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OUR WIRELESS FUTURE: BUILDING A COMPREHENSIVE APPROACH TO SPECTRUM POLICY

TUESDAY, JULY 16, 2019

House of Representatives,

Subcommittee on Communications and Technology,

Committee on Energy and Commerce,

Washington, D.C.

The subcommittee met, pursuant to call, at 10:31 a.m., in Room 2322, Rayburn House Office Building, Hon. Michael Doyle [chairman of the subcommittee] presiding.

Members present: Representatives Doyle, McNerney, Clarke, Loebsack, Veasey, O'Halleran, Eshoo, DeGette, Butterfield, Matsui, Welch, Lujan, Schrader, Cardenas, Dingell, Pallone (ex officio), Latta, Shimkus, Olson, Kinzinger, Bilirakis, Johnson, Long, Flores, Brooks, Walberg,

Gianforte, and Walden (ex officio).

Staff present: AJ Brown, Counsel; Jeff Carroll, Staff Director; Jennifer Epperson, FCC Detailee; Evan Gilert, Deputy Press Secretary; Alex Hoehn-Saric, Chief Counsel, C&T; Jerry Leverich, Counsel; Dan Miller, Policy Analyst; Meghan Mullon, Staff Assistant; Phil Murphy, Policy Coordinator; Joe Orlando, Staff Assistant; Alivia Roberts, Press Assistant; Tim Robinson, Chief Counsel; Rebecca Tomilchik, Staff Assistant; Mike Bloomquist, Minority Staff Director; S.K. Bowen, Minority Press Assistant; Michael Engel, Minority Detailee, C&T; Margaret Tucker Fogarty, Minority Staff Assistant; Tim Kurth, Minority Deputy Chief Counsel, C&T; and Brannon Rains, Minority Staff Assistant.

Mr. Doyle. [Presiding] The Subcommittee on Communications and Technology will now come to order.

The chair now recognizes himself for 5 minutes for an opening statement.

Good morning. I would like to welcome everyone to this subcommittee's first hearing on wireless spectrum policy. I would also like to thank our two panels of witnesses for appearing before us today to discuss these important issues.

Wireless spectrum enables much of technology that powers our modern economy. From connecting/streaming Netflix over Wi-Fi or listening to Spotify on your phone, these technologies rely on spectrum that has been carefully licensed and coordinated by the FCC. As we look to the future and the explosion of smart home devices, like digital assistance and connected appliances and smart city technologies, such as connected infrastructure and smart environmental sensors, it is clear that this is just the beginning.

To meet the current demand and enable future needs, we need a national spectrum policy that incentives innovation and provides opportunities for new technologies and new entrants. The challenge we face today is just how constrained our spectrum resources are. While there are some greenfield spectrum opportunities, they are few and far

between.

The federal government is the largest holder of spectrum and, as such, much of the new spectrum being made available for commercial purposes is repurposed from federal agencies. In the past, this process has worked well, with the NTIA coordinating federal spectrum use and working with the FCC, impacted agencies, and stakeholders to transition spectrum to the private sector without impacting critical federal users.

I am very concerned that there has been a breakdown between the FCC, NTIA, and other federal stakeholders. Over the last year and a half, several federal agencies have expressed deep concerns about a number of FCC proceedings relating to spectrum policy, including the Department of Education, the Department of Transportation, the Defense Department, the Department of Commerce, and NOAA.

You know it is a strange day when Democrats agree with Secretary DeVos about education policy, but many of us here are concerned that the FCC's recent order regarding the educational broadband service effectively stripped the education purpose and benefit from the band. It is also concerning that NOAA and the Department of Commerce continue to assert that the recently completed auction of 24 gigahertz band could have serious impact on NOAA's ability to forecast hurricanes.

It makes a great deal of sense to look at bands and repurpose them as needed, but it is very concerning when Cabinet officials are publicly fighting with the FCC over spectrum policy. I am deeply concerned that this process has broken down and that the American people are going to be the ones that suffer. These challenges aren't new, and policymaker and stakeholders are in a constant struggle to enable spectrum to be shared more efficiently or to be transitioned to better uses.

Today, Congress has an opportunity with the so-called C-band, and I am happy to have several witnesses testifying on the second panel who can discuss this opportunity as well as the challenges in transitioning it. Through congressional action, I believe that this band can provide consumers, incumbent users, satellite operators, wireless companies, and new entrants an incredible opportunity.

Congresswoman Matsui and I are working on a proposal to make a significant amount of mid-band spectrum available over the next five years and in a way that helps accelerate deployment of 5G. We also hope that a portion of the proceeds from this transaction can be used for the priorities that this committee has focused on for so long: rural broadband deployment, next-generation 911, and closing the digital divide.

We hope to work together with our friends, my ranking member, Mr. Latta, with ranking member of the full committee, Mr. Walden, and all our colleagues on the Republican side and the Senate to help facilitate that transition and ensure all Americans can benefit from the opportunities these new technologies order.

I want to yield the balance of my time to the vice chair of the subcommittee and my good friend, Doris Matsui.

Ms. Matsui. Thank you, Mr. Chairman.

As I said before in the FCC oversight hearing in May, the C-band has been one of the most complex and high-stakes proceedings in front of the Commission and Congress. And that is why I released the WIN 5G Act, to propose a compromise, consensus-based approach to rapidly reallocate the spectrum in a manner that addresses many of the concerns raised on the Commission's record.

Of note, the WIN 5G Act solves the legal issues presented by an FCC action that would otherwise be hamstrung by the holdout problem and creates a funding opportunity for rural broadband deployment. I am pleased that it has the support of wireless, rural, and cable stakeholders, including many of those represented here today.

I do look forward to working with the chairman, the members of this committee, and all interested parties to

ensure C-band spectrum is reallocated quickly and equitably. We cannot afford to wait while this proceeding is tied up in court.

Thank you, and I yield back.

Mr. Doyle. I thank the gentlelady. The chair now recognizes Mr. Latta, the ranking member of the subcommittee, for 5 minutes for his opening statement.

Mr. Latta. Well, thank you, Mr. Chairman. And I appreciate the subcommittee holding this hearing today, and I thank both our panels of witnesses for testifying today, especially our government witnesses that are here on pretty short notice. But thanks very much for being here.

I am pleased that this subcommittee is returning to the importance subject of spectrum policy. As the co-lead of both the Wi-Fi Caucus and the Rural Broadband Caucus, I know there is a careful balance we must achieve as we seek to clear more spectrum for our marketplace. Only through sound, transparent, light-touch policies formed through effective coordination between government, consumers, and industry stakeholders, we will guarantee U.S. leadership in the next generation of wireless connectivity.

This approach to the deployment of 5G will ensure that all people in all sectors of our economy can benefit from its innovative ripple effect. We will cover a lot of territory

today, but it is important that the testimonies be considered in totality, as we examine the implementation of key building blocks such as clearing spectrum for nationwide 5G deployment.

The FCC has made a huge swath of mid-band spectrum available in the incentive auction and has also successfully auctioned off spectrum in the high-band. I appreciate that the agency recognizes the importance of making America a leader in 5G and continue to focus efforts on clearing additional bands.

There is no doubt that 5G will benefit urban areas, but I am also excited how it remakes internet traffic management to prioritize low-band and mid-band spectrum for our rural areas. In cities, the dense, high-speed networks provided over millimeter wave spectrum will unleash unlimited possibilities for the Internet of Things. Therefore, we must not undervalue the benefit of high-band spectrum, as its quick deployment will make such IoT synergies possible as we add capacity. 5G will truly be disruptive in every sector from new technologies and innovations to an expanded workforce.

We must also discuss other technologies that play a critical role in connecting Americans and supporting 5G, such as Wi-Fi. Wi-Fi is convenient deployment that all people

enjoyed and was meant to simply offer a no-wire solution. Certainly, its impact has been underestimated. We live in an increasingly connected world, from streaming live TV from a handheld device to smart thermostats, to self-driving cars. Given the integration of Wi-Fi into our daily lives, I am intrigued by the FCC's recent proposal to expand unlicensed use in the 6-gigahertz band. Doing so would enable Wi-Fi to provide affordable connectivity across the country, assuming such uses would not come at the detriment of another user.

Just as 5G and Wi-Fi are essential components to our telecommunications landscape, so is wireless broadband. Closing the digital divide is one of my top priorities, and the wireless broadband is part of the solution. Spectrum can help students complete their homework, hospitals perform offsite tests and patient checkups, and farmers operate precision agricultural equipment. In my district, I have witnessed firsthand the incredible value wireless technologies have on precision agriculture, such as drones and self-driving tractors that assist farmers with monitoring crops and livestock and analyzing soil.

Access to broadband should not be dependent on one technology, and spectrum allows for another avenue of delivery. Spectrum is a valuable, yet limited, resource that benefits consumers in so many ways. That is why we must have

balanced policies that efficiently utilize bands, encourage innovations, and effectively address our nation's needs.

I will look forward to working with the chairman and the members of the subcommittee as we continue our pursuit to reach such policy solutions and to keep America ahead of the international competition and win the 5G race.

Again, I want to thank the witnesses for being with us today.

And, Mr. Chairman, I yield back the balance of my time.

Mr. Doyle. The gentleman yields back. The chair now recognizes Mr. Pallone, the chairman of the full committee, for 5 minutes for his opening statement.

The Chairman. Thank you, Mr. Chairman.

The topic of today's hearing is important because, in the same way that we manage our water, our air, and our other natural resources, we must manage our airwaves. And that means carefully and deliberately allocating spectrum for the benefit of consumers, whether they live in a dense, urban metropolis or in remote rural areas.

If we manage our airwaves correctly, new wireless technologies, including 5G, promise to meaningfully improve the lives of Americans, and educational institutions, like Rutgers in my home state, will be able to provide greater access to their world-class education. Telehealth services

will be able to better bring medical care to those in need over vast distances to keep us healthier, and small businesses will be given tools to help them better compete with big corporations.

So, smart spectrum management is also critical for public safety. In the face of increasingly frequent natural disasters, new 5G technologies could help first responders better locate us when we call 911 or help spread the word during an impending natural disaster, so that we can prepare. And these examples just scratch the surface of why it is so important that we work together on a comprehensive spectrum policy.

Unfortunately, despite the hard work of incredibly skilled career civil servants like those testifying before us today, I am increasingly concerned that this administration is not up to the task. It seems that, as a nation, we are somehow unable to cobble together a coherent policy for managing our airwaves. Right now, there is a leadership vacuum, and I am concerned that too few people in our government understand that our agencies' spectrum needs must be coordinated and the government must speak with one voice.

A few years ago, Congress, the FCC, and the NTIA were working hard to keep the mobile economy moving forward, but that is not the case anymore. Today, the Trump FCC goes one

way, the Commerce Department and NTIA go another. Then, you have other departments throughout the federal government, like the Departments of Transportation, Education, and Defense, voicing their own opinions about how spectrum should be used. And this lack of coordination affects a mind-numbing list of important bands of spectrum. In my opinion, the process has completely broken down.

So, to be clear, this reality does not reflect the system that Congress created and that this committee has relied on for years. Under the law, Congress charged the FCC with managing commercial uses of spectrum while we charged the NTIA with managing federal spectrum use. And up until now, that meant we had two agencies working together on relevant policy, but not anymore, unfortunately. I don't think it has to be this way. Spectrum is at its heart a bipartisan issue. It is a rural and an urban issue. And it is not all bad news. The FCC is still conducting auctions and working towards making more unlicensed spectrum and shared-use spectrum available.

And I also have tremendous confidence in the bipartisan leadership of this committee -- of this subcommittee, I should say. Mr. Doyle, in the past, we have worked successfully on spectrum policy and passed laws such as the RAY BAUM's Act, the Spectrum Pipeline Act, and the 2012

Spectrum Act. So, I look forward to working with my colleagues to find a consensus approach -- you are known for that -- to fill this void left by this administration and resolve the pressing spectrum issues before us, including the disposition of the C-band, and how we resolve that, being it is incredibly important, and troubling questions remain about the ongoing process at the FCC.

So, it is clear that Congress has to legislate to resolve these concerns and provide the greatest benefits to consumers with a transparent process that generates revenue for the Treasury. And I know we are up to that, and hopefully, that is what we will achieve after this hearing over the next few months.

So, thank you again, Chairman Doyle.

Mr. Doyle. The gentleman yields back. The chair now recognizes the ranking member of the full committee, my friend, Mr. Walden, for 5 minutes.

Mr. Walden. Thank you, Mr. Chairman.

And I just want to say at the head-in to the comments by my friend from New Jersey, the conflict going on in the administration right now on this matter is a bit troubling. We all know we had a good NTIA Director in place and things were going swimmingly, and then, they weren't. And I will express my dissatisfaction with what is happening as well out

of Commerce and elsewhere.

I want to welcome our witnesses to this hearing on spectrum. Almost two years ago, we held a hearing on the so-called race to 5G, and as I said then, it is a sprint, not a marathon. Some may be concerned about overhyping the situation such competitive technology may have, but I believe it is even more disconcerting if we undersell the importance of this.

As we speak, competitors in Asia and Europe are running full speed ahead to be the global leader. Maybe we need an even more dramatic term to convey the immediacy of the situation. Our success in the 5G will revolutionize American competitiveness and further strengthen our position in the global economy. This is really important stuff.

As you all know, I grew up in the radio business. Probably the only member of this committee that has -- I know maybe Billy Long has -- wired in a transmitter or two.

[Laughter.]

But a lot has changed since the '96 Telecom Act -- he always got higher ratings than I think I ever got on air, but I had the face for radio -- which focused primarily on how local long distance rates could be more competitive. But, ultimately, the '96 Act instilled the light-touch regulatory regime that provided the building blocks to the internet

infrastructure we have come to know and depend on.

Similarly, the 5G revolution will deliver on priorities that this committee, and I think our country, share. From closing the digital divide, making cities smarter, improving the grid, these consumer benefits will mean faster and more advanced services with billions of devices expected to come online as part of the Internet of Things.

So, we have to be strategic in how we do this. We have to be smart and unified in how we do this. Spectrum availability, infrastructure deployment, risks to our supply chain, all these need to be worked out together. If we fall behind on any one aspect, it will be a detriment to our future. If you think that sounds too dramatic, let me suggest our adversaries are very focused. They know what needs to happen here.

The potential threats represented by equipment from suspected entities, it has been well publicized. So, I won't spend a lot of time on that. But I would reference The New York Times story on Russian propaganda efforts in this space. The story is headed, "Your 5G Phone Won't Hurt You, But Russia Wants You To Think Otherwise". It is a review of a media outlet known as RT, America running stories of health risks of 5G deployment. RT America, of course, is a division of Russia Today, which has been referred to as, quote, "the

Kremlin's principal international propaganda outlet" -- close quote -- by the Office of the Director of National Intelligence.

We certainly should not dismiss whether there are health concerns. We need to make sure there are not. So, I will look forward to hearing from our expert witnesses on this panel.

However, I must say, when a Russian outlet is reporting on this, and at the same time Russia is pushing ahead with their own 5G efforts, maybe there is something else going on here.

Moving forward to become the world's leader in 5G deployment means we have got to make some tough decisions. The 5G marketplace requires more spectrum, and it does so as quickly as possible. So, we need to carefully balance this demand with our responsibility to consider the effects on incumbent spectrum users and the value they provide to American consumers.

Look, we have done this before multiple times -- with agencies, with the private sector -- to free up spectrum and benefit consumers. So, with your help today, we will continue down this path. And then, my constituents and those across the country can eventually enjoy the 5G revolution, greater connectivity, and a more dynamic economy.

With that, Mr. Chairman, unless anybody on our side wants the remaining minute, I will yield back the balance of my time.

Mr. Doyle. The gentleman yields back.

And I would say to the gentleman, we look forward to working with you on this in a bipartisan fashion to get it done.

Okay. I would now like to introduce our first panel of witnesses today. The Honorable Julius P. Knapp, Chief of the Office of Engineering and Technology at the Federal Communications Commission, and the Honorable Derek Khlopin, Senior Policy Advisor at the National Telecommunications and Information Administration.

We want to thank you both for joining us today. We look forward to your testimony.

At this time, the chair will now recognize each witness for 5 minutes to provide their opening statement.

Before we begin, I would like to explain our lighting system. In front of you is a series of lights. The light will initially be green at the start of your opening statement. It will turn yellow when you have one minute remaining. Please begin to wrap up your testimony at that point. The light will turn red when your time expires.

Mr. Knapp, you are now recognized for 5 minutes.

STATEMENTS OF JULIUS P. KNAPP, CHIEF, OFFICE OF ENGINEERING AND TECHNOLOGY, FEDERAL COMMUNICATIONS COMMISSION, AND DEREK KHLOPIN, SENIOR POLICY ADVISOR, NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION

STATEMENT OF JULIUS P. KNAPP

Mr. Knapp. Chairman Doyle, Ranking Member Latta, and members of the subcommittee, thank you for holding this hearing. I appreciate the opportunity to provide you with an update on the FCC's activities on spectrum.

Spectrum management is woven into the fabric of the FCC across all of our bureaus and offices. And I have the privilege of leading our Office of Engineering and Technology, where I have served as an engineer for, I shudder to admit, 45 years now. My office works closely with the other FCC bureaus and offices to ensure our recommendations to the Chairman and Commissioners on spectrum matters are based on sound engineering and efficient use of the airwaves.

The Commission is hard at work implementing a balanced spectrum policy that is responsive to the many demands for spectrum, including 5G, new satellite services, unlicensed advanced spectrum sharing, rural use, and so forth. And I would like to highlight some of the things we have been working on.

A top priority for the Commission is to ensure the U.S. maintains and advances its leadership in 5G, the next generation of wireless technology. To realize this potential, Chairman Pai developed and we are executing the 5G FAST Plan, a comprehensive strategy that will facilitate America's superiority in 5G technology. And it consists of three central components: freeing up more spectrum, promoting wireless infrastructure deployment, and modernizing our regulations to promote more fiber deployment. And I would like to just focus on the spectrum aspects.

So, 5G networks are going to be woven together with a combination of low-, mid-, and high-band spectrum. The low-band spectrum is important for coverage, particularly in the rural areas. The mid-band spectrum provides a great mix of coverage and capacity, and the high-band spectrum provides much greater capacity and delivers fastest speeds and it is well-suited for urban areas.

On the low-band spectrum, the Commission conducted a successful broadcast incentive auction that yielded 84 megahertz of spectrum for wireless broadband services. The Commission is also taking several actions to make mid-band spectrum available for 5G. Last week, for example, the Commission revised its rules for the 2.5-gigahertz band to make this valuable spectrum available for 5G, much of which

currently lies fallow in rural areas.

This is going to be accomplished by allowing incumbents greater flexibility in their use of spectrum, providing a priority window for tribal nations to obtain unassigned spectrum, and introducing a spectrum auction that will ensure that this public resource is devoted to its highest-valued use. We are anticipating holding the spectrum auction next year.

The Commission also made available 150 megahertz of spectrum in the 3.5-gigahertz band, which is known as the Citizens Broadband Radio Service. We are well along in that process, and it is our hope that very soon we will be able to approve initial commercial deployments in that spectrum.

We have also moved ahead with a rulemaking on what is called C-band, the 3.7-to-4.2-gigahertz band and to make part or all of that spectrum available for flexible use. And the Commission is considering a number of proposals for how we might go about repurposing that spectrum, including through market mechanisms and auctions. It is a very complicated proceeding, and the Chairman has indicated that we will have results to show on this front this fall.

Turning to high-band spectrum, we have had successful auctions of 24 and 28 gigahertz. And let me just turn, in the interest of time, as well to unlicensed, which is also a

very important part of our strategy. We recently modified our rules for the TV white spaces to make them more amenable for deployment. Last year, we proposed to open up as much as 1200 megahertz of spectrum in the 6 gigahertz region for unlicensed use, while protecting the incumbent uses, and we are hard at work on that proceeding as well. And we have also been looking at proceeding at 5.9 gigahertz for unlicensed sharing with Intelligent Transportation Services.

