ("CAF"), and other ongoing reform efforts, I would like to emphasize four key points:

1. Satellite technologies *today* are providing high-quality broadband services to American consumers—and those same technologies are fully available for use in connection with the CAF;
2. Satellite broadband technologies provide a superior end-user experience that is optimized for the vast majority of Internet traffic;
3. Satellite broadband technologies offer an extremely cost-effective means of serving rural and remote areas of the country; and
4. ViaSat's network expansion plans will be influenced by CAF and other USF policies.

But current policy proposals do not provide an environment conducive to ViaSat making long-term commitments to step into the shoes of the wireline incumbents that have declined to continue to serve the costliest and hardest to reach parts of the Nation that are the focus of the final stages of the CAF.

I. Satellite Technologies Provide High-Quality Broadband Services to Consumers *Today*

By investing billions of dollars to develop cutting-edge technologies, ViaSat has fundamentally changed the broadband game. By significantly increasing the level of throughput (*i.e.,* bandwidth or "speed") achievable over satellite networks, and dramatically lowering the "cost per bit," we are now attracting customers from our terrestrial competitors, such as 3G and 4G wireless, cable, and DSL. Indeed, roughly

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[2] *See ViaSat-1 FAQ,* available at *https://www.viasat.com/sites/default/files/legacy/web/ViaSat-1_FAQ_3_09_V3.pdf* (last visited Jan. 27, 2016).

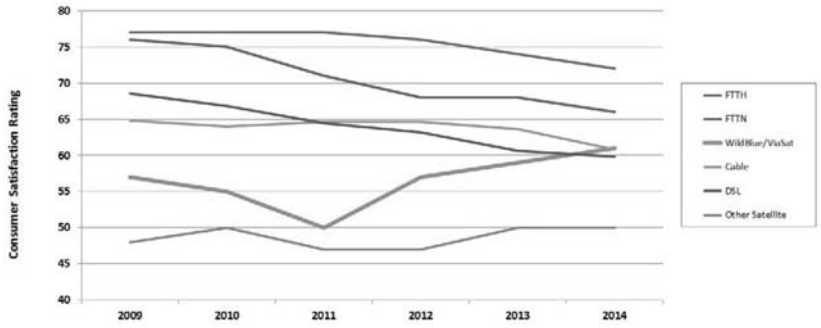
[3] *See ViaSat Q2 2016 ViaSat Earnings Conference Call* (Nov. 9, 2015), available at *http://investors.viasat.com/events.cfm.*

[4] *Id.*

[5] *Id.*

one-third of ViaSat's approximately 700,000 satellite broadband subscribers have switched over from terrestrial broadband alternatives. There is no better indication of widespread market acceptance of satellite broadband solutions.

Furthermore, as shown in the following graph, ViaSat's satellite broadband service has an overall user satisfaction rating that is on par with that of leading cable and DSL-based broadband service providers. Notably, the reported level of satisfaction has been rising, and is considerably higher, since ViaSat-1 was launched in 2011.



FTTH: FiOS, FTTN: U-Verse, Cable: average score of CableOne, Charter, Comcast, Cox, MediaCom, Time Warner, DSL: average score of AT&T, Century Link, FairPoint, Frontier, Verizon, Windstream. ViaSat not ranked in 2013, data point is interpolated.

Source: *Consumer Reports* issues published February 2010, May 2011, June 2012, May 2013, May 2014, and May 2015, available at *www.consumerreports.org.*

Things have changed dramatically for the better in the past five years. With due respect to Chrysler, "We are not your father's satellite broadband service."

II. Satellite Broadband is Optimized for the Vast Majority of Internet Traffic

ViaSat's broadband performance has been made possible by dramatic improvements in the throughput—*i.e.,* bandwidth or "speed"—achievable over satellite and improvements with network equipment on the ground. As I described above, the satellites and network architecture that ViaSat plans to deploy in the coming years will support even higher levels of throughput and speed, translating into even higher-quality broadband service for consumers—service that will more than keep pace with the improvements implemented over time by our competitors.

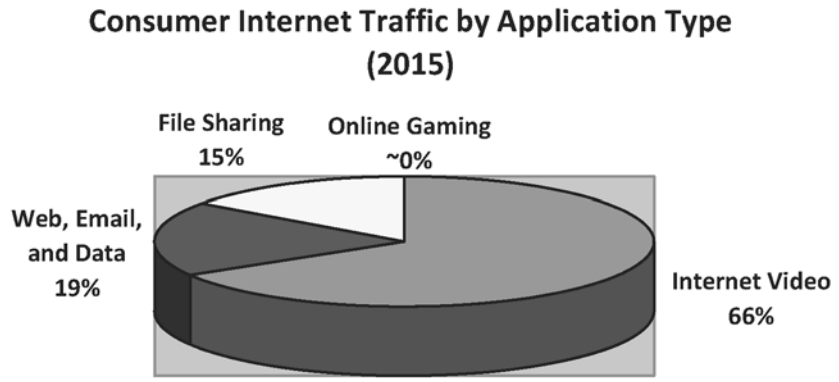
The quality of any broadband service depends on a combination of service characteristics,[6] but bandwidth is *the* central value proposition of a broadband service and speed is the most significant driver of consumer satisfaction. Even a cursory examination of the marketing materials of leading broadband providers reflects that speed is one of the two most critical elements used to market service to the consumer (along with price).[7] And ViaSat has found that the speed of an offered service has a greater impact on consumer adoption than any other factor.

The reason for this is simple: The amount of bandwidth available to a customer has a significant and direct impact on the quality of the end-user experience for the most popular broadband applications, which account for the vast majority of Internet traffic. The following chart, based on data from Cisco's Visual Networking Index, shows a breakdown of consumer Internet traffic by application type last year:

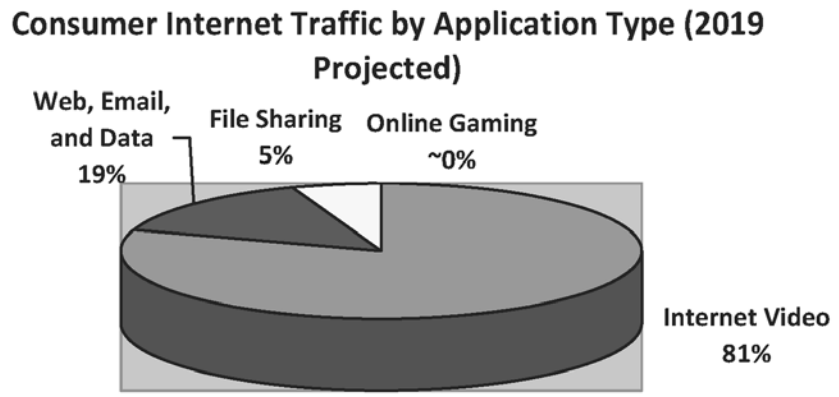
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[6] *See generally* Mark D. Dankberg, Thomas E. Moore, and Girish Chandran, *Toward a National Broadband Plan: Ensuring a Meaningful Understanding of Broadband Capabilities and Facilitating Competitive Choices* (Aug. 31, 2009), attached to Letter from John P. Janka, Counsel to ViaSat to FCC, GN Docket No. 09–51 (Aug. 31, 2009) (discussing the multiple dimensions of "broadband" service and cautioning against the adoption of overly restrictive performance standards that could artificially constrain the evolution of broadband service).

[7] *See, e.g., http://www.verizon.com/home/fios-fastest-internet/#plans* (last visited Jan. 12, 2016) (listing Verizon FIOS plans and emphasizing, in bold type, speeds and prices associated with each offering).



Notably, Internet video streaming and downloads *alone* accounted for over 60 percent of Internet traffic.[8] These applications are expected to account for more than 80 percent of all Internet traffic by 2019.[9]



Higher levels of bandwidth permit the transmission of higher-quality data streams. Consequently, the quality of the end-user experience when using these applications is directly tied to the speeds available to that user.

At the same time, higher speeds allow multiple users and devices in a given household to access the Internet simultaneously. Notably, Gartner, Inc., forecasts that over 13.5 billion consumer devices—and over approximately 20.8 billion total devices—will be connected to the Internet by 2020.[10] This would mean roughly three devices for every person on the face of the Earth—and significantly more devices per person in America's hi-tech society.[11] It is no surprise that Cisco predicts that these demands will cause average broadband speeds to double to 43 Mbps by 2019.[12]

ViaSat's satellite broadband network currently provides service of up to 25/3 Mbps in certain areas and at 12/3 Mbps everywhere else. With the launch of ViaSat-2

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[8] *See 2015 Measuring Broadband America Fixed Broadband Report* at 7 n.3 (citing Cisco Visual Networking Index: Forecast and Methodology, 2014–2019 White Paper (May 27, 2015), available at *http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white__paper__c11-481360.html* ("Cisco VNI Paper").

[9] *Id.*

[10] *See Press Release: Gartner Says 6.4 Billion Connected "Things" Will Be in Use in 2016, Up 30 Percent from 2015* (Nov. 10, 2015), available at *http://www.gartner.com/newsroom/id/3165317.*

[11] The U.S. Census projects that worldwide population will exceed 7.5 billion by 2020. *See* International Data Base: World Population: 1950–2050 (last visited Jan. 28, 2016), available at *ttps://www.census.gov/population/international/data/idb/worldpopgraph.php.*

[12] *Id.*

within the next year, we plan to introduce packages with even higher speeds. These evolving speeds ensure that our 700,000-plus customers have access to service capable of supporting HD video and other in-demand applications. In contrast, many of these areas remain entirely unserved by incumbent providers, which *might* be able to offer 10/1 Mbps service years from now, and only with significant government subsidies.

III. Satellite Broadband Technologies Offer an Extremely Cost-Effective Means of Serving Rural and Remote Areas

As noted above, the advanced satellite broadband technologies developed by ViaSat have resulted in a "cost per bit" for ViaSat's network that is dramatically lower than legacy satellite networks. As a result, today's satellite broadband networks offer performance that meets or exceeds that of its competitors. But ViaSat also offers pricing for that performance that is competitive with the alternatives.

Indeed, ViaSat's network is incredibly cost-effective compared not only to last-generation *satellite* networks, but also compared to *existing incumbent networks* (including cable and DSL)—largely due to the enormous capital efficiency inherent in satellite infrastructure (although, even for us, it still costs more to serve users in remote areas, due to the increased costs associated with installation and service calls).

Indeed, a report commissioned by ViaSat in 2011 estimated that nearly half of the housing units identified as "unserved" by the FCC could be served at lower cost with satellite technologies than with terrestrial alternatives.[13] And even where satellite is not the lowest-cost option, its participation in the CAF would spur competition and compel other providers to provide more cost-effective service. In both cases, allowing satellite broadband providers to participate fully and directly in the CAF would result in significant costs savings and better program outcomes. Conversely, excluding or limiting the participation of satellite broadband providers would unnecessarily inflate costs while undermining the universal service policies objectives of the CAF.

IV. ViaSat's Business Plans Will Be Influenced by Connect America Fund Policies

CAF support undoubtedly would facilitate ViaSat's ability to make its high-quality broadband services available to millions of additional consumers in locations that have been deemed "unserved" by the FCC. ViaSat is well-positioned to make long-term commitments to serve those consumers located in areas supported by the CAF through service plans offering high-quality broadband service at attractive price points, but ViaSat cannot do so without a fair shot at the same support its competitors are seeking.

Consistent with the FCC's longstanding commitment to competitive and technological neutrality, ViaSat has advocated the adoption of CAF eligibility criteria that enable broad program participation by wireline, wireless, satellite, and all other service providers on the same terms and conditions. Stated differently, we believe that policy makers should give the best players a chance to compete. As ViaSat has explained, this approach would offer the best chance of truly bridging the Digital Divide and would facilitate the use of extremely limited CAF funding by the most efficient service providers—regardless of the technologies they use. This approach would minimize the contribution burden placed on average Americans who fund the CAF through surcharges on their telephone bills.

Unfortunately, recent years have seen the adoption of CAF decisions and policies that favor incumbents over new entrants and certain "traditional" technologies over newer, more advanced technologies—and therefore depart from a longstanding commitment to competitive and technological neutrality. In effect, this approach picks winners and losers before the game even starts.

First, the lion's share of available funding was earmarked for terrestrial incumbents. Now, competitive providers are able to seek only a small fraction of total available funds that those incumbents declined, as well as limited (and not nearly sufficient) funds allocated to extremely costly and hard-to-serve areas.

Second, we have seen and continue to see restrictive technical eligibility thresholds that have little bearing on the quality of the end-user experience. For example, we're still seeing requirements that CAF recipients offer service with 100 milliseconds of latency or less, even though: (i) the vast majority of Internet traffic is

[13] See Dr. Charles L. Jackson, *Satellite Service Can Help to Effectively Close the Broadband Gap* (Apr. 18, 2011), attached as Exhibit A to Comments of ViaSat, Inc., WC Docket No. 10–90 (Apr. 18, 2011). Although the data used in that report need to be refreshed to reflect the passage of time (*e.g.,* cost information), we believe the report's basic conclusions with respect to the relative cost-effectiveness of satellite technologies remain sound.

not latency-sensitive; (ii) service providers can design their networks to mitigate the impact of latency (*e.g.,* through higher speeds, by using hybrid networks) for the narrow slice of Internet traffic that is latency-sensitive; and (iii) it would be more neutral, efficient, and direct to simply require recipients to meet standards with respect to overall service quality. In short, these restrictions *do not* ensure the quality of service received by consumers, but *do* limit the participation of entire classes of service providers—including satellite broadband providers—and consequently drive up the costs of the CAF program.

By way of example, in connection with the Rural Broadband Experiments auction held in late 2014, we submitted bids requesting support that was far less than the support levels estimated by the FCC wireline cost model. We also offered to use hybrid networks to carry latency-sensitive traffic in a way that would satisfy the 100 milliseconds requirement, and committed to meet the FCC's voice quality standard. Even though we were identified as the provisionally winning bidder in a number of areas, all of our bids were rejected because our *entire* network would not meet the latency requirement—even though the vast majority of Internet traffic (over 60 percent today and over 80 percent by 2019) is not latency sensitive, and even though we had a viable solution for handling latency-sensitive traffic in a way that would meet the Commission's standard. More than a year later, we're still trying to compete on a level playing field with all technologies, even though some of the preferred technologies would be extremely expensive and not even have a shot at covering all the remain CAF II households, once again leaving vast areas without broadband. Indeed, the current proposal for the CAF reverse auctions effectively would put us at the end of the line, and would relegate us to the most costly-to-serve areas that terrestrial providers apparently are not interested in or capable of serving.

At times, it seems that the folks crafting CAF policy are not taking in the complete picture, including how service providers actually make their business decisions. It would be a mistake to assume, as some apparently do, that satellite broadband providers would participate in the CAF on the extremely constrained basis that has been proposed. Participating in the CAF comes with a number of long-term obligations, including becoming an eligible telecommunications carrier ("ETC") and taking on carrier of last resort obligations. It could make sense for a provider to assume those burdens if it otherwise had a critical mass of customers within a state, but that would not be the case for satellite broadband providers under the current approach.

Stated another way, given the choice between committing capacity to high-volume/high-demand areas or a handful of dispersed, low-volume areas, a business is likely to make the same choice as the wireline incumbents that declined many CAF areas last year. Notably, those wireline companies were unwilling to participate in the CAF in those areas even though they would have been able to receive significant support on a state-wide basis and more than achieve "critical mass."

Moreover, the vast majority of capacity available on the new satellites that ViaSat will launch in the next few years is already allocated to beams serving urban areas of the country, in which the vast majority of ViaSat's existing customers are located. We'd likely have to change our plans or build more spacecraft to participate fully in the CAF, which we're willing to do if the playing field is level. But the way things are going with the CAF, it would not make business sense to redirect capacity away from densely populated areas or away from service to airplanes—and foregoing associated revenue opportunities—or deploy new spacecraft simply to serve a limited number of "extremely high cost" areas in return for a relatively small subsidy.

In short, participating in the CAF likely would make sense only if satellite broadband providers could do so fully and on the same terms as everyone else, so that they have the chance to obtain the critical mass necessary to support the business case for participating. For this reason, among others, ViaSat renews its support for the adoption of CAF eligibility criteria that enable broad program participation by wireline, wireless, satellite, and other service providers on the same terms and conditions. This approach would facilitate the use of limited CAF support by the most efficient service providers—regardless of the technologies they use. This approach therefore would minimize the contribution burden placed on average Americans who fund the CAF.

To be clear, ViaSat does not support eligibility criteria that would compel some consumers to accept inferior services from certain types of supported providers. Rather, ViaSat supports eligibility criteria that can accommodate differences across technology platforms and facilitate service to geographic areas supported through the CAF at the lowest cost to contributing end users, while still ensuring that consumers receive high-quality broadband services.

