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Panel 5: Spectrum Governance: How Can We Better Optimize Usage for the Future?

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 - **Kimberly Baum**, Vice President of Regulatory Affairs, Echostar Corporation
 - **Alexander Kuhn**, Senior Government Official, German Federal Network Agency
 - **Kenneth Turner**, Deputy Director, DoD Chief Information Office, Spectrum Policy & Programs
 - **Jennifer Warren**, Vice President of Technology, Policy and Regulation, Lockheed Martin
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KRYSTAL: We have an exciting and different type of panel to offer you this morning, so now we're going to jump right in. What I want to do is to go over--so this panel is about spectrum, and the idea here is how can we better optimized usage for the future?

The growth in space applications and fifth generation terrestrial networks has heightened tensions over radio frequency, spectrum use and congestion. This panel is designed to explore how RF is governed, particularly internal to government. Do we have a policy and governance structure for making decisions that optimize the spectrum usage across all industries, from terrestrial wireless to aviation to satellite?

How are decisions regarding spectrum policy and negotiating positions managed in other countries? So if you've come here for a debate about space versus 5G, that's not what we're here to do today. We wanna look at--are we doing this and approaching spectrum in a way that recognizes that it is a non-renewable resource?

So I'm very excited to have with me four illustrious speakers. I'm going to introduce them and then we'll get started. First up is Kimberly Baum, the Vice President of Regulatory Affairs at Echostar. We also have Alexander Kuhn, a Senior Government Official from the German Federal Network Agency. We have Kenneth Turner, the Deputy Director in Department of Defense--from the Department of Defense Chief Information Office. He specialize in spectrum policy and programs. And finally we have Jennifer Warner, the Vice President of Technology Policy Regulation at Lockheed Martin.

So I'd like to turn to Kim. You chair the Satellite Industries Association Working--Regulatory Working Group, who's also put out some thoughts on this issue, and I know discusses that at length and gets involved in the WRC and the various working groups leading up to that. Can you share some of industry's perspective on our topic today?

KIM: Hey, thank you, Krystal. I'd be glad to. Within SIA our focus has been on looking at how we can improve the US proposal development process for WRCs. And here I would note that two of our members AT&T and Iridium do not support the improvements that we've identified. And by way of background, and the community may be aware of this, but works happen about every four years, and it's the ITU conference, that makes changes to the international radio regulations, and the radio regulations provide the international table of frequency allocations as well as a myriad of articles and appendices detailing how an administration could implement frequency assignments. And many countries look to the ITU to define how they could implement a new FSS allocation, for example, and how they could ensure that it could safely coexist with other allocated services.

And for the satellite community, the ITU is important as a satellite typically covers more than one country and benefits substantially from common spectrum allocations and further because it covers multiple countries, a satellite system might receive interference from services operating in more than one country.

And the United States, as Jennifer mentioned, has a dual pronged approach, you know, generally to spectrum management and that flows through to the work development process. The FCC has a completely separate process to develop non-federal recommended US proposals while NTIA um, develops the federal proposals under its own separate process. And then at the end, after this multi-year process, the FCC and NTIA work together with the State Department to determine the final US proposal.

And what we found in practice is that leaving this reconciliation of the proposals really to the last step, after several years of work, leads to rush decision making and often slows down getting US proposals out to the international community. And getting a proposal out quickly is key to developing a substantial amount of international support.

So we feel like this is a very important area where we could enhance US leadership in the ITU. And it's difficult to find a meaningful way to address, um, this issue within the current siloed setup. And as a result, SIA recommends, um, establishing a joint interagency advisory committee to develop US WRC proposals.

This joint committee would report both to the FCC and NTIA and could be co-chaired by an industry and a government representative. And it would have representatives for federal agencies and the private sector, you know, all working together to develop US proposals. So we believe that this would allow full discussion of these very complex work issues across the entire set of US interests at the start of the process, instead of a rush at the very end. And the other improvement I'd like to highlight goes back to the current process and on the FCC side.

The FCC has a Work Advisory Committee that develops recommended industry proposals, um, that are submitted to the FCC. And this committee, that we call the WAC, in recent years has not really reached consensus on many agenda items, particularly the more difficult ones that, you know, stretch across multiple services and industries.

And we believe that that really undermines the ability or the opportunity that industry has to provide meaningful input and truly be involved in the proposal development process. So in that regard, we think it's critical to find ways to truly have consensus building within the WAC.