The Commission is also taking a number of actions in the areas of advanced spectrum sharing, support for space services in preparation for the upcoming World Radio Conference. And in the interest of time, I would refer you to my written testimony.

Lastly, I want to recognize the outstanding staff of the FCC who day-in and day-out dedicate themselves to finding solutions to these very difficult problems.

Thank you for your time.

[The prepared statement of Mr. Knapp follows:]

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Mr. Doyle. Thank you, Mr. Knapp.

Mr. Khlopin, you are now recognized for 5 minutes.

STATEMENT OF DEREK KHLOPIN

Mr. Khlopin. Mr. Chairman, Ranking Member, and members of the subcommittee, thank you for the opportunity to testify today on NTIA's activities regarding spectrum management and spectrum policy.

Radio frequency spectrum is a finite resource. Yet, demand for it only continues to grow on an increasingly larger scale, but with shorter expected timelines. This is in large part because so many of our national priorities come with spectrum requirements, including U.S. leadership in 5G wireless, space exploration and commerce, artificial intelligence, autonomous vehicles, and other emerging technologies. It is also fundamental to maintaining our global military superiority, protecting the safety of our national airspace, and forecasting the all-too-frequent weather events that devastate our communities.

Our spectrum management and policy decisions must take into account and balance all of these and other important interests. It is a difficult task, but we have no choice but to succeed. NTIA sits right in the middle of this important decisionmaking process.

NTIA manages use of spectrum by the U.S. Government, accommodating the diverse and compelling spectrum

requirements of federal programs while at the same time seeking opportunities to expand spectrum access for private sector and other non-federal government spectrum users.

President Trump has declared the U.S. must win the race to 5G. 5G connectivity is expected to become essential to the American economy, to national security, and to our continued leadership in the information age. Some estimates have 5G creating up to 3 million new American jobs and generating $500 billion a year in economic growth. The figures are stunning and they help demonstrate why we must accelerate and succeed in 5G.

These networks also must be the most secure and reliable in the world. We will continue to create the conditions for 5G to prosper in the U.S. NTIA and the Department of Commerce are taking numerous actions to ensure U.S. 5G leadership. These include efforts to secure 5G equipment and supply chains in the country, to engage with our allies around the world on these concerns, to support U.S. industry in global standards development, and to conduct and coordinate targeted research activities. But my focus today is on our efforts to identify spectrum bands that can support 5G.

NTIA continues to work with the FCC, with the support and direction of Congress, to significantly increase

commercial access to scores of frequencies across low-, mid-, and high-frequency bands. The efforts to date have been very successful. The U.S. currently leads the world in spectrum made available for mobile wireless services with almost 6 gigahertz for licensed exclusive use, and the more than 3 gigahertz of additional spectrum is under active study. So, we could be at 9 gigahertz soon for commercial use. And this does not include spectrum for unlicensed and satellite uses that will also have a role in 5G connectivity.

So, it is very exciting, but we are very well aware that we have more work to do, especially with respect to the mid-band spectrum that industry is coveting. NTIA continues to make progress on this front. We are excited for the approaching launch of the Citizens Broadband Radio Service, or CBRS, in the dynamically-shared federal and non-federal 3.5 band. It has been a great example of interagency cooperation.

NTIA and its research arm, the Institute for Telecommunication Sciences, has worked closely with the FCC, the Department of Defense, and industry to enable the innovative sharing framework. In addition, NTIA and the DoD are studying the feasibility of shared access by commercial systems to neighboring frequencies at 3450 to 3450 megahertz. In combination with other FCC proceedings addressing mid-

band, the U.S. is well-positioned to ensure such highly sought-after frequencies are available for 5G and other services.

NTIA and the Department are also very busy evaluating how current and future spectrum allocations will help drive a trillion-dollar space economy. At the direction of the President, in 2018, the Department through NTIA issued a report providing recommendations to improve the global competitiveness of the U.S. space sector through spectrum policies.

NTIA also works to advance U.S. spectrum interests globally, and this includes representing the federal government's interests at the ITU's World Radio Conference, which will occur this fall in October in Egypt.

Finally, last October, President Trump issued a Presidential Memorandum titled, "Developing a Sustainable Spectrum Strategy for America's Future". In the PM, the President directed Secretary Wilbur Ross, working through NTIA, to develop and implement a comprehensive, balanced, and forward-looking National Spectrum Strategy to more effectively manage our nation's use of this critical resource. The Department is on track to submit the strategy to the President in the coming weeks.

In conclusion, NTIA, on behalf of the administration,

takes a comprehensive approach to our spectrum management and policy responsibilities. In this way, we ensure the U.S. effectively and efficiently is putting spectrum to use in ways that drive our national economic activity and help protect the safety and security of all Americans.

Thank you.

[The prepared statement of Mr. Khlopin follows:]

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Mr. Doyle. I thank the witnesses.

We have now concluded our openings. We are going to move to member questions. Each member will have 5 minutes to ask questions of our witnesses. And I will start by recognizing myself for 5 minutes.

There has been a lot of concern and confusion regarding the 24-gigahertz band and the level of interference protection necessary to protect other federal incumbent users. Among these users is NOAA, who have claimed that the deployment of 5G in this band could prevent their weather satellites from accurately predicting hurricanes and other major weather events.

Mr. Knapp, my understanding is that NOAA and NASA have submitted a technical report to the FCC that describes their concerns related to interference in the 24-gigahertz band based on updated assumptions related to the propagation of 5G signals. Has that report been made public or shared with industry stakeholders? And if not, when do you expect it to be?

Mr. Knapp. The report has not been made public, and it is not our report. So, that would be up to NOAA and NASA.

Mr. Doyle. To make it public?

Mr. Knapp. Yes.

Mr. Doyle. Thank you.

To both of you, I am concerned that the United States is going into the World Radio Conference, where an international interference protection level will be set in this band, and we don't have a cohesive position. What is the interference level that your respective agencies believe is appropriate?

Mr. Knapp. So, I think the answer is we believe both of these can live together. They are in separate bands. The passive satellite band is below 24 gigahertz; the 5G band is separated by a considerable amount. The Commission adopted a protection standard that would prevent the interference. That is why I was hesitating in answer, because we don't look at it as what is an acceptable level of interference as a standard that will protect it. And the debate is over what is the appropriate level, and there are still discussions going on.

Mr. Doyle. Mr. Khlopin?

Mr. Khlopin. So, NTIA's role in this process, as you are aware, is to represent the federal interest. Some of these specific questions are best answered by NOAA and NASA that performed the study. But, as you indicated, they do have a study available out that they put together that is working through the deliberative process to come to a final number.

Mr. Doyle. I saw Secretary Ross recently responded to a

letter from Senator Johnson related to the 24-gigahertz band. In that letter, which I will submit for the record, Secretary Ross says that an interagency working group had recently reached a compromise on the interference protection levels in that band. Can you tell the committee what that compromise is?

Mr. Knapp. From our point of view, there has not been a compromise. There are still discussions on the levels.

Mr. Doyle. So, you are saying Secretary Ross said a compromise has been reached, and you are saying that hasn't occurred?

Mr. Knapp. From the perspective of the FCC, we have not reached a compromise.

Mr. Doyle. When do you think we are going to reach a compromise?

Mr. Knapp. Well, clearly, we have to have a position before we go into the CTeL meetings that are coming up in August. And everybody is working hard to make sure that we get to that point.

Mr. Doyle. Well, I would agree with that.

Mr. Knapp, let me ask you, do you believe the spectrum-sharing model adopted in the CBRS band could be adopted in other bands? Specifically, do you think that using a spectrum access system could make other encumbered bands

accessible on a shared basis while still protecting incumbent users?

Mr. Knapp. So, the short answer is I think dynamic spectrum access is a tool that can provide access to other spectrum bands. I wouldn't look at it as a one-size-fits-all. There are some complexities about the CBRS sharing approach that might not be necessary in other bands. But the model I think is one that we can look at in other bands.

Mr. Doyle. And, Mr. Khlopin, I wanted to ask you, too, about this Secretary Ross letter. Is it your understanding that a compromise has been reached or do you agree with Mr. Knapp that that hasn't been done?

Mr. Khlopin. So, I am certainly not in a position to put words in the Secretary's mouth or speak for him. I think it was his understanding that conversations that were had were leading toward that agreement, but, as Mr. Knapp said, those discussions continue. So, right now, that process is still underway.

Mr. Doyle. So, why would the Secretary tell Senator Johnson that a compromise had been reached?

Mr. Khlopin. Because, again, I think that was his understanding at the time.

Mr. Doyle. Who gave him that understanding?

Mr. Khlopin. That is a part of a larger meeting.

Again, I can't speak for the Secretary. I was not in that meeting.

Mr. Doyle. I see.

I will yield back my time. I am going to now recognize the ranking member of subcommittee, Mr. Latta, for his questions.

Mr. Latta. Well, thanks, Mr. Chairman.

And again, thanks to our witnesses for being with us today.

As the co-chair of the Wi-Fi Caucus, I spend a great deal of time focused on the undeniable benefits of Wi-Fi to American innovation and economic growth. One of the critical inputs, as consumers engage with spectrum-intensive applications, is more spectrum dedicated to unlicensed use.

Mr. Knapp, would you describe the Commission's efforts on this front and the potential candidates as we look for spectrum bands that are most able to be quickly repurposed and deployed?

Mr. Knapp. Yes. And I think a common theme as we go through today's hearing is that none of these are easy. So, as I mentioned, unlicensed is critically important. I think there is real synergy between both licensed and unlicensed.

So, right now, we are concentrating on the spectrum around 5 gigahertz that is used by Wi-Fi today and trying to

expand that. We have the proceeding that we are looking at at 5.9 gigahertz and whether we can share with transportation. We opened up this proceeding at 6 gigahertz, which is 1200 megahertz of spectrum, that could be made available that would be well-suited for Wi-Fi. We need to protect the incumbents there. They are a lot of microwave services used by public safety, the utilities, backhaul. And we are working hard at that. We are optimistic that we are going to be able to get to a positive outcome.

Mr. Latta. Okay. Well, thank you.

Mr. Khlopin, you discussed in your testimony the National Spectrum Strategy, and I appreciate the presence and leadership on the topic. Specifically, you discussed spectrum-sharing tools. The International Telecommunications Union has adopted NTIA's software as the global standard to optimize radio-frequency spectrum-sharing between air and ground systems. Would you share with us about this software and what this will do to advance the 5G development?

Mr. Khlopin. Sure, and thank you very much for the question.

The software you are referring to is a software propagation modeling tool developed by NTIA's ITS, Institute for Telecommunication Sciences, in Boulder, Colorado, which, as you indicated, the ITU has officially adopted. What this

allows is to take the propagation, meaning how far a signal travels, and specifically, this software tool was for working with ground-based systems and air systems and how they interact and share spectrum.

The benefits here, it was used when we were looking at the AWS-3 spectrum made available several years ago and how those systems would work together. And right now, it is being used by NTIA's Office of Spectrum Management, and the Department of Defense as well, to look at 3450-3550 megahertz, key mid-band spectrum that we have talked about. It could be made available for 5G. So, it has a direct impact on trying to advance spectrum-sharing. ITS has a long history of leadership there.

It also ties into our National Spectrum Strategy, as we look for tools that we can collaboratively use across both spectrum managers and spectrum regulators, spectrum users, to more efficiently, effectively, and quickly do this analysis, so we can get spectrum put to better use.

Mr. Latta. Thank you.

Mr. Knapp, we know there are several American cities that have deployed 5G, but it seems that a few of the bands' vital 5G deployment, some of which are under discussion today, may be years from being auctioned. How can the United States get these, and future bands we are not even

discussing, to market quicker to ensure that we don't lag behind our global competitors out there?

Mr. Knapp. Yes, absolutely. So, we have already auctioned 28 and 24 gigahertz, and you are starting to see deployments there. You are also seeing some deployments at 39 gigahertz because of the flexibility we have provided in the rules. It is often not understood that the way we did things didn't require everything to be auctioned, because we provided more flexibility to the existing licenses.

And we are planning to conduct an auction at 37-39 and 47 gigahertz towards the end of this year. And I mentioned, I think, that at 2.5, an overlay auction next year as well as auctions of the PAL licenses at 3.5. So, we are moving pretty quickly across all fronts to auction spectrum.

In these other lower bands, there is flexibility, so that, for example, in the 6, and even the 7, hundred megahertz existing bands, it would be up to the carriers when the technology is ready to deploy there as well.

Mr. Latta. Okay. Well, thank you very much, Mr. Chairman, and I will yield back the balance of my time.

Mr. Doyle. The gentleman yields back. The chair now recognizes -- oh, Mr. Pallone is not here and Mr. Walden is not here. Okay. So, we will now go to Mr. McNerney. You have 5 minutes for questions.

Mr. McNerney. I thank the chairman. I will try not to run over.

And I thank the witnesses.

This is an inherently bipartisan issue, and the real focus should be on effective use of the spectrum. Access to unlicensed spectrum has fostered innovation and created opportunities in many sectors, revolutionizing areas such as health care, agriculture, and education. This has led to a lot of benefits across the spectrum in another sense.

Mr. Knapp, do you think freeing up more unlicensed spectrum is important for continuing to promote innovation.

Mr. Knapp. Long answer: absolutely.

Mr. McNerney. Okay, good. Thank you. That is what I would hope you would do.

Last month, I, together with several bipartisan members of this subcommittee, sent a letter to Chairman Pai urging him to move forward with a rulemaking proceeding that takes a fresh look at the 5.9-gigahertz band, which provides significant opportunities for unlicensed usage. I am disappointed that this isn't on the tentative August open meeting agenda. We are overdue for reexamining how to reallocate this band, so that it meets the demands of our times and best serves the American people. It is important that the Commission act quickly to get this proceeding

underway.

The 6-gigahertz band is also critical for providing unlicensed spectrum. This band is very important for deploying next-generation Wi-Fi technology to offer tremendous opportunities for our customers and our nation's economy. There is a record, however, of the 6-gigahertz proceedings that includes discussions about potential interference with unlicensed use in this band.

Mr. Knapp, how are things progressing toward finding a solution that allows unlicensed use of the 6-gigahertz band while protecting utilities and public safety users?

Mr. Knapp. Yes, thank you for the question.

Things are moving along well. The key challenges there are all of these point-to-point microwave systems that we have to make sure we don't interfere with, the public safety systems, the systems used by the utilities, and so forth. So, what we proposed was an automatic frequency coordination system for outdoor deployments that makes sure, essentially, we stay out of the way of the areas that could interfere with those microwave systems. There is debate about the indoor use and whether it needs to be included as part of that system or the power levels are so low and the protections that they can just operate like your normal system.

So, we are continuing to have meetings with

stakeholders, lots of good ideas put forward. And the key is that we want to move forward and protect the incumbents.

Mr. McNerney. Well, we need to move forward in a timely fashion.

Mr. Knapp. Yes.

Mr. McNerney. It is certainly an exciting area there.

NTIA's Engineering Lab recently shared its Spectrum Access System laboratory test results, and they said that there was a critical part of advancing the sharing model of the Citizens Band Radio Service in the 3.5-gigahertz band. Mr. Khlopin, can you explain how these engineering reports are used in disposition of the 3.5-gigahertz band?

Mr. Khlopin. Sure. I am happy to do so, and some of this, I think, will actually be a question for the FCC.

But the Spectrum Access Systems are the software controllers, if you will, to manage the protection for incumbents there. So, it literally will send signals to the networks and the devices when channels are available or when they need to vacate them to protect incumbents. So, the SAS literally manages that. It is software-based. It is a newer technology.

What we are working through is a process with the Commission on how they will be certified. So, the ITS role was to test the software and work with the SAS vendors. As

you indicated, those draft reports were completed, sent to the SAS vendors, and, ultimately, these will end up back at the Commission for the Commission to do the final certification approval.

Mr. McNerney. Well, good. I am glad to hear about that. Can you tell us a little bit more about how the collaboration has been working?

Mr. Khlopin. The collaboration has been absolutely fantastic at both NTIA, including ITS, with the FCC, with the Department of Defense as an important stakeholder there with the incumbent Navy radars, as well as the industry, the SAS vendors and other vendors as well; organizations like the WInn forum, the CBRS Alliance. So, it is an extremely great example of collaboration/coordination that we would like to use in other places as well, too.

Mr. McNerney. Can you describe the disagreement in the 24-gigahertz band?

Mr. Khlopin. So, the disagreement, again, this is, you know, at a high level it is not so much a disagreement on the spectrum being made available or an auction occurring. This has to do with out-of-band emission levels, that there is a long process for setting these that we continue to work through.

Mr. McNerney. I have heard that we are behind our

competitors with 5G, and I am going to leave that hanging. But I would like a little explanation of that in the written word.

Mr. McNerney. Thank you.

Mr. Doyle. The gentleman's time has expired. The chair now recognizes Mr. Shimkus for 5 minutes.

Mr. Shimkus. Thank you, Mr. Chairman, and thank you, Mr. McNerney, for leaving it hanging. So, I appreciate that.

So, we hear a lot about 5G and not to be confused with 10-gigabyte internet or the Internet of Things. But I want to make sure, from a rural district, that we don't lose focus on trying to get rural areas connected. 5G offers a great opportunity.

Also in your testimony, you say that -- well, I am really speaking to Mr. Knapp right now -- we have low spectrum, mid, and high-band spectrum that all has to work together. But in my focus to rural America, how do we make low-band spectrum available and how might this additional spectrum be applied in practical sense to improve the daily lives of rural Americans?

I did an ag tour just last week. We have a tariff war going on. We have a wet season. And agricultural America is really moving to technology, like everybody else, to be able to help them feed the world.

So, for the low band, what do you perceive as you listed in your testimony?

Mr. Knapp. So, I know that at least one of the carriers has suggested that they would provide coverage out into the rural areas in low band. I do think, absolutely, we need to improve the availability of broadband into the rural areas. Much of that is also on the policy side, things like providing greater flexibility for the incumbent licenses to provide access to spectrum. We have a proceeding on aggregation and disaggregation, and so forth, that is seeking to provide that kind of flexibility. It stemmed from the NOW Act. But we are fixated as well making sure we get 5G out into the rural areas.

Mr. Shimkus. So, did I get an answer?

[Laughter.]

I mean you say flexibility and kind of mealy-mouth.

Mr. Knapp. Yes. So, basically, it is providing the policy structure to give the incentives to the carriers to deploy out there. And it is a combination of programs, whether it is universal service or policy changes that I just referred to.

Mr. Shimkus. Okay, thanks. And mid-band spectrum will be helpful in making use of the multiple new Wi-Fi devices coming to the market, correct?

Mr. Knapp. Correct.

Mr. Shimkus. And you mentioned your work on the 2.5-gigahertz band, and Mr. McNerney mentioned that briefly. Is that generally where we start using the mid-band label?

Mr. Knapp. Yes. I mean --

Mr. Shimkus. Great answer.

[Laughter.]

Mr. Knapp. Like a lot of things, it is a little bit more nuanced, but that is the area that we are generally focused on when we talk about mid-band, is from, roughly, 2.5 up to the high end of C-band, 4.2.

Mr. Shimkus. So, you indicated FCC was conducting the phase 2 and phase 3 field tests exploring the feasibility of spectrum-sharing with unlicensed devices in the 5.9-gigahertz band. Do you know when the FCC will issue a notice that takes a fresh look at this band?

Mr. Knapp. So, the spectrum we were talking about, 75 megahertz of spectrum, was allocated quite a long time ago for Intelligent Transportation Services. So, we started proceeding, following from the Spectrum Act in 2012, to look at sharing with unlicensed. We have completed phase 1, the lab tests, issued a report. The Transportation Department is working on phase 2 right now, which is basic field tests. And there have been some other developments with a new

technology called C-V2X. That is different than what our rules allow right now for something called dedicated short-range communications.

So, all along, we have worked closely with the NTIA and the Department of Transportation. We are continuing to do so. And I expect that there will be an item presented to the Commission very soon.

