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NEXT STEPS FOR SPECTRUM POLICY

HEARING

BEFORE THE

SUBCOMMITTEE ON COMMUNICATIONS AND TECHNOLOGY

OF THE

COMMITTEE ON ENERGY AND COMMERCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED FOURTEENTH CONGRESS

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NEXT STEPS FOR SPECTRUM POLICY

THURSDAY, MARCH 26, 2015

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

The subcommittee met, pursuant to call, at 10:16 a.m., in room 2322 of the Rayburn House Office Building, Hon. Greg Walden (chairman of the subcommittee) presiding.

Members present: Representatives Walden, Latta, Shimkus, Lance, Guthrie, Olson, Pompeo, Bilirakis, Johnson, Long, Collins, Cramer, Eshoo, Yarmuth, Clarke, Loebsack, Rush, Butterfield, Matsui, and McNerney.

Staff present: Ray Baum, Senior Policy Advisor for Communications and Technology; Andy Duberstein, Deputy Press Secretary; Gene Fullano, Detailee, Telecom; Kelsey Guyselman, Counsel, Telecom; Grace Koh, Counsel, Telecom; David Redl, Counsel, Telecom; Charlotte Savercool, Legislative Clerk; David Goldman, Democratic Chief Counsel, Communications and Technology; Margaret McCarthy, Democratic Senior Professional Staff Member; and Ryan Skukowski, Democratic Policy Analyst.

OPENING STATEMENT OF HON. GREG WALDEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Mr. WALDEN. We are going to go ahead and call to order the subcommittee on Communications and Technology, and welcome our Members and our witnesses here today. Since this is a go-away day and we have votes coming up in about an hour or so, we are going to go ahead and get started.

There is no question that mobile technology is one of the key components of the economy of both today and of the future. Americans have wholeheartedly embraced the role of mobile in their lives. In fact, there are more wireless devices in the country than there are people in the country. Mobile is even more critical in developing nations for whom mobile is the first national network for connectivity. Time and again, as the country that pioneered spectrum auctions once, and is the process of doing it again, the world looks to the United States to lead spectrum policy and answer the challenge of meeting spectrum demand. We must continue to rise to that challenge.

Demand for connectivity will only continue to grow as the Internet of Things becomes a ubiquitous part of our daily lives. People rely on spectrum to stay connected to friends and family, conduct

business, engage with the government, and access resources for things like healthcare and education.

This committee has long been a leader in freeing up spectrum for commercial and unlicensed use to meet demand and feed the innovation that has been the hallmark of U.S. spectrum policy. In just the last few Congresses we have brought forth bipartisan legislation to authorize a first-of-its-kind broadcast television incentive auction, formed working groups that Ms. Matsui and Mr. Guthrie co-chaired that we organized to look at how do we modernize the federal spectrum, how do we work together to ensure that this vital national resource is put the most efficient and effective use. By the way, going into that legislation, the Congressional Budget Office said it would never happen, and they gave us a zero score, or something like that. And after the fine work of you all at the FCC and the people who actually arrived with checkbooks, I think the net is somewhere around $41 billion, paying fully for the interoperable system for public safety, as well as 911 enhanced process, and paying down debt. And that is just the first part of the auction with AWS–3.

Now, as we go forward, we need to make sure that there continues to be good cooperation and understanding about all the parties as we go into the broadcast incentive auction. I know our broadcasters were involved in this auction with some of the spectrum they had with the Defense Department and other federal agencies, so it was more than just the Federal Government, and I commend the broadcasters for their involvement. But the model can hopefully be recreated in other spectrum bands through the Federal Spectrum Incentive Act. This was introduced, by the way, by Congressman Guthrie and Congresswoman Matsui, as the broadcast incentive auction is doing for broadcasters, this legislation would allow participating government agencies to receive a portion of the proceeds from the auction of spectrum assigned to it. That makes sense. It incentivizes agencies to take a hard look at the modern spectrum needs and consider alternatives, free up even more spectrum for commercial or unlicensed use.

Now, in the past, there has been a great deal of focus on so-called beachfront spectrum, the spectrum with the best propagation characteristics for commercial mobile use. Some of this will be auctioned off in the upcoming incentive auction of the 600 megahertz band currently used for UHF broadcasting. But these types of opportunities are going to be even more scarce in the future and it means we have to start looking outside of the traditionally desirable spectrum bands. There is only so much spectrum out there, so we need to work together with what we have and that means expanding use into the spectrum frontiers.

The FCC began a proceeding last fall to examine the use of frequencies above 24 gigahertz. To put that in perspective, most commercial use happens below 6 gigahertz, and most mobile use is in the 3 gigahertz level. Development of technologies that can utilize higher frequencies to meet current and future needs could be a real game-changer. I look forward to hearing more about the FCC's work in the space from our witnesses.

So how do we achieve these goals and ensure that America remains a leader in wireless technology, development and deploy-

ment of mobile innovations? It will require a great deal of working together to leverage industry and engineering know-how, government authority, and agency implementation. To achieve this, both Congress and the FCC must be flexible and forward-looking stewards of our public spectrum asset.

So I look forward to hearing from our witnesses today. And with that, I will turn over the remaining time to my vice chair, Mr. Latta.

[The prepared statement of Mr. Walden follows:]

PREPARED STATEMENT OF HON. GREG WALDEN

There's no question that mobile technology is one of the key components of the economy of both today and of the future. Americans have wholeheartedly embraced the role of mobile in their lives-in fact, there are more wireless devices in this country than people—and mobile is even more critical in developing nations for whom mobile is the first national network for connectivity. Time and again, as the country that pioneered spectrum auctions once, and is the process of doing it again, the world looks to the United States to lead spectrum policy and answer the challenge of meeting spectrum demand. We must continue to rise to that challenge.

Demand for connectivity will only continue to grow as the "Internet of Things" becomes a ubiquitous part of our daily lives. People rely on spectrum to stay connected to friends and family, conduct business, engage with government, and access resources for things like healthcare and education.

This committee has long been a leader in freeing up spectrum for commercial and unlicensed use to meet demand and feed the innovation that has been the hallmark of U.S. spectrum policy. In just the past few congresses we have brought forth legislation to authorize a first-of-its-kind broadcast TV incentive auction legislation, formed working groups focused on modernizing federal spectrum, and worked together to ensure that this vital national resource is put the most efficient and effective use.

The most recent example of this committee's spectrum leadership came just a few months ago with the successful auction of 65 MHz of AWS–3 spectrum for more than $44 billion. This is particularly significant not only because this single auction raised enough to fully fund FirstNet, but perhaps more strangely, because some said that this auction would never happen. The spectrum auctioned was occupied by the U.S. Department of Defense and other federal agencies, but thanks to bipartisan leadership of this committee and cooperation between industry and government, we were able to bring more spectrum to market to meet demand without adversely impacting government operations. This success is a terrific example of what can be achieved when we work together.

This model can hopefully be recreated in other spectrum bands through the Federal Spectrum Incentive Act. Introduced by Mr. Guthrie and Ms. Matsui, as the broadcast incentive auction is doing for broadcasters, this legislation would allow participating government agencies to receive a portion of the proceeds from the auction of spectrum assigned to it. By incentivizing agencies to take a hard look at their modern spectrum needs and consider alternatives, we can free up even more spectrum for commercial or unlicensed use.

In the past, there has been a great deal of focus on so-called "beachfront" spectrum-the spectrum with the best propagation characteristics for commercial mobile use. Some of this will be auctioned off in the upcoming incentive auction of the 600 MHz band currently used for UHF broadcasting. But these types of opportunities are going to be even more scarce in the future and it means we're going to have to start looking outside of the traditionally desirable spectrum bands. There's only so much spectrum out there, so we need to work with what we have and that means expanding use into the "spectrum frontiers." The FCC began a proceeding last fall to examine the use of frequencies above 24 GHz—to put that in perspective, most commercial use happens below 6 GHz, and most mobile use is below 3 GHz. Development of technologies that can utilize higher frequencies to meet current and future needs could be a real game-changer. I look forward to hearing more about the FCC's work in the space from our witnesses.

So how do we achieve these goals and ensure that America remains a leader in wireless technology, and development and deployment of mobile innovations? It will require a great deal of working together to leverage industry and engineering know-how, government authority, and agency implementation. To achieve this, both Con-

gress and the FCC must be flexible and forward-looking stewards of our public spectrum asset. I look forward to hearing from our witnesses how the commission is working to ensure a successful incentive auction, as well as their hard work to ensure we can meet spectrum demand in the future.

Mr. LATTA. Well, thanks, Mr. Chairman, for yielding. And thank you for our witnesses for being here with us today.

The demand for wireless spectrum capacity is growing daily, as technologically advanced devices and products are increasingly using unlicensed spectrum instead of cellular networks to connect to the Internet. There is no doubt that spectrum has become an integral part of our everyday lives, and contributes greatly to economic growth and innovation. It is vital that the capacity of our Nation's airways is able to accommodate advanced mobile innovation, therefore, we must examine all ways to expand access to spectrum. That is why I introduced H.R. 821, the Wi-Fi Innovation Act, which would examine ways to maximize the use of spectrum in the upper 5 gigahertz band, without creating harmful interference with incumbent users. My bill also recognizes that unlicensed spectrum is a critical component of promoting continued economic development, increased connectivity, and greater productivity.

Mr. Chairman, I look forward to hearing from today's witnesses, and I thank you for yielding. And I yield back.

Mr. WALDEN. Mr. Latta, we appreciate your participation and your comments.

We will turn now to Ms. Eshoo from California for an opening statement.

OPENING STATEMENT OF HON. ANNA G. ESHOO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Ms. ESHOO. Thank you, Mr. Chairman. And good morning to all of our witnesses. It is wonderful to see you. Roger, is this the first time you have ever testified? It is.

Mr. WALDEN. Oh, boy.

Ms. ESHOO. Isn't that great? Yes. Well, we miss you, but we are proud of you.

$41.3 billion. How would you like to have that in your checking account? That is a lot of money. It is really unprecedented in terms—that it was raised from the AWS–3 auction. It is a huge win, and I think that it is instructive to all of us in the value of spectrum. Spectrum is gold. Some is 18 karat, some is 24 karat, there are different levels of gold, but it is still gold. And we know that these funds are going to be used to reduce the deficit by some $20 billion. I don't know what other committee is producing that, but everyone here should pat themselves on the back. It is going to pay for the build-out of the first ever nationwide interoperable public safety network. That was the only recommendation of the 9/11 Commission that the Congress had not made good on, and it is going to upgrade our 911 call centers across the country to support next-generation technology. So this is, I think anyone that takes a look at this would say this is a success story.

Now, less than 2 years ago, Chairman Walden and I began regular meetings with NTIA, with the FCC, with the DoD, to ensure that our efforts to relocate or share spectrum held by federal agen-

cies really stayed on track. And those were important informal meetings as well as hearings, but it really paid off. Many thought that the DoD wouldn't cooperate, but thanks in part, I think, to this bipartisan process and their cooperation that we established in June of 2013, 65 megahertz of spectrum will be brought to market to support America's insatiable appetite for wireless broadband. But our work is far from complete, because our goal is to free-up 500 megahertz of spectrum, and ensure that every American has access to 4G high-speed wireless broadband.

According to Cisco's latest forecast, global mobile data traffic will increase nearly tenfold over the next 4 years. That is a lot; increasing tenfold over the next 4 years, reaching an estimated 24.3 X-bits per month by 2019. So as a finite resource, we have to think big in our approach to spectrum management.

I think a 21st century spectrum policy should recognize the following. The complimentary benefits of both licensed and unlicensed spectrum. The need for competitive safeguards to prevent excessive concentration of spectrum, particularly within the prime beachfront bands below 1 gigahertz. And the need to utilize new sharing technologies to enhance efficiency and better manage spectrum.

The upcoming incentive auction can achieve, I think, each of these policy goals, while generously compensating broadcasters who voluntarily chose to participate. And I salute the broadcasters for cooperating. I want this to work very well for them because when it does, it is going to compliment the rest of the system. Similarly, freeing up additional unlicensed spectrum in the 5 gigahertz band will unlock immense economic value in our country, promote access to broadband, and expand the digital sandbox used by innovators and entrepreneurs.

So it is a pleasure for me to welcome all of you here, the experts, and as I said before I began my opening statement, to see our former Chief Democratic Counsel, Roger Sherman, you are a great source of pride to us, Roger. So I look forward to your testimony and the conversation that we are going to have, and the input that you will give to us.

And with that, I yield back.

Mr. WALDEN. Gentlelady yields back.

Anyone on the Republican side want to make an opening comment, or should we move on to our witnesses? OK.

We will go to Ms. Matsui now, using Mr. Pallone's time as the senior Member on their side.

OPENING STATEMENT OF HON. DORIS O. MATSUI, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Ms. MATSUI. Thank you, Mr. Chairman, for yielding me time. And I also would like to welcome Roger Sherman. It is great to see you.

The future of American innovation would be fueled by spectrum, and more and more spectrum. Never has this been more evident than the record-breaking AWS–3 auction which generated nearly $42 billion. That is more than four times the reserve price that the FCC put on the sale, and more than double the previous record of $18.9 billion set in the 2008 wireless auction.

The planning for the AWS–3 auction did not happen overnight. There were many skeptics who doubted this auction would ever occur. But as a result of years of bipartisan congressional collaboration with the Department of Defense, the FCC and the NTIA, along with our Nation's broadcasters, the final product of the AWS–3 auction was truly historic for the wireless market and for consumers. The major investments put forth all provides us with fresh evidence of the increasing consumer demand for Internet access by smartphones, tablets and devices. Spectrum has become one of the lynchpins in our economy. 4G speeds will soon become 5G speeds. New cars rely on spectrum to improve driver safety. Wi-Fi hotspots are popping up across the country. Innovative healthcare devices are being introduced utilizing spectrum to monitor blood pressure, oxygen levels, and activity levels. Technologies that allow consumers to control home energy consumption from mobile devices also rely on spectrum.

To more efficiently utilize our Nation's airwaves, America needs a national spectrum plan, one that would require a healthy mix of licensed and unlicensed spectrum bands. To that end, Congress must look for creative ways to produce more spectrum and create a pipeline for spectrum reallocation or sharing. That is why today I join Congressman Guthrie in introducing legislation that would create the first ever incentive auction for federal agencies, and for once, offer revenue to federal spectrum users in exchange for federal spectrum. It is a game-changer.

I thank Chairman Walden and Ranking Member Eshoo for cosponsoring this bill. I also welcome the Senate Companion Bill also introduced today by Senators Ed Markey and Deb Fischer.

Moving forward, I also believe that unlicensed spectrum should be part of our spectrum plan. It is important for the FCC to develop a testing process on the upper 5 gigahertz band this year. It is time for the FCC to bring together in one room engineers from both the auto and technology sectors to see if they can coexist without interference in the 5 gigahertz band. That was the underlying principle of the bipartisan law passed in 2012.

I look forward to continuing to work in a bipartisan manner on spectrum issues. It is one of the key issues for our economy.

I would now like to yield the balance of my time to the gentlelady from New York, Ms. Clarke.

Ms. CLARKE. I thank the gentlelady from California.

Chairman Walden and Ranking Member Eshoo, thanks for convening this hearing. Thank you once again to Congresswoman Matsui for yielding time.

For years, we have been discussing the Nation's spectrum crunch, and it is good to see the progress in this area, particularly as consumers are increasingly becoming dependent on their mobile devices. The world is going wireless, needless to say. Most of us couldn't even imagine going through the day without our mobile devices. But it is more than having our phones in our pockets. Our kids are using connected textbooks, our cars are equipped with fourth-generation wireless technology, our doctors treat us faster, at lower cost, by using wireless equipment, and everyone expects to watch what they want, when they want to, where they want it, and with whatever wireless devices they have handy.

Americans are clearly more engaged in the wireless ecosystem, and we need to ensure that our Nation has the capacity to accommodate current and future wireless needs. But all of this innovation does not happen alone. Our hunger for all things mobile is driving our insatiable demand for the airwaves that feed our devices. These airwaves are the invisible infrastructure that is all around us. It powers the devices and services we use every day. That is why Congress charged the FCC with managing this scarce public resource on our behalf, and that is why we directed the FCC to conduct spectrum auctions that make more spectrum available for wireless carriers, and to supercharge the Nation's supply of spectrum of Wi-Fi.

The FCC has taken the ball and ran with it. Earlier this year, the agency completed the most successful auction in history. It raised over $41 billion for public safety and wireless, and made a significant slice of the airwaves available for mobile broadband. The FCC also gearing—is also gearing up for the broadcast incentive auction next year, but if we want the United States to continue to lead the world in wireless, there is a lot more to be done.