And one idea we had was to create working groups that would be sort of a cross cutting working group that would--if a regular working group couldn't work, reach consensus, you could transition the agenda item to the cross cutting group to try in a different way to find consensus.

And even though the WAC has already been established with set working groups, um, you know, certainly the overall chair and vice chair of the WAC could take an active role in, in driving towards consensus, once an IDBG, you know, kind of reach, reaches a standstill. So thank you Krystal, for the opportunity to talk about some of those improvements we've identified within SIA.

KRYSTAL: What I would like to do now is turn to Ken. So the Department of Defense obviously has a huge stake in spectrum allocation negotiations. But as we talked a little bit about in the beginning and as most people are aware--it's not the lead organization, for instance, within the United States government for determining US position.

What are your thoughts on how best to ensure effective, equitable and fact-based decision making in determining the US's position on various spectrum issues?

KENNETH: Well, I mean, I'm a very basic person, and I like to keep things very simple. I think process doesn't make decisions, people do. So it begins with people. There is in my mind the time for people to get to a position only if they want to.

There's gotta be--like spectrum sharing, it's a matter of you being a goal, not a default being the primary objective of what you're trying to achieve. And from there you have to understand there's a certain amount of risk and with risk there's gotta be a certain level of trust.

What I've seen, at least in my perspective and seeing negotiations going back 25 years--and they're never easy, they've got some important functions and some important capabilities, uh, that we're all trying to perform, and we think are essential. Um, this--even with in regards to the department, if I go back to my early days of being in a program office and supporting Gulf One and I go back to going back Gulf Two, there was a vast difference in amount of equipment and kind of needs we had going into the Middle East again, and it created a lot of issues that had to be resolved, but the only way we're able to resolve them is for people to start to come together and talk. And there had to be some compromises and had to be some--an acknowledgement of certain things had to perform, be performant and and synchronized, and I think in a broader context that's true even in the negotiations that I've been involved in. You know, if one side is going at it all risk, or is risk avoidant or is not wanting to compromise, then it's very difficult to come to any reasonable decision.

And it stands to reason that we've all got to kind of look at things in a different perspective. I think from a Department of Defense standpoint, having watched their basic perspective when I first got to Washington and--it's all our frequencies, it's ours!--and to a point now where we're

investing in technology to the National Spectrum Consortium or, or we're trying to find new ways to share through the NASCTN, which is National Advanced Spectrum and Communication Test Network.

We're investing in what I think are key components of us better understanding sharing, because it's not just for us, just on a day to day basis during peacetime. We've got to operate in a contested and congested environment and we're starting to realize if we can operate in a contested environment, congested environment, then that allows us to be more effective on the battlefield.

We're running into a situation now we're moving out of the Middle East and we're going to what we consider a peer to peer adversary, where they will try, deny us access and to limit ourselves to sometimes--to some of the bands we've been allocated to makes us an easy target.

So we're looking to ways to better to be able to move, maneuver through the electromagnetic--maneuver through spectrum in a manner that's not intrusive, that's not going to disrupt people, but ultimately to allow us to perform our mission. Are we going to get there overnight? No, but that's a commitment to something. And are there going to be days that there are going to be difficult decisions? Yeah, of course.

At some point--you may get to a point we say this is just--no matter what we try to do, this is not going to work. So then you're just going to have to make a decision. And we've had to do that in the past.

But I think it all begins initially with people sitting down, like Kim may have mentioned before, earlier versus later coming to the table in honesty with the notion of some level of risk, because you're going to have to reveal yourself, you're going to have to talk, and you're going to have to be willing to concede a little bit. If you always come to the table never wanting to concede, then there's not a negotiation, it's just an argument, and you're never going to get to what I consider a reasonable outcome where everybody is happy.

It's a forced march. And that's kind of how I see it.

KRYSTAL: Thank you, Ken. I think we can all take to heart those words, that it's easy to just have an argument and not a negotiation. And this is something that has always struck me when I went to my very first detail meeting many years ago now, I remember thinking, wow, this is diplomacy, like, real diplomacy, in the room, negotiating among various interests and various countries and, and various interests in those countries, and I think you're exactly right.

It would be easy to have that be an argument. And so now I'd actually like to turn to our fourth speaker and hear about a different region's approach.

And so, for Alexander, different regions and different countries approach spectrum governance in a variety of ways. What insights can you share about how European countries come to their positions on how to allocate spectrum usage? What works for you? What doesn't?