Mr. Shimkus. Thank you.

We just finished having the House National Defense Authorization Act on the Floor. Of course, it ended up going into jurisdictional issues across committee lines.

So, for Mr. Khlopin, the Senate Armed Services Committee included language in theirs that would give DoD a role in managing both federal and non-federal spectrum. Did you all review and approve this language?

Mr. Khlopin. No, we did not.

Mr. Shimkus. Okay. Thank you.

And that is my time. I yield back.

Mr. Doyle. Thank you. The gentleman yields back. The chair now recognizes the vice chair of the committee, Ms. Clarke, for 5 minutes.

Ms. Clarke. Thank you very much, Mr. Chairman, and I thank our ranking member, Mr. Latta.

I want to thank our witnesses for your testimony here

today.

Today's discussion is critical to the future of our nation. Our discussion will help ensure that the United States is the preeminent leader in the race to 5G. However, we can't settle for a silver or a bronze medal. Right now, China is the world's leader in 5G. They are eating our lunch. And with Russian propaganda campaigns and our seeming lack of urgency, we are not pursuing this with the type of urgency that is required for us to be preeminent in this space and to use this technology to be leaders in the world. America must win the readiness race and, through that, the innovation, unleashing of innovation worldwide.

And as we race forward, it is important to keep in mind that there are so many people with skin in the game. Our constituents want to know and hear our approach to spectrum policy that will impact their daily lives. This month, Public Knowledge and other interest groups wrote a letter to the Senate Committee on Commerce, Science, and Transportation on this very topic, specifically the reallocation of C-band. This request must be highlighted in our discussion to ensure that underserved areas and historically underserved communities have voices at the table.

I will close by quoting Phillip Berenbroick, policy director at Public Knowledge. "Allowing this spectrum to

remain underutilized or permitting a private sale will not serve the public interest or help achieve pressing national goals such as closing the digital divide."

So, I urge my colleagues to keep this in mind as we discuss this matter on spectrum.

And I wanted to just ask a question of you, Mr. Knapp. It should be expected from Members of Congress to work to bring our communities into the 21st century through innovation and technological change. Today, we see the workforce transforming before our eyes. Mr. Knapp, as you highlighted in your testimony, new generations of wireless services have created new businesses and new jobs. Can you please elaborate on the transformation of the workforce as you have described in your testimony and with regard to the new creation of new businesses and jobs?

Mr. Knapp. Yes. So, as I mentioned in the testimony, each generation of wireless technology has brought with it growth in jobs and the economy. When 3G and 4G came along, nobody envisioned the apps economy that we all take for granted today, the applications for getting us through traffic, and so forth.

So, the one thing that I think we can be certain of is that the capabilities of this next generation of technology which effectively allow for instantaneous interactions -- so,

I can now react and remotely control a machine, for example -- which of these things might emerge? Which of these things haven't been imagined yet, I can't tell you, but what I do know for sure it is going to be astounding.

Ms. Clarke. Yes, and I am talking about workforce, entrepreneurship --

Mr. Knapp. Yes.

Ms. Clarke. -- and the future of work --

Mr. Knapp. Yes.

Ms. Clarke. -- for Americans. So, having said that, knowing the ultimate potential or the idea of the potential of what this will unleash in terms of what I call the next industrial revolution, which is the use of technology at work, do you believe that this new workforce should reflect the diversity of America?

Mr. Knapp. Yes.

Ms. Clarke. If so, how could the FCC ensure that that occurs?

Mr. Knapp. I think by making sure that we have a variety of ways that people can gain access to spectrum as well as access to the services that are provided.

Ms. Clarke. And that means that we have to have a deployment that goes into every community across this nation, rural, suburban, urban.

Mr. Knapp. Yes.

Ms. Clarke. Okay. Very well. There is work to be done in that regard.

Mr. Knapp. Yes, and we are trying to do it every day.

Ms. Clarke. All right. Very well.

Mr. Chairman, I yield back.

Mr. Doyle. The gentlelady yields back. The chair now recognizes my friend, Mr. Olson, for 5 minutes.

Mr. Olson. Thank you, my dear friend from Pittsburgh, Pennsylvania, home of the Pittsburgh Steelers.

Welcome to our witnesses.

As has been said over and over, this hearing is about technology and lots of challenges, like 5G, spectrum access. We have been talking about conflicts between key players in this whole endeavor. I want to remind everybody that on this day 50 years ago Americans showed the whole world we could overcome anything with technology. Apollo 11 was going to the moon right now 50 years ago to bring Neil Armstrong and Buzz Aldrin to walk on the moon, and Mike Collins to bring them back home. So, again, we can do this if we commit and work together.

My first question is to you, Mr. Khlopin. Given the need for more mid-band spectrum, can you elaborate on what NTIA is doing to encourage and accelerate spectrum-sharing in

the 3.1-to-3.55 giga-band arena?

Mr. Khlopin. Sure. Happy to do so. Thank you very much for the question.

The 3.1-to-3.55 is a large block of spectrum. In fact, Congress directed us to take a look at that in the RAM BAUM's Act. So, we will be submitting a report to Congress by, I believe, March 2020.

So, we started aggressively looking at that range. What we found in the short term is the upper 100, the 3450-to-3550 presents the opportunity in the near term to make spectrum available. Having said that, we will continue to look for the larger block as well.

So, we started internal work, extensive work, with our engineers and the scientists to examine initial feasibility on whether that spectrum could be available using all kinds of analysis and tools, and working with the Department of Defense as the incumbent. And that is likely to transition into a further study, assuming everything looks good upfront, from the Department of Defense, using the Spectrum Relocation Fund/Spectrum Pipeline Act dollars, Spectrum Pipeline proposal, to look into more detail on how that could occur.

Mr. Olson. Interesting answer. Somewhere, hopefully, 2020, late 2020, early 2021, that is something we should expect?

Mr. Khlopin. Absolutely. Yes, for more of a final determination, if you will, on availability. Again, we are very optimistic about it. It is similar to the CBRS band, but the radar systems in there from the Department of Defense are different.

Mr. Olson. Yes, yes, yes.

Mr. Khlopin. Yes.

Mr. Olson. The next one is for you, Mr. Knapp. A company back home called Wilson Amplifiers -- they are in Stafford, Texas; they are in Texas 22 -- they are a value-added reseller of cellular amplification. They use this technology; they provide it to individuals, homes, cars, and commercial buildings. Can you please explain how signal boosters will assist in the implementation of 5G technology? How about signal boosters?

Mr. Knapp. Sure. So, what a signal booster does, it basically is an add-on to a device like a cell phone to increase the range. And the FCC adopted rules just a few years ago, I think, largely driven by Wilson, to accommodate those devices, to make sure that they didn't spill out energy into frequency bands that they shouldn't. So, it is something that we have made an allowance for, and it would be up to consumers whether they want to take advantage of that.

Mr. Olson. And the consumer is always right. One final

question, sir. In case you don't know this, but Mr. McNerney and I are the co-chairs of the House AI Caucus. And we have had a few packed meetings this past couple of weeks, I mean jammed-packed meetings on flyaway days.

As you know, AI can impact on the future telecommunication industry. What is the FCC doing for AI and the network optimization?

Mr. Knapp. So, we have a Technological Advisory Council. And one of the things that we have tasked them to do for this year is to give us feedback and recommendations on artificial intelligence, its role in the networks, conceivably what it could do to increase access to the spectrum.

Mr. Olson. Chairman, I have no more questions. I yield back the balance of my time. Thank you.

Mr. Doyle. The gentleman yields back. The chair now recognizes Ms. Eshoo for 5 minutes.

Ms. Eshoo. Thank you, Mr. Chairman.

And it is wonderful to see both of you.

Mr. Knapp, I have probably been asking you questions and working with you for almost half of your career.

Mr. Knapp. Yes.

Ms. Eshoo. So, thank you for everything --

Mr. Knapp. Thank you.

Ms. Eshoo. -- that you have done and your commitment to all the issues over the years. I mean, you have an encyclopedic knowledge of all of this.

So, it seems to me that the discussion about unlicensed continues to be in many ways the same. First of all, it is the most, I think, innovative platform relative its use of spectrum. And there always issues about interference. There are always groups that say, "Uh-uh, no, we can't do this because it is going to be a problem." And then, there is the other kind of Greek chorus on the side of the stage that says, "Let's share," except there are problems with that. So, this isn't any -- I don't want to hurt your feelings, but this isn't anything new.

[Laughter.]

These things come up all the time. I have confidence that you can work them out.

Mr. Knapp. Yes.

Ms. Eshoo. You are a pro, and we always have to pay attention to what the public safety people are saying, because that whole system has to always be working superbly well 24/7. There just isn't any room for something that would take down what they need.

So, the FCC is considering the 5.9-gigahertz and the 6-gigahertz bands for unlicensed uses. Aside from just

allocating more spectrum for unlicensed uses such as for Wi-Fi, are there benefits to assigning a contiguous spectrum band or subparts of the bands for unlicensed uses, rather than more of a piecemeal approach? Are you considering that?

Mr. Knapp. What we have, the existing 5-gigahertz band. We have the transportation spectrum here, and then, we have above it the 6-gigahertz spectrum that we have been talking about.

Ms. Eshoo. Right.

Mr. Knapp. The kind of sharing that has been discussed in 5.9 has not been all of it. It has been some of it.

Ms. Eshoo. So, what are you saying? It is not, can't be contiguous?

Mr. Knapp. So, to finish this out, though, the technology today does not have a real problem with these little discontinuities, as long as they are close. The technology has the smarts to piece it all together in a way --

Ms. Eshoo. So, the technology can, essentially, make it contiguous?

Mr. Knapp. Yes.

Ms. Eshoo. I see. Well, that is good news.

If you consider all the various bands that the FCC is considering for unlicensed uses, is this enough?

Mr. Knapp. Is this enough? I have been at it a while; it is never enough.

[Laughter.]

Ms. Eshoo. Well, the appetite keeps increasing. So, yes.

Mr. Knapp. And that is a good thing --

Ms. Eshoo. Yes.

Mr. Knapp. -- because it is doing terrific things for the American people. I think we have got a lot on our plate right now. We want to make the TV white spaces more amenable for rural deployment. We are working on 5.9. We have got the proceeding on 6. We opened up the spectrum at 60 gigahertz a huge amount. And the technology evolves at something called WiGig. And we just opened up another 21.2 gigahertz of spectrum above 95 gigahertz. This is spectrum --

Ms. Eshoo. So, what you are describing, does that get us out in front of it all or are we just trying to keep up with the appetite?

Mr. Knapp. I think what we are always trying to do is stay out in front.

Ms. Eshoo. Good.

Mr. Knapp. And I would say the United States has led the way worldwide --

Ms. Eshoo. Don't say, "try"; say, "We're going to."

Mr. Knapp. Yes.

Ms. Eshoo. Say, "We're going to."

Mr. Knapp. We are going to.

Ms. Eshoo. Okay, good. Good. Now I am satisfied.

With all of this becoming available, what kind of hardware upgrades will be needed? Will we need new chips in phones, routers in our homes?

Mr. Knapp. No, you won't need new things. What will happen is, you will see products with new capabilities. So, everything you have is not obsolete. It will be up to the consumer --

Ms. Eshoo. Oh, I am going to remember that, then. Yes, okay.

[Laughter.]

Words don't matter here?

Mr. Knapp. You are going to back me up, I sure hope.

But, absolutely, the idea is that you would continue to be able to use all the existing stuff. But if we open up the 6-gigahertz band, what I anticipate will happen is this will be added as a new capability.

Ms. Eshoo. Thank you, Mr. Chairman. Yield back.

Mr. Doyle. I thank the gentlelady. I now recognize Mr. Johnson for 5 minutes.

Mr. Johnson. Thank you, Mr. Chairman.

Mr. Knapp, I was a little bit disappointed -- well, a lot disappointed, actually -- to see last week that there was not a priority window included for rural educators using EBS licenses as part of the FCC's order on the 2.5-gigahertz band. How will the new rules for the 2.5-gigahertz band spectrum benefit rural areas? And is there a strategy for using 2.5-gigahertz band spectrum to bridge the digital divide?

Mr. Knapp. Yes. So, this was certainly a policy call, not a technical issue. And I know there were tough decisions that were made. There is a drive for mid-band spectrum. And so, this was one of the -- this is the largest band of mid-band spectrum below 3 gigahertz that was available. Throughout much of the country, the spectrum was not in use. And so, what the Commission did is the existing licensees don't lose any of their rights. Their existing leases can continue, and it will give them flexibility to move from some of the constraints that there are in the current rules, with the idea that we also have a priority window for tribal nations to apply for use of that spectrum, and then, to do an overlay auction for the areas where there is no use now.

Mr. Johnson. But if we could do a carveout for tribal nations, which have the same problem that rural America does

as far as the urban-rural divide, why wasn't there a carveout for those licenses in rural America?

Mr. Knapp. I think there is an explanation in the Commission's decision that basically said there was a belief that greater flexibility would better incentivize investment into the rural areas, rather than the restrictions that we had before. And those restrictions that were there previously were largely used as part of leases for broadband.

Mr. Johnson. Well, I wish I shared your optimism that that investment is going to come because we have been talking about the rural-urban divide now for almost nine years, since I came in in 2011. And in spite of the amount of money that we have put into it, I can tell you, in Appalachia, we are not seeing a lot of progress on the ground.

I also understand the FCC is considered the expert agency at determining thresholds for interference between entities using spectrum. I would like to ask you some questions specifically about the process the FCC undertook when it looked at auctioning the 24-gigahertz band, a band identified for 5G services. So, did standard interagency coordination take place before the FCC moved forward with rules and the auction of the 24-gigahertz band? I understand that process took nearly five years.

Mr. Knapp. The short answer is, yes, there was standard

interagency coordination.

Mr. Johnson. Okay. And that auction of the 24-gigahertz band earned over $2 billion from wireless companies; do I have that figure right? Is that right?

Mr. Knapp. That is roughly right, yes.

Mr. Johnson. Okay. Chairman Pai, in a recent letter, wrote that, during your interagency process, quote, "Other federal agencies did not object" -- unquote -- to expanded use of the 24-gigahertz band to 5G. Is that correct?

Mr. Knapp. That is correct.

Mr. Johnson. Okay. When the Department of Commerce provided a study purporting to show there may be interference between weather centers and 5G use of the 24-gigahertz band, were you able to validate that study? I mean, wasn't that study based on a sensor that doesn't exist?

Mr. Knapp. That is correct, and we had a number of concerns about the study.

Mr. Johnson. Okay. All right. Given your experience and long tenure at the FCC, are you confident that commercial wireless operations in the 24-gigahertz band can peacefully coexist with weather-sensing capabilities now and in the future?

Mr. Knapp. Yes.

Mr. Johnson. Okay. Mr. Chairman, I am going to give

you back 37 seconds. I yield back.

Mr. Doyle. I thank the gentleman. The chair now recognizes Mr. Veasey for 5 minutes.

Mr. Veasey. Thank you, Mr. Chairman.

Mr. Knapp, good morning, and I want to thank you for being here today.

I represent the Dallas-Fort Worth area. And it is one of the 11 cities of the FCC-granted T-band spectrum2 for public safety purposes. In the Middle Class Tax Relief and Job Creation Act of 2012, this spectrum was directed to be reallocated and auctioned off to commercial entities. And I was wondering if you could discuss some of the challenges of relocating the T-band spectrum to commercial users and whether there is any benefit to moving public safety entities and, to a lesser degree, broadcasters off of them?

Mr. Knapp. Yes, so we are following the statute as it exists. I understand that parties are talking to folks in Congress. And so, we have just looked to whatever guidance there is from Congress.

And the technical challenges are always when you are trying to find space for systems that have spectrum today. And I don't know that there is an obvious place to relocate them, but that we would carry out whatever the statute calls for.

Mr. Veasey. Well, thank you. Mr. Chairman, I yield back.

Mr. Doyle. The gentleman yields back. The chair now recognizes Mr. Bilirakis for 5 minutes.

Mr. Bilirakis. Thank you. I appreciate it.

And thank you for your testimony, Panel.

Mr. Knapp, CTIA has suggested we need a national five-year spectrum plan. From an investment standpoint, I can see the value of this policy, since the testing and rollout of new capabilities is often a multiyear process. What are your thoughts on adopting a multiyear spectrum plan? This is for, again, Mr. Knapp.

Mr. Knapp. Yes. So, there are a few things that are going on. One, from time to time, for example, we conducted an inquiry about spectrum above 24 gigahertz, spectrum in the lower bands, and so forth, to identify spaces. It does take time to roll them out. So, that is what we have been doing, for example, in what we call the millimeter way of proceeding. So, we are constantly, rather than a static process, constantly looking at what are the others that are ripe for a look as well.

And perhaps Mr. Khlopin can also talk about the work that is going on in the National Spectrum Strategy.

Mr. Bilirakis. Yes, please. Please, if you would like

to.

Mr. Khlopin. Sure. I would be happy to talk about the National Spectrum Strategy. So, this is, again, from the directive of the President, NTIA is leading development of this strategy. A forward-looking, sustainable approach, better tools, better collaboration, and how we can do a better job of managing spectrum into the future. It is less of a band-specific, technology-specific approach we are looking at, but more in getting away from that and how we can ultimately expand access in a larger perspective, rather than just looking piecemeal. So, we can come up with an approach for better solutions long term.

Mr. Bilirakis. Okay. Very good.

One question for you, sir, again, Mr. Khlopin -- and you have touched on this -- but there is an article on the front page of The Washington Times last week, actually, titled, "Savvy South Koreans Race to Embrace 5G Networks". Did you read that?

Mr. Khlopin. I believe I am familiar with it, yes.

Mr. Bilirakis. Okay. The article notes that South Korea already has tens of thousands of 5G-based stations and it is projecting to serve 90 percent of the population by the of the year, while South Korea is significantly smaller than the U.S., obviously. This is a substantial deployment and

consumer pickup rate of, again, 5G in such a short period of time.

NTIA is required to release a report this month on the National Spectrum Strategy, as you alluded to. What do you recommend in your report to make more mid-band spectrum available, as we compete with South Korea and other countries in this race to get the 5G?

Mr. Khlopin. So, again, in the National Spectrum Strategy we look at, particularly I think on the increased collaboration side, on how we can get parties together to act quicker, because a lot of this is about timing. We have talked about spectrum roadmaps and making spectrum available. How do we do it quicker? How do we do it faster?

In the 3450-3550 megahertz discussion, which, again, is key mid-band spectrum, we have already -- I talked before about an internal NTIA analysis going on on the band, but we have also reached out to industry stakeholders and invited them to come in and discuss with us a process on how we collaborate not just as the government, but with industry as well. So, get a better understanding on the license side, on 5G, on unlicensed, the visions for how they might utilize the band, come up with an approach where we can get groups together, get engineers together from the government and industry, and more quickly get the requirements in,

understand systems, and work through that process.

We did this in AWS-3 and that expedited things. And we are looking at similar things here. Again, each band, each analysis, is going to be a little bit different, but those are the type of tools we are looking at.

And then, automating software, too. So, one of the big initiatives for NTIA is so much of our processes are more manual and slow, and we are trying to bring modernization, to bring better technology and artificial intelligence, bring that into the spectrum, you know, update spectrum management tools to reflect the industry that we are trying to make spectrum available for.

Mr. Bilirakis. All right. Very good.

Mr. Knapp, the FCC has an open rulemaking to allow unlicensed devices in the 6-gigahertz band. This spectrum is currently used for mission-critical backhaulings for public safety, again, commercial carriers, and utility companies. What steps can you take to prevent harmful interference to these important services?

I don't have a lot of time, but --

Mr. Knapp. I will make it very quick.

Mr. Bilirakis. Thank you.

Mr. Knapp. So, for the outdoor deployments, we would use an automated frequency coordination system to stay out of

the way of those point-to-point links and not interfere with them. This is still an open proceeding. So, that is what we had proposed.

For the indoor use, there is a debate about whether they need to be part of that or not, and at certain power levels, where there is so little risk that we don't need to tie them into a separate mechanism.