I look forward to the hearing from—to hearing from our expert panelists today about what is next in the spectrum pipeline, and I yield back.

Mr. WALDEN. Gentlelady yields back. We appreciate her comments.

And now we will go to our witnesses. We want to thank each of you for being here, not only before our committee but also the work you do not far away at the FCC. So thanks for being here.

And we will start out with Mr. Roger Sherman, he is the Chief of the Wireless Telecommunications Bureau of the Federal Communications Commission. Mr. Sherman, we are delighted to have you back here. I have 23 yes-or-no questions Mr. Dingell submitted, but go ahead with your testimony.

STATEMENT OF ROGER SHERMAN, CHIEF, WIRELESS TELECOMMUNICATIONS BUREAU, FEDERAL COMMUNICATIONS COMMISSION; ACCOMPANIED BY GARY EPSTEIN, CHAIR, INCENTIVE AUCTION TASK FORCE, FEDERAL COMMUNICATIONS COMMISSION; JULIUS KNAPP, CHIEF, OFFICE OF ENGINEERING AND TECHNOLOGY, FEDERAL COMMUNICATIONS COMMISSION; AND JOHN LEIBOVITZ, DEPUTY BUREAU CHIEF, WIRELESS TELECOMMUNICATIONS BUREAU, FEDERAL COMMUNICATIONS COMMISSION

Mr. SHERMAN. Thank you. Good morning, Chairman Walden, Ranking Member Eshoo, and members of the subcommittee. We appreciate the opportunity to discuss next steps for spectrum policy, and welcome your interest in this topic.

At the table with me today are three experts well known to this committee; Julie Knapp, the Chief of the Office of Engineering and Technology; Gary Epstein, the Chair of the Incentive Auction Task Force; and John Leibovitz, the Deputy Chief of the Wireless Bureau, and Special Advisor to the Chairman for Spectrum Policy.

We know that time is limited and you are probably anxious to ask questions, so I won't reiterate our testimony, but instead briefly highlight three basic points. First, the demand for spectrum con-

tinues to grow exponentially, and as a nation, we need to maintain our collective focus on this resource to continue to be the world leader in wireless. There is no debate that wireless is an engine of economic growth and progress in the United States, and there is no debate that spectrum fuels this engine.

As Chairman Walden and Chairman Wheeler pointed out in a recent op-ed upon the close of Auction 97, there is direct linkage between spectrum, jobs and economic growth, not to mention innovation, competition and consumer choice. You can be sure FCC staff is focused on making licensed and unlicensed spectrum available for mobile broadband to meet consumer and business demands. This has certainly been a key area of focus for Chairman Wheeler and all of the commissioners.

Second, we are actively bringing more spectrum online. Since Chairman Wheeler's arrival at the FCC, we have auctioned the 10 megahertz H block, and 65 megahertz of AWS–3 spectrum. We have also made other spectrum newly available and useable for wireless broadband and unlicensed uses. Of course, we are working towards the incentive auction early next year.

A couple of quick observations about AWS–3, many points that you have already raised in your statements. AWS–3 was a team effort, and it is well known that it was a success in large part due to the important work of NTIA, DoD, and other Federal agencies. What is less well known, at least outside the Rayburn Building, is that full engagement of the Energy and Commerce Committee was a critical element of this success. Members of this subcommittee in particular took a personal interest in the success of this effort, and did everything possible to bring along other stakeholders with interest in this spectrum. These collective efforts yielded a great result. More spectrum is available for wireless broadband, federal agency transitions are paid for, and a number of congressional priorities have received critical funding, including the nationwide broadband public safety network, public safety research, next generation 911 implementation, and more than $20 billion for federal deficit reduction. As you are well aware, these priorities came directly from legislation authored by this subcommittee.

Third, and finally, the FCC is continuing to think hard and creatively about how to ensure a continuing supply of spectrum is in the pipeline. We all know how long it takes to ready spectrum for auction, or otherwise make it available for commercial use. The agency intends to use the tools Congress has provided towards this end. We will also continue to working closely with this committee and our federal partners going forward. Along these lines, I am pleased to report that tomorrow Chairman Wheeler plans to circulate with the commissioners draft final rules to create a new service in the 3.5 gigahertz band, the Citizens Broadband Radio Service. This is an exciting opportunity to use new innovative technologies and policies to leverage 150 megahertz for wireless broadband. We have also initiated a proceeding aptly titled Spectrum Frontiers. This Notice of Inquiry examines spectrum high up on the spectrum chart, the bands above 24 gigahertz. This proceeding will help us understand better the future of wireless services, and hopefully create a regulatory environment in which new innovative technologies can flourish for the benefit of consumers.

On behalf of my colleagues here today and at the FCC, we thank the subcommittee for the opportunity to testify, and stand ready to answer your questions. Thank you.

[The prepared statement of Mr. Sherman follows:]

STATEMENT OF

Roger C. Sherman, Chief, Wireless Telecommunications Bureau; Julius P. Knapp, Chief, Office of Engineering and Technology; Gary Epstein, Chair, Incentive Auction Task Force; and John Leibovitz, Deputy Chief, Wireless Telecommunications Bureau and Special Advisor to the Chairman for Spectrum Policy
Federal Communications Commission

BEFORE THE

Subcommittee on Communications and Technology
Energy and Commerce Committee
United States House of Representatives

"Next Steps for Spectrum Policy"
March 26, 2015

I. Introduction

Chairman Walden, Ranking Member Eshoo, and Members of the Subcommittee, we thank you for the opportunity to share our thoughts on the *Next Steps for Spectrum Policy*.

Wireless is an engine of economic growth and progress in the United States. It enables the transfer of information and ideas anywhere, at any time. It has stimulated significant technological innovation, from networks, to devices, to software and apps. It creates new jobs and sustains entire industries, not just in telecommunications or IT, but increasingly in other areas of the economy like health care, transportation, and energy.

Spectrum, as the Members of the Subcommittee know, is an essential input to wireless connectivity. The United States is the world leader in wireless broadband thanks in part to the bipartisan pursuit of a comprehensive spectrum agenda.

We jointly represent the many outstanding professionals who assist the Commission in its development of spectrum policy. Our testimony will focus on efforts to help meet the wireless needs of consumers and industry, and ensure that the United States continues to lead the world in wireless.

II. Meeting the Nation's Wireless Broadband Demand

Historically, the process of identifying spectrum, developing rules, and conducting an auction has taken many years – typically a decade or more. Prior to late last year, the last major spectrum auction occurred in 2008 when the Commission completed the 700 MHz auction, following the AWS-1 auction in 2006. These auctions made a substantial amount of spectrum newly available for wireless broadband, and these bands are integral to today's wireless networks.

Although these new bands provided a launch pad for fourth-generation wireless networks, it soon became clear that more action was required. The mobile economy was undergoing seismic change. The proliferation of new smartphone, tablet, and increasingly, machine-to-machine platforms was causing demand for wireless broadband to accelerate rapidly toward an inflection point. The need to provide more spectrum – more bandwidth – to meet the broadband demands of consumers was evident. Yet, the Commission had no plans to bring new spectrum to market. We had to act quickly.

In response to a statutory directive from Congress, the Commission developed the National Broadband Plan, released five years ago. Among other things, the Plan set out to accelerate the Commission's spectrum efforts. It established two spectrum goals: to make 300 megahertz available for wireless broadband by 2015 and 500 megahertz by 2020. It also set out a series of recommendations to help meet these goals.

Since the Plan was released, the Commission:

- Made 30 megahertz in the long-fallow Wireless Communications Service useable for wireless broadband;
- Created new service rules and auctioned rights to 10 megahertz of spectrum in the H Block;
- Granted new flexible use terrestrial rights to 40 megahertz of spectrum in AWS-4, which was previously usable only for the Mobile Satellite Service; and
- Worked collaboratively with Congress and numerous federal agencies, with input and assistance from the wireless industry, to make 65 megahertz available for broadband in AWS-3, 40 megahertz of which was made available on a shared basis with incumbent federal users.

The Commission has also recognized the critical role unlicensed spectrum plays in the wireless ecosystem and the economic benefits unlicensed spectrum generates. We believe that unlicensed spectrum is an essential component of an effective spectrum strategy. We have continued to support development of advanced unlicensed sharing techniques in the white spaces in the TV bands, including exploring additional opportunities for unlicensed use of the new 600 MHz band guard bands following the Incentive Auction. Last year the Commission also took action to greatly improve the utility of 100 megahertz of unlicensed spectrum in the 5 GHz band.

The Commission has used a variety of spectrum tools authorized by Congress to achieve these spectrum gains. Specifically, it has used traditional auctions, relied on spectrum sharing, worked with industry to develop technical solutions to complicated coexistence problems, and removed restrictions to promote flexible use policies.

When it comes to making additional spectrum available for commercial use, the experience of the past five years demonstrates we must rely on an all-of-the-above approach.

The Commission's spectrum efforts have benefited greatly from the bipartisan support and encouragement of Congress. The Middle Class Tax Relief and Job Creation Act of 2012 was a watershed: it laid the groundwork for the successful AWS-3 auction, triggered ongoing work to make available additional spectrum in the 5 GHz band, and gave the Commission authority to design and run the world's first Incentive Auction.

Bipartisan leadership from members of Congress and their staff was instrumental in making the 1755-1780 MHz portion of the AWS-3 band newly available for commercial use, while protecting important federal missions. The resulting auction (Auction 97) generated an unprecedented $41.3 billion in net bids, reflecting spectrum's enormous value to the economy on an ongoing basis. As a bonus, this revenue will support important Congressional priorities, including funding the Nation's first nationwide broadband public safety network, supporting critical public safety and 911 research, and contributing more than $20 billion towards deficit reduction.

While the revenues from auctions may generate the headlines, the Commission is also focused on the important responsibility of issuing and administering more than two million spectrum licenses, certifying devices, and otherwise fulfilling our obligations under the Communications Act to manage the spectrum.

III. Keeping the Pipeline Flowing

According to one estimate, the volume of mobile data traffic in 2019 will be equivalent to 210 times the mobile data traffic in 2009. We are hard at work on ongoing initiatives and are looking to the future with a focus on maintaining a spectrum policy to meet this continuing growth in wireless broadband demand.

In the near term, we are establishing new rules for the 3.5 GHz band, moving forward with the Incentive Auction, and working toward making more spectrum available in the 5 GHz band. We have started a proceeding to open new "spectrum frontiers" – including the millimeter wave bands, which some are touting for "5G" – that advances in technology are making viable for mobile broadband use. We are examining new ways to make the rules for existing spectrum bands more flexible so users can adapt to changes in technology and market needs. And we are working with our federal partners to identify additional spectrum that might be reallocated or made available on a shared basis.

Incentive Auction

We plan to begin accepting applications for the Incentive Auction this fall and are on track to conduct the auction in the first quarter of 2016. Exercising the authority Congress provided in the Middle Class Tax Relief and Job Creation Act, the Commission has adopted service rules for the 600 MHz band and we have teams working aggressively on the auction procedures and final recommendations for all of the rules and procedures necessary to implement the world's first Incentive Auction.

The Incentive Auction is an opportunity to use a market-based mechanism to make highly-valued 600 MHz spectrum newly available for wireless broadband. The 600 MHz band is uniquely situated on the spectrum chart to meet both capacity and coverage needs. The Incentive Auction Task Force has held extensive discussions with broadcasters across the country, and we believe there is strong broadcaster interest in participating in the auction.

Moving forward with the Incentive Auction next year is essential to meet the continuing need for spectrum, especially sub-one gigahertz spectrum. The recently-concluded AWS-3 auction confirmed the strong market demand for more spectrum. We believe that carriers have ample interest and financial capability to participate vigorously in the Incentive Auction.

3.5 GHz

We are in the final stages of crafting new rules for the 3.5 GHz band. This proceeding is an opportunity to enable a contiguous 150-megahertz band useable for wireless broadband. Through new innovative sharing technologies and policies, the Commission can make this spectrum available for a variety of commercial use cases while continuing to protect important federal missions and other incumbent users. By supporting ultra-dense small cell networks, this band could provide an important boost to our Nation's wireless capacity needs. It could also support broadband deployment in important industrial applications like manufacturing and health care.

5 GHz

We continue to work with our federal counterparts and industry to explore and develop sharing techniques to enable coexistence between unlicensed and other uses in an additional 195 megahertz in the 5 GHz band. We appreciate Congress's continued interest in this band, and we will continue to press towards finding sharing solutions to make available this additional spectrum for "gigabit Wi-Fi" and other unlicensed uses.

Spectrum Frontiers

In the fall of 2014, the Commission unanimously initiated a proceeding to explore the feasibility of using bands above 24 GHz for mobile wireless broadband and other wireless applications. The Commission is taking a proactive approach to examine the future evolution of wireless broadband technologies and determine what steps to take to create a flexible regulatory environment in which these technologies can flourish.

III. Conclusion

The Nation's leadership in wireless, and our ability to meet the wireless needs of consumers, depends in large part on spectrum resources. We will continue to pursue effective spectrum policies, leveraging the tools Congress has provided. We will also look to this Subcommittee for assistance and guidance in developing new, innovative approaches to spectrum management, and stand ready to work with Congress and our federal partners towards these important goals.

Mr. WALDEN. Mr. Sherman, thank you for your testimony. We thank the other witnesses for being here today for the committee.

Mr. Sherman is the only one presenting testimony today, so we will go right into our questions and then he told me he is more like the point guard, he will hand it off to the other experts on the panel as well, but feel free to ask him questions too.

So we will start with—please, lots of questions, Mr. Sherman. We will start with Mr. Epstein.

The FCC's budget requests include $2.4 million to engage an administrator to manage the broadband relocation fund. Is that engagement going to be awarded through competitive bidding, and if not, why, and is this a one-time request or do you think additional funding will be necessary? I have a couple of other follow-up questions, but——

Mr. EPSTEIN. Well, thank you, Mr. Chairman.

Mr. WALDEN. And, yes, turn on that mic. There you go.

Mr. EPSTEIN. Yes. Thank you very much, Mr. Chairman, for the opportunity to testify today. The broadcast administrator is going to be a crucial part of the transition post-auction, and yes, we do anticipate it as being a fair and open compete, and we do anticipate that it will be a one-time-only request.

Mr. WALDEN. All right. And where will those funds come from, the $2.4 million estimated cost?

Mr. EPSTEIN. I am not an expert in the budget aspects of things. My anticipation is it will come out of auction proceeds, but I will confirm that with our Office of Managing Director.

Mr. WALDEN. OK. And the commission has engaged clearinghouses before to manage cost sharing in the clearing of spectrum bands. Do you know how much it costs those entities to manage a clearinghouse?

Mr. EPSTEIN. Mr. Chairman, I don't have those numbers.

Mr. WALDEN. Yes, if other members on the panel have answers to any of these questions our Members have, please feel free to speak up.

VOICE. We will get that back to you.

Mr. WALDEN. All right.

Mr. EPSTEIN. We will get that information back to you.

Mr. WALDEN. Perfect. OK. And, Mr. Knapp, welcome, by the way. We are always delighted to have you in the room, and helping us on the technical side of these issues. And so I want to talk about performance requirements for receivers. Do you think that a sort of one-size-fits-all rule setting performance requirements for receivers or defining the interference environment will solve the problems across many different types of radio devices, and if not, how would you tailor an appropriate framework?

Mr. KNAPP. Thanks, Mr. Chairman. We have had our technological advisory council look at this issue. One of the things that came out of that is a proposed new approach for dealing with receivers. It is based on something called interference harm threshold.

Mr. WALDEN. Yes.

Mr. KNAPP. Rather than setting standards for receivers, which as we got into it, found that a one-size-fits-all would be really difficult——

Mr. WALDEN. Right.

Mr. KNAPP [continuing]. To come up with. In fact, I was at a conference earlier this week where I heard another idea that is coming out of a multi-stakeholder group that is a variation on that, which talks about more of a generic mask. So the receiver issue continues to come up. We are still working with the industry on approaches that we can take to this without moving quickly to mandatory standards.

Mr. WALDEN. All right. I will go to this next question. Mr. Knapp and Mr. Sherman, the proposed use of heightened receiver performance standards as a solution to interference problems has long been of interest to our subcommittee, as you all know. However, we recognize requiring more stringent standards for receivers can result in over-engineering and higher consumer prices, which I think is what you are alluding to there. So how do we balance this? Is there a way to improve receiver performance without concurrent increase in price or device size? And then I still have people asking me about, you know, spectrum is limited, are there ways to maximize use, and that leads to a discussion about FM chips in cell phones and all of that. So, Mr. Knapp, do you want to address that?