Thank you for the opportunity to appear before you today to discuss these important issues. I would be pleased to answer any questions you might have.

Senator WICKER. And thank you very much.
Mr. Carlson?

STATEMENT OF LEROY T. CARLSON, JR., CHAIRMAN, UNITED STATES CELLULAR CORPORATION

Mr. CARLSON. Chairman Wicker, Ranking Member Schatz, and members of the Subcommittee, thank you for the opportunity to speak with you about the need to renew the commitment to Federal Universal Service policies that will provide rural Americans with leading-edge mobile broadband and the economic, educational, and life-improving opportunities mobile broadband provides.

You may have heard some say that the job of providing mobile broadband to rural America is largely done. I must tell you otherwise. Even under the rosiest of scenarios, there is much still to be done. Mobile broadband is the under-appreciated portion of the Federal Universal Service program. It is allocated only 13 percent of the high-cost fund, despite mobility's preeminent role today in Americans' lives. No amount of wishful thinking that current coverage meets the needs of rural Americans will make it so. The hard work of completing that mobile broadband job starts today with this hearing, and your recognition that the congressional directive that mobile services in rural America be reasonably comparable to urban areas is not being met.

If we continue down the current regulatory path, the mobile services your rural constituents have today may be the best that they will ever experience. Many will never see good coverage beyond towns and major roads, and many may never see 5G services that are just around the corner.

I am encouraged by this committee's interest in mobile broadband and am really hopeful that your bipartisan leadership will help provide rural Americans the economic opportunities and public safety benefits from mobile that they need and deserve.

Today there are countless mobile devices with far more computing power than ever imagined. Our rural mobile networks enable these devices to place calls, access the Internet, and run millions of vital applications, but only in areas where there are strong signals.

Let me cite three examples of the power of mobile coverage.

One, 70 percent today of 911 calls are placed from wireless phones.

Two, mobile applications that diagnose, monitor, and treat disease are already saving and improving the quality of people's lives.

And three, the Internet of Things, which depends on wireless, will transform numerous industries in this country and, indeed, may create $15 trillion of annual global GDP by 2030.

Now, none of what I just described will benefit rural Americans unless high-quality mobile broadband coverage is available everywhere rural Americans live, work, and travel. It is therefore vital for our Nation to have accurate data from the FCC about the quality of mobile broadband coverage in rural America.

Just last week, the FCC reported that 87 percent of rural Americans lack access to mobile broadband at a standard of 10 megabits per second downstream and 1 megabit per second upstream. 87 percent. Without knowing where rural coverage is deficient, Con-

gress and the FCC cannot know how much support is needed to fix it. Without knowing how much it will cost to fix, how can Congress and the FCC know if the Mobility Fund is sufficient?

The FCC has allocated only a percentage of its Universal Service budget to mobile broadband. This is not good policymaking, and the FCC needs to do better.

The FCC should be required, first, to determine the coverage quality facts and then size the fund.

Also, the FCC should solicit new ideas for how to leverage Federal funds, along with State funds and private investment, to provide incentives to invest and improve service in rural areas. Several states such as Nebraska, Colorado, and New Mexico are developing State broadband Universal Service mechanisms, any of which could be trialed in a joint Federal-State pilot program, something the FCC has recently done with fixed service.

In summary, compared with the standard enacted by Congress, rural Americans today do not have access to 4G mobile broadband networks that are reasonably comparable to those in urban areas. Congress and the FCC must move quickly to address this inequity.

Thank you.

[The prepared statement of Mr. Carlson follows:]

PREPARED STATEMENT OF LEROY T. CARLSON, JR., CHAIRMAN, UNITED STATES CELLULAR CORPORATION

Chairman Wicker, Ranking Member Schatz, and members of the Subcommittee, my name is LeRoy T. Carlson, Jr., and I am Chairman of United States Cellular Corporation. Thank you for the opportunity to discuss the need for mobile broadband in our Nation's rural areas and the important role that the Federal Universal Service Fund can play to address this need.

Introduction

U.S. Cellular provides wireless service in nearly 200 markets across 24 states located in regional clusters across the country, including many of the states represented on this Committee such as Missouri, New Hampshire, Nebraska, Kansas, West Virginia, Wisconsin, and Washington. The overwhelming majority of the geography we serve is rural in character. We have participated in the FCC's universal service program for many years, using support to construct and operate network facilities in small towns and on rural roads that would not otherwise receive service, because they would never prove to be economically feasible without assistance.

In each of our company's previous appearances before this Committee to discuss universal service, we have made the point that Congress directed the FCC to ensure that rural citizens have access to modern telecommunications and information services that are reasonably comparable to those available in urban areas.[1]

Based on our deep experience in rural America, we have concluded that the current and proposed Mobility Fund mechanism lacks the necessary size and focus to ensure that rural communities have timely access to high-quality mobile broadband services needed to compete, here in the United States and around the world, for jobs and economic opportunities. We fear that policy makers have grossly underestimated the amount of work that remains to be done in rural America before mobile broadband can be deemed comparable to what exists in our Nation's urban areas.

As explained below, we urge the Committee to direct the FCC to develop a more accurate picture of mobile coverage and mobile broadband availability in rural America, and to estimate how much it will cost to bring mobile broadband networks in rural America up to the reasonably comparable standard that Congress set. Once these tasks are done, Congress can make the policy choice as to how best to complete the task.

Today, my testimony touches upon three things: (1) the critical role that mobile broadband plays in enabling public safety, education, and our rapidly expanding information economy; (2) the insufficiency of mobile broadband deployment in rural

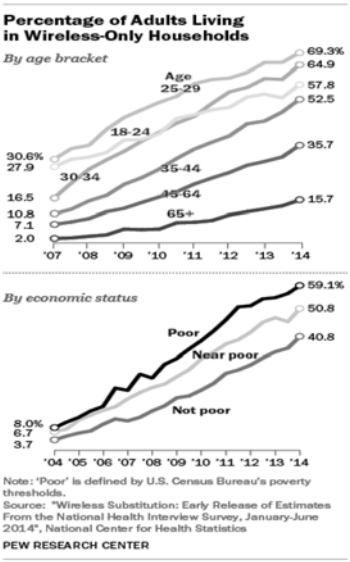
[1] *See,* 47 C.F.R. § 254(b)(3).

America today to meet stated goals; and (3) the need to make smart and creative policy choices to allocate and target scarce Federal universal service funds to rural and high-cost areas to maximize the value of such investments in extending the reach of mobile broadband service.

1. The Rise of Mobile Broadband as an Enabler of Public Safety Education and Economic Development

In the 1980s, experts projected that there could be 800,000 mobile phones in use by 2000. They came up short by 10,000,000. Today there are over 350 million mobile wireless subscriptions in the U.S. In 1984, the first commercial cell phone sold for $3,995.00. Today, there are more types of mobile wireless devices than I can list, capable of performing thousands upon thousands of tasks, at a small fraction of the 1984 price, with many having far more computing power than Apollo 11. However, looking back at how we have benefited from mobile services dramatically undersells the future that consumers will enjoy, because we're just getting started.

At a time when consumer preferences are rapidly shifting to mobile broadband, policymakers must refocus universal service mechanisms to ensure that citizens in rural areas have access to high-quality service. For example, the Pew Research Center reports that adults living in households with a cellphone but no landline, and the number of households that rely solely on a smartphone for broadband have increased dramatically:[2]



Several groups are shifting their home internet connectivity away from broadband and toward smartphones

% of each group who have ...

	Broadband at home			Smartphone, but no broadband at home		
	2013	2015	CHANGE	2013	2015	CHANGE
All adults	70%	67%	-3%	8%	13%	+5%
African Americans	62	54	-8	10	19	+9
Rural residents	60	55	-5	9	15	+6
Household income < $20K	46	41	-5	13	21	+8
$20K-$50K	67	63	-4	10	16	+6
$50K-$75K	85	80	-5	5	10	+5
Parents	77	73	-4	10	17	+7
High school degree or less	50	47	-3	11	18	+7

Source: Pew Research Center surveys
PEW RESEARCH CENTER

These compelling statistics gain further meaning when you consider just a few of the many benefits that mobile services provide:

- *Public Safety.* The ability to use 911/E–911/Text-to-911 depends 100 percent on high quality coverage, to fully enable location-based services.[3] When disaster strikes, first responders depend on mobile wireless and broadband networks, which are the first to return to service. The value and utility of FirstNet, our Nation's mobile broadband public safety network, increase every time a new cell

[2] *See, http://www.pewresearch.org/fact-tank/2015/01/07/pew-research-will-call-more-cell phones-in-2015/;* and *http://www.pewinternet.org/2015/12/21/home-broadband-2015/.* Another barometer of consumer preference is mobile ad revenue, as evidenced in Facebook's most recent quarterly report: "Mobile ad revenue reached $4.5 billion, up 81 percent year-over-year, and is now 80 percent of total ad revenue." *See also, http://files.shareholder.com/downloads/AMDA-NJ5DZ/1421180082x0x872005/02B28FAD-354C-4CA0-8CDE-3ADB6F8A4734/Q415__and__FY__2015__Earnings__Call__Transcript.pdf.*

[3] As of November, 2015, the FCC estimates that 70 percent of 911 calls are placed from wireless phones, and that percentage is growing. *See, https://www.fcc.gov/consumers/guides/911-wireless-services.*

tower is constructed, as it provides a place to locate critical public safety communications equipment.

- *Health Care.* Mobile devices and applications capable of diagnosing, monitoring and treating various conditions are exploding into the marketplace and revolutionizing health care.[4] These advances improve patient outcomes, and increase efficient delivery of services. It is now possible for a diabetic patient to continuously monitor, store, and transmit glucose levels to health care providers through a mobile device.[5] Mobile video conferencing is increasingly important to emergency medical services and in delivering health care to remote areas where facilities are not easily accessible. These applications are but a small fraction of the incredible health care tools enabled by mobile broadband.
- *The Internet of Things.* Soon, almost any object will be capable of connecting to the Internet. Gartner expects 21 billion devices to be deployed by 2020.[6] According to General Electric, the Industrial Internet, defined as the combination of Big Data and the Internet of Things, may be responsible for $15 trillion (not a typo) of worldwide GDP by 2030.[7] Most of these connected devices, numbering in the tens of billions, will need the flexibility that mobile wireless provides. The amount of data flowing through mobile broadband networks will dwarf what we see today. Cisco predicts that, between 2014–2019, U.S. mobile data traffic will rise seven-fold, driven by four billion new mobile connections, a 2.5X increase in throughput speeds, and mobile video traffic reaching 72 percent of all traffic.[8]
- *Education.* Students are increasingly using mobile devices to access learning materials, do homework, create presentations, and communicate with teachers. Students with connectivity throughout the community are more likely to meet educational goals, especially in an age where learning through the Internet is essential.
- *Agriculture.* Connected tractors, irrigation systems, livestock management, commodity tracking, and many more applications depend upon mobile wireless connectivity.
- *Low-income households.* For households that cannot afford to purchase a desktop computer and subscribe to both mobile and fixed networks, a single mobile device is capable of meeting voice communications and Internet needs.

If the Committee takes nothing else away from these examples of how mobile wireless is enriching our lives, it should be this: *none of the benefits described above will adequately benefit rural Americans unless high-quality mobile broadband coverage is available everywhere they live, work, and travel.*

In areas where emergency calls cannot connect, or where medical devices cannot transmit data, lives will be lost. In areas where tablets and laptops don't work, educational opportunities will be foreclosed. The enormous power of the Internet of Things cannot be fully realized without ubiquitous mobile broadband. As Deere & Company has previously noted to the FCC, a lack of connectivity on our Nation's farmlands costs productivity and wastes water and fertilizer.[9] The lack of mobile broadband denies low-income households the opportunity to fully participate in our Nation's economy. Mobile broadband, which didn't exist thirty years ago, and was considered a luxury item just ten years ago, is now an essential part of our lives.

I cannot emphasize enough how important it is for Congress and the FCC to foster development of robust mobile broadband networks in rural areas. We are in just the second inning of a huge revolution in how Americans live their lives, a revolution that may never come to rural Americans who live in areas where it is too expensive to make a business case to build and upgrade networks. We at U.S. Cellular provide our customers with access to the applications they use, because we enable all of them. If coverage is weak or throughput is slow, devices will not work as designed.

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[4] A list of mobile medical applications can be found at: *http://www.fda.gov/MedicalDevices/DigitalHealth/MobileMedicalApplications/ucm368743.htm*

[5] *http://www.dexcom.com/g5-mobile-cgm.* Someday soon, patients may wear a contact lens that constantly measures glucose level through tears, transmitting the data to attending physicians. *See, https://verily.com/.*

[6] *See, http://www.gartner.com/newsroom/id/3165317.*

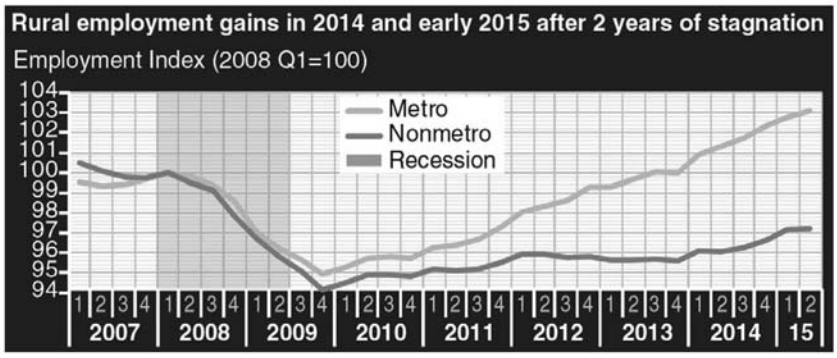
[7] *See, http://www.ge.com/digital/sites/default/files/industrial-internet-insights-report.pdf*

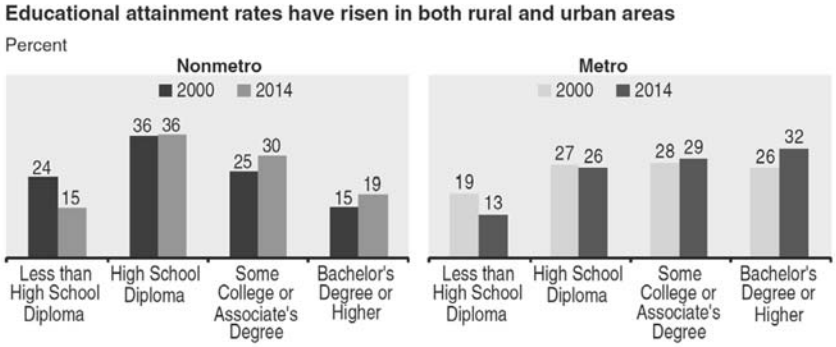
[8] *See, Cisco VNI Global Mobile Data Traffic Forecast, 2014–2019,* accessed at: *http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.pdf.*

[9] *See, http://apps.fcc.gov/ecfs/document/view?id=7521752479.*

We note that new investments in mobile broadband infrastructure each year will have multiplier effects, creating jobs and stimulating economic growth.[10] One wireless industry job supports over six additional jobs in the economy, almost one and one half times higher than that of the U.S. manufacturing sector.[11] Each dollar of investment in wireless results in $2.32 of economic activity.[12] In our experience, rural areas continue to support a tremendous amount of manufacturing, as well as a growing distributed service economy (for example, call centers and medical clinics). We hear directly from our employees and customers that managers and educated professionals no longer consider rural areas that lack high-quality mobile wireless services to be attractive to locate to, or to stay in. I'm sure members of this subcommittee have heard the same thing from their rural constituents.

This is not just anecdotal evidence. Rural areas have large gaps with urban areas, which gaps need to be closed. Data from the Department of Agriculture reveals that "2010–2014 is the first period of overall population decline on record for rural America as a whole."[13] The same report shows employment growth since the 2008 recession heavily skewing in favor of our Nation's urban areas and a persistent rural/urban educational attainment gap:





One of the best ways to stimulate economic activity, attract talented people to areas needing an employment boost, and to increase educational opportunities, is to build mobile broadband infrastructure. It is therefore vital for policymakers to have accurate data about the state of mobile deployment in rural America. As a Committee that is forward-looking, I urge you to consider the essential role that mobile

[10] *See, http://www2.deloitte.com/content/dam/Deloitte/us/Documents/technology-media-telecommunications/us-tmt-impactof-4g-060612.pdf.*

[11] *See,* Coleman Bazelon and Giulia McHenry, *Mobile Broadband Spectrum, A Vital Resource for the U.S. Economy,* at pp. 19–20 (May 11, 2015), available at: *http://www.brattle.com/system/publications/pdfs/000/005/168/original/Mobile__Broadband__Spectrum__-__A__Valuable__Resource__for__the__American__Economy__Bazelon__McHenry__051115.pdf?1431372403.*

[12] *Id.*

[13] *See,* USDA, Rural America at a Glance, 2015 Edition, accessed at: *http://www.ers.usda.gov/media/1952235/eib145.pdf* (revised Jan. 2016).

broadband services will play in the future, and to ensure that the universal service program provides sufficient resources to realize that future in rural areas.