Mr. Veasey. Very good.

Mr. Doyle. The gentleman's time has expired. The chair now recognizes Ms. Matsui for 5 minutes.

Ms. Matsui. Thank you, Mr. Chairman.

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

As you know, Agenda Item 1.13 will be considered at WRC-19 to discuss identification of additional millimeter wave bands for International Mobile Telecommunications, or IMT. The 26-gigahertz band has emerged internationally as a leading candidate for 5G services. International harmonization includes various different efficiencies, especially as equipment manufacturers are able to integrate several spectrum bands that the Commission has already auctioned for commercial use into a single radio. As you already know, the 26-gigahertz band is allocated primarily for federal government services.

Mr. Knapp and Mr. Khlopin, could you comment on the

potential of appropriate sharing of protection arrangements for federal users in the band?

Mr. Knapp. So, one of the reasons that 24 is so important is because we asked about 26 in an open rulemaking proceeding, but the key here is it is very active federal government use.

Ms. Matsui. Right.

Mr. Knapp. It is probably better for the Department of Defense to speak to what they have in there.

Ms. Matsui. Okay. All right.

Mr. Khlopin. Yes. No, I would echo that point, that we did take a look and it is more intensive use --

Ms. Matsui. Okay.

Mr. Khlopin. -- as opposed to some of these bands where you are dealing with adjacent, as opposed to co-band systems.

Ms. Matsui. Okay. So, it is much more difficult. We will have to -- okay.

The international community has had a long history with consideration of the 4200-to-4400-megahertz band for terrestrial mobile use. In 1990, the ITU concluded that the whole of the band would be required up to the year 2015 for radio navigation services, but noted that current accuracy requirements may be achievable in a smaller bandwidth. And

NTIA had previously initially identified the upper and lower 20-megahertz segments of this band as a potential candidate for terrestrial wireless use. Of course, this band is reserved internationally for radio altimeters, based on onboard aircraft, and for the associated transponders on the ground. It is also adjacent to the 500-megahertz, the C-band spectrum currently under consideration for mobile use.

Mr. Khlopin, what would NTIA's role be in determining the suitability of introducing mobile services into the upper 100-megahertz of the C-band?

Mr. Khlopin. Thank you very much for the question. And I am not real familiar with the specifics that you raised on the bands up above. So, we will probably have to get back to you and your staff. But, in general, again, if we have adjacent federal services there, then we would be involved in the analysis and recommendations on how to move forward.

Ms. Matsui. Okay. Two major issues in slow additional wireless uses of both federal and commercial spectrum bands are the need to relocate incumbent users and the need to conduct incompatibility analysis testing of additional services in existing bands, frequencies such as those between 7.125 gigahertz and 8.4 gigahertz or the 4.9 gigahertz. Both offer potential opportunities, but, currently, there is no precise mechanism that exists for prospective commercial

users to coordinate with either federal or other commercial users to relocate or study compatible uses of spectrum bands.

My SPECTRUM NOW Act creates additional opportunities for federal users to access otherwise unused Spectrum Relocation Fund resources in some instances to perform the services. But I believe, if given the opportunity, commercial users may be open to providing resources to accelerate the relocation of incumbent users or study additional uses of existing bands as appropriate.

Mr. Khlopin and Mr. Knapp, do any of you have any thoughts on allowing commercial users to make payments that could accelerate spectrum transitions?

Mr. Khlopin. So, thank you very much for the question, and appreciate your leadership on these issues.

I will start by saying that the administration does not have a position on your legislation specifically, but, more generally, we are certainly always willing to have these conversations about how to enable more effective tools. As much as I mentioned with the National Spectrum Strategy, it is figuring out how to better collaborate between industry and government users. So, we are very interested in exploring the possibilities.

Ms. Matsui. Okay, fine.

Yes, any other comments here, Mr. Knapp?

Mr. Knapp. No, not on that.

Ms. Matsui. Okay, great.

Mr. Knapp. Federal spectrum.

Ms. Matsui. Okay. I think I am going to run out of time before I can ask the next question. So, I will just yield back. Thank you very much.

Mr. Doyle. The gentlelady yields back. The chair now recognizes Mr. Walden for 5 minutes.

Mr. Walden. Thank you very much, Mr. Chairman.

And again, both of you, thank you for being here.

Mr. Knapp, we were talking earlier in the hearing about the WRC conference that is coming up, a little focus on CTeL, focusing on the Americas. And I would appreciate your insights on both of these critical forums and other priorities that the U.S. and the administration have for this.

I also want to get back to this NOAA and NASA study issue. I would just tell you, I am tired of reading about it in the press and not being able to get a copy of it. I am told the Science Committee was provided a copy of it. I realize there are processes you all have to go through in the administration, but I recall pretty distinctly a time when the President stood next to the Chairman of the FCC and said, "Here's my policy going forward on 5G." And then, there has

1557 been all this dysfunction since.

1558 And so, I want a copy of that study. Mr. Knapp and I

1559 have worked together on a number of issues going back to

1560 LightSquared, when I dragged you in as the engineer-in-chief

1561 to help sort out the politics from the reality of the actual

1562 technology.

1563 And we have got to figure this out, and we can only do

1564 it effectively if we have access to the information. And so,

1565 this has to get cleaned up. It is nonsense.

1566 So, if you all can, back to the point here, if you all

1567 can talk about what you expect we should pay attention to in

1568 WRC coming up? Mr. Knapp?

1569 Mr. Knapp. So, quite a few issues. I have been more

1570 involved in support for the spectrum side. I think

1571 Congresswoman Matsui referred to Item 1.13 --

1572 Mr. Walden. Right.

1573 Mr. Knapp. -- which is all about spectrum for 5G, and

1574 so forth. And so, it is always a dual mission for us to make

1575 sure we get access and make sure that nothing is done that is

1576 going to harm the U.S.

1577 Mr. Walden. Right.

1578 Mr. Knapp. And what is being debated here is what are

1579 the protections for the passive satellite bands.

1580 Mr. Walden. Correct.

Mr. Knapp. Twenty-four is just one of them. There are others at 32, and so forth. And so, the discussions -- I know there is a lot of reference to this one study. There is actually more than 10 studies that have been submitted internationally --

Mr. Walden. Ah.

Mr. Knapp. -- that are publicly available. It is not just one.

Mr. Walden. Maybe you could give us a list of those at some point?

Mr. Knapp. Right. Happy to.

And each comes to a different proposed limit. The tradeoffs here are always the level of protection that is assumed through the analyses --

Mr. Walden. Right.

Mr. Knapp. -- versus the viability, whether anybody can meet it. I think one of the big concerns for us, and as we strive to find access to spectrum, is that we don't create protections that are so stringent that we are leaving thousands of megahertz of --

Mr. Walden. Right.

Mr. Knapp. -- of spectrum on the table.

Mr. Walden. Right, and I think that has been my concern. Nobody wants interference, but I have heard that

you are going to wipe out every satellite that does anything related to weather and NASA is going to have shut down. I mean, that is kind of the spin that seems to be coming, and I am not convinced that is what we are doing.

Mr. Knapp. I am quite confident that is not going to happen.

Mr. Walden. And I have read some things, that these are old transponders, or something, that aren't even in use now that was part of an underlying study, some receiver.

Mr. Knapp. So, there is a number of sensors on the satellite.

Mr. Walden. Right.

Mr. Knapp. This was one of them that was used for the analysis. There are other sensors. We are committed to protecting them. What we also want to see is that whatever is adopted is reasonable, based on not absolute worst-case science.

Mr. Walden. And while we are on the international conferences, I referenced the issue with the Russians and RT, which, Mr. Chairman, I would put in the record the story, if that is okay.

Have the Russians raised this issue of health effects from 5G at any of the international conferences you all have attended?

Mr. Knapp. I am not aware.

Mr. Khlopin. I do not believe so. I have heard there has maybe been the equivalent of water-cooler talk, if you will, when the story was out in The New York Times, but I am happy to also explore further with our team that attends the ITU meetings.

I also wanted to take just a quick opportunity, too --

Mr. Walden. Sure.

Mr. Khlopin. -- to come back on the studies and 24 gigahertz. And I know it was characterized before that NOAA and NASA -- and by the way, on the study, again, it is not an NTIA study. So, we can't deliver it, but I am happy to take back that request for the committee --

Mr. Walden. Yes, it needs to happen.

Mr. Khlopin. -- to the Department and NOAA. I do know they want to be transparent.

But, on the issue generally of the studies, I want to be clear. It was not that NOAA and NASA or NTIA, or anybody, was thinking this band with 24 gigahertz is not available for 5G. Again, it is a discrete issue on the out-of-band mission protection levels. And as Mr. Knapp indicated, we believe that both can coexist.

And also, going back in time, there was also, I believe, a conversation or an allegation that the agencies brought

this to attention late. And this goes back two or three years, a study underway. The FCC report and order actually says that we have the potential to reevaluate these rules, based on further international studies. You know, auction participants were fully on notice. So, all that. This is a typical process. It just, unfortunately, got a lot more publicity this time.

Mr. Walden. Thank you, Mr. Chairman.

Thank you, gentlemen.

Mr. Doyle. The chair requests unanimous consent to enter the document that Mr. Walden referenced into the record. Without objection, so ordered.

[The information follows:]

********** COMMITTEE INSERT **********

Mr. Doyle. The chair now recognizes Mr. Schrader for 5 minutes.

Mr. Schrader. Thank you, Mr. Chairman. I appreciate that.

I guess, Mr. Knapp, with regard to low spectrum sales and auctions, when is that going to occur and, given the interest in the mid-band and the versatility of the mid-band, are we concerned about subscription to that auction? And what are we doing to incentivize that? I mean, this is going to be the rural broadband or the rural expansion. And historically, the ROI has been less than you see in some of the suburban and urban areas. So, how are we going to incentivize, since our plan is based on, frankly, private industry supplying the need, how are we going to incentivize that? And what do you anticipate?

Mr. Knapp. So, the spectrum at 600 megahertz is what was obtained through the TV incentive auction. So, we are repacking the TV band. We have auctioned the licenses. The carriers are in the process of deploying. One of the carriers has made commitments that they would deploy service into most of the country, including the rural areas. These other bands that we talk about as low, 700 megahertz, which we have done a while ago; the 800 megahertz -- sorry to throw out so many numbers -- but, as a matter of policy, we

provided flexibility to the carriers to change the technologies as they see fit.

So, what has happened is, as they introduce the newer technologies into the newer bands, and then, over time deploy it into the legacy ones -- in other words, changing out the old ones. And I mentioned before that I think, on the policy side, there is work that is going on to incentivize deployment into the rural areas.

Mr. Schrader. All right. I appreciate it. I am just concerned that it, frankly, doesn't quite sound like enough. I have the same concerns my colleagues from Illinois and Ohio have about how this is going to play out. We don't want to have rural America, rural Oregon in my case, left behind in this new international economy that is out there. So, anything we can do to incentivize folks, more competition and, frankly, more investment in those areas would be great.

Mr. Khlopin, first, 5G sounds wonderful. It is a nice, little buzzword. And I can hardly keep up with 4G personally, but understand I am old and that is just the way of things.

But there are dangers. The Internet of Things sounds great, but, given the evidence of the cyber threats that we are seeing nowadays from our "friends" in Russia, China, North Korea, Iran, you name it, what are we doing or what are

our friends in the private sector, or what are our friends in the federal government doing, to make sure that we are not going to have a wholesale shutdown of the Internet of Things or some big energy sector or our financial institutions? How do we guard against this with the 5G interoperability and speeds that are occurring?

Mr. Khlopin. Thank you for the question. I really do appreciate it. And I will preface this by I have mostly focused more on the spectrum issues, and I am certainly happy to have a followup conversation with you and your staff and bring in some of our experts.

But you are right; there are a number of pillars, if you will, to 5G and IoT to make sure it is a success, and the spectrum was one piece. But we do need to make sure the security is there, the cybersecurity, the standards work, and a number of areas where we are involved in, along with plenty of other government colleagues as well, is supply chain security. It is a significant issue and we have seen vulnerabilities particularly in IoT, where they connect to the network and you can't trust the supplier necessarily or you have software upgradeability concerns and ways to tap into the network. So, we do worry about that: where the products are coming from; what is the supply chain?

And cybersecurity as well is a significant issue, and

NTIA and the Department of Commerce, with our colleagues at NIST, in particular, do a lot of work there as well. And one of the big reports we did recently is how to counter botnets, which are a significant threat in this space as well, too.

So, it is a little bit "all of the above" and, also, working internationally with our global allies, so we all share similar concerns.

Mr. Schrader. I appreciate it. I just want to draw attention that I know we are having an intelligence reauthorization coming up and I know there is a lot of work going on, partnering with the private sector, government sectors, partners across the world, because that is going to be a big issue. We don't want to have a brownout of the United States of America as a result of our connectivity, frankly.

Well, I guess my time has expired. Thank you, Mr. Chairman. I yield back.

Mr. Doyle. The gentleman yields back. The chair now recognizes Mr. Kinzinger for 5 minutes.

Mr. Kinzinger. Thank you, Mr. Chairman.

And thank you all for being here.

I would like to circle back on the 24-gigahertz band, which I broached at the FCC oversight hearing in May. As I explained to the Chairman and Commissioners in May, my top

priority when I come to work every day is U.S. national security and the safety of my constituents. Thankfully, Chairman Pai provided assurances to me and this committee that there was really nothing that is cause for concern, and he promised to work with us and other relevant agencies to assess and report cases of interference, in order to mitigate future instances.

But I would like to ask some more technical questions, Mr. Knapp. It is my understanding that there is nearly 40,000 high-powered fixed microwave links deployed in the 21.2-to-23.6-gigahertz band, which is adjacent to and directly below the 23.6-to-24-gigahertz band. These services are operated under the same out-of-band emission limits adopted for the 24-gigahertz band. And unlike with the 24-gigahertz band, there is no guard band separating this from the 23.6-to-24-gigahertz band. So, have you been alerted to any interference to the passive band from those services at all?

Mr. Knapp. No.

Mr. Kinzinger. And how would NOAA's suggested out-of-bands emission limit for the 24 gigahertz impact 5G deployment in that band?

Mr. Knapp. So, the question is the achievability of the level that they are talking about. And if it is set so

stringent that nobody can meet it, it risks our ability to use that spectrum.

Mr. Kinzinger. Got it. And let me ask you a little bit about a little less controversial, the C-band. Mr. Cardenas and I wrote a letter to the FCC in January expressing thanks for working to clear spectrum for 5G, but also expressing our desire for the Commission to simultaneously strive to avoid unnecessary disruptions in the content-based services American consumers currently enjoy during the transition. Let me ask you again, sir: the Commission responded to our letter, and it seemed to confirm that it generally shares those goals. But would you please briefly explain how the Commission proposes to facilitate continuity in services with minimal disruption?

Mr. Knapp. Yes. We have several proposals before us about how to transition the spectrum. One of the objectives for the Commission all through this is that the incumbents would be protected and made whole. So, although there are different approaches, and without going into some of the technical details about switching channels, and so forth, we would ensure that they are accommodated.

Mr. Kinzinger. So, you have multiple options with those overall values that you will --

Mr. Knapp. Yes.

Mr. Kinzinger. Okay. Do you know when that is going to be decided, by chance?

Mr. Knapp. So, the Chairman has said a bit later this year, as I mentioned in the testimony, that we would have some action to report.

Mr. Kinzinger. Okay. And how is the FCC ensuring that important safety of flight services are protected from interference, such as the 4200-to-4400-megahertz band, also known as the flight altimeter band, and are you working on that with affected stakeholders?

Mr. Knapp. Yes. So, it is often missed, and I think it came up before when we talked about this band just above it at 4200 to 4400, the radio altimeters are there. We need to make sure that they are protected as well. I think these different plans are looking at different amounts of spectrum, and we have to understand, if we get close, what the tradeoffs would be to protect them.

Mr. Kinzinger. Okay. Because I know, obviously, that is really important --

Mr. Knapp. Yes.

Mr. Kinzinger. -- safety in flight issue.

Mr. Knapp. Absolutely.

Mr. Kinzinger. And then, Mr. Khlopin -- I am probably not saying your name right; I am sorry.

Mr. Khlopin. No, you got it.

Mr. Kinzinger. Did I? Whoa.

Next-generation national security systems and solutions are often spectrum-dependent. What is the NTIA doing to ensure that there is adequate spectrum to accommodate growing national security requirements generally?

Mr. Khlopin. Thank you very much for the question.

And if you don't mind, I am actually going to go back to your 24 gigahertz --

Mr. Kinzinger. Sure.

Mr. Khlopin. -- real quickly. You raised the issue of other adjacent services to 24, and I just thought it was important to point out one of the distinctions there, and those are longstanding rules. And when they were originally set up, you had a much lower number, and these are generally, traditionally fixed microwave deployments. So now, we are looking at an analysis here on 5G coming in there. It does change the scene a little bit. You are talking about intensive mobile use, high-density areas. So, this is why you go through this long, lengthy process of doing a study and taking opinions from Study Group One, ITU, that brings in the parameters when you are looking at a 5G system. So, it is not quite an exact comparison to look at the protection values that have existed before.

Mr. Kinzinger. Okay. And I will just cut you off there because the other one is really broad, and we are running out of time. But I thank you guys both for being here and your testimony.

And I will yield back.

Mr. Doyle. The gentleman yields back. The chair now recognizes Ms. Dingell for 5 minutes.

Mrs. Dingell. Thank you, Mr. Chairman.

As you know, I am from Michigan. I am a car girl. And I am probably the one person in this room really paying attention on the 5.9-GHz spectrum band, and I am really worried about what is going to happen to it because I am hearing rumors.

Mr. Knapp, it is my understanding that you helped designate this spectrum. So, I thank you for your leadership and your work on it.

I also read, though, that the FCC plans to announce a new NPR to take a fresh look at the 5.9 band that includes the potential of allowing non-auto safety technologies to utilize it. This happens as the Department of Transportation is about to begin phase 2 and phase 3 of interference testing to see if additional technologies can harmoniously exist within this spectrum. So, obviously, I am focused.

So, Mr. Knapp, these questions are for you. One of the

arguments I keep hearing against maintaining the 5.9-GHz spectrum strictly for automotive safety use is that the band is underutilized, that the auto industry has had 20 years, and the level of DSRC deployments hasn't happened as promised. Do you believe that?

Mr. Knapp. I do believe that the things that were planned when the original allocation was done, and the hopes that we all had for the improvements to safety, haven't blossomed to the point that were envisioned at the time. So, I am happy to take your questions or I can say a little bit more.

Mrs. Dingell. Well, let me keep building on this.

Mr. Knapp. Yes, go ahead.

Mrs. Dingell. Because I am worried that you are going to take that away and the companies are worried.

Mr. Knapp. Yes.

Mrs. Dingell. So, I also understand that, in addition to DSRC, the C-V2X technology shows great promise in the connecting of vehicles and infrastructure to achieve both the safety and orchestration benefits that were intended when the 5.9 spectrum was reserved for automotive use. Would you agree that C-V2X could also help deployments and increase the utilization of the band?

Mr. Knapp. So, to be clear, these decisions in the end

will be for the Chairman and the Commissioners to decide. And what we have been doing --

Mrs. Dingell. And I want you to make sure the Chairman of the Commission knows that some of us are paying attention.

Mr. Knapp. And we anticipated that. So, we have been working with the Department of Transportation and the NTIA on the next steps on this. And you are absolutely right, we have this other technology, C-V2X, that looks promising. I don't think we are at a point of saying whether it should be DSRC or C-V2X. But I think that the issue that we are grappling with is it has been a long time; there is a lot of things that have been happening. What should we do to take a look at how we can foster better use of the spectrum?

Mrs. Dingell. Well, how are we going to make sure that the industry has the spectrum that they need as these things are coming online? And there have been a lot of forces that --

Mr. Knapp. Yes.

Mrs. Dingell. I mean, we are not going to do it in this whole hearing room.