Mr. KNAPP. So the problem is a lot easier to deal with when introducing new services. In the spectrum that Roger referred to, the proceeding on Citizens Broadband Radio Service, one of the things that we are looking to a multi-stakeholder group to do is to try to address the receiver issues at the start. That is how we are trying to approach this. It is difficult to do something about receivers that are already out there, but we think——

Mr. WALDEN. I think we learned that with LightSquared and GPS and all of that, right?

Mr. KNAPP. Right. Absolutely.

Mr. WALDEN. Mr. Sherman?

Mr. SHERMAN. On the question about FM chips thatyou——

Mr. WALDEN. Right.

Mr. SHERMAN [continuing]. Asked earlier, I think Chairman Wheeler spoke about that last week at one of his hearings.

Mr. WALDEN. I heard he was on the Hill.

Mr. SHERMAN. I think he indicated that he thinks the market seems to be working, and if consumers want their FM chips, they can let their carriers know, and that the market should solve that problem. I probably don't have anything to add to that.

Mr. WALDEN. All right. Those are the only questions I have, so I will yield back the balance of my time.

And I will turn now to my friend from California, Ms. Eshoo.

Ms. ESHOO. Thank you, Mr. Chairman.

I am going to go as quickly as I can because I have a lot of questions, and I doubt I will get them all in, but the ones that I don't, we will submit them to you in writing for a response.

To Roger, I think, very well that it has been a long-held belief of mine that the upcoming incentive auction rules really have to be sufficient to prevent excessive concentration of spectrum among the Nation's largest wireless providers. Now, today, approximately 73 percent of the highly desirable spectrum below 1 gigahertz is held by two companies in the country. Is it the commission's view that

wireless carriers who lack substantial low frequency spectrum are at a competitive disadvantage?

Mr. SHERMAN. Thanks for the question, Ms. Eshoo. I think the commission has been wrestling with this issue for the last several years in various competition reports.

Ms. ESHOO. Yes. It is a sticky wicket, yes.

Mr. SHERMAN. And last year——

Ms. ESHOO. Yes.

Mr. SHERMAN [continuing]. About a year ago, when it adopted the incentive auction order, it also adopted a companion order of mobile spectrum holdings in which it recognized that a complimentary mix of spectrum, including low band spectrum, because of its special properties, was critical to competition. And it took steps in that order to recognize the unique characteristics of low band, which as you know, is better for rural coverage because it propagates over further distances——

Ms. ESHOO. Yes.

Mr. SHERMAN [continuing]. And it also is great for urban areas where it can go through buildings and walls. So the commission took action in that item to recognize the special qualities of low band, and in transactions it gives special deference to the amount of low band spectrum being transferred. And then importantly, in the incentive auction, it established what we call a market-based reserve, which is a real balancing act to try to make sure that nobody can get all of it——

Ms. ESHOO. Yes.

Mr. SHERMAN [continuing]. And make sure it is available to the smaller providers, because as you mentioned, it is disproportionately held by a couple of large carriers. Not suggesting those carriers did anything wrong, it is just a historic fact.

Ms. ESHOO. No, they didn't, but the whole issue is that we have competition in our country.

Mr. SHERMAN. Right. Right.

Ms. ESHOO. We have free markets, but competition is one of the essential ingredients in our national economy. Thank you.

Mr. Knapp, it is great to see you. I have fought very hard for unlicensed in the TV white spaces, which is why I was concerned to hear that the FCC recently received a petition to suspend the TV white spaces database. Can you explain to the committee exactly what is going on with this, and if you are aware of any instances of interference as a result of the database problems raised by the NAB?

Mr. KNAPP. Sure. These are databases that were set up through private providers where only fixed users, the people who do things like wireless broadband and provide service to businesses, can register their locations and some related information into the databases. We are aware there are some anomalies in the databases, and we have been working with the database providers and the other stakeholders to take care of any housekeeping that needs to be done, as well as continuing to work with the broadcasters to correct any problems that we find. But we have not——

Ms. ESHOO. What is the upshot of it though? Is this going to be settled, is it going to be left hanging in limbo, what is going to happen to the TV white spaces?

Mr. KNAPP. So I am confident that this can be easily corrected.

Ms. ESHOO. That is great.

Mr. KNAPP. It is things like missing phone numbers.

Ms. ESHOO. I like the word easily. OK, good. Moving on.

Both to Mr. Leibovitz and to Mr. Knapp, the prospect of 5G technology is very exciting. It is very exciting for consumers. I think for everyone on the committee, we understand what superfast speeds will bring about for people in our country, and that is the cause of excitement. It is my understanding that the commission is currently examining which bands of spectrum would best be suited for 5G services. When can consumers expect to see 5G deployed in our country?

Mr. LEIBOVITZ. Thank you, Congresswoman, and thanks for the invitation to speak today.

Ms. ESHOO. Yes.

Mr. LEIBOVITZ. 5G is a topic of growing interest in the wireless industry.

Ms. ESHOO. Yes.

Mr. LEIBOVITZ. As I think Members know here, in the U.S. our policy is not to earmark spectrum for certain technologies. We have a strong policy of technology neutrality and we intend to continue that.

Ms. ESHOO. And I think that is a sound policy.

Mr. LEIBOVITZ. At the same time, we recognize that some of the new technologies that are coming down the pipe have the potential to use very wide channels, and use spectrum that otherwise is previously thought unusable for terrestrial service. We put out the NOI last fall on spectrum frontiers which teed-up a number of different bands above 24 gigahertz for both licensed and unlicensed 5G-type service. There are also incumbents in those bands. Some of those bands that we have to think about protecting their users, satellite users and others, but the technology itself is not really ready yet, it is still in the lab. I think most people anticipate that these technologies would happen in the 2020-plus time frame. If you look at the history of wireless, the schedules sometimes tend to slip a little bit. We want America to be the first country to have it, and the place where the technology gets developed and thrives.

Ms. ESHOO. Speed it up.

Mr. LEIBOVITZ. Is that my testimony, or are you——

Ms. ESHOO. No, your testimony is over. My time is up.

Mr. WALDEN. Gentlelady's time has expired. We have to move now to the gentleman from Ohio, Mr. Latta.

Mr. LATTA. Thank you very much, Mr. Chairman. Again, gentlemen, thanks very much for being here today to testify.

Mr. Knapp, if I could just start questioning with you. The FCC has done very good work in facilitating compromise solutions so that the 5.1 gigahertz band can be shared to the benefit of Wi-Fi consumers. We now need more such compromise solutions to enable efficient use of the 5.9 gigahertz band to keep up with consumer Wi-Fi demand. Wi-Fi can share the band with future intelligent transportation systems if those systems are ever deployed. What is your timeline do you think for allowing Wi-Fi operations in this band?

Mr. KNAPP. We brought together the stakeholders for the two bands that are in play. One is a band of 120 megahertz that is used primarily by the Department of Defense. We have set up a working group with Department of Defense, NTIA, NASA, and industry stakeholders. There have been studies done on the required protections. We are not quite there on the ability of the equipment to meet what the requirements would be. So we are still working on that. Once we get to a point where we have a solution, there will need to be prototype devices from industry to be tested to make sure it works.

So it is a little bit hard to give you a firm timeline. I can tell you that we are trying to accelerate this as fast as we can.

Mr. LATTA. Let me ask, when did the working groups first form——

Mr. KNAPP. So most of the work had been going on internationally. So that has been going on actually probably a year and a half, 2 years. We reached a point where it was clear we were not going to be able to have everything necessary in place to succeed internationally, so we created the work group, I think we started late last summer, and then we picked up the pace with meetings once a month earlier this year.

Mr. LATTA. So you are meeting with the working groups about every month that you are working——

Mr. KNAPP. Every month.

Mr. LATTA. OK.

Mr. KNAPP. We created a technical subgroup that is meeting in between. So we have all the players there trying to find an answer here.

Mr. LATTA. OK. Let me ask also, given the tremendous advance in the wireless technology over the last decade, should the commission review its DSRC spectrum designation to determine in the public interest if there are other more advanced vehicle-to-vehicle safety technologies using services like the LTE advance 5G or Wi-Fi?

Mr. KNAPP. So this is the other portion of the spectrum, 75 megahertz, that we have been looking at. There, the technology is very similar to Wi-Fi, and so the IEEE, which is basically the developer of both the Wi-Fi standard and the DSRC standard, put together a tiger team to try to find a solution. They are nearing the completion of a report. There are a couple of proposals on the table to be looked at, plus we have been meeting separately with the NTIA and Department of Transportation, and one of the things I think that we have agreed we need to look at is the broader scope of communications for vehicles beyond just the DSRC.

Mr. LATTA. Thank you.

Mr. Leibovitz, if I could ask you quickly, how can we move forward and ensure shared use of the upper 5 gigahertz band, and would it be beneficial for the FCC to hold routine meetings with the committee in order to accomplish the goal?

Mr. LEIBOVITZ. So I would like to yield to Mr. Knapp on that question.

Mr. LATTA. OK, that is fine, if you want to do that. He is on the hot seat then.

Mr. KNAPP. We would be more than happy to meet if you would like and keep you apprised of the progress.

Mr. LATTA. Yes, we would appreciate that.

Mr. Sherman, as stated in your joint testimony, in 2010, the FCC analyzed spectrum demands and determined that the 300 megahertz would be needed by 2015. It is now 2015, and as you have outlined, the FCC has released 145 megahertz of spectrum for wireless broadband use.

What is the plan for our Nation to meet the skyrocketing consumer demand for wireless services?

Mr. SHERMAN. Thanks for the question, Mr. Latta. I think he announcement about the 3.5 gigahertz item that is being circulated will make progress, but I would defer to my colleague, John Leibovitz, because he has been working on this plan for several years, and he probably can give you more up-to-date information.

Mr. LATTA. Thank you.

Mr. LEIBOVITZ. Yes, so the National Broadband Plan, which of course, was authorized and directed by Congress, which came out in 2010, talked about 2 goals. One was 300 megahertz for mobile use in 5 years, and then 500 megahertz within 10 years. Towards the first goal, as you mentioned, we have succeeded in getting close to 150 megahertz out already, which if you look at the history of spectrum release, is very fast actually. The 3.5 gigahertz item, which looks to be voted in the April meeting, would add another 100 megahertz of new spectrum. And then, of course, we have the incentive auction coming in early 2016. So it might not exactly be in the 5-year time frame, but it is pretty close, that we actually have a roadmap to get to the 300 megahertz.

Beyond that, we would be looking at other bands. We have talked about some of them today for both unlicensed and licensed broadband use, which would take the Nation to 500 megahertz.

Mr. LATTA. Thank you.

Mr. Chairman, my time has expired, and I yield back.

Mr. WALDEN. And we will now turn to the gentleman from Kentucky, Mr. Yarmuth, for 5 minutes.

Mr. YARMUTH. Thank you very much, Mr. Chairman. Thanks to the witnesses for being here today.

I know there are some stakeholders who think the FCC should focus exclusively on allowing opportunities for licensed spectrum. And, Mr. Sherman, I think in your testimony you referenced the commission's commitment to both licensed and unlicensed, which I think is a good idea. Could you explain why it is important to allow the opportunities for unlicensed spectrum?

Mr. SHERMAN. Sure, I would be happy to. And I would ask if my colleagues, Julie Knapp or John Leibovitz, have anything to add, but I think the agency recognizes that in this environment, licensed spectrum and unlicensed spectrum are complementary and support each other in a lot of ways. Consumers use both and consumers want both, and there are benefits to licensed users and licensees by having unlicensed, and vice-versa. Congress recognized this in the Middle Class Tax Relief and Job Creation Act by allowing for unlicensed uses in the 600 megahertz. So I think everybody is very comfortable with the symbiotic relationship between licensed and unlicensed.

I would ask if Julie or John have anything to add.

Mr. KNAPP. No, I completely agree with what Roger said, and we are working hard on both fronts to provide spectrum and opportunities for growth of both licenses and unlicensed services.

Mr. YARMUTH. I know that unlicensed spectrum is really important for innovation and for small business and so forth. How do some of the larger wireless carriers use unlicensed?

Mr. SHERMAN. Well, I think the most obvious way is unlicensed—a lot of people in their everyday use of their smartphones will be on a licensed network, so to speak, as they travel from their office to their house. When they get into their house, a lot of times their phone will transfer onto a Wi-Fi network within the residence, and they will be using data on an unlicensed Wi-Fi network.

Mr. YARMUTH. OK.

Mr. KNAPP. Yes, I would just add that certainly, Wi-Fi gets all the attention, but in those same devices are Bluetooth to connect to your headphones and the Near Field Communications for the automatic payment that is emerging. All that is unlicensed.

Mr. YARMUTH. OK. Thank you for that.

And one of my kind of personal obsessions now is how we make policy in real time with as fast as the world is changing, and certainly, in this area, that kind of dilemma is certainly relevant. You talked about research on 5G and so forth, is there anything going on out there, research and so forth, that actually scares you, and might be so disruptive that the world as you know it, and we know it, will change?

Mr. SHERMAN. Well, if you are talking about research, I should probably defer to the engineer.

Mr. YARMUTH. For instance, I read something a few weeks ago where somebody has invented a way to transmit electricity through sound waves to appliances, and I think that, if it is scalable and if it actually works, that is a disruptive technology because then we have to say, well, should we really be investing trillions of dollars in the grid if we are going to have another way to transmit electricity. I was just curious whether in your specific area there are things that promise that kind of disruption. I mean it is fine if you say no.

Mr. LEIBOVITZ. I would just add, I would just say that I think this is a big policy challenge that we always face about how do you prepare for the next disruptive technology. I think it is instructive and reinforces the policy of technology neutrality, of flexibility, as much as possible so that we don't, as much as possible that we don't lock certain types of uses categorically into the rules, we allow lots of different applications to thrive. Our 3.5 gigahertz proceeding actually is an attempt to try to push the boundary of flexibility even farther. So in some ways it is a hybrid between licensed and unlicensed uses, and I think there is a lot more we can do looking forward to 5G and so forth.

Mr. YARMUTH. Yes. I have no other questions. I yield back, Mr. Chairman. Thank you.

Mr. WALDEN. Gentleman yields back.

And we now turn to the gentleman from New Jersey, Mr. Lance.

Mr. LANCE. Thank you very much. Good morning to you all.

The incentive auction will be the first time the FCC auctions a band plan that is not set in advance of the auction, using a new auction mechanism, ascending clock, that includes a separate round to assign licenses after the main auction is over. It will also include a spectrum reserve triggered when bidding reaches a certain level, impaired licenses and something called intra-round bidding. As I understand it, all of this new, even for those wireless carriers who have participated in traditional auctions.

To the panel in general, and perhaps to Mr. Epstein and Mr. Leibovitz, what steps will you take to help prepare carriers for bidding in this first of its kind auction? For example, will there be multiple mock auctions and seminars?

Mr. EPSTEIN. Thank you very much, Congressman. You are absolutely right. Outreach is extremely important in this auction on both sides of it; both the reverse auction side and on the forward auction side.

On the reverse auction side, broadcasters are really not used to bidding in an auction, and especially in a new auction, a voluntary auction like this. And so I can go into detail later, but we have taken many new steps to encourage and to inform broadcasters.

On the forward auction side are—wireless providers are more familiar with auctions, they are expert, but you are exactly right, there are several new features of this auction. We have been working with them on a daily and on a weekly basis to help formulate the appropriate policy, and we will have outreach and we will have mock auctions as part of the planning to go forward before the auction.

Mr. LANCE. Thank you. Would others like to address the issue?

VOICE. No, thank you.

Mr. LANCE. Thank you. The FCC's incentive auction public notice proposes to sell both impaired and unimpaired licenses. As I understand it, a license is impaired when a carrier cannot serve the entire geographic market due to interference from television broadcasts. Before bidding on a license, carriers will need to know the extent to which licenses are impaired, meaning which parts of their license area they may not serve or may be subject to interference.

What kind of information will carriers have prior to bidding regarding the geographic areas that may be impaired?

Mr. EPSTEIN. This concept of impairment, Congressman, comes from the fact that the commission made the policy decision that it really doesn't want to go to what is called the least common denominator. And, you know, if we can't get a reasonable amount of spectrum in certain congested areas, we don't want the whole country to have that limited amount of spectrum. And what that means is, as you said, you are exactly right, we may have broadcasters in that particular band which will mean that hopefully in some limited areas, bordering congested areas, that certain blocks in the auction will be subject to interference.