ALEXANDER: Okay, good afternoon, Krystal. Good afternoon, everybody. Thank you for inviting me here. And, I'm happy to speak about the European approach on the spectrum governance. First of all, all the European countries, and I can speak for my own country as well as for some others, we struggle with the same different arguments between the different stakeholders in the country.

So if you want to come to a clear position, we need to take a decision in the end. And this is something which we brought forward in Europe as well. And as a former chairman of the CEPT towards the WRC 19, I know exactly what I'm talking about. So we need to have a specific decision time which is working.

But that takes also into account what Ken said. It's something about negotiation and trust. You have to trust into your negotiation partner and you have to discuss with them on the basis of that. And this is something where--which we learned also within CEPT, where we have to work together with 48 different countries and come together to one single position in the end, which then we brought forward to our partners all over the world, so we can really bring something into the WRC context.

This is not easy from the beginning and there is something which, if we take into account that a top down approach is usually not working at all. So we will not get something where we said from the beginning, this is what we would like to have and everybody else doesn't care about it. So we need to take it. That doesn't work at all. We need to build something up. We need take a bottom up approach here.

That is, that is something where we take on board also the different arguments and the different needs from different stakeholders. And this is something we do in Europe with a lot of discussions, with a lot of meetings on the different subjects and, if we do that, then we take on board also the process of the ITU. It seems complex, but it is the constant negotiation towards the WRC.

It's not something that we can say, we just go to a conference, discuss the things there and then we take a decision. And we are a little bit at risk, and maybe becomes at that point later for WRC 23 that we're losing this point in time, that we have really some good discussions and some good negotiations before the conference and we're struggling then, in order to find the right compromise in the end.

And of course, Ken is right, we need to have the will to compromise in the end. The European structure of CEPT is just based on that kind of building up. Of course we have the possibility of taking a decision by a majority in the end, but it's always better to have a clear majority by consensus so everybody is on the same side, than leaving someone out because this one, this one will work against the overall compromise.

Europe is in one way complicated as well, because we need to take into account a different stakeholder here, that's the European Union. They have a different approach. They have often the top down approach as well. And so we need to balance the interests here of the 27 countries.

And this is something which is coming up in the near future and where which we have to take into account as well and where we have to learn also by inside discussions that we need to bring forward this concept of constant dialogue. And this is something which we need to take into account also, or which the US needs to take into account for their future. And maybe we come to that one as well, because I think that this is still some kind of disadvantage.

We have a good experience in Europe with this dialogue between the countries and border coordination in particular for the space industry, Europe is an enormous market as well. And therefore we need to find, find ways and means how we can move forward earlier in the process in order to come together with solutions and proposals for the, for the WRC, and not at a later stage to see that maybe some other countries have different approaches.

There is something we need to work together, and there is definitely room for improvement.

KRYSTAL: Thank you, Alexander. I think that gives us a really good sense of how different organizations negotiate this, because it's not mandated how countries and regions come to the various high level negotiations with their positions intact. And so everybody does it a little bit differently. So thank you for that insight.

I'd like to turn to the whole group now. In many ways, spectrum allocation is very public. It's something that is available for all to comment on, but in other ways, unless it's someone's primary job and focus, the process can actually seem quite opaque from the outside, or at least difficult to learn. And here I'm thinking of smaller companies or academia who now has a very strong interest in this, and even some established companies as they explore new capabilities within their systems. How can--what can we do to change the process to ensure that all stakeholders can actually contribute and have a voice?

I'm going to start with Kim and then we'll see how Jennifer's audio is. What do you think, Kim?

KIM: Thank you, Krystal. So, I participated in some ways with consultations in other countries, perhaps not in Germany but, for example, in the UK and--you know, it's incredibly different. The consultation documents themselves are much shorter, and the responses to them are much shorter.

So you know, I think, and it's a difficult idea, I think to achieve in practice, but if we could move towards greater brevity both in the documents put out by the government and the responses from industry, or perhaps having more detailed summaries that are over several pages with bullets--but somehow having brief summaries but with adequate specificity that you're truly understanding the gist of the document. So, I would look for fewer page numbers in all documents.

KRYSTAL: I have to say that wasn't the answer I was expecting. But it's actually incredibly logical, that sometimes even just trying to tackle this is hard. I mean, I spent a lot of time in the last few

weeks reading all of these reports and items, and you're exactly right. Alright, Jennifer, I'm going to turn over to you. What are your thoughts on this?