Mr. Knapp. Yes.

Mrs. Dingell. But what I am worried about is that, when they need it, it is not going to be there.

Mr. Knapp. Yes, understood. And I think for the

Commission, it will be trying to take a look at these issues and get a better understanding of everything.

Mrs. Dingell. I also understand that the Chinese government and 13 Chinese OEMs have committed to utilizing C-V2X. Is China ahead of the U.S. in recognizing the benefits of this technology?

Mr. Knapp. I think that it is so new, that I would not characterize it as "ahead".

Mrs. Dingell. But don't we need to worry?

Mr. Knapp. I think we need to be focused.

Mrs. Dingell. Okay. With the FCC considering opening up the 5.9-GHz safety spectrum to new technologies, how will the FCC ensure that there is no interference in the auto safety technologies and that vehicles equipped with different V2X technologies can talk to each other, which is a real concern?

Mr. Knapp. Yes, absolutely. And I know that is a key point, for example, in working with the Department of Transportation. What do we do? Do we leave it open for all technologies, and what if they can't talk to each other? Is it partitioned in some way? And that all kind of speaks to trying to better understand where to go with this.

Mrs. Dingell. Do you and DOT are talking the way that you need to be? This is non-scripted now and I am about to

go --

Mr. Knapp. Yes, absolutely.

Mrs. Dingell. I don't see everybody on the same page some days.

Mr. Knapp. Well, I think we are working through some of the different viewpoints on it, but we absolutely are talking through it.

Mrs. Dingell. Will the FCC move forward with any actions on the 5.9-GHz band prior to the completion of all interference testing? And should the testing prove that these additional technologies do, indeed, cause harmful interference on auto safety technologies, will you still split or look to open up this band?

Mr. Knapp. So, a couple of things. We are continuing with the program for the testing. So, we continue to be committed to seeing it through to its completion. If there is a rulemaking proceeding, then we will see where that all goes.

Mrs. Dingell. I am paying attention.

Thank you, Mr. Chairman.

Mr. Knapp. Thank you.

Mr. Doyle. The gentlelady yields back. The chair now recognizes Mr. Long for 5 minutes.

Mr. Long. Thank you, Mr. Chairman.

1980 And thank you all for being here today.

1981 I am from Missouri, and another Missourian, Mark Twain,

1982 his publicist telegraphed him one day. And if you don't know

1983 what a telegraph is, Google it.

1984 [Laughter.]

1985 But he telegraphed him one day and he said, "Need two

1986 pages two days."

1987 Twain replied back, "No can do two pages two days. Can

1988 do 30 pages in two days. Need 30 days to do two pages."

1989 So, I have spent the last two days coming up with 30

1990 questions for you all.

1991 [Laughter.]

1992 And after sitting here all morning and hearing the

1993 questions hashed and rehashed, I am down to one.

1994 [Laughter.]

1995 So, I want to ask one question. I am going to yield

1996 back a lot of my time here in just a second.

1997 Mr. Doyle. Good.

1998 Mr. Long. What do you mean "good"? I wasn't talking to

1999 you.

2000 [Laughter.]

2001 Mr. Knapp, the 24-gigahertz band represents critical

2002 spectrum that could be used to implement 5G technology. And

2003 the Commission recently concluded a successful auction of

that spectrum. But now, at the 11th hour, objections to the use of the band have been raised by some federal agencies. Were any of these objections raised on the record during the rulemaking process that resulted in the allocation of spectrum for commercial use?

Mr. Knapp. No.

Mr. Long. I yield back.

Mr. Khlopin. Can I, Congressman, to that question? I would just, yes, disagree with Mr. Knapp's answer that the concerns were not expressed.

Mr. Long. Thank you. Do you have anything else to add? I'm sorry I didn't --

Mr. Khlopin. No, I just wanted to state that in the interagency coordination process the concerns over protecting the passive centers was clearly raised and reflected in FCC documents.

Mr. Long. Care to comment, Mr. Knapp, or?

Mr. Knapp. Sure.

Mr. Long. And I will rescind my yield back.

[Laughter.]

Mr. Knapp. The objection, I think, as Mr. Khlopin said before, was not to allocating or using the spectrum for 5G. The question was about the upcoming World Radio Conference and what limits might come out of that. And the Commission's

decision recognized that and said it was open if there was submittal of validated studies about a different out-of-band-emissions limit.

Mr. Khlopin. You know, I agree with that statement.

Mr. Long. Okay. Now, Mr. Chairman, I yield back.

Mr. Doyle. The gentleman yields back. The chair now recognizes Mr. Lujan for 5 minutes.

Mr. Lujan. Thank you very much, Mr. Chairman.

Mr. Knapp, I want to start by reading a section of your testimony that I especially appreciated regarding 5G. You say, I quote, "Each generation of wireless services brought with it new opportunities for innovation, enhanced the safety of our citizens, new businesses, and job creation, and improved our overall quality of life. If you ask 5 people what 5G is, you will probably get 6 different answers. Yet, most seem to agree on certain important aspects of 5G's potential -- speeds 100 times faster than today's networks, much greater capacity, and lag-times one-tenth of what they are today that enable real-time interactions with people and the Internet of Things." Close quote.

That sounds great, but here is the thing. Too many communities that I represent are still waiting for 4G, rural parts of America. And according to the FCC, less than half of New Mexicans have access to mobile broadband that reaches

10 megabits, 3 megabits upload.

Regarding tribal communities, the 2018 GAO report on tribal access to spectrum stated that, I quote, "The FCC has not collected data related to tribal access to spectrum, analyzed unused license spectrum that exists over tribal lands, or made data available to tribal entities in an accessible and easy manner that could be beneficial in their efforts to obtain spectrum licenses from other providers." Close quote.

What progress has the FCC made in addressing these issues?

Mr. Knapp. So, I think what you saw reflected in the 2.5-gigahertz decision last week was a priority for, first, access for tribal nations to that spectrum as a way to encourage the coverage in that. And we are also working across a number of fronts on better collection of information on the availability of service and policies that can support that deployment.

Mr. Lujan. Can I get a commitment today, Mr. Chairman and Mr. Knapp, that we can work together to raise this issue and work with other FCC Commissioners and staff to ensure that, when we are here in a year from now, that we will not have a GAO report that says the FCC has not collected data related to tribal access to spectrum?

Mr. Knapp. So, I know that the Commission will continue to work with you on the deployment to rural areas.

Mr. Lujan. Can we work together to raise the issue, though?

Mr. Knapp. Sure.

Mr. Lujan. I appreciate that.

Mr. Knapp, I have also repeatedly heard concerns that 5G networks may not reach rural and tribal communities for years. What specifically is the FCC doing to prevent the creation of what I will describe as the new digital divide?

Mr. Knapp. Yes, and the deployment of 5G into the rural areas is also one of our key objectives. The low bands that we have been talking about are probably the best vehicle, although all of the bands will be woven together to provide that coverage, so it is not necessarily just any one. And so, what we are trying to do is make sure there is spectrum out there and that people will have access to it.

Mr. Lujan. I appreciate that. When we had Commissioner Pai and Commissioner Rosenworcel before us, we asked a question to them about mapping, that if we, indeed, were going to be able to make investments to close the digital divide, we needed to have more accurate mapping. Is there something that we could be doing, working with you as well and with the other Commissioners, to ensure that we have

accurate maps as opposed to being dependent on what some of the mobile providers are putting out there that show that there is coverage everywhere?

Mr. Knapp. Yes.

Mr. Lujan. Matter of fact, if I went by their maps, all the dead spots that exist in New Mexico and other parts of the country that I have traveled should have coverage, but they don't. Just because someone's measurement of a bar on my phone to them means coverage, I can't make a call, can't use the internet, can't even use that phone if there was an AMBER Alert to let me know that I should be looking for somebody. What can we be doing to better close that divide to ensure that this is going to get out?

Mr. Knapp. Of course, we would be happy to work with Congress, providing technical assistance for anything that Congress wanted to take a look at. We are working hard at the agency on ways we can improve the maps. We know that they need to be better.

Mr. Lujan. I appreciate that.

Chairman, I thank you for your support with this important hearing. And to my colleagues on both sides of the aisle, I have been stepping up to make sure that we are able to close these divides across the country and make use of spectrum as well. Thank you, Mr. Chairman.

Mr. Doyle. The gentleman yields back. The chair now recognizes Mr. Flores for 5 minutes.

Mr. Flores. Thank you, Mr. Chairman, and I have appreciated this hearing and the witnesses who have been here.

Mr. Knapp, I want to echo the comments of Ms. Dingell regarding the 5.9-gigahertz part of the spectrum. I am also concerned about any attempts to make that spectrum or to keep that spectrum from being able to the transportation sector.

I think one of the reasons we have a slow adoption was nobody dreamed 20 years ago about autonomous vehicles, No. 1. And No. 2 is the FCC set the standard, the DSRC standard, which maybe it shouldn't have done then. It should have made it available to the ecosystem to develop its own standard.

So, (A) I am glad the FCC is doing the NPRM on this issue, but (B) I encourage the FCC to look at this carefully, so that it allows the autonomous vehicle space, that ecosystem, a chance to grow into it to fill that spectrum up before that spectrum is given away. So, I encourage you to be very careful about that, as part of that NPR-A. And you may want to consider getting rid of the DSRC standard, since it hadn't been widely adopted, so that the stakeholders in the space will develop the standard that works.

I know you have talked about Cellular Vehicle-to-

Everything technologies, but one of the challenges there is the latency that comes by going to cellular, then, back to go somewhere else, and then, come back to the vehicles, when really we need to make sure that we allow for vehicle-to-vehicle communications using that set of spectrums.

So, again, I am glad you are doing the NPRM, but (B) Ms. Dingell and I, and others, will be paying close attention to that because there are important stakeholder interests that are involved in that space.

Mr. Khlopin, as you know, the President recently announced his Memorandum Developing a Sustainable Spectrum Strategy for America's Future. A key part of that strategy is to protect the homeland, but part of the protecting the homeland is also to make sure that we have proper cybersecurity elements built into the Internet of Things and to other ways to close off vulnerabilities that may exist, as we begin to move forward with that memorandum.

Can you expand on the administration's strategy in this regard to keep the cyber vulnerability low in the Internet of Things, as part of the memorandum?

Mr. Khlopin. Sure, and thank you. Thank you very much for the question.

Again, I will preface this by focusing a little more on the spectrum side. And I think the way we are viewing the

National Spectrum Strategy is, while considering the security issues and the national security considerations, a little more directly on spectrum management. And then, the administration has a number of other interagency activities to implement: the national security strategy, cybersecurity strategy, and those type of issues. So, while there is an overlap, and I think increasingly going forward on the spectrum side we do need to consider that, I think that the spectrum strategy is a little less focused on that.

On the bigger issues there, on IoT security and 5G security, I think probably my best response would be to come back to you on that and maybe welcome a dialog with you and your staff.

Mr. Flores. That would be great. And when we do that, we would like to talk about working with industry experts on this issue as well.

Mr. Knapp, one of the things I was excited to hear about is what used to a spectrum wasteland, and that is 95 gigahertz and above. In the hearing the FCC had, tell us about some of the things that may be available using that set of spectrum. Mr. Khlopin, I will come to you and see if we have got any incumbents in that area that we have to worry about.

Mr. Knapp?

Mr. Knapp. So, I think back to when we opened up the spectrum in 1985 for what we called spread spectrum.

Mr. Flores. Right.

Mr. Knapp. It was a dozen years before we saw Wi-Fi. So, what we have really done here is opened up a huge amount of space for people to be creative and innovate. There is work going on around the world looking at different potential applications, potentially improved security applications, and so forth. I think it is a little early to tell. These signals tend to be very pinpoint.

Mr. Flores. Right.

Mr. Knapp. They don't go very far, but they have got huge bandwidth.

Mr. Flores. And they are attenuated by almost everything.

Mr. Knapp. Yes.

Mr. Flores. As a geek, I am pretty exited about it.

Mr. Knapp. Yes, if you put your hand up in front, they stop.

Mr. Flores. Yes. I am hopeful that we can get something done.

Mr. Khlopin, are there any incumbents that are potentially damaged by opening up the 95-gigahertz part of the spectrum?

Mr. Khlopin. Of 95 and above? That is why I would have to come back and probably get a little more details on that. Are you looking anywhere above 95 or what are you --

Mr. Flores. Well, there is 21 gigahertz from 95 and above that has been opened up by the FCC. I just want to make sure we haven't damaged any incumbent users.

Mr. Khlopin. Yes, and I know when the FCC does these proceedings, again, they coordinate through the IRAC, through the agency processes. So, we did have comments back to the FCC I believe were largely incorporated.

Mr. Flores. Very good. Thank you. I yield back.

Mr. Doyle. The gentleman yields back. The chair now recognizes Mr. Engel for 5 minutes.

Mr. Engel. Thank you, Chairman Doyle, Ranking Member Latta.

I would like to address the T-band. The T-band is radio spectrum located on portions of the 470-to-512-megahertz band. For decades in 11 major metropolitan areas around the country, the T-band has supported vital public safety radio communications for our first responders. It allows police, firefighters, and EMS to communicate, even when cell towers, electricity, or the internet are down. It functions deep underground in tunnels and inside concrete buildings. But now, thanks to an outdated provision in the law, the FCC is

required to reallocate and auction the T-band spectrum by 2021.

I have heard from my constituents back home in New York, in Westchester and the Bronx, that this auction would endanger crucial public safety communications. Options to replace the spectrum are extremely limited. New York City police, fire, and emergency management departments have said that there is no alternative spectrum available for them. Further, GAO completed a study last month which found that auctioning off the T-band radio spectrum without the availability of alternative spectrum would definitely jeopardize public safety in major metropolitan areas around the country.

Mr. Knapp, let me ask you, are you familiar with the GAO study on the T-band? Do you have any reason to doubt its conclusion or that of the New York City police, fire, and emergency management departments that auctioning off the T-band could jeopardize public safety in some of the nation's largest metropolitan areas?

Mr. Knapp. So, I have been involved, obviously, with a lot of things at the agency, but, actually, it has been our Public Safety and Homeland Security Bureau that has been lead on this, and I am not familiar with the report.

Mr. Engel. Okay. Well, trust me, what I am saying is

accurate, and it is really very, very worrisome. The GAO also concluded that, even if alternative available spectrum were available, public safety users are likely to bear significant costs associated with relocating and reestablishing interoperability. The National Public Safety Telecommunication Council, which is NPSTC, calculated in 2013 and again in 2016 that the cost of relocating public safety options off the T-band would be $5.9 billion. It is $5.9 billion. In early 2019, the FCC also placed the total cost between $5 billion and $6 billion.

So, Mr. Knapp, the same question, probably the same answer. Do you have reason to doubt the members from the NPSTC or the FCC on the enormous costs associated with reallocating and auctioning the T-band spectrum?

Mr. Knapp. Yes, I haven't been involved. So, I can't comment either way.

Mr. Engel. Okay. Well, we are going to have to follow this up.

To deal with this problem, the GAO concluded that Congress should pass legislation allowing first responders to continue using the T-band radio spectrum. I wrote a bill last year with Mr. Zeldin and others. We call it the Don't Break Up the T-Band Act, which would allow law enforcement, fire officials, and EMS to continue using the T-band. A

companion bill was later introduced in the Senate. Neither of these bills got a vote last Congress, but I have reintroduced the bill with Mr. Zeldin and others again this Congress. It is H.R. 451. Our bipartisan legislation is backed by law enforcement and fire department officials from different jurisdictions across the country, and it is my hope that we will move this critical bill forward and allow our first responders to continue using the T-band spectrum to communicate effectively and keep us safe.

And if anyone cares to comment on it? I will just leave my statement the way it is.

Thank you, Mr. Chairman.

Mr. Doyle. The gentleman yields back. The chair now recognizes Ms. Brooks for 5 minutes.

Mrs. Brooks. Thank you, Mr. Chairman.

And thank you both for being here today.

I co-founded, actually with Congresswoman Debbie Dingell, the House 5G Caucus. And so, my questions are focused more on 5G.

A recent Defense Innovation Board study highlighted mid-band frequencies below 6 gigahertz as critical to America's competitiveness in 5G. And the New Citizens Broadband Radio Service at 3.5 gigahertz has great potential for delivering 5G services in this critical mid-band spectrum. I understand

that network and consumer equipment are available systems needed to manage are built and are just waiting for the FCC go-ahead.

So, can either of you speak to what is causing the delay in getting the CBRS launched for commercial use? I would be interested in both your perspectives.

Mr. Knapp. Yes. So, I think we are very close. Just to clarify a couple of points, that sharing to protect the Navy radars is based on a computer system, a spectrum access system. So, when the ships are close-by, the devices get out of the way; they just use other spectrum.

These spectrum access systems are developed in the private sector. They have just gone through a cycle of tests out at the NTIA labs in Boulder, Colorado. They have completed the tests. The test reports haven't come yet to FCC. We expect them very soon.

Mrs. Brooks. Okay.

Mr. Knapp. Once we have that, once we have the controlling element to make all of this work, then we will be ready to move ahead with the initial commercial developments, the ICDs. We already have proposals for it. Everybody is excited about it. It is a way to just kind of kick the tires before we go full bore nationwide, but we are pretty close.

Mrs. Brooks. Thank you.

Mr. Khlopin, anything you want to add?

Mr. Khlopin. No, I certainly agree with 100 percent of what Mr. Knapp said. And again, it is a complex system, both on the technology side, even the licensing side, ultimately, to have some priority access licenses and general authorized access. So, a lot of moving parts here.

I think what we are really excited about, though, is the dynamic sharing here ultimately. When we started this process, we were looking at drawing a large circle of exclusion zones for the Navy radars, and now we are moving, hopefully, to where it is a much more dynamic sharing and the spectrum can be used more efficiently.

Mrs. Brooks. But, as we talk about the delay, and while you say "very close," are we talking about this calendar year possibly or are we not?

Mr. Knapp. We had better be.

Mrs. Brooks. Okay.

Mr. Knapp. I think we are talking, you know, hopefully, within a couple of months.

Mrs. Brooks. Okay.

Mr. Knapp. I can't nail that because it depends that there are no surprises that crop up in the review.

Mrs. Brooks. Right.

Mr. Knapp. But we are just as eager as everybody to get

this up and running.

Mrs. Brooks. Okay. Thank you.

I want to go to something that I think some of my colleagues have talked about, and that is the race that we all hear about, the U.S. leading the race in 5G. And I am really proud the city of Indianapolis was actually the first city where both AT&T and Verizon built out and we are doing development testing. And it is very exciting to be one of the first cities and to be the first city in the country.

But, then, I recently saw -- and it has been talked about -- the RT story, the Russian network spreading propaganda about the dangers of 5G and causing dire health effects, including brain cancer. But, yet, ironically, in Russia, it is my understanding from this New York Times article, that they are actually talking about the health benefits of 5G. And so, health benefits versus here, you know, spreading information to our citizens and those here in our country about all the health dangers. And then, someone has called it economic warfare.

Are you familiar with this story? And can you comment? Can you comment on it? Mr. Knapp?

Mr. Knapp. So, familiar with the story. What I will tell you is we have RF exposure limits in place --

Mrs. Brooks. Okay.

Mr. Knapp. -- that go all the way up to 100 gigahertz.

Mrs. Brooks. Okay.

Mr. Knapp. We are not a health agency. We work closely with other agencies, particularly the FDA. The FDA issued a statement last year that the existing standards -- they reviewed all of the science -- the existing standards should remain in place without major change. We also have an open proceeding. We are working hard to try and get next steps out on that as well. There is also a lot of work going on in the Institute of Electrical Engineers and another group called ICNIRP. I won't go through the acronym. But it includes scientists and they are updating the standards a bit, but there is not a major change in what the standards are. It has more to do with test procedures and things like that.

Mrs. Brooks. But I think what you are saying is that the health professionals are also engaged in this as well.

Mr. Knapp. Yes, absolutely.

Mrs. Brooks. Thank you. I yield back.