What we have said in the public notice that you have talked about, and what the commission will decide in the summer when it resolves that, is the amount of detail, what we have talked to the carriers about, is very specific detail so that they will know exactly what they are bidding on in the forward auction, almost on a 2 by 2 sale level.

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

Thank you very much, Mr. Chairman. I yield back the balance of my time.

Mr. WALDEN. Gentleman yields back the balance of his time.

Now turn to the gentleman from Iowa for 5 minutes.

Mr. LOEBSACK. I was not expecting to speak this soon. Thank you, Mr. Chair.

I want to be pretty brief just because some of the things that I wanted to ask about have already been covered, but I would like to just—and I may be repeating, and that is fine, but refer to the unlicensed issue, and this is to any of the witnesses. Some stakeholders argue that the FCC should focus exclusively on maximizing opportunities for licensed spectrum. I believe, however, that the FCC should pursue a balanced spectrum policy that includes more spectrum for both licensed and unlicensed. I know unlicensed spectrum has lower barriers to entry which can help startups, I think that was mentioned already, and small businesses get access to this platform for innovation. How do larger wireless carriers use unlicensed spectrum? And that is really for anybody here.

Mr. SHERMAN. Well, I think we would agree that there is a symbiotic relationship between licensed and unlicensed spectrum, and they are not mutually exclusive; you can have both. And I think the Congress has recognized that, and the FCC strives to implement a policy that recognizes that.

I mentioned earlier the example of offloading data usage onto an unlicensed network to ease capacity, and there are other new innovations that are coming down that use both licensed and unlicensed technology, and seamlessly between unlicensed and licensed services.

I don't know if John or Julie have anything to add.

Mr. KNAPP. Yes, I mentioned some before, and I think most people appreciate where we had the arguments years ago about should be one or the other or more, that the two win when there is spectrum for both.

I mentioned a couple of things before, even on the medical front, we have got glucose monitors that use unlicensed spectrum, or lightly licensed spectrum, to collect data. They feed it to the wireless device, and then the information can go back to the doctor, so there are things that are being accomplished and innovations that are occurring because we have both, and we need to continue to provide for both.

Mr. LOEBSACK. Thank you. Anyone else? OK. Just one—go ahead.

Mr. SHERMAN. I just wanted to add one other thing. We often look at it also, consumers don't really care if it is licensed or unlicensed——

Mr. LOEBSACK. Right.

Mr. SHERMAN [continuing]. They just want their device to work and the services——

Mr. LOEBSACK. Right.

Mr. SHERMAN [continuing]. To perform. So I think at the end of the day, consumers are going to want services in both the required to make things robust.

Mr. LOEBSACK. And I think that is the bottom line for us here in Congress too. We have to make sure that that access is there.

Mr. Sherman, paying for a broadband connection, including wireless broadband, can be a major challenge obviously for many of my constituents, many of the folks here on the dais today, and competition in the wireless industry is critical, no doubt, if we are going to help low-income Americans get connected. And I have a particular concern about rural America, I have to say, not just because I represent a lot of rural areas, but a lot of folks on this committee now who have that particular concern as well.

How does access to spectrum impact the level of competition in the wireless industry, because competition, hopefully, would lead to, you know, lower prices or at least more competitive prices, and providing the same kind of access as well. And so if you could speak specifically to the rural areas, I think that would be important for a lot of us here.

Mr. SHERMAN. Thanks for that question. It is also very important to the Commission on a bipartisan basis. And there are a number of policies that the Commission has adopted over time to incent rural deployment and build out. We need to do more but there are a lot of things already in place.

One thing that is critical is low band spectrum, which we talked briefly about before.

Mr. LOEBSACK. You mentioned that earlier. Can you elaborate on that a little bit?

Mr. SHERMAN. The low band spectrum, because of its propagation characteristics——

Mr. LOEBSACK. Yes.

Mr. SHERMAN [continuing]. Is really well suited for rural areas. It goes farther with less infrastructure——

Mr. LOEBSACK. Yes.

Mr. SHERMAN [continuing]. So that it costs less and can serve those areas where people live longer distances apart. Or in congested cities oftentimes you can have multiple sites attached to buildings and serve lots of densely populated areas, but rural areas you have bigger distances, so low band spectrum is particularly well suited. We want to make sure that there is lots of low band spectrum in rural areas with lots of providers having options, so rural consumers have the same benefit of competition that——

Mr. LOEBSACK. Right.

Mr. SHERMAN [continuing]. That urban consumers have. We also have incentives for building out—we have build-out requirements. There are, right now in looking at small business preferences and incentives in an open NPRM, the question of rural build-out incentives is also keyed up and the commission is very sensitive to those issues.

But I think in everything we do with competition policy, rural is a big part of it.

Mr. LOEBSACK. It is. And again, I cited a lot of examples where it is just really hard for folks in a rural area to—because there isn't that much competition. And in the end, they end up paying a lot of money and they are not getting as good a service often as is the case in urban areas. So how we can incentivize that is the question.

Mr. SHERMAN. Well, one other thing I should mention in the incentive option, one thing the commission did is it changed the standard license size to what is called a PEA——

Mr. LOEBSACK. Yes.

Mr. SHERMAN [continuing]. And it was a compromise amongst various stakeholders, but it allows smaller providers to have access to a smaller license area, which might not be as expensive as a large, nationwide or regional license——

Mr. LOEBSACK. OK.

Mr. SHERMAN [continuing]. And a lot of the small rural providers that we talked with and engaged in that proceeding were really pleased that the commission came up with a way that they can get into the auction——

Mr. LOEBSACK. Thank you.

Mr. SHERMAN [continuing]. At a reasonable basis.

Mr. LOEBSACK. Thank you.

Mr. Chair, I see my time has expired. I yield back.

Mr. WALDEN. The gentleman yields back. And I just concur with what he said about the rural areas. I have a town, Mitchell, Oregon, 130 people in 2010, now to 129. The local city had to pay to put in a payphone because there is no cell coverage, and you have a highway going by, and people have a problem, break down, knock on somebody's door. We still have these areas, like Mitchell, Oregon, that need coverage.

Ms. ESHOO. Would you just yield for a moment——

Mr. WALDEN. Yes, sure.

Ms. ESHOO [continuing]. Mr. Chairman?

Mr. WALDEN. I don't know whose time I am on.

Ms. ESHOO. Yes, I—sure. You have the best time. It is the chairman's time. But it is great spectrum, yes.

Mr. WALDEN. Yes.

Ms. ESHOO. On this issue of rural, in the last Congress, I had counted how many members of the Energy and Commerce Committee represented rural areas, and a combined from both sides of the aisle there were 18 members. So, the rural representation could take over this entire committee. I don't know how many——

Mr. WALDEN. We just haven't told you we have them.

Ms. ESHOO [continuing]. I haven't counted. I haven't counted for this Congress, but this issue is sweeping in terms of—and it has excellent representation here. So it is very important to highlight it.

Mr. WALDEN. Yes.

Ms. ESHOO. Thank you.

Mr. WALDEN. Yes, actually in this county, there is one person for every 9 miles of power line. So it is hard to find the economic—anyway.

We will go now to Mr. Guthrie, who helped lead our bipartisan task force on this issue. Thanks for your leadership, you and the rest of the Members did a terrific job. So please go ahead.

Mr. GUTHRIE. Thank you, and I appreciate that, and I think people who have heard this will get tired of hearing me say this but it is true that now that we are having these spectrum meetings, it is interesting when you get into public service, things you get involved in you never thought about. I have said I didn't walk around

Kentucky going, "send me to Washington and I will deliver you spectrum," but that is something that people want and expect, and so it is really good that we are here doing this. And so I would just kind of make a statement for a few minutes and then ask a couple of questions. But I would like to thank all you guys for testifying. It is very important. And I also want to mention my appreciation for working with Doris Matsui and for all of her efforts working with me on the spectrum issues, as co-chairs of the Congressional Spectrum Caucus, it was a bipartisan effort and worked well together. And, in fact, today we have reintroduced together the Federal Spectrum Incentives Act, a bill that would provide financial incentives to encourage government agencies to relocate from their existing spectrum bands in order to free up additional spectrum for other uses. And I look forward to working with all of you to move this forward.

As we have already discussed at length today, spectrum is an important limited resource, and by encouraging federal agencies to make additional spectrum available, we can invest in innovation and ensure spectrum is available to meet the demands of our critical emergency needs and commercial uses. And this bill received strong bipartisan support last Congress, and I look forward to working at the same again this time.

And just what my friend from Iowa, Mr. Loebsack, just said, I was going to mention that we also want to recognize the commission's work to create rules for the upcoming incentive auction that does use the partial economic areas for geographic support in Kentucky. I am one of those 18. I have a couple of good-sized cities, but I do have a lot of rural area, and it will aid my constituents and it will aid better participation in the auction, so we appreciate that.

I just have a couple of questions with the couple of minutes I have left. Mr. Epstein, for you, I have heard concerns that the $1.7 billion relocation fund for broadcaster expenses may be inadequate for the true cost of relocating stations. What is your opinion on this, and assuming that it could be inadequate, what are potential solutions?

Mr. EPSTEIN. Yes, we too, Congressman, are concerned about both the amount and the process, so we commissioned an expert report called the Widelity Report, that was out there, and they came back with the conclusion that it was challenging but feasible to do so if we were careful and took certain steps. So we have no reason to believe that the $1.75 billion which Congress set forth will be insufficient to be able to do the relocation, but we are working with the NAB, with broadcasters, with the industry generally, and we are also taking certain other steps such as building into the software ways to minimize relocation costs. And that includes, you know, minimizing the number of stations that have to change channels, or taking special account of those stations which have really expensive relocations new—and minimizing those. So we look forward to working with the industry and with everybody else, but at this point we have no reason to believe the $1.75 billion won't be sufficient.

Mr. GUTHRIE. Yes, it was just pointed out to me, I said $1.75 million. We couldn't do it for that, could we?

Mr. EPSTEIN. Billion.

Mr. GUTHRIE. If we could do it for that, we could use the money for the deficit——

Mr. EPSTEIN. Yes, sir.

Mr. GUTHRIE [continuing]. Couldn't we? And I will ask Mr. Sherman, we are talking about referring spectrum through broadcasting, trying to free the bill to free spectrum through government spectrum, but outside of the crunch for procurement of more spectrum, is FCC doing to encourage more spectrum, and—don't create spectrum, better use of spectrum, maybe sharing, efficiencies, those types of things? I have about a minute left, if you could elaborate on what you guys are doing to create more spectrum than what we have——

Mr. SHERMAN. I——

Mr. GUTHRIE [continuing]. Or more availability.

Mr. SHERMAN. I can initially respond, but then will ask John to elaborate. But I think all of the above is what the FCC is doing. Unlicensed, licensed, sharing, exclusive use, we are exploring everything because we have to be as efficient as possible. And I know John has spent a lot of time working on that.

Mr. LEIBOVITZ. Yes, I will come back to the theme of flexibility. Obviously, the unlicensed spectrum is the ultimate in flexibility, and sharing and unlicensed spectrum today is where most of the spectrum sharing happens, and people don't even realize it, Wi-Fi is intensive sharing with Bluetooth and other technologies. We have secondary market rules which allow people to transfer spectrum to others. They can essentially sell the rights so the market can work, which is really important. And then we are looking at ways to push the rules to even be more flexible. I mentioned the 3.5 gigahertz item in some ways will encourage not only sharing between commercial and federal users, but also among different types of commercial users so that, for example, maybe in the future some very large industries, including some that are well known by the committee, energy, and so forth, will have access to a 150 megahertz band that they can use for LTE to do lots of smart grid, deployments, other types of things.

Mr. GUTHRIE. Thank you. My time has expired. Thank you, Mr. Chairman.

Mr. WALDEN. Thank the gentleman for his good work and good questions.

We will now turn to the gentleman from California, Mr. McNerney, for 5 minutes.

Mr. MCNERNEY. Thank you, Mr. Chairman. And I thank the witnesses.

Mr. Leibovitz, is there any language in the current regulations that discuss how new technologies in the unlicensed spectrum should interact so that existing technologies are not unfairly hampered?

Mr. LEIBOVITZ. I think Mr. Knapp is probably the——

Mr. MCNERNEY. OK, sure.

Mr. LEIBOVITZ [continuing]. Best person to answer that.

Mr. KNAPP. So the way unlicensed works is the devices, they all have a little label on them that says they are not protected against interference, but obviously they are serving a wide public good. So

when new technologies—the beauty of it is it allows flexibility for cutting-edge technologies to be introduced, but we also try to keep an eye on that so there is not something that disrupts all of the good applications——

Mr. MCNERNEY. Yes.

Mr. KNAPP [continuing]. That are out there now.

Mr. MCNERNEY. So that was kind of vague. I mean——

Mr. KNAPP. Yes.

Mr. MCNERNEY [continuing]. When we expect some new technologies to come in, can't they be disruptive to existing technology like Wi-Fi?

Mr. KNAPP. What we try to do, because there is freedom there, is just keep an eye on what is going on. There is not a specific benchmark like in the licensed service where there is protection. And most of those technologies are built to be robust and operate in a shared environment.

Mr. MCNERNEY. Yes, I am little worried though that some of the new technology can come in and be very dominant, like the LightSquared problem.

Mr. KNAPP. Yes, I think we are always keeping an eye on what is coming in the way of new technologies and those bands, and we have been encouraging the industries, because they normally sort out the details of the sharing, to work those things out before a new technology is introduced that is disruptive.

Mr. MCNERNEY. OK. I am not sure who to ask this question, but is there any portion of the spectrum that will be reserved for small bidders in future auctions? Mr. Sherman?

Mr. SHERMAN. Well, I think the question is about the ability of small bidders in future auctions?

Mr. MCNERNEY. Right.

Mr. SHERMAN. The way the FCC has approached that in the last few years is through something called our competitive bidding rules where we have small business discounts, and that is an issue that is currently open before the commission, evaluating whether the current rules make sense or we should update them. And there are some proposals in the record to update the rules to allow small bidders to get a more realistic opportunity to bid for a spectrum, which is pretty expensive. So that is an active proceeding that the commissioners are all engaged in.

Mr. MCNERNEY. OK. I don't understand exactly what is going on with the incentive auction. What are the current holders of the 600 megahertz band and how are they going to be treated in an auction?

Mr. EPSTEIN. Well, most generally, the current holders of the 600 megahertz band are UHF broadcast television stations, and the act that Congress passed was an innovative act, a way to look at spectrum in a different way, and what we are charged with by this subcommittee and the Congress and the commission with doing is having a workable back-to-back auction, and by that I mean is a reverse auction where the broadcasters will voluntarily submit their spectrum for compensation for a share of the proceeds that we will get in the forward auction from the wireless providers. And that is the challenge that Congress has put before us.

There are other present users of the 600 megahertz band such as wireless microphones and unlicensed, and as part of our overall planning, we have to make transition and other plans for them. So it is a complex of items which is part of the Spectrum Act which we are charged with implementing.

Mr. MCNERNEY. OK, thank you.

Mr. Chairman, I yield back.

Mr. WALDEN. Gentleman yields back.

Chair now recognizes, let us see, Mr. Pompeo has left, the gentleman from Ohio, Mr. Johnson, for 5 minutes.

Mr. JOHNSON. Well, thank you very much, Mr. Chairman.

Mr. Epstein, given the success of AWS–3 and the feedback that you have received, do you feel that you have a better idea of how much spectrum might be reallocated as a result of the incentive auction?

Mr. EPSTEIN. Congressman, I think we are more optimistic, we are comfortable. The success of the AWS–3 auction may not be directly transferrable or relatable, but it is an optimistic and good thing, and we are noticing it not by any kind of administrative decision that the commission makes, but by the increased interest of the broadcasters in participating.

Mr. JOHNSON. Sure.

Mr. EPSTEIN. We have a very strong broadcaster outreach program, and we are seeing a lot of interest.

Mr. JOHNSON. Maybe this has already been asked, and if it has just say so and we will move on. How did you come up, or how are you coming up with the calculations on how much spectrum is to be auctioned?

Mr. EPSTEIN. It is really a market-based decision that Congress put before us. We don't have a predetermination. We have put out a bunch of sample band plans, but the challenge of this auction and the new innovative thing that Congress put before the commission is it is market-based. So we will know how much spectrum when the broadcasters show up.

Mr. JOHNSON. OK. Can you be specific about maybe some of the lessons learned from AWS–3 that can be applied to this upcoming incentive auction? Mr. Epstein, that is for you.