2. Mobile Broadband Deployment in Rural America is Insufficient

Let me continue by acknowledging that we are well aware of the misleading claim that the job of providing mobile broadband to rural America is largely finished.[14] When the FCC proposed Phase II of its Mobility Fund in 2014, it stated, "According to some sources, nearly 99.5 percent of the U.S. population today (and the road miles associated with that population) is covered by some form of mobile broadband technology."[15]

That statistic cannot be right. Based on our experience, the state of mobile broadband is nowhere near developed enough to conclude that rural Americans have access to a strong 4G LTE signal *throughout the area where they live, work, and travel.* In a recent letter to the FCC, Senator Manchin astutely called out problems with available mapping resources, stating "the reality in my state is far different than what the maps indicate."[16]

Senator Manchin's experience is far from an isolated case and I'm sure each of you know from personal experience in your own states that mobile broadband coverage with a strong signal is far from complete and dead zones remain to be covered. In testing our networks, and those of our competition, we can confirm that the National Broadband Map and other publicly available mapping resources significantly overstate where rural citizens can actually use their devices to access rapid mobile broadband service, especially on rural secondary roads and in agricultural areas.[17]

In its recently released Eighteenth Mobile Competition Report, the FCC states that 25 percent of road miles and 50 percent of square miles in the U.S. do not have coverage by two or more carriers, and concedes that its data sources likely overstate coverage.[18] This is significant because there continue to be two incompatible wireless network technologies in use today—the GSM standard and its 3G successors, used by AT&T, T-Mobile, and a number of other carriers, and the CDMA standard, used by Verizon, Sprint, U.S. Cellular, and a number of other carriers.

A person with a CDMA-only phone cannot complete a call when they are in an area served only by GSM, and vice-versa. As a result, the current reality in rural areas is a patchwork quilt of coverage by incompatible technologies, frustrating the goal of seamless access. Accordingly, for public safety, it is critical that rural Americans have access to wireless networks capable of connecting both kinds of devices, just as those who live in cities do.

In the run up to the FCC's 2011 Connect America Fund reforms, we warned of universal service mechanisms that pick a single winner in the auction room rather than allowing consumers to pick winners in the market. By limiting support to a single carrier, the current mechanism is promoting service by one carrier and one technology, thus limiting consumer choice in many areas that would otherwise support competition, and requiring additional regulation. We urge the Committee to encourage the FCC to adopt universal service mechanisms that direct support to high-cost rural areas without picking a winner in advance.

Last year, we inaugurated new coverage and mobile broadband service in Paw Paw, West Virginia, a town of 500, a project that would not have been possible without the Federal universal service program.[19] There are many more towns similar to Paw Paw that we would like to serve or upgrade, if support mechanisms provide us with a reasonable opportunity to succeed. It is low population density and traffic levels that make new construction infeasible and make necessary an effective universal service mechanism.

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[14] *See, http://www.theverge.com/2015/3/23/8273759/obama-administration-passes-goal-lte-for-98-percent-of-americans.*

[15] *See, Connect America Fund,* Report and Order, Declaratory Ruling, Order, Memorandum Opinion and Order, Seventh Order on Reconsideration, and Further Notice of Proposed Rulemaking, FCC 14–54, 29 FCC Rcd 7051, 7127 (2014) ("Further Notice").

[16] *See,* Letter from Hon. Joe Manchin, III to Hon. Thomas Wheeler, September 22, 2015, at *http://www.manchin.senate.gov/public/index.cfm?a=files.serve&File__id=D660F970-2859-46B3-8145-CFE461A47719.*

[17] For example, we've heard directly from Senator Tester that he can't get any signal on and around his working farm in Montana, and from Senator Brown that southeastern Ohio lacks coverage.

[18] *See, Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993,* Eighteenth Report, FCC 15–1487 (Dec. 23, 2015) at p. 28, Chart III.A.3 ("Eighteenth Mobile Competition Report").

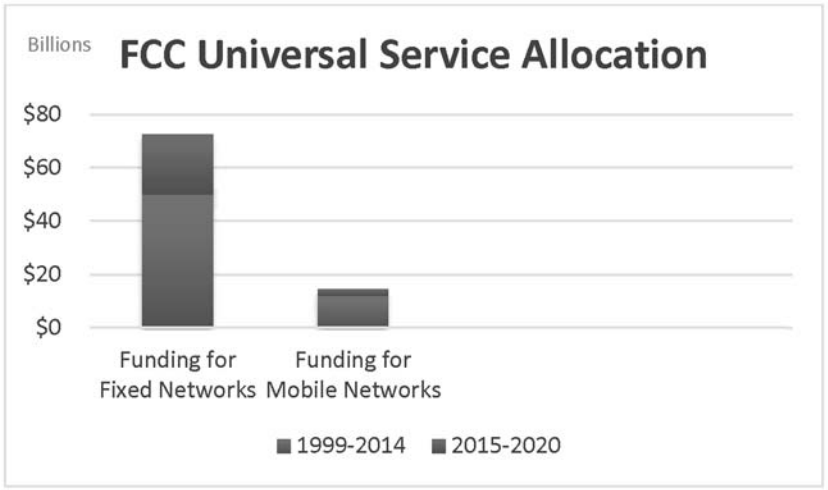
[19] *See, http://www.morganmessenger.com/news/2015-11-18/Front__Page/Paw__Paw__welcomes__arrival__of__cell__service.html.*

Today mobile broadband coverage and throughput speeds in rural America must receive a grade of "Incomplete." Using the "reasonably comparable" standard set by Congress in 1996, anyone telling you that rural Americans have access to mobile broadband networks that are reasonably comparable to those in urban areas has not taken a drive across this great nation. And that's not a surprise—no carrier can be expected to invest unless there's at least the possibility of earning a return. If it could be done, we wouldn't need a universal service mechanism because it would have happened already.

In sum, we cannot base critical policy choices on conflicting data and maps that the government admits overstate coverage. We must have accurate data in order to target funds where they are needed.

3. Allocating Scarce Federal Universal Service Funds Effectively Requires Smart Policy Choices

Over the years, we have consistently advocated for a robust Federal universal service fund that provides rural consumers with access to both mobile and fixed networks. We believe the FCC's historical allocation of support to wireless networks has been insufficient to close up coverage gaps and deliver mobile broadband to many areas. As shown in the chart below, between 1999 and 2014 the FCC allocated over $50 billion in support to fixed networks and less than $12 billion to mobile networks.[20] Over the next five years, fixed networks are projected to receive $22.5 billion in Federal funding, while mobile networks are projected to receive $2.5 billion, a disparity in the universal service mechanism going forward of nearly 90/10.[21]



With wireless consumers nationwide now contributing nearly half of the total Federal Universal Service Fund of $9 billion (which includes E-Rate, Lifeline, Connect America Fund, Mobility Fund, and Rural Health Care)[22] the proposed funding for mobile broadband does not accurately reflect consumer usage, preferences, and infrastructure needs in rural areas. Given rapidly expanding demand for high-quality coverage and fast broadband connections, the current level of funding shortchanges rural Americans who increasingly rely on mobile services.

Nor does the FCC's proposed budget account for investments that mobile wireless carriers have made over the years. Many carriers, including U.S. Cellular, have used support to build towers in areas so remote that revenues are insufficient to meet ongoing operating expenses and to earn a reasonable return. These invest-

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[20] Source: Federal-State Joint Board Monitoring Reports, at *https://www.fcc.gov/general/federal-state-joint-board-monitoring-reports.*

[21] The fixed network allocation is estimated by summing Connect America Fund support with projected support for rate of return carriers. The mobile network allocation derives from the FCC's Further Notice, *supra.*

[22] The most recently available FCC report from 2011 containing assessable carrier revenues for universal service can be accessed at: *https://transition.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/quarterly_roll-upsasof050112.pdf.*

ments were made with the understanding that support for ongoing operations would be made available, either in the original fund, or in Mobility Fund Phase II.

Although the FCC proposed to use at least some of Mobility Fund Phase II support to cover operating expenses on towers, it recently proposed to change course based on "substantial marketplace developments," nothing more than fallacious claims by some carriers that the job of covering rural America is largely done.[23] This course change may prove to be catastrophic for rural citizens in small communities, which often do not generate enough revenue to meet a tower's operating expenses.

In addition to our experience and the weight of data, I am troubled by these FCC claims of substantial marketplace developments leading toward a conclusion that a Mobility Fund of less than $400 million annually may be appropriate. When it comes to broadband, I agree that we as a nation should be setting big and audacious goals and working toward them.[24] In last week's 2016 Broadband Progress Report, the FCC reported that *87 percent* of rural Americans lack access to mobile broadband at 10 Mbps/1 Mbps:

Table 4
Americans Without Access to Mobile Broadband Services (Millions)

	LTE Technology		10 Mbps/1 Mbps	
	Population	Percentage of Population	Population	Percentage of Population
United States	1.682	1%	171.486	53%
Rural Areas	1.519	3%	52.231	87%
Urban Areas	0.163	0%	119.255	45%

Because the above data for LTE technology is based largely on advertised coverage at a single point within a census block, I don't agree that the job of populating rural areas with LTE technology is largely done. That said, if the data on 10/1 availability is even in the ballpark, it is beyond dispute that the job of getting to an adequate level in rural America is only beginning.

Because the big carriers continue to provide their customers with access to many rural areas by using the networks of rural carriers, it is fair to conclude that the future of 10/1 Mbps service depends on a universal service policy that encourages rural carriers to invest, as well as an FCC spectrum policy that ensures rural carriers have access to sufficient bandwidth to deliver speeds of the future. The critical role of universal service is to ensure that broadband technologies being deployed and commonly used in urban areas are made available to our rural communities in a timely manner. This is no different than any other infrastructure, whether it be roads, electricity, or water.

My takeaway from the past several years of uncertainty is that the FCC has not devoted sufficient attention to determining how best to maintain the investments that have already been made, how much it will cost to fill in slow broadband zones and dead zones, and what it will cost to deliver 5G services, and more, to rural citizens in the coming years. The Mobility Fund Phase I auction left many areas still without coverage, and bidders forfeited back to the FCC nearly 25 percent of the $300 million in original funding, for a variety of reasons. The Commission has yet to act on our petition to distribute forfeited support to "next in line" bidders who could move quickly to build towers in many states that need investment. Moreover, the amount projected for Mobility Fund Phase II is insufficient to do the job on a reasonable schedule. In sum, the Mobility Fund program has not fulfilled the goal of fostering "an environment in which the widest possible variety of new technologies can grow and flourish."[25]

We also believe that the reverse auction approach for distributing mobile broadband support did not produce equitable results across the Nation. Because reverse auctions allocate funds first to areas that cost less to serve, mountainous parts of the country are served last, or not served at all if funding runs out. I predict that with a reverse auction mechanism, many of you on this committee representing mountainous regions will never see your states receive meaningful assistance, even though the rhetoric of the program gives you false hope. And, we can assure mem-

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[23] *See,* Further Notice, *supra,* FCC Rcd at 7126–29.

[24] *See, Separate Statement of Commissioner Jessica Rosenworcel,* at: *http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0129/FCC-16-6A5.pdf.*

[25] *See, https://www.fcc.gov/news-events/blog/2015/08/03/leading-towards-next-generation-5g-mobile-services.*

bers of the Committee representing flatter states that, based on our experience, the program is insufficient in those areas as well.

In recognition of the fact that the fund is finite and consumer willingness to fund programs is an important factor, we suggest that the FCC solicit new ideas for how to leverage existing Federal funds, in combination with state universal service mechanisms, and private investment, to provide an incentive for competitors to invest and improve service. Several states, such as for example, Nebraska, Colorado, and New Mexico, have begun developing their own broadband universal service mechanisms, any of which could be trialed in a pilot program, something the FCC has recently done in the fixed service arena.

We suggest that the FCC consider a grant program in which the combined Federal and state support funds could be used in a targeted way to address those areas most in need of mobile broadband coverage. States may be in the best position of all to know what is adequately covered and what is not. States that have been shortchanged by the legacy program (paying into the fund far more than they have drawn out for mobile voice, let alone mobile broadband coverage) and are willing to contribute state funds to the mechanism, should be given an opportunity to access some level of support, especially where the need for expanded coverage has been established. Equitable distribution of funding will likely not occur if the fund is administered at the Federal level in an auction format, which disfavors the highest cost rural areas.

Separately, Congress can make all universal service fund support go farther by passing legislation to exclude universal service support from taxable income, similar to funds provided under the American Recovery and Reinvestment Act. By excluding support from taxation, we will be able to use 100 percent of the support received for investments in rural areas and not just the net amount after taxes.

Concluding Remarks

Just last month, Verizon announced an intent to begin limited deployments of 5G technology as early as 2017, technology that will provide speeds perhaps 50 times faster than 4G.[26] National carriers will continue to focus on urban areas, and they will invest billions upgrading networks to 5G. But make no mistake, these investments will take priority over building new coverage and upgrading rural areas that make less economic sense. In sum, if we fail to foster robust mobile broadband networks in rural areas, they will likely never have access to the amazing things described above.

Having studied this industry for many years, I'm humble enough to know that this task is easier said than done, in part because in a nation of entrepreneurs and risk takers and innovation, if there were a business plan to cover all of rural America, the free market would have done it long ago. Making rural infrastructure reasonably comparable is a big and multi-faceted task, as evidenced by the enormous efforts the FCC has made in over twenty years since the 1996 Act.

This year, we celebrate the sixtieth anniversary of Eisenhower administration's enduring achievement, the Federal interstate highway system. My sense is that broadband networks will be as important to our Nation's success in the next sixty years as our interstate highway system has been over the past sixty. Just as our highway needs have expanded, so too will our broadband needs, and it will be up to this Committee to give the FCC proper direction to ensure that rural Americans fully participate in modern life and remain comparable with their urban counterparts.

Senator WICKER. Thank you very much, and thank you all.

We have a lot of interest in this hearing today, and 11 Senators have checked in. What we are going to do, with the consent of Ranking Member Schatz, is this. He and I will save our questions for later, if there is time. The order of questions with 5-minute rounds each will be this: Moran, Booker, Heller, Manchin, Gardner, Daines, Fischer, Klobuchar, and Sullivan. So, Senator Moran, you are recognized.

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[26] *See, http://www.pcworld.com/article/3025461/mobile/verizon-vows-to-build-the-first-5g-network-in-the-us.html.*

STATEMENT OF HON. JERRY MORAN,
U.S. SENATOR FROM KANSAS

Senator MORAN. Mr. Chairman, thank you very much. Obviously, you learned generosity and grace at breakfast this morning. Thank you for deferring to me.

Let me start with Mr. Carlson. Thank you very much for your testimony. One of the things that you said that caught my attention is the map the FCC shows us about coverage. And my impression is, based upon my own experience in my own state, that map does not accurately reflect actual service. And so I would ask you how do we get—in a sense I think what you are asking for—how do we get there? How do we get the FCC to give us the information that shows where there is coverage and where there is not coverage so we can actually see what needs to be accomplished?

I also would ask you to comment. Is there such a thing as coverage that really is not very good coverage, and therefore, it could show up on a map or a diagram or a list of places that are covered, but we ought to recognize that is not really the truth?

Mr. CARLSON. Yes, thank you. Thank you for that question.

Yes, I believe those maps do not show what good coverage represents, and that is from our experience with our own view of measuring coverage by doing drive tests of our own service areas. The maps that the FCC produces do not represent good coverage. So we need to ask the FCC—not me, but you, sir—to produce maps that show a quality standard of coverage level and produce that map rapidly so that we can get on with the job.

Senator MORAN. I think your point being that in the absence of that information, it is hard for us to make policy decisions.

Mr. CARLSON. Exactly. You cannot know what you are doing if you do not have a map of the road to get there.

Senator MORAN. Thank you very much for that reminder, and we will ask once again for accurate mapping.

Let me turn to maybe Mr. Carr or Mr. Berry or both. One of the things that I have tried to pay a lot of attention to in the role of the Universal Service Fund is its ability to—let me say it this way. There seems to be a lack of coordination between various departments and agencies within the Federal Government related to reimbursement to providers from the Universal Service Fund. So my point being that the Federal Communications Commission, the FCC, makes decisions about reimbursements that may be contrary to the ability for that telephone company to repay a loan they have with rural utility services.