Mr. Doyle. The gentlelady yields back. The chair recognizes Mr. Walberg for 5 minutes.

Mr. Walberg. Thank you, Mr. Chairman.

And thanks to the panel for being here.

If there is one thing that is positive about being

toward the end of the line here, you get a chance to hear all the testimony. And with what has been discussed here today, I think there is an important trend that we fully need to consider, and that is the fact that new services derive new demand. It is very clear, and I appreciated your comments earlier on that.

Mr. Knapp, given this demand, it is clear that everyone is going to have neighbors in their respective bands. The easy decisions probably are over. And as you know, the FCC is required to protect from harmful effluents. So, let me ask you, what does the FCC look at when making those determinations of what constitutes harmful interference?

Mr. Knapp. I am thinking people have been trying to define harmful interference for as long as we have been in existence. So, here is the rub of it: technically, it is interference that would disrupt the service, cause it to go off the air.

A lot of the debates center around things like not whether your device is operating or it is giving you the wrong information, but whether the noise level in the background rises above a particular point that under the worst set of conditions you might not be able to get a connection. So, in our rulemakings we invite studies. We do an analysis of everything that has been submitted to come up

with what we believe is a reasonable protection level that is not going to disrupt services.

Mr. Walberg. Do you account for legacy systems that may be less spectrally efficient?

Mr. Knapp. Yes. The one point I will get to is, if we have an outlier that is a system that really is operating far outside of its lane, the question -- and it depends what it is and how many people have got it, and what the extent of deployment is. It may not be appropriate to have one outlier drive prevention of access to spectrum.

Mr. Walberg. Okay. Mr. Khlopin, are there things we need to do on the federal side to improve incumbents' efficient use of the spectrum?

Mr. Khlopin. Sure, and thank you for the question. I think that is an ongoing question that I am sure this committee, Congress, and NTIA, and others have asked for years.

Yes, we are always interested in more efficient spectrum use. And I think sometimes the agencies' use can be mischaracterized as inefficient. I will give an example of spectrum bands. When we did the AWS look, we realized there were -- I don't know -- 15, 16, 17, 18, many different federal systems operating who actually already share spectrum today. So, in some ways there is a lot of innovation on the

federal side because we cram a lot of federal agency use into frequency bands.

Having said that, we know there is always opportunities to be more efficient. And part of the challenges are that, from any agency perspective, they are mission-driven, right? They are not driven to be especially efficient for the sake of the good of the order, right? I mean, they are driven to accomplish their mission, and Congress wants them to accomplish their mission.

So, it is sort of aligning where those incentives are, how we get a framework. And again, I will come back to the National Spectrum Strategy, where we are trying to determine how we do those processes better, how we incentivize agencies, and how collectively we do a better job of that.

Mr. Walberg. Okay. Thank you.

Mr. Knapp, in cases where incumbents claim new entrants may harmfully interfere with their existing systems, how does the FCC weigh the criticality of certain services like providing for public safety?

Mr. Knapp. So, public safety is always going to be a prime concern for the Commission, to make sure that it is protected. So, if we are looking at something where we think there would be a risk of interference to public safety, we try to figure out a way that we can make sure they are

protected.

Mr. Walberg. To what extent can interference concerns be allayed without testing?

Mr. Knapp. So, in some cases testing is appropriate. I think the one thing you have to be a little bit concerned about, that testing doesn't become a way to delay implementation of a new service. I mean, for many years, the Commission has acted without having to have tests in every case, just based on the analysis of what we have in the record. And there are times where, for example, in the white spaces and unlicensed, and in the sharing with the Intelligent Transportation Services, where to get a better understanding, we had to do tests.

Mr. Walberg. Okay. Thank you, and I yield back.

Mr. Doyle. The gentleman yields back. Last, but certainly not least, Mr. Gianforte, you have 5 minutes to wrap it up.

Mr. Gianforte. Thank you, Mr. Chairman.

And thank you for the panelists today.

My concern is rural deployment, being from Montana. We recently had Commissioner Carr. I was there with him and I applaud him. He has been to 30 states, as FCC Commissioner, experiencing on the ground. And he shared with me that Montana is probably worst of all 30 states he has been in for

cell phone coverage.

So, what we do related to 5G is critically important. 5G will come to rural America if, and only if, these spectrum bands are available. My understanding is that mid-band spectrum is particularly important here. I am an electrical engineer. I can follow most of the discussion we are having. High-frequency spectrum has a very short range and is less suited for rural communities. Lower frequencies have better range, but challenges on throughput. This is why mid-band so important, and, of course, you know this.

Mr. Knapp, we heard that a critical input for 5G is mid-band. I find it interesting that China has deployed 100 megahertz to multiple providers, giving each one of their state-owned carriers a 100-megahertz band, while here in the U.S. we have only allocated 70 megahertz of licensed spectrum, and this hasn't been auctioned off yet.

You have spoken about this today, but could you just for the record talk about when can we expect this spectrum to get to market?

Mr. Knapp. Yes, absolutely. So, let me just try to run through it fast and break it into pieces. So, we talked about 2.5 and things we have tried to do on the policy side to make that more flexible. Then, you start moving up. You have got the NTIA studies with DoD of 3.1 to 3.45, or 3.55.

So, they are looking mostly at the upper 100 megahertz of that. Then, we have got our Citizens Broadband Radio Service. The 70 that you are referring to, it is actually 150 megahertz that is available to everybody under kind of an unlicensed model. the 70 megahertz is what we are going to be auctioning next year. And there was a lot of interest from rural folks in that spectrum as well.

Then, we come up to the C-band at 3.7 to 4.2. Why, when you look at China? We have deployments in a lot of this spectrum; whereas, China may not. We also are accommodating a lot of missions on the federal side that are very important as well, probably more than anybody else in the world. So, it is sometimes a bigger challenge for us in accomplishing these transitions. But we have got a lot of activity going on trying to make mid-band available.

Mr. Gianforte. Okay. And so, you mentioned C-band. I am interested in learning more about your efforts around the reallocation of C-band. As you consider the best way to reallocate this in a timely manner, I understand that if it is a private sale, there is really no buildout requirements. Is that correct for rural America?

Mr. Knapp. So, this is an open proceeding. We are still getting new ideas seemingly every day to look at. So, I know that the Chairman and Commissioners are considering

everything that is being presented to them. So, nothing has really been decided at this point.

Mr. Gianforte. So, in fact, there may be buildout requirements attached to transfer of C-band?

Mr. Knapp. I think all of these issues are part of the package.

Mr. Gianforte. And just for the record, I want to just reiterate that, as we make spectrum available for 5G, if, in part, it is through private sales, we have to keep in mind that rural America wants to participate, and without buildout requirements, that would be difficult.

There are entities using parts of that band today. And we have got to really be conscious of these areas of the country where the buildout is not as economically viable. That is why places like Montana lag behind. What else can we do to make sure that we get buildout in these rural areas?

Mr. Knapp. Yes. So, I have referred kind of earlier to more on the policy side. We have actually had our Technological Advisory Council looking at what we could do on the technical side, and it often comes down to money. And so, I think there is a lot going on on the policy side that I am not directly involved in to try to make sure that that happens.

Mr. Gianforte. Okay. Well, we want to continue to work

together to close this digital divide, so we can have rural health care, education, and, of course, economic development. It is critically important.

So, again, I thank you.

And with that, Mr. Chairman, I yield back.

Mr. Khlopin. Could I make just a quick comment, Congressman?

Mr. Doyle. Sure.

Mr. Khlopin. Congressman, I just wanted to offer, too, from the NTIA perspective, outside of spectrum, we are doing a lot of work there that I think you would appreciate. The American Broadband Initiative, and the administration is looking at these obstacles in rural areas, in particular. And part of this is an acknowledgment that the federal government is actually a large landowner. So, we are looking at ways to improve access to federal facilities, including federal fiber networks. So, there are a lot of opportunities there as well.

And also, as is the Commissioner, we are looking at the mapping opportunities that I think would be helpful as well.

Mr. Gianforte. Okay. Thank you.

Mr. Doyle. Well, that concludes our first panel. I want to thank our witnesses for joining us today.

I would also ask that each witness respond promptly to

any questions for the record that you receive from our members following this hearing.

Mr. Doyle. So, thank you very much for being here today.

At this time, I would ask the staff to prepare the witness table such that we may begin our second panel shortly.

[Recess.]

Mr. Doyle. Okay. We are going to ask the second panel to come forward and take their seats.

Okay. We will now hear from a second panel of witnesses on this important issue. Those witnesses include Mr. Jeffrey Cohen, chief counsel at APCO International; Mr. Michael Calabrese, Director of Wireless Future Project at the Open Technology Institute at New America; Ms. Mariel Triggs, Chief Executive Officer of MuralNet; Mr. Tim Donovan, Senior Vice President of Legislative Affairs at the Competitive Carriers Association; Mr. Scott Bergmann, Senior Vice President of Legislative Affairs at CTIA; Mr. Peter Pitsch, head of Advocacy and Government Relations for the C-Band Alliance.

We want to thank all of our witnesses for joining us today. We look forward to your testimony. We will recognize each witness for 5 minutes to provide their opening statement.

And since you were probably all sitting here for the first panel, you know about the lighting system. So, when that light turns yellow, wrap up your remarks. And when it turns red, please finish up.

So, Mr. Cohen, we will start with you. You are recognized for 5 minutes.

STATEMENTS OF JEFFREY COHEN, CHIEF COUNSEL, APCO INTERNATIONAL; MICHAEL CALABRESE, DIRECTOR, WIRELESS FUTURE PROJECT, OPEN TECHNOLOGY INSTITUTE, NEW AMERICA; MARIEL TRIGGS, CHIEF EXECUTIVE OFFICER, MURALNET; TIM DONOVAN, SENIOR VICE PRESIDENT, LEGISLATIVE AFFAIRS, COMPETITIVE CARRIERS ASSOCIATION; SCOTT BERGMANN, SENIOR VICE PRESIDENT, LEGISLATIVE AFFAIRS, CTIA, AND PETER PITSCH, HEAD OF ADVOCACY AND GOVERNMENT RELATIONS, C-BAND ALLIANCE

STATEMENT OF JEFFREY S. COHEN

Mr. Cohen. Chairman Doyle and Ranking Member Latta, members of the subcommittee, thank you for the opportunity to appear before you today on behalf of APCO International. Founded in 1935, APCO was the world's largest and oldest organization of public safety communications professionals with over 33,000 members. I serve as APCO's chief counsel and Director of Government Relations. It is an honor to be back before this subcommittee.

For many decades, public safety professionals have relied upon the availability of dedicated and interference-free spectrum for mission-critical communications ranging from essential 911 dispatch operations to radio communications among police, fire, and EMS responders.

Today, I will address three spectrum matters of pressing

concern: the 6-gigahertz band, the T-band, and the potential of 5G technology.

Beginning in August 2017, the FCC began to explore the potential of introducing new, unlicensed operations into the 6-gigahertz band. This band is heavily encumbered by public safety for extremely reliable, fixed, point-to-point microwave links support backhaul for 911 dispatch and first responder radio communications.

The plan advanced by the unlicensed community for sharing this band could result in the deployment of hundreds of millions of unlicensed devices, many of which would be managed by an automated frequency coordination mechanism. This has left APCO concerned because, if the sharing mechanism fails or consumers or equipment manufacturers disable or misuse the mechanism, or devices are allowed to operate outside the control of the mechanism, there is no way to reverse the resulting interference. There will be hundreds of millions of unlicensed devices out in the stream of commerce, and when interference occurs, that would mean the irreparable loss of communications critical to public safety.

Switching over the T-band, this spectrum is located in portions of the 470-to-512-megahertz band, available in 11 metropolitan areas, available for public safety use. The

2012 spectrum legislation requires the FCC to reallocate and auction the spectrum by February 2021. With nowhere for public safety to move, Congress should repeat this provision. Further, there has been little, if any, interest expressed by potential bidders for this spectrum.

I would like to acknowledge Congressman Walden, who has been engaged in this matter and which we appreciate. Also, the International Association of Fire Chiefs has been at the forefront of representing the interests of public safety on this important topic.

Finally, I would like to turn to the potential benefits to public safety of 5G technologies. First, 5G can provide wireless carriers with more options to improve location accuracy for 911 callers. For example, in-home and in-business products can provide dispatchable location quality information, meaning the street address of the building plus the room, suite, or apartment number. We encourage service providers to more actively leverage 5G and tools in their current networks as a 911 location solution.

5G can also contribute to significant advances in wireless emergency alerts. The platform currently used by the wireless industry is outdated. Ongoing enhancements to wireless networks such as 5G present new opportunities to enhance public safety features.

Finally, if we don't upgrade the nation's 911 systems, 5G will never reach its full potential. While 5G will tremendously enhance the communications capabilities of the general public and first responders, it will only further widen the gap between those capabilities and what is possible for 911. Unless we modernize the 911 system, all these innovations are lost at the door of the 911 center.

While I am discussing 911, I would like to specifically thank Representatives Eshoo and Shimkus for their bipartisan work to introduce the Next Generation 9-1-1 Act of 2019, and to Chairman Pallone for including the provisions of this bill into the LIFT America Act. This legislation would modernize 911 in an innovative, interoperable, effective, and efficient manner while preserving state and local control over 911 operations, which are all goals that we fully support.

Again, I thank you for the opportunity to testify and present APCO's views. I look forward to any questions. Thank you.

[The prepared statement of Mr. Cohen follows:]

********** INSERT 3**********

Mr. Doyle. Thank you, Mr. Cohen.

Mr. Calabrese, you are recognized for 5 minutes.

STATEMENT OF MICHAEL CALABRESE

Mr. Calabrese. Good afternoon. My name is Michael Calabrese. I direct the Wireless Future Project at New America's Open Technology Institute.

There are two fundamental reasons we believe it is critical to make substantially more mid-band spectrum available on a licensed, unlicensed, and shared basis. The first is that the most robust 5G wireless ecosystem will not be built out by mobile carriers alone on exclusively-licensed spectrum. Like today's 4G ecosystem, America's 5G wireless future will rely on carrier networks for mobile, on-the-go use, but also on many thousands of complementary, high-capacity Wi-Fi, private LTE, and other networks deployed by individual enterprises and households.

A second reason we need more unlicensed and shared spectrum is the critical need to assist rural and low-income communities that find themselves on the losing side of the digital divide. At least 20 million Americans, including one in four rural residents, still lack access to basic broadband service. More unlicensed and shared mid-band spectrum can serve as the public infrastructure that enables high-speed broadband in underserved areas at a fraction of the cost of trenching fiber.

One historic step in this direction is the new Citizens Broadband Radio Service. By using dynamic database coordination, CBRS allows private operators to share this underutilized band with the military, fully protecting Navy radar from interference.

Immediately above the CBRS band is C-band. We support the FCC's proposal to combine clearing and sharing in C-band to achieve three vital, public interest outcomes. First, to reallocate a large portion of the band for mobile 5G; second, to enable shared use of unused C-band spectrum for high-speed, fixed wireless service in rural, small town, and other underserved areas, and third, to protect existing earth stations from harmful interference.

Consumer and taxpayer advocates remain concerned, however, that the FCC continues to consider proposals for a private auction that would needlessly transfer $10 to $30 billion or more to four foreign satellite companies that never paid for the public airwaves they use. A private auction would violate Section 309(j) and willfully ignore congressional intent and precedent.

When the TV bands at 700 and, later, 600 megahertz were consolidated for auctions that raised $20 billion each, Congress twice passed legislation ensuring that local TV stations would receive either no windfall or, at most,

incentive payments limited by a competitive reverse auction. Just as Congress in 2012 designated $7 billion to fund FirstNet, Congress should require a public auction and designate $10 billion or more to pay for rural broadband infrastructure.

The FCC should hold a traditional public auction that consolidates existing earth stations into the upper portion of the band and requires auction winners to reimburse incumbents for reasonable costs. Congress should also direct the FCC to authorize coordinated shared access to unused spectrum across the entire C-band to support broadband buildout in rural and underserved areas.

Moving up in frequency, OTI comments the FCC for its pending proposal to open the 5.9- and 6-gigahertz bands to fuel next-generation Wi-Fi. Wi-Fi today makes broadband connectivity more available, productive, and affordable for all. Next-gen Wi-Fi can, likewise, make 5G capabilities immediately available to all homes and businesses in rural, small town, and exurban areas that may not see mobile carrier 5G for many years.

The FCC's pending proposal for unlicensed sharing across the entire band, 1200 megahertz in total, deserves your full support. The FCC's proposed rulemaking has one critical shortcoming, however. Consumer, rural, and high-tech

advocates have urged the Commission to authorize lower-power, indoor-only unlicensed use across the entire 1200 megahertz without the added cost of database coordination.

Finally, concerning 5.9 gigahertz, we encourage Members to urge the FCC and DOT to move forward to determine a way consumers can benefit from both vehicle safety communications and next-gen Wi-Fi. Authorizing unlicensed use of the 5.9-gigahertz band is key to removing the roadblock to a Wi-Fi Superhighway. The FCC should move forward and consider whether another band, such as the nearly-vacant 4.9-gigahertz public safety band, could be equally or more useful for vehicle safety integrated with 4G networks.

Thank you.

[The prepared statement of Mr. Calabrese follows:]

********** INSERT 4**********

Mr. Doyle. Thank you, Mr. Calabrese.

Ms. Triggs, you are recognized for 5 minutes.

STATEMENT OF MARIEL TRIGGS

Ms. Triggs. Thank you. Good afternoon, Chairman Doyle, Ranking Member Latta, and members of the subcommittee. My name is Mariel Triggs, and I am the CEO of MuralNet, a young, nonprofit dedicated to helping tribal nations build wireless internet networks.

I am here to tell you the story about how the Havasupai Tribe, MuralNet, and local partners brought high-speed internet service to the bottom of the Grand Canyon, and how spectrum acquisition was the biggest challenge time and time again.

As schools increase their internet connectivity, teachers assign more online homework. In order to meet academic expectations, students with no access to sufficient internet at home have to go to extreme measures, such as working out of a McDonald's parking lot to pick up Wi-Fi. Rural areas are hit hard, with only 60 percent of homes having broadband access, and on tribal lands that number is halved to 30 percent.

Martin Casado, the father of software-defined networking, and Brian Shih, an expert in E-rate policy, wanted to address the homework gap on tribal lands. In February of 2017, the founded MuralNet. LTE technologies had

matured, so equipment was cheap, reliable, and could be easily installed on existing structures. Network management platforms used to be prohibitively expensive, but now there were free open-source software stacks in beta phase. Many anchor institutions already were connected to fiber.

The remaining hurdle with spectrum for that last mile to homes, and educational broadband service spectrum in the 2.5-gigahertz range was perfect. It could travel far, penetrate trees, had high throughput, and was protected from interference through licensing. But applications have been frozen since the mid-nineties, and we worked to find a solution.

In the spring of 2017, Dr. Chad Hamill of Northern Arizona University vetted MuralNet and connected us with the Councilwoman Ophelia Watahomigie-Corliss of the Havasupai Tribe. The village of Supai is home to about 400 members and is located at the bottom of the Grand Canyon. Travel there requires a helicopter or an 8-mile hike through difficult terrain.

We asked the FCC for special temporary authorization to use EBS-A channels over Supai. We thought it would take two weeks for approval, but it actually took four months. In February of 2018, the Havasupai Tribe was granted access, and within a few days, they made their first high-speed internet

connection through their own network. It took Niles Radio Communications and MuralNet half a day to install the network equipment on the rim of the Grand Canyon. It provides signal to the whole town with the village center having broadband speeds.

The network was a success. So, we applied for a permanent license, and this was the second hurdle, and it took a year to obtain. The delay was due to the FCC's efforts to utilize fallow EBS spectrum by changing the 2.5-gigahertz licensing rules. They proposed opening applications through a tribal priority window and educational priority window, and then, auctioning off what remained.