Mr. EPSTEIN. OK. One of the lessons is that, as Roger noted, we have an ongoing proceeding about entities that are considered small businesses, and we are looking at that issue. We have to see whether there are any lessons learned, and the Wireless Bureau and the commission has said that that will be resolved prior to the start of the incentive auction. We are looking at some of the financial results, and seeing whether any of the metrics we have in the incentive auction should be tweaked and modified. And I am sure there are other lessons that we will look at and we will learn from that very successful auction.

Mr. JOHNSON. So is it safe to say that your experience with AWS–3 informs the agency's actions as you move forward with this major undertaking?

Mr. EPSTEIN. Yes, sir, to some extent, yes, it does.

Mr. JOHNSON. OK. Mr. Sherman and Mr. Knapp, what industry initiatives have you encountered that effectively attempt to use

spectrum more efficiently and with less impact on adjacent users? Mr. Sherman, you can go first.

Mr. SHERMAN. I am not aware of specific industry initiatives. I know that industry is always working to be more efficient and do more with less, and are constantly changing out equipment and building more facilities to be more efficient with their spectrum use, but I would defer to Julie's expertise on how it happens technically.

Mr. JOHNSON. Mr. Knapp?

Mr. KNAPP. Thanks, Roger. As I sit here thinking about it, we are seeing innovation as a result of flexible rules on multiple fronts. On the unlicensed front, one of the things that doesn't get much attention is that there is spectrum that we have opened up, way up, at 60 gigahertz. You are going to see what I think is a result of an industry developed standard, new unlicensed equipment that will be called Wi-Gig. So it is trying to use spectrum more efficiently. In the existing unlicensed bands, all of the development in the standards that have gone from the slower standards to the more faster and improved products you are seeing on the shelf has been a progression of industry initiatives. And on the licensed front, as we are sitting here just talking about the success of an auction that has occurred, we are just moving through 4G, and we are already talking about 5G. And so I think across industry and on all fronts you are seeing lots of innovation and trying to use spectrum more efficiently for new services and products.

Mr. JOHNSON. Yes, as a 30-year IT professional myself, one of the questions that continues to go around in my head is that with current technology there is only so much spectrum. I am wondering what the industry is doing to explore the unknown. How do we create more spectrum? What is the next big advance in technology that will get us there? Anybody?

Mr. LEIBOVITZ. I will take that. So, I think there are two big trends to keep an eye on. One is the densification of the network. So using a spectrum with smaller and smaller cells, both on the license and unlicensed sides of the equation, so that the spectrum gets reused more effectively. And the other is, as Julie mentioned, looking at higher spectrum bands and using new technologies which I think mainly have to do with smart antennas to focus energy using those higher-up bands in ways that were not practical beforehand. And that we are looking at technologies that can produce 10 gigabit speeds in the lab by using very wide channels, of course, shorter distance. So there are some really exciting things happening, and that is really the subject of the 5G——

Mr. JOHNSON. We could have some great conversations over dinner but I have run out of time.

Mr. Chairman, I yield back.

Mr. WALDEN. Thank the gentleman for his questions and comments.

We will now go to the gentlelady from New York, Ms. Clarke. Thank you for being here and for your participation.

Ms. CLARKE. Thank you very much, Mr. Chairman. And I thank the ranking member and our panelists as well.

Mr. Sherman, I wanted to ask, what is the plan to ensure that broadcasters adequately participate in the auction, and what incen-

tives are the FCC offering to increase their engagement? Much of the incentive auction's success is based on broadcaster participation so that they will in turn provide the demand for the auction's next stage.

Can you give us some insights there?

Mr. SHERMAN. Sure, I can tell you that we do have a plan, and we are in the process of implementing it. And Gary Epstein is leading that effort and I think he can walk you through a number of the steps the commission is taking.

Mr. EPSTEIN. Yes. Thank you very much, Congresswoman. Your point is absolutely the most crucial one. We won't have an auction unless we have broadcaster participation. And so we have done what we usually do which is meet with broadcasters and have Webinars and seminars, but we have taken two special extra steps, and we intend to take more.

One of those steps is, in response to requests from broadcasters, we have released 2 broadcaster information packages, made them available to every licensee in the country, and they contain both business information and estimated pricing information. And that, combined with the AWS–3 auction figures, has piqued a lot of interest by broadcasters.

And the second major effort we have undertaken is we are going around the country on broadcaster information trips, OK, and visiting, both in general sessions and in private sessions, we are getting out of Washington, we are visiting 50 cities, we are going around the country and meeting with broadcasters in order to inform them so that they can make decisions on whether to participate.

Ms. CLARKE. Have you begun receiving any feedback as of yet? I am concerned about averting any unintended consequences to smaller, perhaps rural broadcasters, and maintaining an inclusive and diverse broadcast ownership and offerings that perhaps repackaging and channel shifting that is being proposed may inadvertently create some consternation out there. What kind of feedback are you getting?

Mr. EPSTEIN. Congresswoman, an excellent point. We have gotten a lot of positive feedback from a lot of stations who are interested in participating in the auction and in allowing the commission to reclaim their spectrum, and that is from small broadcasters and large broadcasters alike, but with some other broadcasters like the broadcasters you are talking about, there are other options to participate in the auction, such as channel sharing and going from U to V, which Congress has as an option in the statute. So what we have done is we have emphasized those alternatives with these other broadcasters. They can get proceeds from the auction, but continue the broadcast even after the action is over.

Ms. CLARKE. That is good news. Can you share with us how the FCC proposes to engage in repacking and channel shifting, and ensure that consumers are adequately informed about the impacts?

Mr. EPSTEIN. We have learned lessons from the digital transition, and if you look at the report and order that the commission adopted in May, there is a whole section on consumer outreach. And so we have delegated to part of the commission, the CGB part, the consumer governmental part, with the responsibility to come up

with an overall comprehensive plan to engage with consumers and make sure that people do not lose service.

Ms. CLARKE. Well, on that very point of consumer outreach, that will be necessary to minimize confusion and disruption of the stations after they are repacked. Is there any discussion currently at the FCC about how to work that out logistically?

Mr. EPSTEIN. Yes, there is. OK, there is planning going on. There is a specific obligation in the commission's report and order for—at the appropriate time for the commission to come up with a specific plan. And we are at the beginning stages of that because the auction is a year away. I don't want to go beyond that, but it is an important part of our outreach efforts.

Ms. CLARKE. Very well. Thank you very much, Mr. Chairman, and I yield back.

Mr. WALDEN. Good questions. I thank the gentlelady.

We will now go to the gentleman from Missouri, Mr. Long, for 5 minutes.

Mr. LONG. Thank you, Mr. Chairman. I thank you all for being here today.

Mr. Knapp, I have a story here that appeared in the publication Re/code on March the 17th, and I would like to have that added to the record. And——

Mr. WALDEN. Without objection.

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

Mr. LONG. Thank you, Mr. Chairman. The first couple of paragraphs, he is among dozens—let us see, John Doe of 123 Jump Street has some explaining to do. He is among dozens of questionable characters in a Federal Government database that is supposed to keep unlicensed Wi-Fi devices from knocking broadcast TV signals off the air. There are actually four John Does in the system, along with six entries for Sue Q. Public of Any Town, USA, and two from John Q. Public of the ever-popular location None/None. Even a quick look at the database suggests there is something not quite right. Is there really a company called Acme at 1600 Amphitheater Parkway, an address more generally associated with Google, and does Lin Su really own 59 unregistered—or, excuse me, registered, unlicensed Wi-Fi devices, or have actual owners simply copied that name from the installer's guide of the devices that they bought? Is it possible to go to the white space databases and enter fake addresses?

Mr. KNAPP. So I think what we did is we went through the databases. We did find the four John Does. It appears to us that these may have been for testing purposes when this was rolled out. There are some things, these databases are cutting-edge, and I think from anything, there are some things that you can improve upon, and one of them maybe is the authentication of the individuals that we can work on with the database providers. But out of roughly 550 records, we only found four John Does and one John Q. Public, and they are easily taken out.

Mr. LONG. OK, so Lin Su——

Mr. KNAPP. Lin Su is with Acme Company.

Mr. LONG. Or Sun—excuse me, Lin Sun.

Mr. KNAPP. Yes, he is an employee of a company that makes these products, and so it would not be unreasonable for them to be testing them at their location.

Mr. LONG. What is the effect of entering a fake address?

Mr. KNAPP. So bear in mind that the way the database works, the device can't operate because it has to get the available channels from the database. The database was a tool to just help us locate a source of interference if it occurred. Even if the information wasn't right, we could still find the interference and take enforcement action if we needed to.

Mr. LONG. Well, is requiring GPSs for fixed white space devices, would that fix it?

Mr. KNAPP. So the things that were referred to were things like a phone number wasn't right, or there was an incomplete e-mail address. So these weren't incorrect locations, so just having the GPS location alone is not going to address some of these other issues. But we are working with the database providers to make sure that you can't enter in something that is just erroneous.

Mr. WALDEN. Would the gentleman yield?

Mr. LONG. Yes.

Mr. WALDEN. How will closing so many field offices help deal with interference issues in a timely manner?

Mr. KNAPP. So the restructuring of the field offices that is being contemplated, at the same time we would be looking at alternative ways that we could more effectively get out and locate and diagnose the interference cases. There are tools that are available now to actually have sensors in place and do the outreach, and I think we are also looking at things like tiger teams that we could send out when we had an interference case. So we are mindful of that in that exercise as well. And, of course, it is pending with the commissioners.

Mr. WALDEN. Thank you. I yield back to Mr. Long.

Mr. LONG. And I yield back also, Mr. Chairman.

Mr. WALDEN. Gentleman yields back.

We will now go to Mr. Rush, it appears is next. We are glad you are here and——

Mr. RUSH. Good morning.

Mr. WALDEN [continuing]. Please go ahead.

Mr. RUSH. Thank you, Mr. Chairman. And I certainly want to welcome the witnesses.

I must be quite frank, I sit here as an angry, black American male. We are all aware of the scarcity of spectrum, and we just witnessed a successful AWS–3 auction where again the millionaires were able to buy up valuable so-called beachfront property. And soon we will be witnessing another auction, the broadcast incentive auction where it seems as though, unless something drastically changes, we will have a—the same outcome.

I have been on this committee for 22 years, and 20 years I have sat on this subcommittee. I was a part of the subcommittee that worked on legislation to grant the FCC its competitive bidding authority back in 1993. I was here, I was present, sitting in these very same seats. And all the major auctions, going all the way back to the C block auction, H block auction, the AWS–3, and seem to

be ill-designed to enable small and minority businesses to bid and to win.

The question still looms large for the FCC. In light of the abysmal failures of these last three auctions, to be fair and equitable to minority and small businesses, what can you say to us this very morning that can assure us that this next auction will give us an opportunity for small and minority bidders to fair better and to have different and better outcomes? Again, in my opinion, where some might say these auctions have been successful, success is in the eye of the beholder, and from my vantage point, my eyes, my constituents, they are an abysmal failure. Reassure me please if you can.

Mr. Chairman, with that, I think that we ought to really have some hearing in the future on the status of these auctions as it relates to the minority and small business bidding process isn't fair and equitable, some time in the near future.

With that, I will ask—Mr. Epstein, maybe you can answer the question that I have.

Mr. SHERMAN. Thanks for that question, Mr. Rush. This is a priority for the Commission, and last year the Commission issued a Notice of Proposed Rulemaking to focus on the issue of empowering small businesses, including businesses owned by women and minority groups. The Notice of Proposed Rulemaking recognizes that the wireless industry has changed dramatically since the rules were last updated, and that our current rules may not work anymore to get people into the business. And so what it proposed, through a number of specific proposals, was allowing more flexibility and maybe looking at updating business models to reflect the reality that 95 percent of wireless consumers are served by four carriers. In such a capital-intensive business, how do you allow small entities to get into the market, and how do you allow them to acquire spectrum? That has been teed-up.

In the interim, we had AWS–3 which also raised a number of questions about the designated entity program and bidding practices. So just this week, Chairman Wheeler circulated with the other commissioners a public notice asking a number of additional questions about this issue; how do we promote and empower small businesses while preserving the integrity of the auction process. And it is open, and once that is voted on by the commissioners, there will be an additional comment period. And it is something that we are going to wrap up before the incentive auctions start. So there are proposals on the table. There is a vigorous debate in the record by various stakeholders.

One of the things that was in the Notice of Proposed Rulemaking was a proposal that has been put forth by a number of groups that have been active in the designated entity space. I think it was MMTC that had a proposal about the attributable material relationship rule, and one of the proposals was to change the way we apply that so that a small company that might have a business relationship with a big company isn't automatically excluded.

These are complicated issues, and we need to make sure we do them in a way that doesn't allow for gaming of the system, but all of these topics are on the table.

Mr. WALDEN. Gentleman's time has expired.

Mr. RUSH. Thank you, Mr. Chairman.

Mr. WALDEN. Thank the gentleman.

We will go now to the gentleman from North Dakota, Mr. Cramer.

Mr. CRAMER. Thank you, Mr. Chairman. I thank the witnesses.

I am just going to throw it out for discussion because I have to admit, you might have to bring it down a level or two for me to really grasp this. But I come from one of these rural places, yes. You can make it 19 now if you—I don't know we lost, but anyway it is—North Dakota is very rural, right, and so my small market, broadcasters have expressed, of course, this concern about the repacking cost. And we have talked about whether $1.7 billion is inadequate and whether you need more, and where it would come from, and that has been fascinating, but my question more is a step even further back, and that is if a small market TV broadcaster, for example, in Fargo declines to participate, can we be assured that they then won't have to also then participate later in the repacking? In other words, hear conflicting messages about that, so somebody really smart explain to me how either we avoid that, or secondly, what do we do to mitigate it?

Mr. EPSTEIN. Well, I won't claim to be real smart, I will defer to Julie on that.

Mr. CRAMER. I have set the bar very low, just so you know.

Mr. EPSTEIN. But let me start and Julie can pick up.

Mr. CRAMER. Sure.

Mr. EPSTEIN. What we are seeking to do in this auction is to have a near nationwide contiguous band of spectrum, and that is the key, so that when you have your cellphone and you move from Fargo to New York, to New Jersey, or anywhere else, it works.

Mr. CRAMER. Yes.

Mr. EPSTEIN. And so two things have to happen. One, we have to get volunteers, stations to participate in the auction, especially in crowded areas, but in some smaller markets too. And then everywhere, if we cleared down from channel 51, and a station even in a rural market is at channel 47 or channel 46, we won't get that contiguous band of spectrum unless we repack them——

Mr. CRAMER. Yes.

Mr. EPSTEIN [continuing]. Even though we may have room to do that. And what Congress did—what you did in the act is you said, yes, we have the authority to repack it, but we have to repay your expenses.

Mr. CRAMER. Yes.

Mr. EPSTEIN. And that is just from an overview standpoint why somebody in a smaller market would have to move. So we have this contiguous band of spectrum for the wireless providers in the forward auction.

Mr. CRAMER. Thank you for that very nice clarification.

Then that does bring up the rest of the questions that we have already tried to sort of ask, and that is how much is enough, and if it is not enough, how do we do it differently, but I suspect we are going to continue discover that through this process. But thank you for that 101 for the guy from North Dakota.

With that, I yield back, Mr. Chairman.

Mr. WALDEN. Thank the gentleman.

And we will now go to Mr. Butterfield for questions.

Mr. BUTTERFIELD. Thank you very much, Mr. Chairman. Looks like we are getting very close to votes and so I am going to forego some of the formalities that I normally would go through in the early part of my remarks, and get right to the meat of the point that I want to make.

Let me just begin by associating myself with the remarks made by my good friend, Mr. Rush, from Illinois. I agree with him completely. I am the chairman of the Congressional Black Caucus, and the CBC takes the position that Mr. Rush just articulated a few moments ago.

One of our top priorities in the CBC is to increase representation of African-Americans at all levels of corporate America. That includes the Boards of Directors, that includes executive leadership, the workforce, vendors, contractors, and even community reimbursement. And so the CBC will not only be focused on increasing diversity in general, but we are focused on African-American representation in particular. So this is not only about spectrum, this is about corporate diversity as well.

And so it is in this context that I want to ask, I guess Mr. Epstein, the following question about diversity and specifically how it relates to the companies who come before the commission for a variety of matters, including those who seek to acquire spectrum. As chair of the CBC, and as a member of this committee now for 22 years, one of my priorities is to encourage companies to have both leadership and rank and file employees who better represent the makeup of their communities and their customers and our country. However, when you look closer at many of the entities that come before your commission, they do not have a very good diversity profile. That is just a fact, they do not have a good diversity profile in either the internal or external operations. And so I am wondering, how do you and other members of the panel today think we can better address the lack of diversity in the companies that are competing for spectrum?