So during the deployment of lots of dollars, stimulus money, the rural utility services programs to provide loans to those who will provide services to rural America, certain assumptions were made. And that would be that the Universal Service Fund will be there for us to repay those loans. Changes in the formula by which those companies are now reimbursed has a consequence, and there does not seem to me that there is any coordination, in other words, the challenge that rural utility services may have in getting their loans repaid.

Do either of you have a comment on that from your member companies?

Mr. BERRY. Well, I can address on the wireless side, the mobility side. There are several different issues that I think you refer to.

One is the fact that we do not have many loans on the mobility side from the RUS program or some of the utility type programs. But we have monies that were given and awarded under Mobility Fund I, and carriers built the network, spent their time, effort, and energy and money in providing service, and they are not reimbursed.

We were talking about the maps. In that process, the FCC, the USAC, asked for drive-testing to ensure that you actually built out your network to where you say you were going to build it out. Our companies did that and spent the money, and then we turned back around and the FCC then required, USAC required, that you drive-test them again to make sure that you got the numbers right. Absolutely no reason whatsoever that you should do that twice. So there are impediments there.

There are also impediments in actually locating and siting the facilities. I would say that we have carriers that received funds, *i.e.,* made plans to build out, and in the middle of that, they get another Federal agency that says, oh, we are not going to give you a permit to site that facility on that particular piece of land, whether it is some Federal land manager. And the FCC has a deadline and said if you do not build out to a certain percentage, say, 73 percent, by a certain time, you will not get reimbursed.

We have several instances where we have letters from the agency that did not give the permit on time telling the carrier, I am sorry, we messed up. And we presented it at the FCC, and the FCC would look at it and say, well, I am sorry. You are not built out. And he said but the reason why I am not built out is because the Federal agency just said that they messed up, they did not process our application.

There needs to be some common sense come to the forefront on this. If you built out the network or you are trying to build out the network and you only lack a permit that another Federal agency has sole responsibility to give, why are you penalized? And that is what is happening. You are getting fines and penalties, and in some instances we have small carriers actually returning the money because they cannot afford the fines and penalties. Not a good situation.

Senator MORAN. Thank you.

Mr. CARR. Senator, briefly I would say that from our industry's perspective, we have been effectively shut out from a lot of the programs that you have mentioned in particular because those programs——

Senator MORAN. You have or have not.

Mr. CARR.—have been shut out particularly because those programs are not technology agnostic. And we think one of the things that I believe everyone on this panel agrees is that we should channel the support to the access technologies that are going to be most effective for connecting rural America.

Senator MORAN. I am pleased to give you the opportunity to say that one more time. Thank you very much.

Senator WICKER. Mr. Heller, followed by Mr. Manchin.

STATEMENT OF HON. DEAN HELLER,
U.S. SENATOR FROM NEVADA

Senator. HELLER. Mr. Chairman, thank you for holding this hearing, and I want to thank our witnesses for being here also. This is a fascinating discussion that sometimes gets too far into the weeds, and yet, these are discussions that need to be had.

I was recently at a small town in Nevada that is on the Utah-Nevada border. It is a small town called Ely. And I will be in a few more small towns this weekend, and I am going to hear about how poor their Internet service is. But it is serious business for them out there. This is about quality of life. This is a way that they want to improve their ability to move forward. But it is the basic needs that they have.

For example, some of the residents either do or do not have Internet service, and if they do, it is very slow. Their businesses complain about a lack of service, and schools, their high school and middle school, are piggybacking on hospitals in other counties in order to get some sort of Internet service. Now, this is a small town, but there are 5,000 people in it. 5,000 people. I mean, you would think in the 21st century we could get Internet out to 5,000 people.

And one other. There is a medical facility in that same town. This local hospital had difficulty sending out X-rays. They have difficult with lab tests due to the need of more fiber.

Again, the businesses are complaining that their Internet service is so weak that half the time you cannot slide a debit card in any of the businesses in this town.

These are stories you have heard. And I think everybody here in this audience has heard the same story.

Like Mr. Seward, I live in a small town and we grow a little bit of hay ourselves. But I have children that live in Los Angeles and they are very used to a very fast Internet service. They come home for the holidays and they said, hey, we are not coming back if you do not speed up your Internet service. And I want my children to come home for the holidays.

He was trying to download something. We called our satellite service and upgraded, upgraded, upgraded. And they were watching somehow the service that was being used in the home. They said someone else is using it. He ran around the house and said nobody else is using it. Why is the service not working? And he ended up finding that his wife had downloaded Netflix and her iPad was sitting on the bed, and that is why he could not get through. It just fascinating.

In fact, he has a platform now that people watch him play video games. Now, this is a generation I do not understand completely. I said who wants to watch you play Internet games. I do not think anybody in this room would pay somebody $5 to watch him. And this is what he is doing. He is on the Internet and they pay $5 to watch him play. I said who is paying that. He says, well, people watch sports. So it is a different thought process. But this just goes to show you the next generation coming up and what their needs and concerns are.

So I am concerned about small towns like Ely, as all of you are, and making sure that they get the quality service that they need in these Internet services.

So I guess my question, I guess for you, Mr. Carr, specifically is how do we make sure that these programs like Connect America Fund and Mobility Fund get to these small communities. And frankly, is the best option for a rural town like that to be fiber, or is there another option out there that would be better for them?

Mr. CARR. Well, Senator, thank you for the question.

I think all access technologies, fiber, wireless, satellite, have their pros and cons. And the reality is that modern networks are built using a combination of those technologies. And so rather than having a framework in particular for the next phase of CAF that favors one technology over another, we will get better results as a society if we let providers compete to meet a uniform set of threshold requirements, then figure out who can deploy which combination of technologies to serve a particular area in the most cost-effective way. And that is fundamentally by applying competition and market forces. That is how we are going to get the most efficient bang for the buck.

Senator HELLER. What is the next round of CAF?

Mr. CARR. The Phase III reverse auction?

Senator HELLER. Yes. OK. Is there a time certain on that?

Mr. CARR. As I understand, the FCC has talked about putting out—starting a proceeding to determine the rules of the auction as early as this spring, and the target was by the end of this year to begin rolling it out. But I am not sure if they are on track to meet that schedule.

Senator HELLER. How will it take, once the funds are distributed, to get it out?

Mr. CARR. You know, that really depends on the speed, how quickly the provider can deploy.

Senator HELLER. We need help today. Are we talking a couple years from now?

Mr. CARR. Certainly. You know, CAF I—the build-out requirements were 6 years. So in some areas it could take an extremely long time, again depending on the access technology and how long it takes to deploy that particular technology.

Senator HELLER. Anybody else have any comments?

Mr. BERRY. Senator, thank you for the question.

I think that he is exactly right. It takes a mix of technologies, but in rural America the Mobility Fund II was originally designed so it would be a follow-on to Mobility Fund I and we would have an opportunity to immediately begin this process, which is a long process of many years, in order to fill out those gaps in coverage.

I think that the Mobility Fund II, should we get it correct—Congress got it correct when they said let us make sure let us have comparable service—we could immediately begin that process. And it is very disturbing that we have been 3–4 years now with a legacy program that has consistently been reduced, and we do not have a replacement program in place. And that is why Congress I think most astutely suggested to the FCC that you do not further reduce existing support until you get a new replacement program operational.

Senator HELLER. Mr. Chairman, you know I am going to end with this question, though. You are talking 3 or 4 years. Is the technology up to date? I mean, 4 or 5 years in this world is an eternity as the change in technology occurs. Are we still up to date if this program started in 2011?

Mr. BERRY. I think the technology is available now. It is the funds that it requires to build it out. And I think Mr. Carlson knows that better than anyone. But if we get a Mobility Fund II that actually starts deploying resources, like I said Mobility Fund I—they have only released like $66 million in the entire fund. And we have got carriers, small carriers, out there that are sustaining that economic investment with no reimbursement. They cannot do it for very long. They are very small.

Senator HELLER. Steve, thank you. My time has run out.

Mr. Chairman, thank you very much for holding this hearing.

Senator WICKER. Thank you, Senator Heller.

Senator Manchin and then Senator Gardner.

STATEMENT OF HON. JOE MANCHIN,
U.S. SENATOR FROM WEST VIRGINIA

Senator MANCHIN. Thank you, Chairman Wicker. And to Ranking Member Senator Schatz, I want to thank both of you for answering the request I had made for this hearing. I really appreciate it, and I think it is much needed. And thank all of you for being here.

In the 2016 broadband progress report, the FCC determined that fixed and mobile broadband are not functional substitutes for one another. They are both essential components of our lives today.

We have heard a lot of discussion today about the Connect America Fund and the importance of allowing different technologies to compete for building out fixed broadband to homes and businesses throughout the Nation. While this is an important goal that I fully support, our primary responsibility here is ensuring that all Americans pick up their phone, call for help in an emergency, and the only technology that allows me to do that wherever I am is my cell phone.

The concept of Universal Service, the idea that all people should have access to a telephone, be able to call for help in an emergency, has been the guiding principle in Federal communications regulations since they first began in 1934. Wireless companies contributed more than $4 billion to the Universal Service Fund last year. Yet, there is no dedicated source of funding for those companies that want to expand services in these high-cost areas. And they have no idea what, if any, long-term support they will get to maintain these networks once they build them.

In June 2014, the Federal Communications Commission declared that over 99 percent—I cannot believe this. They declared that over 99 percent of the U.S. population was covered by some form of mobile broadband technology. And I am beginning to believe that some people over there believe the job is done. They think that they have got it done, completed. Unfortunately, the reality in my home state of West Virginia and many other places throughout this country simply does not fit into the FCC's narrative.

I understand that your organization, Mr. Berry, hired Dr. Raul Katz to reevaluate the FCC data, and he found that wireless coverage in rural communities is as low as 77 percent in my state of West Virginia and only 81 percent in North Carolina.

For those of you who have ever visited my beautiful state, it is beautiful but it is challenging. And we have some of the highest unemployment now with the dispersion of the jobs we have had in the energy market. So we are having a tough time. And if people cannot connect, I will guarantee you they will not stay. And you might be in Iowa and have a cell tower or whatever to reach certain people and you might have a 50-mile line of sight. In West Virginia, you are lucky to have a 50-foot line of sight sometimes in the terrain we are in. So it is much different.

And Senator Wicker and Senator Schatz, on this in some of our areas, it just depends. I mean, their life depends on and these communities depend on whether they have this service.

If this money is disproportionately not going to the companies that are willing to do the job—and there is not going to be return on investment. I am the first to tell you that. I know it. But I am asking all of you. Is there any—probably Mr. Berry—other information you can share with this committee about Dr. Katz's work?

Mr. BERRY. Yes, Senator, and thank you for recognizing his work. He has done several studies for us. The most recent—obviously, we focused on coverage because we too believe that the FCC numbers are just not correct.

Senator MANCHIN. Did he find other areas of discrepancies in his work? They made a broad statement of 99 percent.

Mr. BERRY. Actually, if you like, I also have a statement of declaration——

Senator MANCHIN. If you would for the record——

Mr. BERRY.—the doctor made to the FCC.

Senator MANCHIN. May he provide that for the record, sir?

Senator WICKER. Without objection.

[The information referred to follows:]

EXHIBIT A

I, Dr. Raul L. Katz, provide the following declaration pursuant to 47 C.F.R. § 1.16:

1. My name is Dr. Raul L. Katz. I am President of Telecom Advisory Services, LLC, an international consulting firm specializing in providing advisory services in business, policy and financial strategies to telecommunications and technology companies, governments and international organizations. Before founding Telecom Advisory Services, I was a Lead Partner at Booz Allen Hamilton and CEO of Adventis, a telecommunications consulting company. I am a Director of Business Strategy Research at Columbia University's Center for Tele-Information, an Adjunct Professor in Columbia Business School's Division of Finance and Economics, and a Visiting Professor at the Universidad de San Andres in Argentina. I have written three books on the telecommunications industry, and have published articles in journals including Telecommunications Policy, Telephony, Strategy and Business, Communications and Strategies, Intereconomics, America's Network and The Information Society. I hold a Ph.D. in Management Science and Political Science and an M.S. in Communications Technology and Policy from the Massachusetts Institute of Technology (MIT).
2. I have been retained by Competitive Carriers Association (CCA) to assemble a collection of data for a number of states to analyze mobile broadband coverage at a county level for these states, the quality of mobile broadband service experienced in these areas, and the rigor of competitive offerings of mobile

broadband services in the selected sample area. This examination is undertaken in response to assumptions underlying the Federal Communications Commission's (Commission) recent Further Notice of Proposed Rulemaking (FNPRM) with respect to funding mechanisms for Phase II of the Connect America Fund and Mobility Fund.[1] I am currently researching for and drafting a comprehensive report for later release, but provide some preliminary data herein.

3. In the FNPRM, the Commission claims that "according to some sources, nearly 99.5 percent of the U.S. population today (and the road miles associated with that population) is covered by some form of mobile broadband technology," though the Commission admits that this is likely an overstatement.[2] My initial review of available data, including the National Broadband Map, Connected Nation and other crowdsourcing databases, however, shows that rural wireless broadband coverage, and service offerings at download speeds above 3 Mbps in the states sampled often fall below 90 percent. Indeed, wireless coverage in rural counties ranges as low as 76.7 percent of the population in West Virginia and 81.1 percent in North Carolina. Furthermore service coverage at download speeds at or above 3 Mbps ranges as low as 78.6 percent in Kentucky and 86.3 percent in New Hampshire.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on August 8, 2014 in Stanfordville, New York.

DR. RAUL L. KATZ,
President,
Telecom Advisory Services, LLC.

Mr. BERRY. Thank you.

But you are absolutely correct. The map itself—it is unfortunate we are using a methodology that does not accurately reflect the coverage. If you have a signal in a centroid of a Census block, then they count that area as covered. And we just heard in the exchange with Mr. Carlson and Senator Moran that just because there is a signal there does not mean it is a quality signal, does not mean you have coverage. But if you are saying anytime there is a signal there that meets that centroid in a population area, Census area, it is covered, then that is part of the problem.

Senator MANCHIN. Let me segue into that to Mr. Carlson, if you do not mind, because my time runs pretty short very quickly here.

Mr. Carlson, do you think the FCC could seek comment on other ways to measure the coverage? Because we do not think it is accurate right now. They must have missed my state completely.

Mr. CARLSON. Absolutely. I think there are innovative ways to——

Senator MANCHIN. Are they asking for that from you all who are on the front lines?

Mr. CARLSON. They have not asked for that from us at this point in time.

Senator MANCHIN. Anybody at this table—has FCC engaged you all?

Mr. BERRY. You know, I would say that we should look at every innovation. I mean, if we can put an advanced recon controller in the middle of Afghanistan——

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[1] Connect America Fund, Universal Service Reform—Mobility Fund, *et al.,* WC Docket Nos. 10–90, 10–208 *et al., Report and Order, Declaratory Ruling, Order, Memorandum Opinion and Order, Seventh Order on Reconsideration, and Further Notice of Proposed Rulemaking,* FCC 14–54 (rel. June 10, 2014) ("FNPRM").

[2] FNPRM ¶ 238, n.436.

Senator MANCHIN. I am saying is the FCC engaging you all in your comments since you all are delivering the service to the people who need it.

Mr. BERRY. They have not asked for methodology.

Mr. RAPELYEA. No, sir.

Mr. CARR. No, sir.

Senator MANCHIN. You do not talk to them at all. Do you?

Mr. SEWARD. No.

Senator MANCHIN. I do not blame you.

[Laughter.]

Senator MANCHIN. Let me just say, Mr. Carlson, basically I know that companies such as yourself are willing to go into these areas. You cannot do it just based on economics. Is that correct?

Mr. CARLSON. That is correct. We need support to meet the needs of these small towns and rural areas and to bring them a high-quality signal.

Senator MANCHIN. Well, the difference between you two sitting right here—he is coming at us from the sky. You are coming at us from the ground.

Mr. CARLSON. Well, he is providing a fixed location focus. We are providing mobility, and mobility is the future for Americans. I counted up the number of people in a row back here that were on their mobile smart phones. Four out of five.

Senator MANCHIN. Well, let me ask you this. Why has the FCC not seen fit for the money to go where the need is? I mean, why are you all not participating in this?

Mr. RAPELYEA. There seems to be a preconceived notion that is a wireline solution. And as a matter of fact, this program is administered and run out of the Wireline Bureau of the Federal Communications Commission. So therefore, the tilt or the bias is that way, not for this panel here.

Senator MANCHIN. So you are saying disproportionately that mindset is still getting a disproportionate share of the funds.

Mr. RAPELYEA. If you look at the tally of the distribution of the funds thus far, absolutely.