I learned everything I could about the FCC policy from organizations like Schools, Health, and Libraries Broadband Coalition and the National EBS Association. Councilwoman Ophelia Watahomigie-Corliss and I met with decisionmakers in D.C., telling them of the success of our pilot. We wanted to let them know what was possible if 2.5-gigahertz spectrum became available to other tribal nations.

Last week, the FCC announced that there will be a 90-day outreach period, a 60-day tribal priority window, and then, an immediate auction. Having a tribal priority window is tremendous, but its impact will be stunted because the window is too short. It took five months for the Havasupai Tribe to

assess the impact of a high-speed internet network on their way of life and decide to move forward. Other tribal nations learned from their example and are now working with us to build their own networks. If tribal party windows were a year-long with rolling application approvals, the first wave of applicants would inspire a second, much bigger wave.

Now the Havasupai want broadband coverage for the whole village. They want emergency communications throughout their canyon, an online charter high school, and telemedicine for a new clinic. MuralNet already has grants for this work. And now, we have hit our third spectrum hurdle.

Niles Radio Communications applied for a spectrum license in the 6-gigahertz band to make the necessary increases to microwave backhaul for Supai, but their application might be rejected because, in 2015, another company expressed interest in the frequencies through the prior coordination notification process. Even though the other company did not apply for a license until Niles Radio made their interest public, their application has seniority. If Niles Radio application is rejected, we must wait 18 months to try again. That is a year and a half of schooling, telemedicine, and economic development lost.

The rural digital divide is surmountable. Our LTE network toolkits, the infrastructure we erect, and the skills

of our tribal community partners that they build will make 5G upgrades easy. Spectrum acquisition has been our biggest issue. And as you make new rules to encourage 5G and make current wireless internet faster, please do not create policies that make it harder for tribal nations to build their first networks and connect their people for the first time to this vital resource.

I will be honored to address any questions the committee has, and thank you for your time.

[The prepared statement of Ms. Triggs follows:]

********** INSERT 5**********

Mr. Doyle. Thank you, Ms. Triggs.

Mr. Donovan, you are recognized for 5 minutes.

STATEMENT OF TIM DONOVAN

Mr. Donovan. Chairman Doyle, Ranking Member Latta, and members of the subcommittee, thank you for the opportunity to testify about how to best use finite, taxpayer-owned spectrum resources to support ubiquitous wireless service across the United States.

CCA is the nation's leading association for competitive wireless providers, representing carrier members ranging from small, rural providers serving fewer than 5,000 customers to regional and nationwide providers serving millions, as well as vendors and suppliers that provide products and services throughout the wireless communications ecosystem.

This hearing is timely. Our future is, indeed, wireless. There are now more wireless connections than people in the United States. The National Center for Health Statistics reports that over half of all adults live in wireless-only households. What's more, the share of adults that primarily rely on a smartphone to access the internet has nearly doubled since 2013.

While Americans continue to cut the cord, today wireless services power so much more than voice calls. Mobile connections power new technologies and improve quality of life across the United States. These services rely on a

tremendous and increasing amount of wireless data, with no signs of slowing down.

5G will supercharge these services and enable new services, some not yet even imagined. To make this future a reality, all carriers must have meaningful opportunity to access sufficient spectrum. And while the potential of 5G is exciting, without the right spectrum policies in place to make spectrum available for competitive carriers to serve rural areas, rural America will be left behind.

Congress has established several guiding policies to foster fair and transparent opportunities for all carriers to access spectrum on a level playing field. Policymakers should continue to support these policies.

One, spectrum must be made available in sufficiently small license size, while respecting technological use cases and power levels, to ensure that competitive carriers that serve rural areas have a true meaningful opportunity to gain access.

Two, standards within spectrum bands must be interoperable to support roaming and viable equipment ecosystems.

Three, enough spectrum must be made available to support competition as bands are brought to market.

And four, auctions should be designed with incentives

for small entities and to serve rural and tribal areas, and designed to avoid unnecessary complex and unpredictable processes.

These policies should apply to spectrum allocated for wireless use in low-, mid-, and high-frequency bands. Greenfield opportunities do not exist in the frequencies best suited to support our wireless future, so we must make all efforts to reallocate spectrum from inefficient users.

The SPECTRUM NOW Act may unlock new opportunities through smart policies to support research and development. CCA thanks Representatives Matsui and Guthrie for introducing this bill and supports its consideration.

While low-band spectrum provides a strong foundation for wireless service with vast coverage, and high-band spectrum promises blistering speeds and capacity, mid-band spectrum balances both characteristics. That is why competitive carriers have prioritized ways to access additional mid-band spectrum, particularly to support expanded buildout and next-generation services in less sparsely populated areas.

There are many steps being taken or under consideration regarding mid-band spectrum. We heard about many of them on the first panel, including the 1675 proceeding, the upcoming 3.5 auction, and last week's FCC order on 2.5. These should all be pursued.

But the C-band presents a unique and immediate opportunity to reallocate a substantial portion of mid-band airwaves for wireless use. We should seize the opportunity for this 500-megahertz slide of mid-band spectrum with important foundational principles in place.

Maximize the amount of spectrum made available for wireless use;

Implement a transparent, reliable assignment process that ensures meaningful opportunities for all carriers to access spectrum;

Make spectrum available for wireless use as efficiently and timely as possible;

And ensure that the proceeds of selling licenses to use this taxpayer-owned resource benefit taxpayers, with profits flowing to the U.S. Treasury or used to benefit the American public, as directed by Congress.

CCA recently filed a joint compromise plan to meet these goals with substantial benefits for rural America, including expanded wireless and wire-line broadband services that merit strong consideration from Congress and the FCC.

We are also pleased to hear, Chairman Doyle, your work with Congressman Matsui to advance continued focus on these issues.

In closing, only a comprehensive, holistic approach to

spectrum policy will ensure that Americans in all corners of the United States reap the benefits that stem from next-generation wireless broadband networks and technologies. All carriers require equitable access to spectrum resources, or Americans throughout the nation will miss out on a massive opportunity for economic growth, job creation, and world-wide leadership across industries.

Thank you for your leadership on these critical issues, and I would welcome any questions you may have.

[The prepared statement of Mr. Donovan follows:]

********** INSERT 6**********

Mr. Doyle. Thank you, Mr. Donovan.

Mr. Bergmann, you are recognized for 5 minutes.

STATEMENT OF SCOTT BERGMANN

Mr. Bergmann. Thank you, Chairman Doyle, Ranking Member Latta, and members of the subcommittee. I am Scott Bergmann, and on behalf of CTIA and the wireless industry, I want to thank you for your leadership in making spectrum available for 5G. Your continued focus on crafting smart spectrum policies will be critical to our 5G future.

Thanks to this committee's past efforts, we lead the world in initial 5G deployments. U.S. wireless providers were the first to deploy 5G last year, and by year end, we will have launched 92 deployments across the country, nearly double that of any other nation.

With the right spectrum resources, the U.S. wireless industry is ready to invest $275 billion, creating 3 million new jobs, and adding $500 billion to our economy. But the full societal and economic impact will likely be even greater. U.S. entrepreneurs will leverage new 5G platforms to lead the world in tomorrow's advancements in health care, public safety, transportation, robotics, the environment, and every other key sector.

But every benefit we expect to reap from 5G is predicated on the availability of spectrum. It is the building block of everything we do. We led the world in 4G

and benefitted from economic growth, jobs, and the emergence of the wireless ecosystem. Not surprisingly, other nations saw those benefits and have been aggressive in identifying spectrum for 5G.

Fortunately, we know the roadmap for success, and all of the above spectrum policy focused on low-, mid-, and high-band spectrum. Our mobile wireless networks will need access to all three types of spectrum. They are the three-legged stool that we need for 5G.

Low-band provides great coverage. It goes for miles. It is what your wireless service relies on today. High-band has huge capacity, but it travels short distances. It will be key for bandwidth-intensive applications. And mid-band is the sweet spot. It offers both capacity and coverage. It can handle the increased traffic that 5G will bring and it can travel distances. It will be a workhorse for 5G. To deliver all of the benefits and services that 5G will offer, we need to have a healthy mix of all three.

Our leadership in 5G today is thanks to the wise spectrum policies adopted over the past several years. We applaud Congress and the FCC for pushing low-band spectrum into the market through the broadcast incentive auction. Providers are busy building out this spectrum today. And to their credit, the FCC just successfully concluded the second

of three planned high-band auctions scheduled for this year. As a result, we are leading the world in high-band availability, but other nations are scrambling to catch up.

To keep our 5G leadership, mid-band will be the key. The challenge is that we are behind globally today. Our key rivals will have four times the amount of licensed mid-band spectrum above 3 gigahertz available by 2020. Chairman Pai and the FCC deserve credit for working hard to catch up. The FCC recently finalized the rules for the licensed portion of the 3.5-gigahertz band, and we are eager for the FCC to resolve its C-band proceeding, which has the potential to make available hundreds of megahertz of mid-band spectrum.

The administration is also reviewing the 3.45-gigahertz band, part of the larger 3100-to-3550 band which Congress identified last year in the MOBILE NOW Act. We appreciate this committee's continued focus on efficient use of spectrum by government users, including the recently-introduced SPECTRUM NOW Act. The opportunities for mid-band are there. It is now about execution. We need to free up hundreds of megahertz of mid-band, and fast.

Even as you focus on these national priorities, we must maintain our leadership on the international stage for the 2019 World Radiocommunication Conference. This includes events in 5G in the 2400-gigahertz band, which the FCC just

auctioned for over $2 billion.

We urge Congress to ensure that our U.S. positions reinforce our 5G leadership and do not undermine access to critical bands that have already been made available for 5G. We must be unified across government and respect the interagency process to free up more spectrum.

Mr. Chairman, we look forward to working with you and the committee to craft spectrum policies that meet the needs of wireless users to rapidly address our nation's mid-band needs and to provide a consistent pipeline of high-, mid-, and low-band spectrum.

Thank you for the opportunity to testify today, and I welcome your questions.

[The prepared statement of Mr. Bergmann follows:]

********** INSERT 7**********

Mr. Doyle. Thank you, Mr. Bergmann.

Mr. Pitsch, you have 5 minutes.

STATEMENT OF PETER PITSCH

Mr. Pitsch. Thank you, Mr. Chairman. My name is Peter Pitsch. I am the Executive Vice President for Government Affairs for the C-Band Alliance, CBA.

I would like to thank you, Mr. Chairman, and Ranking Member Latta, and the other members of the subcommittee, for this opportunity to explain the efforts of the C-band satellite operators and what they are doing to make mid-band spectrum available for 5G.

The United States is at risk of falling behind in the global race to 5G. Countries like China, Korea, Japan, many others, have made more mid-band spectrum available to 5G than we have. That is a problem for U.S. 5G leadership and security.

Mid-band spectrum is the Goldilocks band for 5G because it has the right balance of coverage and capacity, especially in rural America, and the portion of the band known as C-band is especially well-suited for 5G. But repurposing the C0band for 5G is complicated.

First, all the major television and radio networks -- Fox, NBC, ESPN, NPR, and religious broadcasters -- rely on C-band to deliver programming to nearly 120 million television and radio households.

The other complication is that each of the operating satellite companies has a non-exclusive right to use the full 500 megahertz, which means that no one satellite operator alone can make that spectrum available for 5G.

To solve these challenges, the four satellite companies that are providing C-band services in the continental United States have formed a consortium called the C-Band Alliance, and we have developed a proposal to assign and clear 5G spectrum as soon as possible. Here is how it will work:

The C-band will clear the lower 200 megahertz of the C-band -- that is 40 percent of the spectrum -- for 5G within 36 months. This could lead, should lead to spectrum assignments in the first half of 2020, years ahead of the alternative approaches. Some economists have calculated that, for each year the rollout of 5G is delayed, the U.S. economy would lose $50 billion in GDP. Making this spectrum available quickly will also foster a more secure 5G vendor ecosystem.

The C-band proposal that we put forward is the only proposal that fully protects existing satellite services. We have the expertise and knowhow to clear the lower 200 megahertz. We will assume substantial costs to make that spectrum available, and the fiber alternatives are not timely and suitable.

I want to move to the transparency of our plan. We have publicly filed our auction design, customer commitments, band plan, transition implementation process, and other key aspects of our plan. The FCC will be involved throughout this process. We will be fully accountable. The FCC will be involved, for example, in approving the auction design and issuing licenses, and as one of the members raised, determining buildout requirements, and so on.

Finally, our proposal is fair. CBA member companies have committed to delivering a significant portion of the auction proceeds to the U.S. Government. We are also committed to working with the Congress and this committee to assure that that goal is met. The CBA members are undertaking substantial risk and expense to clear 40 percent of their spectrum and break the 5G logjam to make this spectrum available years ahead of the alternatives. In short, our proposal is the fastest way to repurpose C-band spectrum for near-term benefits for U.S. consumers, workers, businesses, and U.S. security.

We look forward to working with you, Mr. Chairman.

[The prepared statement of Mr. Pitsch follows:]

********** INSERT 8**********

Mr. Doyle. Thank you, Mr. Pitsch.

That concludes our opening statements from our second witness panel. We will now move to member questions, and I will start by recognizing myself for 5 minutes.

Mr. Donovan, the C-Band Alliance has proposed an entirely private transaction in the C-band that would make 180 megahertz available for mobile broadband. Do you think this is enough spectrum to meet our nation's mid-band needs for 5G, and what would be the risks of not providing enough spectrum, if you don't think it is enough?

Mr. Donovan. Thank you, Mr. Chairman.

So, we have heard from our carriers that you really in this spectrum need a minimum of 60 megahertz or so -- more is better -- to provide a meaningful service on that. If you only free up 180 megahertz for wireless use, that is a maximum of three licenses. If we want to talk about putting spectrum in the hands of competitors that serve rural areas, that is not enough to go around. So, we need to be able to free up more spectrum to make sure that there is competitive marketplace for more than three licenses, to make sure that there is enough spectrum available for those to serve rural areas.

Mr. Doyle. Thank you.

Let me ask you this, Mr. Donovan. One of the

subcommittee's priorities is to help facilitate the deployment of rural broadband and close the digital divide. Would a private transaction by the C-Band Alliance, even if it included a donation to the Treasury, help your members deploy broadband in rural America?

Mr. Donovan. I think we don't have the transparency into the private transaction to have that type of assurance. The plan that we have put forward on the record not only frees up additional spectrum, but pushes fiber further out into rural areas to support expanded fiber broadband access as well as backhaul for 5G, while also freeing up additional spectrum for 5G services.

Mr. Doyle. Mr. Calabrese, how would you respond to that question?

Mr. Calabrese. Yes, we actually vastly prefer the proposal that has been put forward by CCA and the smaller cable systems and Charter, for the reasons, I think most of the reasons that Tim mentioned, that there is return back to the public. It would be a public auction that would be more transparent and fair. It seems to have a side benefit of pushing fiber out, although legislation would be preferable, so that that return to the public could be designated specifically for rural and underserved areas, which it wouldn't be if it was simply a public auction. And we also

worry a bit, if the FCC went ahead with this proposal, it sort of has a blank check for incentive payments to satellite companies that never paid spectrum, which completely breaks off precedent and is not necessary.

Mr. Doyle. Mr. Calabrese, what are the potential benefits of unlicensed or coordinated access to spectrum in any parts of the C-band that are not licensed for mobile use or where mobile broadband is not deployed?

Mr. Calabrese. Right. That is a very much overlooked portion of the FCC's Notice of Rulemaking. They also propose that in whatever portion, well, the upper portion of the band that remains in service for fixed satellite use, that you can open that for coordinated shared access, for high-capacity point-to-multiple-point in rural areas, very much the same way a spectrum access system will be used in CBRS to protect the Navy.

Tech companies just put out an engineering study last week that shows why this is the case. And, in fact, you could actually authorize sharing across the entire band using a database mechanism just like you do in the adjacent CBRS.

Mr. Doyle. Thank you.

Mr. Pitsch, in your testimony you note that your proposal for the disposition of C-band includes asking spectrum holders that relinquish spectrum to make voluntary

payments to the Treasury. How do you propose that transaction would occur, and what is the legal authority for that type of donation?

Mr. Pitsch. Thank you, Mr. Chairman, for the question.

We have looked at the legality, and we are confident it is legal for private parties to make contributions to the Treasury. It is also the case that the Commission could choose to condition parts of the decision on our making such a contribution. We are confident that would be legal.

Mr. Doyle. Has such a donation to the FCC ever occurred before, to your knowledge?

Mr. Pitsch. Not specifically like that. However, it is the case that parties in settlements have made contributions to particular groups. I can think of a railroad situation that made a contribution that was approved by the FCC to a tribal authority. Of course, a recent merger proponent has promised to make voluntary contributions to the Treasury if they do not live up to certain commitments regarding broadband deployment, and so on. So, we don't think that the legality here is a problem.

Mr. Doyle. Does the Commission have the authority to enforce this?

Mr. Pitsch. It does if it, in fact, conditions our license on our following through. Let me assure you there

will not be a problem in following through by the C-band companies.

Mr. Doyle. Thank you.

I see my time is expired, and I yield to my good friend, Mr. Latta.

Mr. Latta. Well, thank you, Mr. Chairman.

And again, thanks to our panel for being with us and all your great information.

Again, there is certainly no shortage of discussion topics when it comes to spectrum. One that factored heavily in the testimony of some of our witnesses is C-band and the different proposals for harnessing this prime mid-band real estate for 5G.

I also appreciate the chairman's invitation to work together on this and, also, along with Ms. Matsui. It is my hope that we can all engage in a very productive conversation toward a solution that could address some other priorities while it turbo-charges our transition to 5G.

As the chairman just mentioned in his questions, one of the biggest sticking points in the current discussion is the mechanism of the potential sale. Everyone agrees the spectrum should be auctioned, but the question is whether that auction should be handled by the private sector with appropriate oversight or by the federal government.

I will start my question with you, Mr. Pitsch, if I may, but we will ask several of the witnesses as well. What are your thoughts on the pros and cons of each approach on a private or an FCC auction?

Mr. Pitsch. Thank you for that question, Congressman Latta.

First off, as I indicated, our approach would assign spectrum early next year. I think if you look at all the alternatives with a public auction in the future, and look at the track record for how long it takes for the Commission to go through a public auction process, or through this legislation, we are talking years later.

The impact on 5G could be crucial. China, Korea, Japan, the UK, Germany, Spain, Italy, Sweden, the Ukraine, Qatar, Australia all have much more spectrum available or will have before the end of 2020.

This proposal balances the interests of the incumbents. There is discussion about what happens and could we do more. It is important to realize that, on some of those fiber-based proposals, Disney, Fox, Discovery, CBS, Viacom have all said they do not think that that fiber solution is appropriate. Under our approach, the members of this committee will be able to look at one entity who will be fully accountable for clearing spectrum quickly for 5G and make sure that all of

those viewers and listeners at home are getting ESPN and NPR.

Mr. Latta. Okay. Thank you.

Mr. Calabrese? And if I could, if you would do it in about 30 seconds, I would appreciate that.

Mr. Calabrese. I think the main advantage to the CBA proposal is that the satellite operators could be far more cooperative with the process if they are receiving billions and billions of dollars. The downsize, of course, is that the public would lose that revenue, which could be far better used, as I said, for rural and underserved infrastructure. It is also just a terrible precedent to --

Mr. Doyle. Mr. Calabrese, can you pull your microphone up a little closer to you?

Mr. Calabrese. Oh, yes.

Mr. Doyle. Is it on?

Mr. Calabrese. I believe so, yes. Oh, okay.

Mr. Doyle. There we go.

Mr. Calabrese. It wasn't yet. I replaced it, but I didn't turn it on. Sorry about that.

And then, it would also be, we believe, just a terrible precedent to set because we are moving, as Julian Knapp said earlier, we are moving into an era where all the new spectrum we make available is going to be in bands that are in use, but underutilized. And so, for sharing, for consolidating,

as we did with the broadcasters earlier, and we should do here now, we can't be paying off unnecessarily these incumbents. The Commission has the authority to consolidate them, modify licenses. We should take advantage of that.