Mr. EPSTEIN. OK. Well, let me start. My specialty and what I do 24/7 is the incentive auction, and to focus on your questions and Congressman Rush's questions, it is the proceeding—the general proceeding that Roger Sherman talked about, OK, where we are looking very seriously about generally, in auctions throughout the commission, and specifically, with respect to the incentive auction, how do we do exactly what you are talking about. How do we increase diversity? We have done things like have smaller geographic areas, and we are looking at the bidding issues which Roger talked about, but specifically with the incentive auction, those are some of the initiatives that we are undertaking.

Mr. BUTTERFIELD. But you do acknowledge the lack of diversity.

Mr. EPSTEIN. We acknowledge the need for small business and diversity. This Commission does, yes.

Mr. BUTTERFIELD. Yes, all right. All right.

In the interest of time, Mr. Chairman, I am going to ask unanimous consent to enter into the record a letter regarding the FCC's designated entity program, and the letter was written to you and Ranking Member Eshoo——

Mr. WALDEN. Yes.

Mr. BUTTERFIELD [continuing]. On March 25 by the National Association of Black Owned Broadcasters. I ask to put it in the record.

Mr. WALDEN. I have read the letter. Without objection, it will be entered into the record, sir.

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

Mr. BUTTERFIELD. Thank you. I yield back.

Mr. WALDEN. And I appreciate the gentleman.

And will now move on to Mr. Shimkus of the great State of Illinois.

Mr. SHIMKUS. Yes, thank you, Mr. Chairman. It is great to have you all here, and we are getting close to getting out of town. So, Roger, welcome back. It is good to see you.

And the points raised by my two colleagues, Mr. Butterfield and Mr. Rush, just brings me to, a lot of us extolled the success of the AS–3 auction, everybody being pleased. Obviously, we find out not everyone is pleased, and that there are bidding rules in this process. Has the FCC done an after-action review on to do a lessons learned, and can you say everyone is pleased? You know, in an auction, I think there are disappointed people, right, if they don't win the auction, but are there—does anyone storm away angry, that they felt that the bidding rules may not have been adequately exercised?

Mr. SHERMAN. Well, the way the process works, after the auction we always do an after-auction review of things, and in fact, as the auction was ongoing I mentioned this proceeding that we were asking for comments on updating the competitive bidding rules. We were watching the auction develop, and we thought there might be some lessons learned, so we, on our own motion, delayed the comment period 3 times to make sure people had a chance to bring in lessons that is all public from bidding activity, that they may want to enter into the record. And I mentioned Chairman Wheeler circulated something earlier this week asking additional questions about that specific issue. There are 2 tracks. That is 1 track, the sort of forward-looking rulemaking, and what changes or tweaks we might consider in response to what happened in the auction to empower small business and make sure nobody is getting an unfair advantage through the rules through technicalities. I am not saying that occurred, but those were the questions.

The other track is to evaluate the applications from the winning bidders. And a number of the winning bidders applied for a designated entity credit, and the Commission has a longstanding process whereby we evaluate those requests. We put them out basically for comment and for people who might object to weigh-in and file a petition to deny. We haven't—I am not aware of any petitions to deny being filed yet, although we have not completed our review where we put them out for public comment. We are doing that, but it is a very time-intensive process because these applications are complicated, and we want to make sure we are being very thorough.

Mr. SHIMKUS. Yes, because this broad—the whole—now moving into the broadcast debate with the next round, it is kind of different. It is almost regional, the old UHF, now the 600 megahertz, and then how do you cobble that together, which raises issues of

package bidding and other ways to try to put together something that makes sense to different entities. So I think an after action review on the success or that issue will help us as we move forward. I just find it very interesting. A lot of new members on the committee. I have always said, you all have heard me say, the great thing about this subcommittee is really technology moves faster than we can regulate. And then you all have to be involved in trying to mitigate the interference issues or some of the complexities, but this is probably the greatest example of free and open market competition, and the ability for great minds to do great things, and—that I have experienced I think in any other area. So I enjoyed that.

And final question, really directed to Roger again, is these, the fragmented management process between the FCC and the NTIA on spectrum. Is there any talk about how we get that all cobbled together where, when we have hearings, we are dealing with 1 and maybe not 2, and the different processes?

Mr. SHERMAN. Well, I will make an observation, and then I would defer to John and Julie who spend a lot of time with the agencies and NTIA, but in my experience since I have been at the Commission, the relationship with NTIA is great, and there is a lot of collaboration and coordination going on, everybody moving towards the same goal. I know John and Juli have been engaged for years, and everybody sort of has their responsibilities under the respective statutes, but I think it is all working towards getting more spectrum out there.

I don't know if John or Julie have anything to add to that.

Mr. KNAPP. No, just ditto to everything that Roger said. We know that our responsibilities overlap, and that we have to work together for the good of the country, and that is what we try to do.

Mr. SHIMKUS. There is no—or issues that—duplication that—in this process?

Mr. KNAPP. I don't think so much duplication because they've got different systems that they are overseeing, military, justice, et cetera. What we try to do through a lot of good work, both formally and informally, is break down the barriers.

Mr. WALDEN. All right.

Mr. SHIMKUS. Great.

Mr. WALDEN. Gentleman's time has expired.

Apparently, we have had votes on, I am sorry, I didn't realize we were to that point. There are 6 minutes left, but I will be happy to go to——

Mr. COLLINS. Yes.

Mr. WALDEN [continuing]. Mr. Collins.

Mr. COLLINS. Mr. Chairman, I appreciate that. Mine may only take 30 seconds. It is for Mr. Epstein.

I represent Buffalo and then the Rochester area. Our broadcasters, many of the Canadians, are getting our signal. And in spending 24/7 on the spectrum, I hope that includes some time on border coordination. And I just wondered where do we stand on border coordination specifically between the U.S. and Canada, and when do we anticipate an agreement being reached?

Mr. EPSTEIN. We have been working on this for a couple of years. It is really important that we do this. We have been working with

Industry Canada, we have had meetings almost weekly with them. We were most pleased by about 4 months ago they put out a band plan which was analogous to our band plan, and we are hopefully getting reasonably close. They have just got comments in what they call a consultation, which is like our rulemaking, where it is to our mutual benefit to reach agreement——

Ms. ESHOO. Yes.

Mr. EPSTEIN [continuing]. Because we will get spectrum on both sides of the border and coordination. And we are hoping well before the auction, within a matter of months, we will be able to reach—that is our goal.

Ms. ESHOO. Yes.

Mr. EPSTEIN. Can't promise it will happen because it is a sovereign country——

Ms. ESHOO. Right.

Mr. EPSTEIN [continuing]. But that is our goal.

Ms. ESHOO. Would the gentleman yield just for a moment?

Mr. COLLINS. Yes, certainly.

Ms. ESHOO. One of the questions that I didn't get to ask was what you just raised, and it was an issue that Mr. Dingell raised over and over again. So we will get a written response and I will share that with you——

Mr. COLLINS. Yes, we appreciate that.

Ms. ESHOO [continuing]. When we get it. Thank you.

Mr. COLLINS. I mean as bad as the Buffalo Bills are, the Canadians still watch our team play.

Mr. WALDEN. Wow. You may want to revise and extend those remarks.

We will go now to Mrs. Ellmers for final questions.

Mrs. ELLMERS. Thank you, Mr. Chairman. Thank you to our panel. And I apologize for coming in late, so if the questions I ask have already been answered, if you can just indulge me.

Mr. Knapp, the commission looks at the 3.5 gigahertz and the 600 megahertz unlicensed bands. Will the commission be placing any new restrictions on unlicensed users?

Mr. KNAPP. I don't think so in terms of placing new restrictions, it is just we will develop a framework that will include the technical standards to make sure that everything works together without interfering.

Mrs. ELLMERS. OK. Thank you, Mr. Knapp.

Mr. Leibovitz, the subcommittee has heard time and time again about the value of innovation and experimentation within the unlicensed technologies. We have all been concerned that the mantra innovation without permission be applied to improve all aspects of connectivity. Is the commission planning to prohibit the use of LTE-U in any unlicensed bands?

Mr. LEIBOVITZ. The answer is no at this time. We are working with the parties and trying to ensure that people talk to each other so that the technical——

Ms. ELLMERS. Yes.

Mr. LEIBOVITZ [continuing]. Issues don't become something that needs any involvement from the Government.

Mrs. ELLMERS. Great. Well, thank you. My work is done, and I yield back the remainder of my time.

Mr. WALDEN. Appreciate that.

I recognize the gentlelady from California.

Ms. ESHOO. Thank you, Mr. Chairman. Thank you to the panel. Mr. Chairman, I would like unanimous consent to place this in the record. I asked the question about competition, and these are the results of who did what AWS–3 auction. Thank you.

Mr. WALDEN. Without objection.

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

Mr. WALDEN. That will be entered into the record.

And with that, I thank the witnesses for being here today, and the good work you do at the FCC. We appreciate it.

And we are adjourned.

[Whereupon, at 11:54 a.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

PREPARED STATEMENT OF HON. FRED UPTON

Today the future of spectrum use and availability takes center stage—an issue that this subcommittee has rightly spent significant time considering. With the rise of mobile devices and the Internet of Things, American consumers' appetite for spectrum will only continue to grow. Some of the most important and successful work this committee has accomplished has centered on spectrum. We have examined many ways to make spectrum available and ensure that both federal users and commercial licensees are using it efficiently and effectively.

We've passed legislation that gives the FCC the tools it needs to conduct auctions and help meet the growing demand for low-band spectrum. We've also asked the FCC to report back on opportunities and challenges in other bands, particularly the 5 gigahertz (GHz) band. We look forward to hearing how work has progressed on finding solutions that allow for the expansion of unlicensed use in that band, without harming the blossoming Intelligent Transportation System technologies that will make driving safer.

The incentive auction legislation was achieved through bipartisan collaboration with the input of industry, engineers, and so many others. It's been more than three years since the Middle Class Tax Relief and Job Creation Act was passed and the FCC has made good progress in the implementation of the legislation. This first of its kind auction will undoubtedly spur innovation, create jobs, and enable new technologies. If the recent AWS–3 auction is any indication of the level of success we'll see in the incentive auction—this will surely be a job well done. But there are still hurdles to be addressed before the auction can move forward, including border coordination. Representing a state that borders Canada, I am concerned that a failure to adequately solve cross-border coordination issues will mean less spectrum cleared for auction and reallocated for commercial use, and potentially impair the ability of folks in Michigan to receive broadcast signals over-the-air. As we ask broadcasters to make major decisions about the future of their stations, we need to be sure that we have answers for their valid questions about interference, signal protection, and their potential new station location.

Spectrum is a vital resource for the future of our economy and sound policy will ensure the continued leadership of the United States in the mobile space. As the committee responsible for this sector, it's essential that we continue to keep an eye on the status of the spectrum in the pipeline and what is being done to make it available for consumer use. If we do our jobs right, the future for consumers, jobs, and our economy is very bright.

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FCC's Hot Mess of a Database May Not Bode Well for Future Airwaves Sharing

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-
- By Amy Schatz (http://recode.net/author/amy-schatz/) Mar 17, 2015
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- EMAIL (mailto:amy.schatz@recode.net)
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John Doe of 123 Jump Street has some explaining to do.

He's among dozens of questionable characters in a federal government database that's supposed to keep unlicensed Wi-Fi devices from knocking broadcast TV signals off the air. There are actually four John Does in the system, along with six entries for "Sue Q. Public" of "Anytown USA" and two from "John Q. Public" of the ever-popular location "None/None."

Even a quick look at the database suggests there's something not quite right. Is there really a company called "ACME" at 1600 Amphitheatre Parkway (an address more generally associated with Google (https://www.google.com/maps/place/1600+Amphitheatre+Pkwy,+Mountain+View,+CA+94043/@37.4224764 And does Lin Sun really own 59 registered unlicensed Wi-Fi devices or have the actual owners simply copied that name from the installer's guide (http://www.adaptrum.com/acrs2launch/content/acrs20_professional_installer_02062014.pdf) of the devices they bought?

The reason these database entries could be troublesome is that they're part of an initiative by the government to allow use of unlicensed airwaves — so-called "white spaces," or the empty bands between TV channels — and such bogus entries could make that unworkable down the road.

As consumer demand for mobile data grows, federal officials and the wireless industry are increasingly looking at how to share more airwaves. The government currently allows use of these white spaces, but it also wants to keep some protections in place so new wireless devices don't interfere with existing services like TV broadcasts.

In order to do so, the FCC is monitoring a database system set up by third parties including Google that is supposed to show anyone operating an unlicensed white-spaces device who is using nearby channels.

The problem, however, is the database is self-reported, hence the bogus entries. The flaws so far are fairly minor — particularly since there are only about 600 or so actual devices in use right now — but if it isn't fixed, the system could become unworkable down the road when more people try to make use of the unlicensed airwaves.

Current mobile phones use airwaves set aside by wireless carriers, such as Verizon or AT&T. TV signals also broadcast over a specific bandwidth reserved for local station owners. Regular Wi-Fi or Bluetooth technologies use signals that are too weak to disrupt anything outside of a small radius around a home or coffee shop.

Devices using white spaces could, however, be more disruptive because they could be used to create "super Wi-Fi" networks over larger areas, such as a public park or a university campus. If the signals were strong enough they could knock out a local TV station's broadcast or cut into a wireless mic during a stage performance. The database is supposed to help keep that from happening.

But the entries suggest users aren't exactly following the rules. And that could be a big problem since it would be easy to game the system, as it's set up right now.

Since the FCC doesn't require fixed devices using those airwaves to include GPS chips, which automatically report their location, it's relying on people to self-report.

"The cornerstone of making all this possible is the database that tells us where the white-spaces users are versus licensees," said Robert McDowell, a former Republican FCC commissioner who is now a partner at Wiley Rein, a

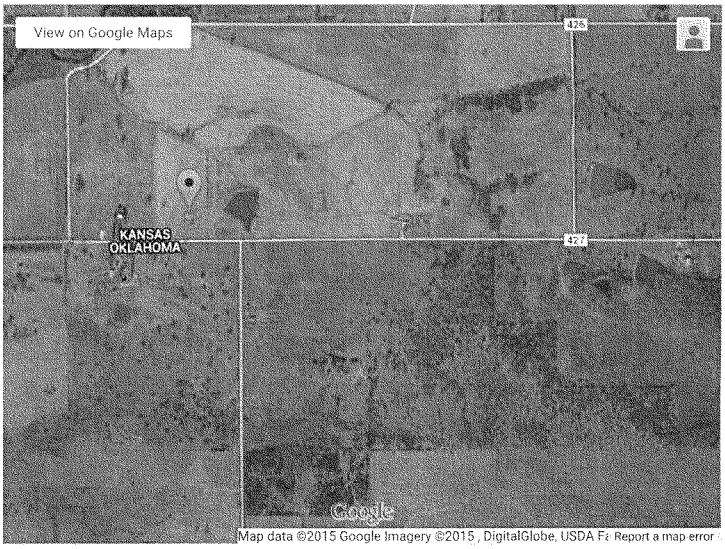
D.C.-based law firm that has a large telecom practice. "Unfortunately, the FCC has not delivered an effective database, and this could delay the rollout of a whole new part of our economy."

Google, Microsoft and other tech companies have been fighting for years to use those empty airwaves for unlicensed wireless devices. Ideally, those gadgets would use technology to sniff out which local airwaves are empty and avoid channels being used by TV stations or wireless microphone users, like churches, theaters or sports venues.

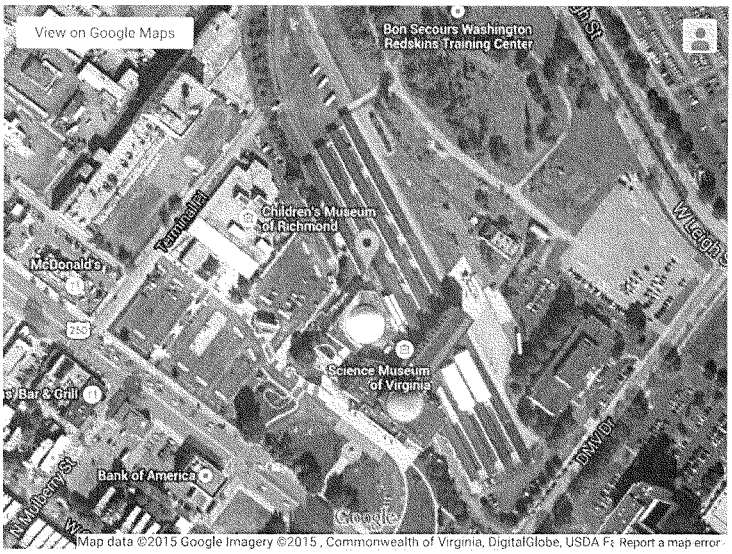
A handful of companies currently operate those databases (http://www.fcc.gov/encyclopedia/white-space-database-administration) and they're supposed to be updated nearly instantaneously, but an examination of the two publicly available databases — maintained by Google and Telcordia Technologies — found differences. Google's database had 561 entries for fixed-location white-spaces devices on Monday morning, while Telecordia's had 628.