Senator MANCHIN. And that is what we are trying to correct right here with the hearing. That is why I appreciate so much. Mr. Chairman, if you will allow——

Senator WICKER. That is helpful information, Senator Manchin.

Senator MANCHIN. Thank you.

Senator WICKER. Senator Gardner, followed by Senator Daines.

STATEMENT OF HON. CORY GARDNER, U.S. SENATOR FROM COLORADO

Senator GARDNER. Thank you, Mr. Chairman, and thank you to the witnesses for joining us today.

You know, there is a lot of talk out in the countryside, so to speak, about red versus blue, red and blue in campaigns and elections. This committee has worked very hard to make sure that we do not focus on red versus blue. But, Mr. Seward, I have a hard time focusing on something in your statement. You talk about green in your statement and green tractors. I sell red tractors. So today we may focus a little bit on red versus green. But I will leave that out for now. Thank you.

Mr. SEWARD. You have my sympathies.

[Laughter.]

Senator GARDNER. Over the last year, we have gone around the state of Colorado. We have probably done—I do not know—20–25 different roundtables focused on rural economic development. And we bring in business owners and county commissioners and city council members and small business owners and schools and community colleges and talk about how can we make rural opportunities grow to stay competitive. And usually before you can even start the meeting, the first comment you hear is, well, we need to talk about broadband. We need to talk about Internet, and we need to talk about connectivity. And then you start the meeting and that is where you spend most of the time talking about it.

And so at some point, we have to realize that we have got to quit talking about it. We have got to start doing it so that the next economic roundtable that we have is not just focused on this one issue that every person here knows has to be the focus of our work.

In Colorado, we have this great state, mountains on the west and flatland on the east, and it creates significant challenges to businesses, to companies, to funding efforts that we can go out to the eastern plains with the great coops that we have and Century Link that is working on the CAF II funds that they have received, 50,000 homes that they will be working on. We have got wireless Internet service providers, satellite companies that are doing great work, including the work that you are doing with about 350 employees out of Englewood. And you know, it is incredible what we have. But we have some significant challenges because of the mountains, some of the hardest places in the country to make sure that we are providing Internet.

Yet, if you go to southwestern Colorado, in Durango, Colorado, Durango, according to some analysis, has the highest connectivity rates and some of the best abilities to work from home of anywhere in the country. And so we have been able to do some of these things.

But obviously, when you go to meetings and you continue to hear from towns that are struggling to put it together, we have got to figure out a better solution.

I am struck by the testimony today because we talk about all these Phase I's and Phase II's and round 1's and round 2's and CAF and Mobility. And then you read the statement from Chairman Wheeler who talked about the Connect America. This is a quote from him. The Connect America Fund Phase II competitive bidding process will be implemented in a technologically neutral manner to allow the participation of as many entities as possible. I think that statement sounds great. That is a great statement.

And so then we get the testimony here, technologically neutral.

Mr. Rapelyea, are we achieving that goal with the proposals we have seen?

Mr. RAPELYEA. No, simply put. There has been an adoption of the opposite where there is a thumb on the scale in a reverse auction, in the auction concept that has been put forth, for fiber solutions versus any of the other solutions on this panel such that if I were going to come with a bid, even though it met certain quality

standards and performance standards, my bid would be scored lower.

Senator GARDNER. And so if you were laying fiber on the western slope of Colorado, you know, Red Mountain Pass, to try to get from Ouray, Colorado, over to Silverton, Colorado—and if you have not been there, it would be a great place to go spend some money. So I encourage you to be there. But that is going to be cost prohibitive. So how can satellite or another kind of technology address that challenge?

Mr. RAPELYEA. In your state to a great extent we do that today and in the state of Mississippi and many of the states around the country.

The way that it will make business sense for a company like ViaSat or any other company to do that is to have an adjustable market that is balanced. It is a blend between populated areas and areas that are not so populated. If there is a preconceived notion that some of our technologies are solely rural and only allowed to compete for funds in ultra-rural places, I am afraid that you will not have a very effective bidding process. And those people frankly have already been left behind once. They will be left behind again.

Senator GARDNER. Mr. Berry, you talked about the $300 million for expanding mobile networks, Mobility Fund Phase I. $300 million—just over $66 million has been allocated. Talk a little bit more about why the delay, how slow that has been released, and what impact it is having on other efforts.

Mr. BERRY. Yes. Thank you, Senator.

We did have $300 million. We actually advocated that $300 million was not enough. We had more bids to acquire those funds than they had funds budgeted. So there is a huge interest out there.

What has happened, though, is because some small carriers actually went out of business, others could not see putting up the funds to build out the network when the legacy fund continues to drop, *i.e.,* 60 percent of its original funding source.

So there are two pressures. One, not enough funds. Two, those people that have actually built out the networks have not been reimbursed. And that is—I do not want to say a bureaucratic shortfall, but it is a slowdown in the process that really should not occur and it could be corrected, I think, very quickly. Some of the bureaucratic responsibilities of the USAC to, I think, over-indulge in the fact-checking has made it very difficult to build.

But we are also talking about two funds, the CAF, which has really been focused on fixed solutions, and Mobility, which is MF II, Mobility Fund II, which is essentially what the FCC gave wireless when they decided that they were not going to have a technology-neutral CAF program. And that is why I think we are talking about two different things. We have a Mobility Fund II that we think we can utilize right now with a little tweak of existing tools. We can solve a new problem in the high-speed mobile broadband world.

Remember, the high-speed mobile broadband can deliver fixed and mobile solutions. Fixed solutions cannot deliver mobile. I am glad we at least have an opportunity to make our case under Mobility II, but you are going to have to have more funds than what

is currently being contemplated by the FCC. And we are going to have to have a lot more rapid response.

Senator BLUNT [presiding]. Senator Daines?

I am going to wait until Senator Wicker gets back from voting. So I believe that we are fine on voting. So go ahead.

STATEMENT OF HON. STEVE DAINES,
U.S. SENATOR FROM MONTANA

Senator DAINES. Thanks, Senator Blunt.

Let us think about my home state of Montana and the importance of connectivity. Believe me, it keeps us connected. You can have a fly rod in one hand and still be doing your business with your other.

I was part of a cloud computing company for 12 years. We started up in Bozeman, Montana, grew it. It has 17 offices around the world, products set in 33 languages. Oracle acquired the company. They thought they were acquiring us for our software. They found out we had incredible cloud computing expertise.

Today, as Oracle is putting together their global cloud command strategy, 24 by 7 by 365, Singapore is covering Asia. They hand off to London. It covers Europe, Middle East, Africa. And they hand off to Bozeman, Montana, for the Americas. That is what is going on in terms of revolution in this global economy.

So I am very proud of what we have built there, but it also shows how world-class operations now exist in places outside of Silicon Valley. They have places like the Gallatin Valley.

So thank you, Mr. Berry, also for mentioning the Ruby Valley there in Montana. I remember that well. I am happy to say that today new wireless towers have been constructed, and the residents of the Ruby Valley do have service again. So thank you.

Mr. Berry, you also mentioned in your testimony that the Mobility Fund should expand services to areas currently underserved by 4G LTE service. I am concerned this means spending money upgrading customers who already have service at the expense of consumers who may not have any service. So should we not be focusing on some of these unserved communities and not even underserved but in some cases unserved communities like we have in Montana before we worry about upgrading to 4G LTE?

Mr. BERRY. Thank you, Senator.

Yes, but we have to do both. A tower that has been built by USF support should conceivably be continued to provide service and supported by the Mobility II Fund if necessary. So the idea is if you are going to get to 4G advanced and 5G, which gets you to the Internet of Things and provides all of the benefits that they are using down here in Mississippi in the fields, you are going to have to do both.

I am very fearful that you are at sort of a precipice of two real difficult challenges. If you do not continue to support existing capability, you will never get to the 4G/5G status. 4G and 5G provide huge increases in capabilities and speeds. They also are much more efficient in technologies and networks to run. So I think we are at that point where you have to do both. And expanding service—the proposal we provided to the FCC says support those that are necessary to continue to be supported and we would use that on a

data-driven basis. Do you need support to ensure that that tower can op-ex, the operational cost of that tower can be maintained? And how can we encourage you to build out services and expand and enhance services as we go forward? That I think is the new challenge in the 4G/5G world. I do not think you just want 3G for your constituents. As soon as they get 3G, they are going to want 4G.

Senator DAINES. We want 4G, 5. We want G just to start with as well.

Mr. BERRY. But it starts with coverage. If you do not have coverage, you do not even have an opportunity.

Senator DAINES. Yes.

So I want to pivot over here and talk about WISPs. I am actually a WISP customer personally. Thank you. My children—when you have children, all they care about is this anymore I think in terms of, Dad, is it fast or not. And so we are thankful that we have WISP delivering excellent service to my home in a rural area in Montana.

Mr. Carr, there are certainly technical and operational differences between wireline service and wireless service. Some have questioned whether wireless providers can offer the same level of service in terms of quality and reliability as the price cap carriers. Could you address those concerns?

Mr. CARR. Sure. Thank you for the question, Senator.

We compete with Fortune 100 and otherwise subsidized carriers all day long. We compete on price, service, and quality. A principal value of fixed wireless is that we can get to areas much more cost effectively than other technologies, and we offer unlimited data. So in my network in Virginia, West Virginia, and Maryland, the average user on our networks—excuse me—the median user consumes more than 100 gigabytes of data every month. And if you were going to buy that on a mobile hotspot, it would be $700 a month. You cannot get it on satellite, but you can get it in a very congested area for unlicensed spectrum on my network for $79 a month.

So the advancements in fixed wireless technology over the last 5 or 6 years have been absolutely breathtaking. Billions of dollars of global R&D is going into improved wireless coverage. And fixed wireless, like all wireless—we benefit from that. Our manufacturers are designing products not for rural America. They are designing it for the two-thirds of the world's populations who have never been served by a wire and never will. And so American consumers and our companies—we benefit from all that innovation.

Senator DAINES. I lived in China for 5 years. I remember when one of my colleagues was getting—a Chinese colleague was getting service and her mother had to wait 6 months for the wireline, and she went downtown and got her cell phone up and running in 24 hours. It is a classic example of how technology is leapfrogging, what is going on in the world.

I want to talk a little bit about satellite possibilities. This is for Mr. Rapelyea. Part of what makes our state great and why people want to come there is the mountains, the valleys. We have got a lot of topography challenges certainly, and that presents technological challenges.

Is satellite service a viable solution for customers who live in mountainous areas like where Gardner is from or where I am from?

Mr. RAPELYEA. So we do have customers in your state. They are around the more populated areas. And then to serve less populated areas, we need a blend of both. A business case of the ultra-remote on a standalone basis is hard to close for us.

Now, from a technological perspective, we operate today with four redundant satellites over the United States and more to come. So we will also employ hybrid networks that involve multiple wireless as well as satellite networks. So, yes, there is absolutely a technological way to do that. The business case is a different story.

Senator DAINES. I am excited to be elk hunting some day there, a long ways away, and have service there on my phone.

Anyway, thanks much.

STATEMENT OF HON. ROY BLUNT,
U.S. SENATOR FROM MISSOURI

Senator BLUNT. Thank you, Senator.

Mr. Seward, I grew up on red and green tractors both. So I would want to specify that in case Senator Gardner is looking at the record here. I will admit that I have only owned green tractors for the last 5 or 8 years.

And my dad, I am sure, would have preferred precision agriculture to some of the things I did on the tractor, driving the tractor from the time I was about 10 years old.

But what about precision agriculture—clearly world food demand is going to double in the next 35 years. A lot of things have to happen. We have to be better than we have ever been. What is your sense of the spotty service component of what you are doing out there in agriculture when you have service and then you do not have service? Give me just a little view of that.

Mr. SEWARD. It makes management of our farm a lot more difficult. We are not able to remotely monitor our machines, the efficiencies, you know, any data that we need to push to those machines to put out nutrients or to put out a seeding prescription. Overall, it will decrease our yield. You talk about feeding the world. It makes us less efficient. We are able to produce less crop. So it is a major issue for us.

Senator BLUNT. Can you rely on the precision agricultural concept if you are in a 40-acre field and you are only connected 90 percent of the time? What kind of problem does that create?

Mr. SEWARD. Yes, you can. I would have to go out there with a thumb drive myself and introduce this data to the machine. It would be kind of like if I told Congress they could not use e-mail for a day, everything had to be handwritten, hand-delivered. It really just reduces our efficiencies. So precision ag still could be performed, but I do not know if it could be performed on a large-scale production like we are doing.

Senator BLUNT. Mr. Chairman, I have one more question. Let me thank you for letting everybody else ask their questions first and putting yourself at the end of the line. Most chairmen do not do that.

Mr. Carlson, almost a year and a half ago, Senator Wicker and I and several other members sent a letter to the FCC urging them to finalize its rules for Phase II of the Mobility Fund. To the best of my knowledge, they have not done that yet. Actually to the best of my knowledge, they have not responded even to our letter yet. We do not have very good success encouraging the FCC to do anything or even to get a response.

But what is your view of where we are now on Phase II?

Mr. CARLSON. To my knowledge, the FCC has not introduced any rules yet. We would encourage all the members of this committee to make sure that those rules do not reduce the fund and that the FCC actually not take any significant action with the current fund until they produce maps about the quality of coverage in rural America so they can know what they are doing because today they are blind.

Senator BLUNT. Thank you.

Senator WICKER [presiding]. Well, thank you, Senator Blunt.

We are currently the first in a series of two votes. Other Senators may actually come back and ask questions. At the last moment on the second vote, I think we have to adjourn this hearing. But you all have been great.

Let me just ask you, Mr. Carlson. What is the best way to get accurate numbers for us, which you are advocating?

Mr. CARLSON. What I would advocate today, because I know it works for us when we measure ourselves against our competitors, is drive tests, and that means chartering an external engineering firm, other than ourselves, to drive the territory and to see what the actual quality of the signal strength is at each point along the territory, driving the State roads and the interstate highways. That is the way to get the job done. Now, you could do that on a national basis. I do not know what the cost is. But the cost is modest compared to the contribution that mobile broadband makes to the American economy. If we can afford to do a Census every 10 years and base our decisions on what we do economically as a Nation based on the Census, we should be able to do a census of our coverage across this country for mobile broadband.

Senator WICKER. For Mr. Seward's purposes, you might want to include county roads. Might you not?

Mr. CARLSON. Absolutely.

Senator WICKER. Now, who else would like to take a stab at that? Yes, Mr. Berry.

Mr. BERRY. If I may, sir. As I was starting to suggest to Senator Manchin, we ought to use all the available technology to do that.

Senator WICKER. The drive-testing and what else?

Mr. BERRY. Well, you can drive-test.

If we can put a team of recon officers in the middle of Afghanistan and they can determine where there is a radio signal, where it is from, and what channel it is on and the strength, we ought to be able to figure out how to figure out where that signal is coming in rural America. We have drone technology now. You could put a spectrum analyzer on the bottom of a drone and computerize the transit of non-populated areas so we could literally map the entire United States out. We have done drive-testing and we know it works. We have been doing that since analog days. There are a lot

of different ways that we can analyze the quality of signals all over the United States. We ought to be looking at new ways.

Senator WICKER. So drones and drive-testing.

Mr. RAPELYEA. Just to build on the drones comment and the troops on the ground, both of those applications are powered by satellite. So I just offer that as an aside.

Senator WICKER. There you go, Mr. Rapelyea.

Now, Mr. Rapelyea, Mr. Seward is not in these population areas that you mentioned. Do you anticipate your technology getting to the point where you are competing with companies like C Spire for his precision agricultural business over these far-flung areas of the Mississippi Delta?

Mr. RAPELYEA. Yes. I wanted to comment specifically about Mississippi.

Senator WICKER. Well, I am all ears.

Mr. RAPELYEA. Great, great.

We have talked a lot about the Mobility Fund. There is also the Connect America Fund, which is the focus here from our perspective. There are about 500,000—as far as we can tell, there are about 500,000 households that are not covered under the current Connect America Fund that were basically left behind in the first two rounds of the Connect America Fund, 1 and 2. It looks like——

Senator WICKER. Why was that?

Mr. RAPELYEA. Because there were telecommunications companies that were given the right of first refusal as to where they were going to serve, what households they were going to serve. They decided that the cost of serving these households was just too high. So they said we will pass. So that is what is left. So what we are talking about is what is left.

Again, as far as we can tell, sir, out of those 500,000 households, 92,000 are in your state.

Senator WICKER. Well, thank you for that. So roughly a sixth of all the unserved households?

Mr. RAPELYEA. Yes, sir.

And then on top of that, if you look at our business——

Senator WICKER. That includes the mountainous West Virginia that you can hardly hear 50 feet, according to Senator Manchin?