Mr. Latta. Mr. Bergmann?

Mr. Bergmann. Thank you, Congressman, for the question.

And I think you are focused on exactly the right band. We recognize that this has exactly those criteria that I talked about earlier, the balance of coverage and capacity. So, this is exactly the right place to focus.

Our members have different perspectives on the question of whether it should be a public auction or a private auction, but I think what they all agree on is we need to find opportunities for hundreds of megahertz of mid-band spectrum. We know that a recent report suggested that bringing 400 megahertz of mid-band spectrum to market would lead to a $274 billion increase to the GDP. So, this is exactly the right place to be focused.

Mr. Latta. Mr. Donovan?

Mr. Donovan. So, there is a track record of success with FCC auctions having raised over $120 billion through mechanisms that carriers, large and small, have comfortable experience with, know how to navigate, know how to place bids, and know how to participate.

Mr. Latta. Okay. Well, thank you very much, Mr. Chairman. My time is expired, but I will ask the last question be submitted for the witnesses. Thank you very much, and I yield back.

Mr. Doyle. Thank you, Mr. Latta. Okay, Mr. McNerney, you have 5 minutes.

Mr. McNerney. Well, I thank the chairman and I thank the witnesses. It is a great hearing. It is a great subject, and you are giving us a fairly diverse viewpoint on this. So, I appreciate that very much.

I care deeply about the United States leading in 5G and maximizing its benefits. Mr. Calabrese, how, then, is the 5G ecosystem likely to impact the amount of mobile traffic that will be offloaded to Wi-Fi?

Mr. Calabrese. Well, it is going to increase that tremendously. Cisco has a continuous survey they do of internet traffic around the world, the Visual Networking Index. And they are projecting a huge increase because 5G will enable applications that are far more bandwidth-intense. And every time that happens, the typical consumer wants to use those same applications. In fact, 80 percent of use in indoors. And so, indoors they will use Wi-Fi. And so, they project a spike in Wi-Fi use, if consumers are going to get the benefit of 5G everywhere.

Mr. McNerney. So, what would happen to U.S. leadership in 5G if we don't make more unlicensed spectrum available?

Mr. Calabrese. Well, we have always been ahead. I mean, we invented unlicensed spectrum in Wi-Fi and all these great innovations. And we will, in turn, fall behind. And also, our average consumers will not have the ability to use these great, new applications nearly as much they would otherwise.

Mr. McNerney. Great. In your written testimony, you mentioned that relocating the 5.9 band to unlicensed spectrum would create a very high-capacity Wi-Fi super-band. What kind of benefits would that lead to in our communities?

Mr. Calabrese. Yes, so that is very important. The Commission set out, you may recall, in 2014, to clear 750 contiguous megahertz in 5 gigahertz. That didn't work out because of military radar, because we are logjammed on 5.9. So, what you can do is, if you can get access to that 5.9 band, you could have as many as, I think it is six or seven contiguous 160-megahertz channels. That is gigabit Wi-Fi for many different users. So, that is great for businesses, for families in congested areas. It really becomes a Wi-Fi Superhighway.

Mr. McNerney. And so, that will help close the digital divide as well?

Mr. Calabrese. Yes, it sure will. Low-income people and communities of color depend far more on Wi-Fi than more affluent folks do, often because it is a primary internet connection. And so, it is going to be important that we have that combination of getting fiber deep into communities and also having plenty of Wi-Fi access, including in schools and libraries and everywhere.

Mr. McNerney. Well, thank you.

You know, spectrum is limited, and the demand for spectrum continues to grow. So, what can we do to incent the more efficient use of spectrum? In other words, packing more information into existing real estate, what is the best way to encourage technology to be developed along those lines?

Mr. Calabrese. Well, I think the Commission -- we see that with Citizens Band Radio Service, with CBRS. If you target these underutilized bands and allow for dynamic spectrum sharing, you really set off a whole wave of innovation for more efficient spectrum sharing and use. So, we are going to be seeing that in CBRS. If we open all these 6-gigahertz band segments to unlicensed use, you will see even more of it. So, the spectrum sharing technologies, even DoD now wants to develop more of that, and I think that is all just for the good.

Mr. Pitsch. Congressman McNerney, could I answer your

question just briefly?

Mr. McNerney. Briefly.

Mr. Pitsch. The C-Band Alliance is going to create the capacity on its remaining 60 megahertz by substituting capital. We are going to buy billions of dollars' worth of satellites and install filters, and that is going to free up 40 percent of the spectrum for 5G use.

Mr. McNerney. Okay. Mr. Calabrese, the chairman mentioned his concern about the enforceability of the spectrum deal that Mr. Pitsch was referring to. What do you think about that in terms of enforceability of the payment to the federal government?

Mr. Calabrese. I don't see how they can really because it is beyond, it is certainly beyond the Commission's authority to require. The Commission is clearly -- it is clear that there is competing applications here for licenses. That puts them within Section 309(j). That requires an auction. 309(j)(8) requires that the revenue, every bit of revenue to the Treasury. This won't be eligible as an incentive auction. So, I just don't see it.

Mr. Doyle. Thank you.

Let me just say that we already started our first of a series of three votes. I think we have nine minutes left. We have checked with the Floor. They are going to give us a

little bit of extra time.

But if the remaining three members can try to be brief with their comments, I think we can get all your questions in and not have to come back and make the panel sit here for 45 minutes or so.

So, Mr. Johnson, you are up.

Mr. Johnson. Thank you, Mr. Chairman. And one quick administrative task. I request to enter into the record this letter from Chairman Pai to the ranking member on Science, Space, and Technology dealing with the recently-completed 24-gigahertz auction.

Mr. Doyle. Without objection, so ordered.

Mr. Johnson. Thank you.

[The information follows:]

********** COMMITTEE INSERT **********

Mr. Johnson. Mr. Donovan, I know that there are a lot of different proposals floating around about how to reallocate C-band spectrum for 5G wireless services. I hear all kinds of numbers discussed about how much spectrum can be freed up in the C-band for 5G use. Some proposals talk about freeing up 200 megahertz of spectrum. Other proposals say that close to 400 megahertz of spectrum can be made available. Still other proposals suggest that the spectrum should be made available in different stages. What is so important about maximizing the amount of C-band spectrum used for 5G? Isn't there other spectrum being made available for 5G use?

Mr. Donovan. Thank you for the question. It makes me think of, why did Willie Sutton rob banks? That is where the money is.

As we are looking at 5G spectrum, where is the most spectrum that we can have? It is in the C-band. And that is why competitive carriers are so focused on it.

Two of your questions, in part -- so, it is important to make it available all at once, so that an equipment ecosystem develops and all carriers have an opportunity to access the spectrum without any carrier getting elite in the market or disrupting economies of scale for smaller carriers to be able to get access to spectrum.

And it is important to make a lot of it available. I really think we need to look at how we can use fiber resources to transition the end-users. Our plan has the buy-in from the cables companies that provide the service to their customers. Even last month, the NBA signed a contract to put fiber to all their arenas, so that all of their content can go out in 10 ADP and they can have another 30 cameras in each arena. We see a lot of benefit to that, and in the process, we can build fiber instead of buying filters. We can free up additional spectrum while advancing our 5G interests.

Mr. Johnson. Okay. I keep hearing this back-and-forth debate about C-band, and I am wondering how these plans will accelerate the deployment of desperately-needed broadband to rural America. So, how will your C-band plan that was recently filed with the FCC benefit rural America?

Mr. Donovan. There are many benefits to rural America from the plan that we recently filed with Charter and with ACA Connects. So, it not only frees up additional spectrum for 5G use, it incents building out the fiber that can be used not only to transition that programming, but also to serve as backhaul for that 5G service, while also freeing up additional revenue to either go to the Treasury or to be used as directed by Congress. We have heard a lot of talk about

using auctions to support important policies like expanding rural broadband access, and we support those.

Mr. Johnson. Okay. Mr. Donovan, continuing with you, and also Ms. Triggs, what role can the 2.5-gigahertz band play in expanding broadband to rural America?

Mr. Donovan. A lot of the 2.5 that will be made available will be in these rural areas. So, we do see it as one of the "all-the-above" options to help expand access in rural areas.

Mr. Johnson. Okay.

Ms. Triggs. The same. Fifty-one percent of EBS spectrum is available in the U.S., and most of that is west of the Mississippi, which overlaps with a lot of tribal lands. So, it is something that they could right away turn around and start building. Builds are fast; builds are cheap. We are talking $15,000 and half a day of labor. That got things up, going for the Havasupai Tribe.

What is stopping us, actually, is the current licenses that aren't being used. The original licensed were a 35-mile radii. And what ends up happening is, any of our partners that are within 30 miles of a major metropolitan center have all of the spectrum allocated, but none of it being used.

I will go along with the spectrum analyzer and I will see that 2.4, huge spikes. Lots of people from outside of

the reservation are beaming in on unlicensed spectrum and offering internet for $40 a month. You see the signs everywhere. 2.5, it is a straight line.

So, if we can find some way to incentivize those people who have the spectrum and get them to share it, that is what I am looking for. And that would be huge for a lot of, about half of our partners.

Mr. Johnson. Okay. All right.

Thank you. Mr. Chairman, I yield back.

Mr. Doyle. Thank you very much.

Ms. Matsui, you are recognized.

Ms. Matsui. Thank you, Mr. Chairman.

As has been discussed here today, C-band offers perhaps the best opportunity to repurpose a potential coordinated range spectrum band for next-generation terrestrial broadband networks. This band has propagation characteristics that make it ideal for reliable satellite distribution and particularly valuable for 5G mobile networks.

My draft WIN 5G Act proposes to ensure the spectrum is reallocated rapidly by building capacity within the C-band, incentivizing a clearing target, and maximizes the amount of spectrum made available for terrestrial services; and requiring a demonstration that incumbent users will continue to receive comparable service. More fundamentally, my

proposal reflects the three pillars necessary to this reallocation: repurposing the maximum amount of spectrum possible; protecting current users, and ensuring an efficient clearing process.

Mr. Donovan, do you agree that developing consensus and compromise around these three pillars will be key to moving forward?

Mr. Donovan. Yes, we do. We agree with those three pillars. We appreciate ongoing discussions with C-Band Alliance and other stakeholders over how we can do this, and support the idea to incent freeing up as much spectrum as possible.

Ms. Matsui. Okay. One tenet of the C-Band Alliance proposal is to tag the entire 3.7-to-4.2-gigahertz range for our mobile and wireless use. As Mr. Pitsch notes in his testimony, C-band satellite operators have equal overlapping, non-exclusive rights to transmit across the entire 500-megahertz range. And I certainly appreciate the CBA's proposal to entice all eligible operators to join the Alliance.

But I remain concerned with the fact that an FCC action taken to allow a portion of the satellite operators to financially benefit from any sale, while another portion with the exact same market rights does not benefit, will result in

the need for a settlement, potentially tying our spectrum policy and 5G deployment up in that process. My WIN 5G Act attempts to address this holdup problem by creating a process to designate satellite operators as a transition facilitator, later directing the FCC to modify the protection rights of the satellite operators and to clear spectrum pursuant to statute.

Mr. Donovan and Mr. Pitsch, how could the WIN 5G Act provide the additional clarity necessary to resolve the holdout issue?

Mr. Donovan?

Mr. Donovan. Thank you.

So, it would certainly address some of the litigation risk that we share and we have heard other issues raised this afternoon that address some of the litigation risk. It also does provide those incentives for a greater incentive payment to free up additional parts of the band.

Ms. Matsui. Okay. Mr. Pitsch?

Mr. Pitsch. Congressman Matsui, we recognize the goals. As you know, we are closely to comment on your legislation. However, we continue to believe that the market-based approach that the FCC proposed will get the spectrum in the market much more quickly and strike the optimal balance between keeping customers whole and getting 5G going. We

will have assignments in the first half of 2020. And as expeditious as your deadlines are, Congresswoman Matsui, that would be substantially later.

I just want to emphasize one point because something was made of it. The foreign companies here purchased their antecedent American companies, PanAmSat and GE Americom. Not surprisingly, most of their employees or many of their employees are U.S. taxpayers, more than any other country. But, more importantly, for decades, they have been providing an integral service for the delivery of video and radio to nearly 120 million households. So --

Ms. Matsui. Thank you, Mr. Pitsch. I have some other questions here.

Mr. Pitsch. Sure.

Ms. Matsui. Last month, Congressman Guthrie and I, along with Senators Wicker and Schatz, introduced the SPECTRUM NOW Act. Now, specifically, the framework in the SPECTRUM NOW Act could provide a pathway for NTIA and DoD to make an additional 100 megahertz of spectrum available in the 3.4-gigahertz band. This language is also included in Title II of my WIN 5G Act.

Mr. Donovan and Mr. Bergmann, what potential does a 3.4-gigahertz band have in our effort to allocate additional mid-band spectrum for wireless use? And do you support these

provisions?

I have got 35 seconds left. Quickly.

Mr. Donovan. Yes, we support, and this falls into "all-the-above" options for mid-band spectrum. We need to look seriously at all of them.

Ms. Matsui. Okay. Mr. Bergmann?

Mr. Bergmann. Congressman, I would say, yes, we support. We really appreciate your focus on this band. These three bands are all contiguous. We need as much as possible as fast as possible. And we really appreciate your focus on making sure that we drive efficiency out of government use of spectrum.

Ms. Matsui. Okay. Thank you, Mr. Chairman. I yield back.

Mr. Doyle. Thank you.

Mr. Walberg, you are up.

Mr. Walberg. Thank you, Mr. Chairman.

And before I begin my questions, I would like to make an observation that we have an excellent and diverse set of panelists here, and thanks for putting that together, representing a wide swath of wireless users. But I also believe that, as we move forward, we should seek participation from the energy sector as well and their growing wireless needs. And representing the energy sector

in my district, the largest energy district in the state, I think that is extremely important.

Mr. Bergmann, yes or no -- dealing with the time here -- as NTIA and the FCC look to identify more spectrum and gain efficiencies through spectrum management, do you think federal incumbents are doing enough to invest in their systems, to become more efficient with the spectrum we have given them?

Mr. Bergmann. I think they are working hard to try to perform very important missions, but the challenge is always lack of incentives. And so, we really appreciate this committee's focus on creating more incentives for efficiency out of those government users.

Mr. Walberg. So, is that yes and no?

Mr. Bergmann. I think that is there are real win-win opportunities to make federal spectrum available for commercial use.

Mr. Walberg. Okay. Given the growing trend of executive branch agencies other than the NTIA playing a more outsized role in spectrum policy over parochial issues, Mr. Bergmann, how do you suggest we promote a more unified, organized, and efficient spectrum policy?

Mr. Bergmann. Well, thank you, Congressman, for the question.

I certainly think oversight hearings like this are tremendously important. There is also the development of a National Spectrum Strategy that the administration is working on. We think that there are real opportunities for both this committee and the administration to work together to put forward a schedule and create a consistent pipeline of spectrums, so that we can make sure that we are getting each of those elements that we talked about earlier, low-, mid-, and high-band spectrum. So, these are real opportunities to set a path forward to bring that spectrum to market for the industry.

Mr. Walberg. Thank you.

Mr. Donovan and Mr. Pitsch, rural America -- and I represent rural America in my district significantly -- not only should it not get left behind, but rural America also benefits from 5G and next-generation technologies. They need to experience that and know that they are getting it.

We know spectrum policy plays a big role here, but carriers need access to spectrum first. And so, Mr. Donovan, and then Mr. Pitsch, what would be the regulatory burden to participate in the respective proposals on C-band for rural carriers in terms of complexity, cost, process, et cetera?

Mr. Donovan?

Mr. Donovan. Thank you for the question.

At one of our recent trade shows, the CTO for a rural company was asked the question of, what does rural America want from 5G? And the answer is simple, the same thing as everyone else, and they don't want to have to wait for it.

So, it is really important that the carriers that are building in rural areas are able to get access to the spectrum that is going to be used to support that 5G future. There is an opportunity cost to participating in any auction. So, it is important to make sure that we are freeing up enough spectrum to give these carriers confidence to go out, obtain the financing, do their necessary legwork ahead of time, and participate in the process, with a meaningful opportunity that, if they do those things, they have a chance to win spectrum. So, that is something that we have had through FCC auctions in the past. If there is enough spectrum brought to market for a future FCC auction, that will be the case in the future. We do not yet have assurances on how CCA members would participate in another process, but we will continue those discussions.

Mr. Walberg. Thank you.

Mr. Pitsch?

Mr. Pitsch. Thank you for the question.

We believe our approach is very relevant and very helpful to rural America. First off, our spectrum in the

first three years will be available nationwide. Assignments will be known early next year. Spectrum will be available nationwide.

We came up with a band plan that includes 9 times 20 megahertz licenses. There will be many opportunities for rural entities, rural businesses, to compete.

We are committed to it. The FCC will determine whether or not there are benchmarks, milestones, buildout requirements, and so. We are committed to working with all of those.

So, then, the last thing I will say is that our approach, unlike some of the fiber proposals, will assure that rural households are able to get ESPN and NPR all through this process.

Mr. Walberg. Okay. Thank you.

I yield back.

Mr. Doyle. okay. Mr. Cardenas, it is up to you to get us down to votes.

Mr. Cardenas. All right. Yes, thank you, Mr. Chairman. I will paraphrase down to my most pertinent questions and points.

There are a lot of proposals out there on how best to reallocate the spectrum. Mr. Donovan and Mr. Pitsch, please help explain the key differences between your plans by

providing very brief responses to each of the following questions:

How much spectrum are you proposing to reallocate? Mr. Donovan, and then, Mr. Pitsch.

Mr. Donovan. At least 370 megahertz.

Mr. Pitsch. Two hundred megahertz within three years. As much as available after that, where efficient.

Mr. Cardenas. Okay. A phase-in.

How much will it take until this spectrum is available to its new owners?

Mr. Donovan. The first set of spectrum within 18 months. Additional, that is within three years, with the most remote areas within five years.

Mr. Pitsch. This is a key difference. Assignments will be known in the first half of 2020, which means people can contact their vendors right away.

Mr. Cardenas. Okay. Thank you.

Does your proposal depend on an FCC-led auction or a private sale?

Mr. Donovan. FCC auction.

Mr. Pitsch. Private sale overseen by the FCC.

Mr. Cardenas. Will your plan provide proceeds to the U.S. Treasury?

Mr. Donovan. Yes.

Mr. Pitsch. Yes.

Mr. Cardenas. Okay. Does your plan include any investments in infrastructure?

Mr. Donovan. Yes, our plan will also support deploying additional fiber resources in rural America.

Mr. Pitsch. We are going to do what the FCC tells us to do on that. And Congress, obviously, can determine where those proceeds go.

Mr. Cardenas. Okay. Thank you for the confidence.

The intersection of the energy and telecommunications sectors is only growing, and their importance to each other for recovery from natural disasters and other hazards is critical to our national security. It is important to have emergency communication networks open and functioning properly, and it is important for our infrastructure, as, for example, the electric sector uses for grid reliability. I think it is important that the FCC protect communications within our power grid.

In addition to that, I understand that the 6-gigahertz band of spectrum used by energy and water utilities is being considered for unlicensed purposes. I think it is important that the FCC take a balanced approach to the reallocation of spectrum to ensure that critical communications are not disrupted.

I yield back the balance of my time, Mr. Chairman.

Mr. Doyle. Thank you, Mr. Cardenas.

Well, that concludes our hearing for today.

I want to remind members that, pursuant to committee rules, they have 10 business days to submit additional questions for the record, to be answered by the witnesses who have appeared. I ask each witness to respond promptly to any such questions. The chair also requests unanimous consent to enter the following documents into the record: an ex parte letter from T-Mobile, a letter from ITS America, a report from CTIA, a statement from R Street, a letter from the Electric Water Utilities. Without objection, so ordered.

[The information follows:]

********** COMMITTEE INSERT **********

Mr. Doyle. At this time, the subcommittee is adjourned. Thank you.

[Whereupon, at 2:01 p.m., the subcommittee was adjourned.]