But it doesn't look as though anyone is keeping tabs on the accuracy of what's actually being added to the database.

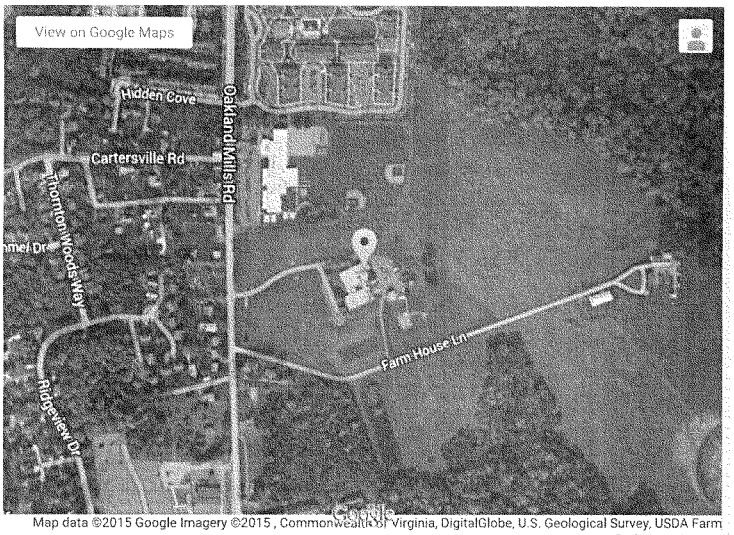
One of the ACME entries, which lists Google's address and a fictional phone number, is for a device that appears to be located in the middle of a Kansas prairie.



John Doe of 123 Jump Street in Richmond, Va., appears to be located near the Science Museum of Virginia.



Some of the bogus entries are likely just test devices that manufacturers are using. Five listings in the system are dubbed simply "C," which appears to be short for Carlson Wireless, an Arcata, Calif.-based company that has been installing white-spaces networks. Even FCC engineers appear to be getting in the act. One of the 59 devices in the system registered to Lin Sun appears to be located at an FCC test facility in Maryland.



"We are aware of some inconsistencies in the database and are working with the database administrators to correct these issues," an FCC official said in an emailed statement. "A plan is in place to ensure that any erroneous data gets corrected as we move through next year's auction."

One reason why FCC engineers haven't exactly been focusing on the system is that it's not really being used by consumers yet, just companies or organizations that are installing large Wi-Fi networks.

That could change in a few years, however, when more devices are expected to be in use. Some companies are waiting while the FCC finalizes the rules when it auctions off more TV station airwaves next year to wireless carriers. Some of those airwaves are expected to be left open for unlicensed use.

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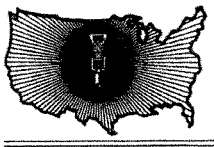

NATIONAL ASSOCIATION OF BLACK OWNED BROADCASTERS

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March 25, 2015

The Honorable Greg Walden
Chairman
United States Subcommittee on Communications and Technology
2185 Rayburn House Office Building
Washington, D.C. 20510

The Honorable Anna Eshoo
Ranking Member
United States Subcommittee on Communications and Technology
241 Cannon House Office Building
Washington, D.C. 20510

Dear Chairman Walden and Ranking Member Eshoo:

In anticipation of your upcoming hearing entitled *Next Steps for Spectrum Policy,* we write to raise two important points:

1. The FCC Designated Entity program is an important tool for promoting diversity of ownership of the nation's airwaves and must be preserved.

2. The FCC should be encouraged to review all transactions in its auctions to make certain that they are in compliance with the Designated Entity rules, including the Dish Network transactions.

Since the Supreme Court's 1995 decision in the *Adarand* case, the FCC has had no program specifically tailored to promote minority ownership. For the past 20 years, the FCC has discussed the need to promote minority ownership, but has failed to create any program for that specific purpose. The FCC's Designated Entity program is designed to promote small business involvement in spectrum policy as a substitute for a minority ownership policy, on the theory that most minority owned businesses are small businesses. While this assumption is true, minority owned businesses are a mere fraction of the total number of small businesses. As a result, most DE

companies are not minority owned, and the DE program therefore has only a modest impact in promoting minority ownership of spectrum.

Set against this background, NABOB was pleased to see a minority owned company, SNR Wireless, participate in the recent AWS-3 auction and win a substantial number of licenses. However, we understand why Dish Network's 85% equity interest in that company might generate concern.

Dish Network appears to have no record of diversity. There are no African-Americans who serve on the Board of Directors or as Executives or Senior Leaders. In addition, absent from Dish's website, unlike its competitors such as Comcast and DirecTV, is any commitment to employee or supplier diversity. Likewise, its channel line-up limits access to programming that appeals to an African-American audience. Channels like BET, OWN and UP are not available on Dish's most widely-penetrated tier. And, TV One, which is African American controlled, and which has been serving the African-American viewer since 2004, has never been carried on Dish.

We find it very troubling that a company of the size and scope of Dish will be leveraging minority ownership to receive a discount on an asset owned by the American public while maintaining a poor record of support for opportunities for minorities. The underlying issue, the lack of business that major corporations are conducting with minority-owned businesses, is ripe for discussion. NABOB has asked the FCC, as it reviews mergers, license applications and other major transactions, to require the companies it regulates to provide written commitments about the specific programs and policies they will put in place to promote diversity. In particular, we have asked the FCC to require those companies to provide information on the minority owned businesses with which they do business. Dish's winning bid in the AWS-3 auction provides an opportunity to ask Dish what it will do in the future to embrace and improve diversity within its own operations.

As we stated above, we wish for the Committee to understand that the DE program is very valuable and important. The DE program may be the only program the FCC has in place that has a chance of increasing minority ownership of the nation's spectrum resources. If a review of the Dish Network involvement in the AWS-3 auction raises any issues requiring improvement of the DE program, the program should be improved but not eliminated.

Thank you for the opportunity to share our views with you in advance of Thursday's hearing. If you have any questions on this matter, please feel free to contact me.

Sincerely,

James L. Winston
President

FierceWireless

AWS-3 AUCTION RESULTS: AT&T leads with $18.2B, Verizon at $10.4B, Dish at $10B and T-Mobile at $1.8B

January 30, 2015 | By Phil Goldstein

	Bidder	Bidding name	Total amount spent	Price per MHz-POP
1	**AT&T**	AT&T Wireless Services 3 LLC	$18,189,285,000	$2.88
2	**Verizon**	Cellco Partnership d/b/a Verizon	$10,430,017,000	$2.92
3	**Dish**	Northstar Wireless and SNR Wireless LicenseCo	$9,995,567,775 ($13,327,423,700 in gross bids plus a 25 percent discount for being designated entities)	$1.68
4	**T-Mobile**	T-Mobile License LLC	$1,774,023,000	$1.63
5	**U.S. Cellular**	Advantage Spectrum, L.P.	$338,304,000	-
6	**John A. Dooley and TerreStar and Jarvinian**	2014 AWS Spectrum Bidco	$291,810,000	-
7	**America Movil and Carlos Slim Family**	Puerto Rico Telephone Company	$170,901,300	-
8	**William M. Mounger II**	Tristar License Group	$47,106,000	-
9	**Francis J. DiRico**	NE Colorado Cellular	$30,718,000	-
10	**Joseph Sofio**	Sofio, Joseph A	$13,483,500	-

Source: BTIG, Hogan Lovells and FCC filings

The FCC has revealed the identities of the winning bidders in the AWS-3 spectrum, and AT&T (NYSE: T) was the biggest bidder, with close to $18.2 billion in provisionally winning bids, roughly in line with analysts' expectations. Verizon Wireless (NYSE: VZ) wound up bidding $10.43 billion, less than many analysts had expected (most had expected Verizon to bid $15 billion to $20 billion).

In a major surprise, Dish Network (NASDAQ: DISH) wound up bidding a net total of close to $10 billion (and $13.3 billion in gross provisional winning bids; Dish's designated bidding entities NorthStar Wireless, LLC and SNR Wireless LicenseCo, LLC got a 25 percent discount). Most analysts had expected Dish to bid at most $6 billion and likely far less. T-Mobile US (NYSE:TMUS) bid $1.77 billion, below analysts' expectations of $2 billion to $3 billion.

Bidding in the auction ended Thursday after 341 rounds and total of $44.899 billion in provisional winning bids. A total of 65 MHz of spectrum was auctioned, including 50 MHz of paired spectrum and 15 MHz of unpaired uplink spectrum. Out of a total of 70 eligible bidding entities, 31 walked away with spectrum. When taking into account discounts, the auction had net proceeds of $41.329 billion.

According to analysts at Jefferies and New Street Research, the paired spectrum in the auction (1755-1780 MHz for uplink operations and 2155-2180 MHz for downlink) sold for an average of $2.71 per MHz-POP, well above what analysts had expected before the auction began Nov. 13. The uplink spectrum, the 1695-1710 MHz band, on average sold for much less at an average of 52 cents per MHz-POP.

The paired spectrum in the auction includes the G Block (1755-1760/2155-2160 MHz), H Block (1760-1765/2160-2165 MHz), I Block (1765-1770/2165-2170 MHz), and J Block (1770-1780 MHz /2170-2180 MHz). The G Block is licensed in 734 Cellular Market Area (CMA) geographies and the other paired spectrum blocks are licensed in 176 geographically larger Economic Areas (EAs). A total of 1,614 licenses were up for auction and the FCC wound up keeping only three of them.

The paired spectrum licenses drew by far the largest bids, especially for the 10x10 MHz J Block licenses in major metropolitan areas like New York City, Los Angeles and Chicago.

AT&T won the J Block in the New York area, the license with the highest provisional winning bid, and paid $2.76 billion for the spectrum. AT&T also won the 10x10 MHz J Block in Chicago, Boston, Houston, Miami, Atlanta, Orlando, Fla., San Antonio, Texas, Cleveland, and other markets. AT&T won a total of 251 licenses.

AT&T said it covers 96 percent of the U.S. population with AWS-3 spectrum. "AT&T will work with network and handset suppliers, and industry standards bodies to deploy the spectrum beginning in the 2017-2018 period, allowing the company to stay ahead of strong growth in mobile Internet traffic," the carrier said. "AT&T anticipates putting this spectrum into service as a supplemental downlink to deliver additional mobile Internet capacity and better performance for its customers. AT&T will work with the FCC, NTIA, DOD, and other federal agencies to also support uplink capacity as soon as possible."

AT&T warned that "with this spectrum investment and other pending acquisitions, in the near term it [AT&T] may go above its 1.8x net-debt-to-EBITDA target."

Verizon won the J Block in Los Angeles, Washington, D.C., San Francisco, Philadelphia, Detroit, Phoenix, Seattle, Denver, Portland, Ore., San Diego, Indianapolis, and other markets. Verizon also won the H and I Blocks in Dallas, the H Block in Orlando, Fla., and many other paired spectrum blocks. Verizon won a total of 181 licenses.

Verizon said its licenses are in markets covering 192 million POPs, or 61 percent of the United States. The company said that it won't comment further under the FCC's anti-collusion quiet period ends at 6 p.m. Eastern Time on Feb. 13, 2015. Dish too said it wouldn't comment further due to the rules.

Dish was the big surprise. Most analysts had not expected Dish or its bidding partners to walk away with much paired spectrum. However, Northstar won the I and G Blocks in New York, the G Block in Los Angeles, the H and I Blocks in Chicago, the G Block in Dallas, and the I Block in Boston; and many other paired spectrum blocks in large markets. Northstar won a total of 345 licenses. Meanwhile, SNR Wireless won the J Block in Minneapolis, Charlotte, N.C., and Cincinnati, Ohio; the H Block in New York; the G Block in Atlanta, Boston, Chicago, Philadelphia, and Washington, D.C.; and many other paired spectrum blocks in large markets. Overall, SNR won 357 licenses.

T-Mobile won a total of 157 licenses and its strategy seemed to be based on winning lots of 5x5 MHz blocks that it can eventually aggregate in markets where it has 15x15 MHz AWS-1 spectrum holdings to create 20x20 MHz channels. T-Mobile won the H Block in Houston, Miami, Cleveland and New Orleans; the G Block in Phoenix and Salt Lake City; the I Block in Indianapolis, Oklahoma City, Memphis, Tenn., and San Antonio and Austin, Texas; and many other paired spectrum blocks in numerous markets.

Each winning bidder must have on deposit with the FCC enough funds to cover the down payments on its winning bids by 6 p.m. Eastern Time on Feb. 13. By 6 p.m. on Feb. 13, winning bidders must submit both a properly-completed long-form application and make sure the FCC has on hand accurate ownership information for the bidding entity. Final payments are due by 6 p.m. ET on March 2.

For more:
- see this FCC page
- see this FCC public notice
- see this BTIG post
- see this Verizon release
- see this AT&T release
- see this FCC list of winning bidders

Related Articles:
IT'S OVER: FCC's AWS-3 spectrum auction ends at record $44.9B in bids
As AWS-3 auction winds down, attention turns to what happens next

Analysts: Bidding in NYC, LA and Chicago in AWS-3 auction is 94% above average prices
AWS-3 auction inches on, with bids passing $43.7B
FCC moves to next stage of AWS-3 auction as bids climb toward $42B

Source URL: http://www.fiercewireless.com/story/aws-3-auction-results-att-leads-182b-verizon-104b-dish-10b-and-t-mobile-18b/2015-01-30

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June 1, 2015

Mr. Gary Epstein
Chair
Incentive Auction Task Force
Federal Communications Commission

Mr. Julius Knapp
Chair
Office of Engineering and Technology
Federal Communications Commission

Mr. John Leibovitz
Deputy Chief, Wireless Telecommunications Bureau
Special Advisor to the Chairman for Spectrum Policy
Federal Communications Commission

Mr. Roger Sherman
Chief
Wireless Telecommunications Bureau
Federal Communications Commission

Dear Mr. Epstein, Mr. Knapp, Mr. Leibovitz, and Mr. Sherman:

Thank you for appearing before the Subcommittee on Communications and Technology on March 26, 2015, to testify at the hearing entitled "Next Steps for Spectrum Policy."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. As with your written testimony, you may submit a joint response to these questions.

The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

To facilitate the printing of the hearing record, please respond to these questions with a transmittal letter by the close of business on Monday, June 15, 2015. Your responses should be mailed to Charlotte Savercool, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515 and e-mailed in Word format to Charlotte.Savercool@mail.house.gov.

Thank you again for your time and effort to testify before the Subcommittee.

Sincerely,

Greg Walden
Chairman
Subcommittee on Communications and Technology

cc: Anna Eshoo, Ranking Member, Subcommittee on Communications and Technology

Attachment

Office of the Director

Federal Communications Commission
Office of Legislative Affairs
Washington, D.C.20554

July 2, 2015

The Honorable Greg Walden
Chairman
Subcommittee on Communications and Technology
Committee on Energy and Commerce
U.S. House of Representatives
2125 Rayburn House Office Building
Washington, D.C. 20515

Enclosed please find responses to the Questions for the Record regarding the Commission's appearance before the Committee on March 26, 2015, at the hearing entitled, "Next Steps for Spectrum Policy"

If you have further questions, please feel free to contact me at (202) 418-0095.

Sincerely,

Michael Dabbs
Director

cc: Anna Eshoo, Ranking Member, Subcommittee on Communications and Technology

Attachment—Additional Questions for the Record

The Honorable Gus Bilirakis

1. **We all know that there is a spectrum crunch in this country for licensed and unlicensed services. I believe unlicensed spectrum offers a real promise for the future, and I've been very interested in the growing "Internet of Things" which is reliant on unlicensed spectrum. I was proud that a team from USF was a part of the Internet of Things showcase yesterday having invented a way to more efficiently track perishable goods.**

   Because of the lack of unused spectrum, I think spectrum sharing is an important option for efficiency and access in the future.