Mr. RAPELYEA. Yes. Now, again, this is what is left behind uncovered, 92,000 households.

Then if you look at where our customers are in your state, they are focused around the more populated areas of your state.

Senator WICKER. Right.

Mr. RAPELYEA. The more rural areas are not where we are not because we cannot get there. Of course, we can get there. We are a satellite company. But we just need a balance to have because it costs us to acquire a customer in a rural area. It is much more expensive than in a more populated area. So, therefore, we think that the policies today—well, we know the current proposals at the Commission today and like we have mentioned several times are not technology-neutral. They are not technology-neutral, such that we probably would not go without support to cover those uncovered households in your state.

Senator WICKER. And that is the principal thing, that is the principal change that you are advocating today. Would that be fair to say?

Mr. RAPELYEA. Let everybody compete. Let everybody compete. That is all.

Senator WICKER. Now, Mr. Seward, you were kind enough to come by my office yesterday afternoon, which is a good thing because your testimony is the only testimony I missed coming in late because of the Prayer Breakfast.

Did you have a chance to explain to this audience an example of how you get better yield and use less fertilizer and other product by getting data about these relatively small parcels of land?

Mr. SEWARD. Yes. You know, in paring the statement down, I did not cover that.

Senator WICKER. Go into that if you will because it is just fascinating to me.

Mr. SEWARD. Just say we have a 40-acre field where we are. We are in the alluvial flood plain of the Mississippi Delta. We have a lot of different soil types. So this field might have 15 different soil types in it. Say like I am growing a corn crop. It is going to grow differently on each different soil type. Each different soil type calls for a different amount of nutrients to produce a certain yield.

So we do grid sampling, two and a half acre grids.

Senator WICKER. And there is a company that does that. Right?

Mr. SEWARD. Yes. Pretty much any agricultural lab would do it, but we use Clinton Pettiet out of Leland, Mississippi, Pettiet Agricultural Services. Clinton is a pretty neat guy.

But anyway, that data is uploaded into the cloud.

Senator WICKER. His name is in the permanent record of this hearing.

Mr. SEWARD. It is. I will have to go back and tell Clinton. He will like that.

But anyway, so it goes up in the cloud. You know, we are a big Sanders customer. They are a seed and chemical retailer there. So I can use their Web-based software——

Senator WICKER. Another commercial.

Mr. SEWARD. Another commercial. Hey, they get a free trip or something.

Senator WICKER. But I digress.

Mr. SEWARD. But anyway, I can write a controller file to put out the nutrients that each two and a half acre grid calls for. And then you take that controller file, which I can wirelessly send to a John Deere application machine, and it knows exactly where it is in the field via GPS and it can put out the exact amount of potassium that I need to grow 240 bushels of corn in that 40-acre field, you know, every two and a half acres.

Senator WICKER. So as that giant John Deere implement moves across this tract of land, it dispenses different amounts based on what it is being told wirelessly.

Mr. SEWARD. Correct. It has a rate controller that controls the rate, yes. And it dispenses different amounts of fertilizer based on what it is being told wirelessly.

Senator WICKER. Giving America better yields——

Mr. SEWARD. Better yields.

Senator WICKER.—and allowing us to put only the amount of fertilizer that is necessary and saving the rest of it from washing out into the Mississippi and Yazoo Rivers.

Mr. SEWARD. You are exactly right.

Senator WICKER. Now, Senator Klobuchar is going to be recognized in a couple of minutes.

Let me just ask you all this. We are all for pro-USF support. We are kind of—all five of you—on the same page. But what differences are there among you that you would like to highlight based on all the questions and testimony. Is there anything that you would like to speak up about and clarify and perhaps take issue with something someone else has advocated? Or are we totally 100 percent on the same page? Mr. Rapelyea and then Mr. Berry.

Mr. RAPELYEA. Sure. Again, I think that there is room for everyone to compete, but I just want to make the very keen difference with satellite. Sir, we deliver high definition video streaming speeds to someone's home. We will deliver that same experience to someone in a plane, on a train. So this is where this is going today. We are competing against wireless and legacy cable and DSL and winning. About a third of our customers come from those solutions, people who have choices. Our next generation satellites will compete against cable. Our third generation satellites will be, with respect to fiber, just below fiber speeds. So we see ourselves as an extremely viable alternative within the Connect America Fund framework for those folks left behind.

Senator WICKER. Mr. Berry?

Mr. BERRY. Well, I guess I would say two big differences.

One, I guess the thing that unites is that we want to deliver high-speed broadband to consumers that currently do not have access.

On the wireless side, it is a mobility product that we are providing under Mobility Fund II. That is where we would like to see a little more attention from the FCC and a few more dollars to deliver that mobility experience that you do not get any other way.

We all are united by the same common challenge, which is how do you deliver a service in an area that is otherwise uneconomical to service. When you are down to three or four people per square mile or on the average—you know, 42 percent of the United States has less than 1 percent of the population. When you are talking about those areas, it is hard to pay for the network unless you have Universal Service funds, the Universal Service Fund, CAF II for the fixed service, whether it is fixed wireless or fixed wireline, and Mobility II for the wireless solution because it is pure mobility.

And those are the two differences that the FCC essentially did in their transformation order, and we are trying to get them to focus on the fact that you just cannot say the job is done and that you think there is 99 percent coverage for the mobility side. That is part of the difference.

And I feel for those other technologies that also appear to feel like they have been biased—the program somehow or another has been biased against them because, quite frankly, Mr. Rapelyea is right. Most of the funds go to a wireline solution that is predicated

on a fiber solution. We are totally different. We want to demonstrate that and provide that service to rural America.

Senator WICKER. Very good.

Mr. CARR. Senator, I would just say about—I think a principal difference from the WISPs and the fixed wireless industry from my colleagues here on the panel is that the overwhelming majority of our companies are small businesses. We are located in the communities that we serve. The folks that we are serving are our friends and neighbors.

And solving the digital divide in rural America, if there was a quick, one-size-fits-all solution that we could just blanket and drop in and have be successful, that would have already been done. And solving this challenge is going to require custom-tailored solutions for local communities based on a local understanding and an understanding of the needs of the community. And that is something that WISPs are uniquely positioned to provide.

Senator WICKER. But in terms of policy coming from this committee, do you advocate something different from what the previous two witnesses have recommended?

Mr. CARR. No. I think we all agree that we should compete on a technology-neutral basis to provide a standard threshold level of service.

Senator WICKER. Ms. Klobuchar, the second vote has not even begun. So we will be in good shape. So, Ms. Klobuchar, you are recognized and then Senator Ayotte.

STATEMENT OF HON. AMY KLOBUCHAR,
U.S. SENATOR FROM MINNESOTA

Senator KLOBUCHAR. Very good. Thank you very much. Thank you, Mr. Chair.

I have been working on this issue for a while. As you know, Mr. Berry, our state has a lot of rural areas and some of them extremely rural. We compete against Canada for our resort areas up in northern Minnesota. They tend to have better broadband I would say. We have got tribal areas where literally we have kids that go to one kid's yard to do their homework because they can get some WiFi off of that yard. We have farmers that are going to McDonald's parking lots—I have talked to them personally. I have seen it—to do their business as things get more complex with the kind of technology. Oftentimes they, of course, have access. They just have such slow-speed access that they are not able to do business in a way that is acceptable.

And I guess I would start with you, Mr. Berry. Part of the problem in getting broadband to rural America is the continuing difficulty of deploying the physical network. And I recently introduced the Streamlining and Investing in Broadband Infrastructure Act, bipartisan, which will simplify the process for siting infrastructure on Federal lands.

Mr. Berry, you mentioned that deploying infrastructure on Federal lands can be a time-consuming and difficult process. How would reducing these challenges increase the number of subscribers you could reach with the given level of support from the Universal Service Fund?

Mr. BERRY. Thank you, Senator. And yes, we are very strongly supportive of your efforts in that regard. Siting is always a difficulty, especially on Federal lands. And the shot clock concept and some of the initiatives that you are proposing will allow us to hopefully site facilities faster. And if you can do that at lower cost, you can provide a service that is economical to provide and hopefully you can get there so you can provide that connectivity to that tower sooner, faster, for more people. I think it will reduce costs. I think it will increase availability of services.

And also another bill that you have also sponsored is the Rural Spectrum Accessibility Act and we very much appreciate that you and Senator Fischer have supported because we do need access to spectrum in rural areas so that you can ride that infrastructure over. And I think your bill gives us an opportunity to more efficiently and effectively use spectrum that is currently not available to the small carriers.

Senator KLOBUCHAR. Thank you. I appreciate Senator Fischer's work with me on that, and Senators Gardner and Daines I think were the cosponsors, as well as some other people on the other bill.

You gave an example of a carrier in rural Montana, Mr. Berry, who was forced to exit the market because of uncertainty in funding. Do you think that this uncertainty in funding has had a disproportionate impact on rural residents?

Mr. BERRY. Yes, I do. As Senator Daines now tells me, Ruby Valley, Montana, now has coverage. But the small carrier that was servicing that area—and they put it in writing at the FCC why they were pulling out is because USF funding started to be reduced. It was down to 60 percent. And at that rate, under the plans that they had to roll out and sustain that service, they could no longer do it on their budget. They are a very small company that could not sustain the loss leader for a very long period of time. So they pulled out. I think that has happened in numerous areas throughout the United States, especially on those smallest of the small carriers, the small businesses that you referred to serving rural America.

Senator KLOBUCHAR. And what do you think the FCC could do to increase certainty as it moves toward the Connect America Fund Phase II auction, the Mobility Fund, the Remote Areas Fund?

Mr. BERRY. Well, we have suggested that—OK, let us try to address your highest priorities, which is to keep—our highest priorities, which is maintain and keep existing services, but expand services in a rational way. And we know there is not unlimited funds. But our suggestion is let us keep what we have, allow it to be enhanced, also encourage expansion in those areas. And I think they can do that very economically and with a lot of sensitivity to the need that is out there. And we talked and Mr. Carlson talked about the need to have better data and better information on the decisions they are making.

Senator KLOBUCHAR. One last question. Mr. Carlson, I head up the 911 Caucus. Do you worry that if we do not improve rural coverage, there could actually be a public safety divide between rural and urban areas? We know that more and more first responders, whether it is fire departments, or law enforcement, are getting their calls in and they are doing things by text and e-mail, and we

are all updating how 911 works, how the data is worked before they go into a building, all kinds of things.

Mr. CARLSON. Yes, Senator. I believe there is a public safety divide today. And as new technology makes available video conferencing back to that ambulance or back to that police car, the technology divide will increase even farther. So to close that divide, we need accurate data on where services actually exist in rural America that are high-quality broadband mobility services, and then the FCC should be required by this committee to address that problem.

Senator KLOBUCHAR. Thank you very much.

Senator WICKER. Thank you, Senator Klobuchar.

Senator Ayotte?

STATEMENT OF HON. KELLY AYOTTE,
U.S. SENATOR FROM NEW HAMPSHIRE

Senator AYOTTE. Thank you, Chairman.

Since I have been serving in the Senate and serving on this committee, I have been a strong voice for advocating a more equitable distribution from the Universal Service Fund. In fact, New Hampshire is 50th this year. We are a net donor by $21 million, but as I have said in the past, drive around my state with me a little bit and we will go up into Coos, Grafton, places in Cheshire, Carroll, and I can guarantee that you do not have service. So to me, this is something that we need to make sure that we address. And I would like to see more contribution reform.

New Hampshire residents have paid into USF. We have paid in, but it is disproportionate to what we are getting back. Yet, I know that we need assistance and we need to have more mobile broadband coverage. So I would ask you, Mr. Carlson, if you could tell me—or anyone on the panel—what ideas do you have and how can you explain how mobile broadband carriers can help correct the coverage gaps and ensure those who reside in a rural state like New Hampshire have access to this innovation, which is so important especially in rural areas, whether you having your own business, communicating, being able to live in that area and have a good job. So whoever is best to answer it, I would appreciate it. And how do you think we could reform this fund to make it work more effectively for us in places like New Hampshire?

Mr. CARLSON. Well, let me make a couple comments, and I am sure my colleagues here will chip in.

First, we need accurate maps at the FCC of the degree of your state that is not covered. The current maps that the FCC sent out appear to show that you are 98 percent covered, but that is not true.

Senator AYOTTE. Well, that is not true. I mean, I wish they would come around and drive around with me in the state. I can assure you we are not——

Mr. CARLSON. Right. So we need drive tests or we need drones to survey your state or we need items put on postal trucks to survey your state. We need a method to get the accurate data so that the FCC can hold themselves accountable, but so that this committee can hold them accountable. So that is a start because it will show that your state is not covered and it needs help. So that is the first thing.

Another thing that we have recommended is that the Federal Government explore joint programs with states so that if your state were to start even a modest Universal Service mechanism itself, then it could apply to have matching grants from the Federal Universal Service Fund. So that would be a combination funding, and if your state were putting up more dollars, then you would get more dollars from the FCC Universal Service Fund. So that is another way to do it.

And of course, another way to do it is to have a map of the whole United States so we can determine which states have the greatest problems. And I would not be surprised if your state did not have the greatest problems, along with West Virginia and some of the other mountain states. But the way the FCC constructed the Mobility Fund I is that they gave an incentive to serve the easiest areas to serve that were unserved, which meant flat states, and your state did not get anything. So we need reform and that kind of thinking.

Senator AYOTTE. It is really hard for me to tell my constituents how they are getting value out of this.

Mr. CARLSON. Right. I agree.

Senator AYOTTE. We are not. I mean, that is the problem.

Mr. BERRY. Senator, thank you for the question.

I totally understand that by reforming the program more, we can actually send assistance to areas that need it more. We did a study and submitted information to the FCC that designated New Hampshire—our economists indicated it was 86.3 percent coverage when the FCC was saying 98, 99 percent.

Senator AYOTTE. Yes, a difference——

Mr. BERRY. Last year, your state got $131,000 out of the USF high-cost fund for mobility.

Senator AYOTTE. Unbelievable.

Mr. BERRY. We should direct the funds to those areas that actually need support and need coverage. And it is going to be a long process. It is not going to be done overnight. But we have to get it on the right track and moving forward as we reform USF Mobility II.

Senator AYOTTE. And what do you think exactly—as we look at the Mobility Fund Phase II, what is this going to have impact on rural America?

Mr. BERRY. Well, I hope that if we can get the rules right and get the structure right at the FCC, that we will be able to provide existing support for towers so that we do not lose our current coverage. So you do not want it to go backwards and also a mechanism that says those that are in need and those areas that do not have served or are highly unserved should actually be able to apply and receive additional funds.

On the mobility side, I think some tweaking of the program could do a lot and we could do a lot better job with the funds that we have. On the wireline side, your state also got some wireline money, but again some of the most efficient and effective technologies that you might be able to deploy in a mountainous area are somewhat restricted in their ability to take it.

Mr. CARR. And, Senator, I would just add on the fixed side, the fastest, most immediate reform to the USF program for fixed would

be to eliminate the voice requirement. Most Americans choose not to have a fixed voice service, and really we should transform these funds into broadband funds because broadband enables voice if you want it. It enables telemedicine, telehealth, anything else you want.

Senator AYOTTE. You are absolutely right about that. I mean, so many of my constituents, including my own household—we do not have a landline anymore. We are all using cell phones.

Mr. CARR. And you raise a good point, and that is one of the reasons that you can actually direct that CAF to a fixed wireless broadband solution that is not dedicated to voice is they have an alternative. In many areas, they have an alternative, *i.e.,* a cell phone. So I think they are complementary in many respects, and we should just get on with trying to accomplish the goal.

Senator AYOTTE. I think what we are talking about is making sure that we are updating this to what the current technology is and what most people need to maximize the resources we have here. And, of course, for my state, I am going to continue to fight for the fact that, you know, $21 million going out the door from my constituents. I cannot tell you what we could do with $21 million for these gaps in our State.

Mr. RAPELYEA. Senator, just to build on it to the mapping point. Under CAF II, I think the presumption is that your state is fine.

Senator AYOTTE. Well, that is the problem.

Mr. RAPELYEA. Right, and we all know that is not true.

And then from an overall perspective, it looks like there is about $250 million on an annual basis, some of which your state is paying into, that is left to cover the balance, the tail end of CAF II. And then when you look at the cost model from the FCC of the per household cost and you add that up, it looks like you have got a billion dollar problem. You have got a budget of $250 million to cover a billion dollar problem.

Yet, despite that discrepancy, you are not inviting all of us to compete. It is hard to close and kind of scratch your head on that one. So I just wanted to offer that as well.

Senator AYOTTE. Great. Thank you. And I think my time has expired.