   Can you talk about what the FCC is doing to make sharing a reality in the 5.9 GHz (giga-hertz) band, which might be our best short term opportunity?

   RESPONSE: The spectrum at 5850 – 5925 MHz (5.9 GHz) is allocated for the Intelligent Transportation Service on a primary basis. The Commission proposed to permit unlicensed devices to share this spectrum on a non-interference basis and invited comment on the specific technology to enable sharing. The Institute of Electronics and Electrical Engineers established a Tiger team to develop sharing methodologies but recently reported that it was unable to achieve consensus. A major manufacturer of unlicensed devices recently advised that it plans to provide a prototype device for testing but it may still be a few months before it is available. We anticipate that testing will be a collaborative effort among the National Telecommunications and Information Administration, the Department of Transportation and the FCC.

2. **I'm intrigued by the broadband deployment opportunities you mention in your testimony for industrial applications, including health care. I've got a lot of seniors and veterans in my district that are increasing involved in the healthcare market. I enjoyed our joint health and telecom subcommittee hearing last Congress that focused on this new intersection of treatment and technology.**

   I've seen wireless technology that can organize medical records and keep track of medications, and the future of sensor technology seems to be boundless.

   Can you expand a little more about how you envision the future of wireless technology's impact on the health care sector and where, including the 3.5 gigahertz band and elsewhere, might there be room for efficient spectrum utilization?

   RESPONSE: We have all seen the explosion of applications on wireless networks, including healthcare applications. The Commission's policy of flexible use for

commercial spectrum supports innovation and allows for spectrum uses that take advantage of rapid changes in technology. As you note, the 3.5 GHz band presents additional opportunities for a variety of broadband applications. The technical characteristics of the band and the spectrum access system used to coordinate Citizens Broadband Radio Service use will allow for a high degree of spatial and spectral re-use, particularly for indoor operations, within the band. As such, the Citizens Broadband Radio Service could provide new options for hospitals, doctor's offices, and other medical facilities with a need for secure private networks. In addition, wireless carriers and Wireless Internet Service Providers may use the band to supplement their service offerings, which could facilitate telemedicine.

3. **I understand that the FCC is in the process of drafting rules to make the 3.5 GHz band available for mobile broadband. I also understand that the Navy uses this spectrum for ship-borne radar and that the exclusion zones along the coast would cover over 50 percent of the population, including major cities with significant populations that would most benefit from access to this spectrum.**

   Are you exploring ways to increase commercial access in this space for coastal populations and has there been any progress in tailoring the size of these exclusion zones so that both objectives can be addressed?

   RESPONSE: On April 17, 2015, the Commission voted unanimously to adopt a Report and Order and Second Further Notice of Proposed rulemaking establishing a new Citizens Broadband Radio Service for shared wireless broadband use of the 3550-3700 MHz band. This band is currently used by the Department of Defense for shipborne and ground-based radar operations (shipborne radars are limited to the 3550-3650 MHz portion of the band). These operations will be designated as "Incumbent Access" and protected from harmful interference from Citizens Broadband Radio Service users.

   In developing this Report and Order, the Commission worked extensively with NTIA, the Department of Defense, and the military services to develop a two-phase approach to protect incumbent federal radar systems while maximizing the utility of the band for wireless broadband services. In phase 1, federal radar systems will be protected by "exclusion zones" that are significantly smaller than those proposed in NTIA's 2010 Fast Track Report and the Commission's Further Notice of Proposed Rulemaking. In phase 2, these radar systems will be protected by an Environmental Sensor Capability that will detect the presence of radar transmissions and report that information to the SAS.

   As a result of this sharing arrangement, the Citizens Broadband Radio Service has a clear path, in phase 2, to be accessible nationwide when radar transmissions are not detected in an area.

The Honorable Bill Johnson

1. **What data and analysis are you relying on to support the claim that the relocation fund will be sufficient? Under the FCC's current plan for repacking broadcasters, would the relocation fund be sufficient to pay for the move of all broadcasters after the auction is over, or just a portion of those moves?**

   RESPONSE: At this point, we have no reason to believe that the $1.75 billion Broadcaster Relocation Fund will be insufficient to cover broadcasters' relocation costs. In order to ensure the sufficiency of the fund, we have proposed to optimize the final broadcaster channel assignments to minimize relocations costs. We have proposed that this optimization will: (1) maximize the number of stations assigned to their pre-auction channel; and (2) avoid reassignments of stations with high anticipated relocation costs, based on the most accurate information available. These steps, taken together, will help to ensure that the $1.75 billion Reimbursement Fund is sufficient to cover broadcasters' relocation costs and that the Fund is disbursed as fairly and efficiently as possible.

2. **What is the FCC's plan in case the relocation fund is not sufficient to pay for moving all broadcasters?**

   RESPONSE: We are taking appropriate measures to disburse funds as fairly and efficiently as possible to ensure the sufficiency of the Reimbursement Fund. If future developments suggest that the $1.75 billion Reimbursement Fund will be insufficient to cover all eligible costs, the Commission has delegated authority to the Media Bureau to develop a prioritization scheme for reimbursement claims.

3. **Will the FCC commit to ensuring that broadcasters that do not participate in the voluntary incentive auction but are assigned new channels and thus required to move in the repacking process will not be required to pay for any portion of that move that comes as a result of changing channel assignments?**

   RESPONSE: Broadcasters who are assigned to a new channel in the repacking process because they choose not to participate in the auction, or participate but are not selected, will be eligible for reimbursement of their reasonably incurred costs from the Reimbursement Fund.

The Honorable Chris Collins

1. **I am concerned that border stations – such as those in Buffalo and Rochester – may be disadvantaged by an insufficiency of the relocation fund and reimbursement window if International coordination is not completed before the auction. Is the FCC making any arrangements for stations that can only be repacked following agreements with Canada and Mexico to be reimbursed if those moves can only occur after the three-year reimbursement window?**

RESPONSE: We continue to make progress in negotiations with both Canada and Mexico and fully expect to reach arrangements with Canada and Mexico that will enable us to carry out the repacking process in an efficient manner consistent with our goals for the auction. In the unlikely event that a border station has not been able to complete construction on its new channel assignment by the end of the 36-month construction period, that station may request authorization to operate on temporary facilities. The Commission will make every reasonable effort to accommodate such requests. We also believe the reimbursement process will provide sufficient flexibility for any stations that encounter difficulties constructing new facilities along the Canadian and Mexican borders. We fully intend to make initial allocations quickly to help broadcasters initiate the relocation process. If cases occur in which a broadcaster's move to a new channel is delayed because of international coordination, that delay need not jeopardize reimbursement. We have afforded stations the flexibility to update their cost estimates if they experience a change in circumstances during the reimbursement period. Moreover, our process recognizes that construction for certain stations may run up against the end of the 36-month reimbursement period and therefore includes a final allocation, to be made based on actual costs incurred by a date prior to the end of the three-year period, in addition to a station's estimated expenses through the end of construction.

The Honorable Anna Eshoo

1. **In an effort to unlock more unlicensed spectrum, Reps. Latta, Matsui, Issa, DelBene and I recently introduced the Wi-Fi Innovation Act. Our bipartisan, bicameral bill directs the FCC to conduct tests within the 5 GHz spectrum band to determine if spectrum can be shared without interfering with current users. What is the FCC's timeframe for completing testing in this band? What is the Commission doing to ensure consumers who rely on Wi-Fi are protected if LTE-U technology is deployed in this band or any other band in which Wi-Fi currently operates?**

   RESPONSE: The draft legislation focuses on the spectrum at 5850 – 5925 MHz (5.9 GHz) that is allocated for the Intelligent Transportation Service on a primary basis. The Commission proposed to permit unlicensed devices to share this spectrum on a non-interference basis and invited comment on the specific technology to enable sharing. The Institute of Electronics and Electrical Engineers established a Tiger team to develop sharing methodologies but recently reported that it was unable to achieve consensus. A major manufacturer of unlicensed devices recently advised that it plans to provide a prototype device for testing but it may still be a few months before it is available. We anticipate that testing will be a collaborative effort among the National Telecommunications and Information Administration, the Department of Transportation and the FCC.

   The Office of Engineering and Technology and the Wireless Telecommunications Bureau recently issued a public notice to develop a record on LTE-U technology and how it may share spectrum with other technologies such as Wi-Fi. We are evaluating the responses we received in response to that notice, and are also closely monitoring discussions in and among international standards bodies.

2. **In 2012, Congress reached a compromise intended to ensure unlicensed use of the guard bands. I'm concerned that some stakeholders are arguing that unlicensed should not be permitted in the duplex gap. Do you see any reason why TV white space devices cannot operate at low power in at least the duplex gap, as the Commission ordered last May?**

   RESPONSE: The Commission proposed to allow unlicensed operation in the duplex gap and other parts of the 600 MHz and TV spectrum. Comments have been filed both in support of and in opposition to these proposals, including various technical analyses. We are evaluating the record in the proceeding, and intend to present final recommendations to the Commission in the coming months.

3. **Over the past year and a half, I've urged the agency to engage proactively in outreach to broadcasters about the benefits of participating in the upcoming incentive auction, so I was pleased when the FCC announced in November that they would be taking this outreach on the road with more than a dozen trips, covering about 50 markets, including San Francisco. While respecting confidentiality, can you characterize how these visits have been received by broadcasters?**

   RESPONSE: The response from both small and large broadcasters to our broadcaster information sessions was very positive. In each city visited, the Incentive Auction Task Force staff conducted a general presentation and met confidentially with individual broadcasters upon request. The information sessions enabled broadcasters to gain a better understanding of the auction and the opportunities it presents, including not only relinquishment of their spectrum but also channel sharing and moving from the UHF to the VHF band. The sessions also enabled the Incentive Auction Task Force staff to address broadcasters' questions about the post-auction transition and reimbursement process. Before, during, and after the end of our outreach, we've continued to meet with broadcasters at the Commission's offices and via teleconference.

4. **In late 2013, Congressman Dingell and I wrote to the Commission about the need for coordination with Canada and Mexico so that Americans in border areas don't lose access to free, over-the-air television signals. What's the status of these negotiations?**

   RESPONSE: The negotiations between our counterparts in Canada and Mexico are on-going and productive. We have been having regular meetings with Canada and Mexico. In late 2014, Industry Canada issued a consultation that proposes a band plan like ours, and we expect them to complete this consultation soon. We are also in the process of coordinating a DTV plan that accommodates Mexico's DTV transition and auction needs and also provides channels for the U.S. to use in repacking.

The Honorable Yvette Clarke

1. **The FCC's Designated Entity (DE) program promotes diversity of ownership and helps small businesses to compete in the FCC's auctions for new wireless frequencies.**

   How does the Commission plan to improve the DE program, in light of the recent criticisms of the program during the AWS-3 auction?

   RESPONSE: On June 25, 2015, Chairman Wheeler circulated a balanced proposal to modernize the Commission's approach to small business participation in wireless spectrum auctions, also known as the competitive bidding rules. The Commission initiated a proceeding in October 2014 to revisit its competitive bidding rules, last updated in 2006, prior to next year's Incentive Auction. In response to today's wireless marketplace, the proposed reforms will provide more flexibility for *bona fide* small businesses, including women- and minority-owned businesses and rural service providers. At the same time, the reforms will increase transparency and efficiency to prevent abuse, as well as protect the integrity of the Commission's auction process. The proposed reforms are meant to ensure that large corporations cannot game the system and that bidding credits will flow only to small businesses and rural service providers, all while revamping outdated policies that no longer serve today's marketplace.

   For example, the proposal would cap the total value of bidding credits that a small business or rural provider is eligible to receive in any one spectrum auction. Moreover, the proposal would include measures to prevent unjust enrichment of ineligible entities by strengthening attribution rules. Furthermore, the proposal would prohibit joint bidding agreements that involve a shared strategy for bidding at auction but permit arrangements that are solely operational (*e.g.*, roaming or leasing), provided they are disclosed.

   The proposed reforms will also ensure that bidding credits continue to flow to small businesses and rural service providers. For instance, to incentivize rural service providers to compete more effectively in future spectrum auctions and provide consumers in rural areas with competitive offerings, the proposal establishes a new rural service provider bidding credit. Additionally, the proposal would provide flexibility in using spectrum won at auction to *bona fide* small businesses, as well as increase the applicable revenue thresholds to qualify as a small business for the first time since 1997.

2. **How does the Commission plan on preserving access to unlicensed spectrum in order to ensure that innovative Wi-Fi-based technology is able to continue to benefit society?**

   RESPONSE: The Commission proposed to provide access to spectrum for unlicensed devices in the 600 MHz band that is the focus of the Incentive Auction and in the white spaces in the spectrum that remains allocated for TV broadcasting. We are continuing to evaluate the comments that have been filed and will present final recommendations to the Commission in the coming months. Wi-Fi today operates in spectrum at 2.4 GHz and 5 GHz. Last year the Commission took action to make 100 MHz of spectrum in the 5 GHz band more usable for Wi-Fi and other unlicensed technologies. The Commission also proposed to provide access to 195 megahertz of additional spectrum in the 5 GHz band for unlicensed use, and we are continuing to work with interested parties on solutions to enable unlicensed to share this additional spectrum without causing harmful interference to incumbent services.

3. **Much of the incentive auction's success is based on broadcaster participation. They will, in turn, provide the demand for the auction's next stage. What is the plan to ensure that broadcasters adequately participate in the auction and what incentives are the FCC offering to increase their engagement?**

   RESPONSE: We agree that the key to a successful auction is broadcaster participation, and the Commission has taken a number of steps to encourage robust participation. We have proposed an opening bid methodology that would offer very generous bids to broadcasters around the country. We have adopted an auction format, called a "descending clock" that will be make it easy for interested broadcasters to participate in the auction without ever having to reveal their drop-out price. We've also worked hard to educate broadcasters on the full range of options available to them in the auction – including not only relinquishment of their spectrum but also channel sharing and moving from the UHF to the VHF band. Finally, we have undertaken an extensive outreach and education program that included information sessions in 30 markets around the country to give broadcasters a better understanding of the auction and the opportunities it presents. Before, during, and after the end of our outreach, we've continued to meet with broadcasters at the Commission's offices and via teleconference. As we move forward, the Task Force will continue to make sure broadcasters are well-informed about the auction, and will conduct bidder seminars and mock auctions to ensure broadcasters are confident in their participation.

4. **I commend the FCC on its aggressive, and very forward thinking approach to spectrum policy. I'm also interested in how the FCC will work towards fostering meaningful participation of small, minority- and women-owned businesses in the upcoming incentive auction. Mr. Sherman, will you speak to this point please?**

   RESPONSE: Please reference the response to Question #1 above.

5. **I understand that critical processes post incentive auction involve REPACKING and CHANNEL SHIFTING to accommodate acquired broadcast spectrum. Can you share how the FCC proposes to engage in these processes, and ensure that consumers are adequately informed about the impacts?**

   RESPONSE: In order to create a contiguous block of spectrum suitable for mobile broadband in what is now the TV band, some of the TV stations that will remain on the air after the incentive auction will need to move to new channels. The Commission will assign new channels to full-power and Class A stations, consistent with the Spectrum Act. In making these assignments, the Commission has proposed maximizing the number of stations that stay on their pre-auction channels, avoid channel reassignments for stations with high anticipated relocation costs, and minimize the maximum aggregate new interference. Broadcasters who are relocated to new channels will be reimbursed for their relocation costs out of the $1.75 billion TV Broadcaster Relocation Fund, funded by proceeds from the forward auction of the repurposed TV band spectrum that Congress created in the Spectrum Act. The Commission has adopted specific requirements for transitioning broadcasters to inform consumers prior to the transition if the stations they view will be changing channels, encourage them to rescan their receivers for new channel assignments, and educate them on steps to resolve potential reception issues.

6. **Is there any discussion currently at the FCC about the consumer outreach that will be necessary to minimize viewer confusion and disruption after stations are repacked?**

   RESPONSE: The Incentive Auction Report and Order specifically adopted an obligation for the Commission to help educate consumers on the post-auction transition. In the Report and Order, the Commission directs the Consumer and Government Affairs Bureau to develop a comprehensive plan to engage with consumers and ensure that consumers do not lose service. The Commission also recently voted to largely reaffirm broadcasters' consumer education requirements established in the Report and Order.

7. **Has there been discussion about setting aside monies for an education initiative?**

   RESPONSE: The Incentive Auction Report and Order specifically obligated the Commission to specify a plan to provide for consumer education following the incentive auction. Although the auction is still many months away, the beginning planning stages for providing consumers with relevant, important information are underway. We will ensure that this effort will be funded sufficiently to effectively educate consumers.