Senator WICKER. Senator Ayotte and I have to scurry over for a vote. You have all been excellent witnesses. This has been a most informative 1 hour and 50 minutes, most of which I have been able to listen to.

I am going to, without objection, stick my opening statement in the record at the place where the clerk feels it would be appropriate.

And thank you all. And we will continue to consider these matters. Thank you, and this hearing is adjourned.

[Whereupon, at 12:20 p.m., the hearing was adjourned.]

A P P E N D I X

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. ROGER F. WICKER TO DARRINGTON SEWARD

Question 1. If you could, how would you direct the FCC to ensure that sufficient Universal Service Fund support remains available to both (1) fund the existing operations of rural wireless networks and (2) encourage further deployment in America's rural areas?

Answer. Thank you for asking specifically about support for wireless broadband. Ag producers need access to all broadband technology options—wireline broadband, fixed wireless, or mobile—to reap the full benefits that new precision agriculture offers. We need the flexibility to adopt the appropriate technology solutions depending on ag equipment used, crops, livestock, terrain, climate, proximity to broadband interconnection points and population centers, and barriers to local land acquisition and access. Wireless services are also important to sustain the developing Internet of Things innovations that have emerged to address machine and data communication needs in the agricultural context.

However, the reality is that broadband, particularly high-speed wireless broadband, still is not readily available in many rural areas including agricultural croplands and ranchlands. To ensure that sufficient funds are available for existing wireless operations, the Commission must reevaluate its programs and rules to provide ongoing support for wireless broadband networks that could not be maintained absent support. *The absence of an unsubsidized competitor in a particular locale could be a threshold test to determine whether ongoing support is necessary to maintain wireless broadband.* In many rural areas, there may not be enough subscribers to cover the ongoing costs of operating existing wireless networks while keeping rates reasonably comparable to those in urban areas. The Commission needs to develop a means to identify markets in need of ongoing support and adopt rules to calculate such ongoing support.

Existing wireless facilities will also benefit if the FCC takes steps to promote middle-mile facilities to support mobile broadband, not just wired last mile connections. In particular, *the FCC should amend its USF Connect America Fund rules so that smaller, rural providers may also receive and use CAF funds for upgrading middle-mile facilities.*

Further deployment of wireless networks must also be a priority that is reflected in the Commission's programs and rules. One important step toward achieving this goal is for *the Commission to give special attention to preserving and updating the Mobility Fund.* In 2011, for the first time, the FCC created a support fund dedicated exclusively to mobile services. The Mobility Fund was established to ensure the availability of mobile broadband networks in areas where a private-sector business case was not supporting needed wireless services. The FCC's early plans contemplated a Mobility Fund Phase II but today, more than 5 years later, that fund is yet to become a reality. The Commission has since revised the program to retarget funds to support 4G LTE mobile broadband and voice service and in 2014, the FCC asked for further input on how best to distribute Mobility Fund Phase II support. Now, after two and a half years, the FCC has not adopted rules to implement Mobility Fund Phase II. Instead, despite the growing demand for and importance of mobile services in rural areas, the Commission's current commitment to the Mobility Fund is in real question and the Commission has even suggested that it may not continue the fund. *The Commission should confirm that expanded broadband in rural areas is a current priority by issuing a decision that preserves and even expands the Mobility Fund Phase II.* Although I believe, and many other Ag producers would agree, that there is a need to update these support programs to better ensure coverage of agricultural areas, the Commission can and should act promptly to confirm the status the Mobility Fund Phase II while considering further updates.

Another important action the Commission should take to encourage further deployment in rural areas is to *revisit how best to distribute CAF support.* The method by which CAF funds are distributed will determine whether rural families and busi-

nesses in agriculture will have the flexibility they require to apply the technology solution—whether fixed or wireless or some combination of both—that best meets their particular needs. The "tiered" approach that the Commission has proposed would enable only wireline providers to bid in the first round and thereby would create significant barriers to wireless funding. That approach would limit the flexibility of users to employ the most appropriate technology solutions to meet a wide variety of circumstances. If a licensed or unlicensed wireless service is a superior option for particular areas based on the cost and other efficiencies that apply to the equipment, terrain, distance and other specific attributes of a locale to be served, then *wireless providers should not be precluded from bidding in the first round to meet these needs.*

Question 2. What is the best way for the FCC to give rural businesses like yours and rural consumers like you and your neighbors in the Delta some certainty that there will be no reduction in access to the multiple wireless service providers your community needs to access healthcare, educational tools, or run your farms and businesses?

Answer. I agree that rural consumers do need certainty about their continuing access to wireless services. The prospects for continuing access to technology is an increasingly important factor for consumers making decisions about *where* to live, go to school, and operate businesses. *The Commission could bring more certainty to this area by making its commitment to expanded rural broadband services, including wireless services, explicit and by taking prompt, meaningful action to update its programs, broadband measurement mechanisms, and rules to make this a reality.*

There is a difference of opinion between commercial providers who quote very high coverage statistics and rural users whose demand for high speed broadband is still unsatisfied. Even Chairman Wheeler recently acknowledged the gap between the FCC's broadband coverage statistics which show nearly 99 percent coverage and the much different real-world experience in many rural areas where broadband is available to a much lower percentage of users. The rural broadband challenge is far from over and the mission cannot only be to avoid *reduction* in services—we must continue to actively support the expanded deployment of rural broadband. The Commission should *consider seeking an update of the public record on the status of mobile broadband in rural areas and the specific measures that can be adopted to obtain better data on the coverage,* quality and performance characteristics of mobile broadband. In addition, both the CAF and Mobility Fund should be re-evaluated *to identify what changes are necessary to address the soaring growth in device-to-device communications in the Internet of Things, including in machine-to-machine (M2M) communications used in agricultural production.*

As a part of this effort, *the Commission should expressly include broadband coverage of agricultural areas—croplands and ranchlands—in its Mobility Fund and CAF policy goals.* However, despite some marketing statements declaring broadband coverage in rural America to be near complete, croplands and ranchlands have lagged behind in adequate mobile coverage. These locations are important centers of economic activity for many rural communities but today's support program rules do not adequately account for the need for broadband services in these areas. The FCC's rules for Mobility Fund support, as well as *CAF support, should direct funding not just to facilities serving residential and business user population centers identified with conventional measures of population, but also to agricultural farming (cropland) and ranching operations that are integral to many local economies in rural areas. The Commission should also direct support from the Mobility Fund to coverage of rural roads.* The evolution of the Mobility Fund priorities and rules would be consistent with the long recognized aim of the support programs to bring services to where "people live, work and travel."

Finally, to implement this step, *the Commission should adopt a metric of broadband access in active croplands and ranchlands (and farm and ranch buildings) to identify areas of greatest need.* "Cropland" coverage can be assessed in a variety of ways and the FCC could take advantage of USDA data for crop operations, the U.S. Geological Survey's Land Use classification, or other databases. In support of this plan, the FCC's program to collect broadband data also should be updated to ensure that broadband service to agricultural machinery is counted.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. ROGER F. WICKER TO STEVEN K. BERRY

Question. Late last year Commissioner Clyburn and members of your staff visited my home state to look at some of the amazing things Mississippi is doing to lead the way on telemedicine. They visited Ruleville in Sunflower County—in the middle

of the Mississippi Delta, not too far from Mr. Seward's farm. There in rural Mississippi a groundbreaking telemedicine program is treating and defeating Type II diabetes. The program depends upon USF supported, robust mobile broadband connections to allow patients to interact with medical professionals around the clock from their home or work.

Do you believe the FCC has done enough to ensure that sufficient USF support remains available to keep existing rural wireless networks up and running—enabling access to these critical life-saving and cost-saving advances in medicine—especially in rural states like mine? How could the FCC do better?

Answer. When the FCC adopted the 2011 USF Transformation Order, it included a transition mechanism from legacy identical support for wireless carriers to a new Mobility Fund. This fund was to be employed in two phases to ensure that sufficient support is available to preserve existing rural wireless service, like the service you mention in Mississippi, as well expand new mobile technologies and services. Importantly, the FCC added a protection mechanism to this transition. The FCC planned to phase down legacy support over a five-year period at 20 percent per year. However, if the second phase of the Mobility Fund (Mobility Fund Phase II) was not operational by the time the phase down reached 60 percent by June 30, 2014, the FCC agreed to pause the phase down to protect rural consumers benefitting from legacy universal service support and to prevent a reduction or loss of wireless service. That pause remains in place today, providing carriers serving rural areas with support and consumers with ongoing wireless service.

Going forward, it is important for the FCC to recognize and affirm that USF support will be made available at sufficient and predictable levels for wireless carriers to preserve existing rural wireless networks as well as expand the latest mobile broadband services in areas that are unserved or underserved. Support for both preservation and expansion of mobile broadband is necessary to meet Congress's mandate to provide reasonably comparable services in urban and rural areas alike.

Response to Written Question Submitted by Hon. Dan Sullivan to Steven K. Berry

Question. In your testimony, you mention carriers that have had to sell part or all of their operations due to uncertainty in funding. As you may know, some of our carriers in Alaska are nearing this point. I am sure you are aware of the proposal set forth by the Alaska Telephone Association targeted specifically to Alaska rate of return carriers. Can you please discuss the challenges for these carriers posed by uncertain funding mechanisms? Can you also discuss how CCA addresses the needs of Alaskan consumers?

Answer. As CCA has told the FCC, CCA supports the adoption of the Alaska Telephone Association plan. The Alaska Telephone Association includes several CCA members that provide life-saving mobile wireless services in these hard-to-serve areas, and the plan is tailored to Alaska's unique needs and situation. Stable funding mechanisms are critical for all carriers to preserve, expand and upgrade voice and broadband services. All carriers deserve certainty regarding what funding mechanisms will be available so they can maintain, upgrade, and expand their networks, and all consumers demand certainty that services they rely on will be available. The Alaska Telephone Association's proposal would provide a fixed amount of support for 10 years to mobile and rate-of-return carriers in Alaska, and require them to make specific commitments to upgrade and maintain advanced mobile networks. The proposal strikes the right balance for carriers and consumers alike, and the FCC should adopt the proposal for the benefit of all Alaska carriers and consumers.

Response to Written Question Submitted by Hon. Deb Fischer to James G. Carr

Question. Mr. Carr, as you may know, in March the Senate passed a bipartisan resolution that I introduced, along with Senators Ayotte, Booker, and Schatz, which stressed the importance of developing a national strategy to encourage the Internet of Things, and this is an issue that we continue to follow closely. We hear frequently about how mobile wireless will enable the growth of the Internet of Things, and I believe that is true, but I also think it is important to keep an expansive view of the technologies that will play a role in this evolution. What do you see as the role of fixed wireless service in growing the Internet of Things?

Answer. Fixed wireless already plays an extremely critical role in the Internet of Things ("IoT"), and will play an even greater role in growing the IoT in the future.

As a threshold matter, Americans who lack access to Internet connectivity cannot benefit from the IoT and related advancements. Thus, extending high-quality, high-data Internet service to rural America is a precondition for extending the benefits of the IoT to rural Americans. Fixed wireless is an extremely cost effective access technology that can be rapidly deployed and should be an important component of a national strategy to bridge the digital divide. This is particularly the case in rural America, where market conditions frequently will not support private investment in wired alternatives. Thus, the first role of fixed wireless in growing the IoT will be providing basic connectivity to communities that are presently unserved or underserved. This is one of the many reasons why it is so critical that the FCC adopt technology-neutral rules that prioritize cost effectiveness for the Connect America Fund ("CAF") Phase II reverse auction. WISPA has recently submitted a proposal to the FCC outlining a technology-neutral framework for the CAF Phase II reverse auction which we believe would foster greater competition and a more efficient allocation of limited public resources.[1]

Fixed wireless will also reduce the cost of IoT applications. This is because the cost per unit of data transmitted over a fixed wireless network typically is substantially lower than the cost per unit of data transmitted over a mobile wireless network. For example, in Loudoun County, Virginia, All Points Broadband's customers can transmit 100GB of data over a fixed wireless network for $79 per month. On the mobile wireless network of a national carrier, the monthly cost of this same amount of data would be $710. While All Points Broadband's unlimited data plans begin at $99 per month, data plans that are truly unlimited are not available from national mobile carriers.

The impact of fixed wireless' relative cost efficiency will continue to grow as end-user data demands continue to increase. For example, America's largest fixed-wireless Internet service provider, Rise Broadband, indicates that its average user presently transmits 94GB of data per month, and that data usage is rising by more than 40 percent each year.

A large proportion of the "things" that will be connected to the IoT are stationary devices such as smart meters, irrigation controls, and surveillance cameras. For example, many water and sanitation authorities are already using fixed wireless networks to conduct water and flow metering, and real-time video surveillance, telemetry and alarming at remote locations. Fixed wireless enables a large proportion of modern precision agriculture techniques, and fixed wireless networks also support electric utilities' "smart grid" metering programs, railroads' remote monitoring of at-grade crossings, and operators' monitoring of tank levels and operating temperatures at remote oil wells. Given the relative cost efficiency of fixed wireless networks, fixed wireless will be the preferred access technology for many IoT devices. The reduced cost access made available by fixed wireless networks will spur innovation and benefit the entire IoT ecosystem.

Fixed wireless networks can also provide service where there is no mobile coverage. In many areas of rural America, mobile wireless networks are unavailable or unreliable. Using fixed wireless technology, operators can efficiently expand coverage to specific remote locations where connectivity is required to support IoT applications.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. DAN SULLIVAN TO JAMES G. CARR

Question. In your testimony, you discuss the Remote Areas Fund, which is intended for "extremely high-cost areas". Most, if not all, of Alaska would fit this profile. Can you tell me what you would like to see from the FCC regarding rules for the Remote Areas Fund?

Answer. WISPA will urge the FCC to adopt rules for the Remote Areas Fund ("RAF") that are technology neutral. That is, the rules should set minimum requirements for the characteristics of the end-user experience (*i.e.,* speed, latency, data limits and time to complete build-out), and require bidders to compete on cost—awarding support to the bidder offering the most cost effective solution. Rules that encourage bidders to use any combination of access technologies (such as terrestrial fixed wireless, wired fiber-optic technologies, and others) would maximize participation in the competitive process. This competition would ensure that limited public

[1] This proposal is set forth in the Letter from Stephen E. Coran, WISPA Counsel, to Marlene H. Dortch, FCC Secretary, WC Docket No. 10–90 (filed March 4, 2016), a copy of which is attached to this response.

resources are allocated as efficiently as possible, and thus maximize the number of Americans who can be connected with the limited funding that is available.

WISPA has recently submitted a proposal to the FCC outlining a recommended, technology-neutral framework for the CAF Phase II Reverse Auction (the "WISPA CAF II Framework").[2] The concepts underlying the WISPA CAF II Framework will form the basis of WISPA's approach to the RAF rules.

It is also critical that the RAF rules not preclude bidders proposing to use unlicensed spectrum to deploy wireless networks to provide Internet connectivity. Unlicensed spectrum is a public resource that is already available to connect rural Americans, and wireless Internet service providers have been deploying over unlicensed spectrum to successfully connect millions of rural Americans and businesses for many years. The remote and sparsely populated areas where RAF funding will be available are the same areas where unlicensed spectrum is most available and least congested. RAF rules that preclude or disadvantage wireless Internet access deployments over unlicensed spectrum will increase the cost of connecting rural America in an amount that dramatically exceeds the corresponding public benefit of this additional cost. By increasing the per-connection cost of providing connectivity, such rules would limit the number of Americans who can benefit from the RAF.

WISPA is in ongoing discussions with other industry associations to seek a consensus approach for allocation of the funding, if any, remaining after the CAF competitive bidding process ends. In order to achieve consensus, WISPA's position may evolve.

Response to Written Question Submitted by Hon. Cory Booker to James G. Carr

Question. Mr. Carr, you state in your written testimony that access to more licensed and unlicensed spectrum is critical to meeting the growing demand for broadband service that we see across the country. I agree that finding and freeing more spectrum is absolutely critical to continued growth and innovation in the telecommunications industry, and I have worked with Senator Rubio on legislation that would help us meet this goal. How important is it that any new spectrum legislation from Congress take a balanced approach in freeing up *both* licensed and unlicensed spectrum to meet today's connectivity needs?

Answer. It is critically important that Congress take a balanced approach to spectrum policy. In particular, Congress needs to find and free more spectrum for use on an unlicensed basis.

When there is adequate unlicensed spectrum in multiple frequency bands, wireless Internet service providers can rapidly and cost effectively deploy last-mile networks. These networks provide connectivity where none is available and create choice and competition in areas where competition is limited. Deploying on unlicensed spectrum enables operators to provide service and competition in areas where additional networks using licensed spectrum are uneconomical, including low-income urban areas and much of rural America.

The public benefit of allocating significant spectrum for unlicensed use dramatically outweighs the potential one-time proceeds that would be obtained through sale of spectrum to a licensee.

For example, a 2014 report found that technologies operating in unlicensed bands in the United States generated a total annual economic value of $222 billion and contributed $6.7 billion to the Nation's GDP.[1]

Response to Written Question Submitted by Hon. Deb Fischer to Michael Rapelyea

Question. Mr. Rapelyea, as you state in your testimony (page 9), it is estimated that by 2020, there will be over 20 billion connected devices worldwide. As you may know, in March the Senate passed a bipartisan resolution that I introduced, along with Senators Ayotte, Booker, and Schatz, which stressed the importance of developing a national strategy to encourage the Internet of Things, and this is an issue that we continue to follow closely. We hear frequently about how mobile wireless

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[2] This proposal is set forth in the Letter from Stephen E. Coran, WISPA Counsel, to Marlene H. Dortch, FCC Secretary, WC Docket No. 10–90 (filed March 4, 2016), a copy of which is attached to this response.

[1] Telecom Advisory Services, LLC, "Assessment of the Economic Value of Unlicensed Spectrum in the United States", February 2014, page 8.

will enable the growth of the Internet of Things, and I believe that is true, but I also think it is important to keep an expansive view of the technologies that will play a role in this evolution. What do you see as the role of satellite in facilitating the growth of the Internet of Things?

Answer. The Internet of Things (IoT) brings together advancements in computing, networking and communications technologies. Among the many things IoT promises are economic growth, increased productivity and new market opportunities. Growth estimates for the 20 developed and emerging economies that generate over 75 percent of the world's economic output is $10.6T added to their cumulative GDP over the next 15 years. Increased productivity results from closer tracking of high valued assets and improved visibility into supply chains that when combined with data analytics provide greater operating efficiencies and higher return on invested capital.

- Engine telemetry transmitted from an aircraft, locomotive, or oil rig predicts engine failure, isolates the part and alerts service personnel to reduce engine downtime.
- Power line sensor data transmitted to a control center detects changes that signal a power demand by a community.
- Truck or delivery vehicle sensor data and camera snapshots ensure driver safety and proper vehicle operation. Data security is a key component of the machine-to-machine (M2M) communications inherent in IoT. Security requirements vary for wired and wireless connections. A bank ATM machine uses a dedicated wired connection to the bank network. An ATM in a mobile vehicle in remote areas uses wireless connection. In order to ensure transmissions cannot be intercepted, data link encryption is employed.

Satellite delivers secure, wireless M2M communications. Satellites provide coverage to serve areas that are not cost effective to build out terrestrial wired (*e.g.,* fiber) or wireless (*e.g.,* WiFi or cellular) networks. For in-flight aircraft and locomotives traveling in remote areas satellite can be the only option since most terrestrial systems elect to direct antennas toward the greatest number of existing subscribers. When terrestrial service is available, satellite increases reliability by providing a redundant communications link. This is especially important when terrestrial systems become damaged or inoperable due to a natural or man-made disaster.

ViaSat Mobile Satellite Services (MSS) leverages Internet Protocol (IP)-based satellite technologies developed for the U.S. DOD's Blue Force Tracking network to improve battlespace communications to reduce casualties due to friendly fire. MSS features and benefits include:

- Data link encryption superior to wireless networks
- Real-time position tracking
- Low user service cost
- Rapid deployment
- Open standards-based IP applies to multiple market verticals

In service since 2013, the DOD network has an installed base of over 70,000 users. ViaSat launched MSS as a separate, commercial variant of the DOD network. This response to the satellite technology for communications mirrors the potential growth of IoT.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. DEB FISCHER TO LEROY T. CARLSON, JR.

Question. Mr. Carlson, in your written testimony, you mention that states, including Nebraska, have their own state universal service funds. You propose that those states could participate in a pilot program to see how to leverage state funding, along with the Federal universal service program and private investment, to support mobile broadband. The state of Nebraska is doing great work with their universal service program, to make sure that all Nebraskans have access to vital communications services. Can you provide more detail on how you see a pilot program being carried out, and what the role of states like Nebraska would be?

Answer. Senator Fischer, thank you for the question and the opportunity to talk a little more about an idea we recently presented to the FCC for consideration. In our view, and the view of many participants that we have spoken to, the FCC's Mobility Phase I reverse auction process has failed to deliver mobile broadband as widely as everyone had hoped. Moreover, the Federal universal service fund, which is now committed to annually providing approximately $2 billion to small landline

carriers, $2 billion to large landline carriers, $2 billion for schools and libraries, $1.5 billion for Lifeline, and $275 million for rural health care, is a finite resource. The FCC originally committed only $500 million for its Mobility Fund Phase II, and has subsequently proposed reducing that amount, despite overwhelming evidence that citizens living in rural America want and need high-quality modern mobile voice and broadband services. With these limitations, creating a mobility fund of $1 billion annually, which we believe to be the absolute minimum needed to "move the needle" in rural America, requires some creativity.

Our idea flows from the Congressional declaration in the 1996 Act that universal service is a responsibility to be shared between the Federal and state governments. That shared responsibility has taken the form of Federal universal service funds being generated from *interstate* telecommunications service revenues, while state universal service funds have been generated from *intrastate* telecommunications service revenues. Over the years, the Federal Government has assumed an increasing share of the overall funding, as well as assuming greater control of the program. In the mobility arena, we believe that states are better positioned to know where mobile coverage and broadband availability is lacking, and to monitor investments to ensure that rural citizens get the benefits that program funds were intended to deliver.

Furthermore, we believe that state contributions through matching funds will increase program leverage. And, having states administer and monitor fund usage will increase accountability and the likelihood of success, as state commissioners are closer to the ground, they understand better where investments are needed, and they are more directly accountable to constituents. In addition, a grant program will force carriers to submit applications that are targeted to the right areas and make the most efficient use of program dollars, otherwise they will not qualify for a grant.

Under a pilot, the FCC would select one or more states willing to participate in a one-year trial of a program that would provide grants to carriers willing to construct mobile broadband infrastructure in unserved and underserved areas. As described in more detail below, key principles of such a program would include a state's agreement to contribute matching funds to those provided by the Federal Government, adoption of a simple Federal grant program rule, and a state's willingness to decide where funds should be invested and monitor program participants so that funds are invested as proposed.

For purposes of a pilot, the FCC would allocate an amount of Federal universal service support to participating states. To obtain valid and fulsome data, we would recommend a total Federal commitment of $25–50 million, divided among as many as five states willing to participate. Funds would be allocated based on any number of available metrics, such as unserved/underserved road miles or census blocks.

States would be required to provide matching funds of up to 50 percent of Federal funding. So for example, if the FCC allocates $1.00 and a state contributes $0.50, the FCC will increase the Federal funding amount to $1.50, making $2.00 available for the state mobility fund. This mechanism will provide program leverage to accelerate investment and promote the sharing of universal service burdens.

There would be a simple rule to be implemented, which limits the "unfunded mandate" problem. State investment in the process would be limited to selecting participants, administering the program, and oversight, not developing new program rules.

Eligible carriers would submit applications for funding that meet the rule requirements, explaining to the state PUC where new services are needed. We believe carriers are best positioned to know where their networks require investments that would not otherwise be made, and PUC commissioners are in a better position than the FCC to know where services in their respective states are lacking. Carriers would be encouraged to submit statements from local communities as to the need for mobile broadband services, which are easily verified by state commissions.

The application for funding must be self-scoring, to simplify review.

PUCs would review applications, verify compliance, and ensure that services are provided as promised.

Funds must be used for capital expenditures to build or upgrade facilities, or to fund ongoing operations in remote areas.

Carriers must deliver mobile broadband service consistent with then-existing FCC requirements (*e.g.,* throughput and coverage).

In a pilot setting, states would do one year of funding, with both the state and participating carriers required to submit a report to the FCC at year-end, describing what worked, and what did not work, so the program could be refined when it is rolled out on a larger scale.

We have drafted a proposed rule that could be refined for use with a pilot program, and a summary providing a brief overview, both of which are attached for your reference.

We must mention the substantial work done by Nebraska, which has informed our thinking. Our entire proposal was based in large part on the successful Nebraska state broadband fund, which we participate in each year. We believe a large part of Nebraska's success flows from the fact that the commissioners are engaged and share a common belief that a high-quality mobile broadband infrastructure are critical to the state's long-term success at providing public safety, education, health care, and economic opportunity. U.S. Cellular is one of several mobile carrier participants that has constructed substantial infrastructure in the state that would not have been built otherwise, to our company's benefit, but more important to the benefit of rural Nebraskans.

With respect to your last question, the role of Nebraska in a federal-state broadband grant program, we offer this thought. If the FCC were to adopt a federal-state grant program along the lines of what we have proposed, we would advocate giving Nebraska the option to continue on with its current and fully formed grant program, but expanded with the addition of new Federal funding. Alternatively, Nebraska could opt to use the Federal rule for future grants to eligible carriers.

In closing, we are committed to each community we serve, and fully understand that the robust infrastructure we have in the U.S., including electricity, water, gas, and telephony, could only be built in remote areas with the assistance of public funding. We believe that a grant program, which requires carriers to identify areas of need, for local communities to support it, for state public utility commissions to oversee and manage it, and for the Federal Government to provide funding and an efficient program for awarding funds and overseeing their use, is the best way to accelerate broadband infrastructure investment in rural areas.

Accordingly, we believe that a pilot program along the lines described above, would be the best way to learn how best to build a successful mobility fund. We would be happy to come in to discuss this with you further, or assist in any way in efforts you may undertake to convince the FCC to adopt such a pilot program.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. DAN SULLIVAN TO LEROY T. CARLSON, JR.

Question. In your testimony, you discuss how the current mobility fund lacks the size and focus to ensure rural communities have timely access. One idea you propose is a grant program combining state and Federal support funds. Can you elaborate on this further? Are there any programs in existence that resemble your proposal?

Answer. Senator Sullivan, thank you for the opportunity to talk about a federal-state broadband grant program, which we believe holds great promise for improving mobile broadband service in America's rural areas. While we would like to see the FCC embrace this idea immediately, we have also suggested a brief pilot project that would validate the concept and permit participants and regulators to figure out what works, and what does not, to improve it before implementing it throughout the Nation.

Let me respond to your last question first. Several states have mobile broadband universal service funds, including Nebraska, Colorado, and now New Mexico (although the latter is the subject of a court challenge to the state statute). Perhaps Nebraska's grant program has had the most success, as it has been in place for a number of years and has had multiple carriers, including our company, apply for and draw funds and construct mobile broadband infrastructure in remote parts of the state.

As you probably know, it is our view and the view of many participants that we have spoken to, that the FCC's Mobility Phase I reverse auction process has failed to deliver mobile broadband as widely as everyone had hoped. Moreover, the Federal universal service fund, which is now committed to annually providing approximately $2 billion to small landline carriers, $2 billion to large landline carriers, $2 billion for schools and libraries, $1.5 billion for Lifeline, and $275 million for rural health care, is a finite resource. The FCC originally committed only $500 million for its Mobility Fund Phase II, and has subsequently proposed reducing that amount, despite overwhelming evidence that citizens living in rural America want and need high-quality modern mobile voice and broadband services.

With these limitations, creating a mobility fund of $1 billion annually, which we believe to be the absolute minimum needed to "move the needle" in rural America, requires some creativity. To date, we have advocated to the FCC that it would be

a mistake to create a fund of any size without first developing an estimate of how big the task is. For example, if the job of providing high-quality coverage and mobile broadband to rural America will cost $20 billion in universal service funding, then one can look to available resources to determine how much can be devoted each year, and how long it will take to complete the task.

At this point, nobody knows with any real accuracy where specific areas of the Nation lack high-quality coverage and 4G LTE service, how much it might cost to provide it, and what is a reasonable time frame to complete the task. Nor is any planning underway to support 5G development in rural areas. Until the FCC undertakes these fundamental steps, the size of its Mobility Fund cannot be said to be properly tied to measurable goals or a budget for completing the task.

What we do know is that in Mobility Fund Phase I, where the FCC allocated $300 million, the areas amount of geography that saw new coverage was very small, and the reverse auction methodology has proven to be so challenging that nearly one-third of the funding has been forfeited back to the FCC by carriers. We participated in that process and, even for a relatively large rural carrier, have found it to be daunting, despite our relative level of success in building out.

What we can safely conclude is that since it takes over $4 billion per year to maintain and upgrade our Nation's existing rural wireline networks, providing about 12 percent of that amount to rural wireless networks, where new coverage must often be established, is not enough. And that is why we are working on creative ideas to leverage Federal program dollars to expand the amount that can be invested in America's rural areas.

Our idea flows from the Congressional declaration in the 1996 Act that universal service is a responsibility to be shared between Federal and state governments. That shared responsibility has taken the form of Federal universal service funds being generated from *interstate* telecommunications service revenues, while state universal service funds have been generated from *intrastate* telecommunications service revenues. Over the years, the Federal Government has assumed an increasing share of the overall funding, as well as increasing control of the program. In the mobility arena, we believe that states are better positioned to know where mobile coverage and broadband availability is lacking, and to monitor investments to ensure that rural citizens get the benefits that program funds were intended to deliver.

Accordingly, we believe that states contributing matching funds will increase program leverage. Having states administer and monitor fund usage will increase accountability and the likelihood of success, as state commissioners are closer to the ground, they understand better where investments are needed, and they are more directly accountable to constituents. In addition, a grant program will force carriers to submit applications that are targeted to the right areas and are the most efficient use of program dollars, otherwise they will not qualify for a grant.

The FCC could conduct a pilot, to allow several states to participate for one year and file a report that would inform the FCC and states on what a nationwide program would look like. Our proposal, as described in more detail below, would include a state's agreement to contribute matching funds to those provided by the Federal Government, adoption of a simple Federal grant program rule, and a state's willingness to decide where funds should be invested and monitor program participants so that funds are invested as proposed. Federal funds would be allocated among the states based on any number of available metrics, such as unserved/underserved road miles or census blocks. It is possible that a separate fund would be created to address Alaska's unique needs, but that is beyond the scope of our initial thinking.

States would be required to provide matching funds of up to 50 percent of Federal funding. So for example, if the FCC allocates $1.00 and a state contributes $0.50, the FCC will increase the Federal funding amount to $1.50, making $2.00 available for the state mobility fund. This mechanism will provide program leverage to accelerate investment and promote the sharing of universal service burdens.

There would be a simple rule to be implemented, which limits the "unfunded mandate" problem. State investment in the process would be limited to selecting participants, administering the program, and oversight, not developing new program rules or engaging in litigation that often follows.

Eligible carriers would submit applications for funding that meet the rule requirements, explaining to the state PUC where new services are needed. We believe carriers are best positioned to know where their networks require investments that would not otherwise be made, and PUC commissioners are in a better position than the FCC to know where services in their respective states are lacking. Carriers would be encouraged to submit statements from local communities as to the need for mobile broadband services, which are easily verified by state commissions.

The application for funding must be self-scoring, to simplify review.

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Funds must be used for capital expenditures to build or upgrade facilities, or to fund ongoing operations in remote areas.

Carriers must deliver mobile broadband service consistent with then-existing FCC requirements (*e.g.,* throughput and coverage).

In a pilot setting, states would provide one year of funding, with both the state and participating carriers required to submit a report to the FCC at year-end, describing what worked, and what did not work, so the program could be refined when it is rolled out on a larger scale.

We have drafted a proposed rule that could be refined for use with a pilot program, and a summary providing a brief overview, both of which are attached for your reference.

Our proposal is based on the work of state commissions that have created mobile broadband funds, in large part on the successful Nebraska program, which we participate in each year. We believe a large part of Nebraska's success flows from the fact that the commissioners are engaged and share a common belief that a high-quality mobile broadband infrastructure are critical to the state's long-term success at providing public safety, education, health care, and economic opportunity. We are one of several mobile carrier participants that have constructed substantial infrastructure in the state that would not have been built otherwise, to our company's benefit, but more important to the benefit of rural Nebraskans. We think such a model can work throughout the Nation.

In closing, we are committed to each community we serve, and fully understand that the robust infrastructure we have in the U.S., including electricity, water, gas, and telephony, could only be built in remote areas with the assistance of public funding. We believe that a grant program, which requires carriers to identify areas of need, for local communities to support it, for state public utility commissions to oversee and manage it, and for the Federal Government to provide funding and an efficient program for awarding funds and overseeing their use, is the best way to accelerate broadband infrastructure investment in rural areas.

Accordingly, we believe that a program along the lines described above, would be the best way to build a successful mobility fund. We would be happy to come in to discuss this with you further, or assist in any way in efforts you may undertake to convince the FCC to adopt such a pilot program.

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