And also please feel free to jump back in, assuming we have good audio, with a little bit more about the advisory group.

JENNIFER: Wonderful. Sorry about that. So let me, um let me answer this question, but I would like to go back for a moment on the, on the advisory committee, because I think it's important and, uh, worthwhile to focus on the challenge that the bifurcation brings.

And I think that bifurcation brings challenge even into the international context, as I think both Kim and Alex have mentioned, and Ken, perhaps when I was dialing back in. If we are to--if we bring together so that were able to set up a national spectrum policy through a single, perhaps a spectrum resource agency, there's options on how to do this--but where you can reconcile internally what we want to prioritize as a country when we're having to deal with spectrum sharing and competing needs, I think we will be able to be in a stronger negotiating position with other regions and with other countries. Which is important.

Sometimes we can--we're an easier, we're an easier group to negotiate with because we have so many factions. Sometimes that makes it more complicated to get to the end. I'm looking at Alex, who's smiling. But I think we need to understand what, what would be those options?

How do we, as the United States, become stronger so that we can take, take spectrum policy, which has enabled so much innovation of the last 30, 40 years and make it work for us going forward, right? In the context of your question, I appreciate the simplicity but importance of Kim's answer. Another, actually perhaps very simple answer is also, not use acronyms and shorthand to describe everything.

So the FCC's Work Advisory Committee is all about numbers and references to agenda items that mean nothing to anybody who is not on the inside. If I ask you, do you know what agenda item 1.3 is? No one but our three panelists are going to know what I'm talking about. And so we make it hard, even by how we do our work in our own processes. We have created a club of acronyms that makes it exceedingly hard for someone to recognize. There's something about suborbital planes that might be something somebody wants to look at.

You would never know that from the way most of the work is structured because it's all numbers. It's an interesting point. I used to work at NASA, which we call the alphabet soup land. And then I worked on spectrum for a while, and I mean in your right, if you, even if you know what you want to follow up on, it's not even easy to figure out how to do that.

And so, maybe turning to Alex, you know, do you feel that it's possible for various interests, especially those whose you know, this might not be their primary thing or they're newer to the industry, you know, how did they engage in Europe?

Are they able to be part of the process? Do you have any thoughts on that?

ALEXANDER: Yes, they do. Of course they can, they show up. They usually come back to the different agencies, in particular also to my agency, and ask questions, how they can be involved in the process.

And they just have to move on and join the meetings. And they can bring forward every thought they would like to. But Jennifer and Kim are definitely right on that one. We have our own speech in this spectrum village, I would say, where we really have to be forward and be more clear and explain what is really essential towards the WRC process or other processes as well.

It's always good that we have new people in the room which are asking them--and don't be shy on that one--asking the process as well and be trustful that if they got an answer on that one and work with the process too, that is really something which brings us all forward. And up to now we made very good experiences with the so-called vertical industries right now, which, usually a spectrum user that turn out into a spectrum manager, more and more in the process of we call it in Europe Industry 4.0, but that they need to learn more about spectrum management and they're showing up more and more into the process as well and asking more questions towards the WRC and the international scene.

And this is a good thing because then you have a broader --a bunch of people who are talking to the process and bringing in different perspectives as well. So we may have these factions too, Jennifer, but we need to work with them, and we need to find them the consensus because otherwise we're losing more or less the basis on that one, and you just leave it to the specialists.

And that's not the right way forward for the administration.

KRYSTAL: Thank you. Ken, I would like to get your thoughts on this as well, especially because you're representing spectrum interest within a much larger government agency that then absolutely runs technology that is dependent on that spectrum. How do you communicate with your colleagues? Are there things that we could change that you feel would make that process easier within DOD, for instance?

KENNETH: In my years, I think the first thing is you have to recognize you have to have patience. I mean, you have to talk to people. And I think one of the comments I saw here earlier was this, we need to use simpler language. We don't need to mystify our work. With a lot of political appointees coming into the Pentagon or general officers coming in from the field, it's incumbent on me to always respond--my responsibility to make spectrum management clear and simple, so they could make an informed decision.

And, uh, with greater participation in the people, being inclusive, it allows for much more of, I think, a more holistic answer, which is what we're always trying to achieve. In some cases--I'll go back this, no matter what you try, sometimes you just reach a point where it's just, it's just damn hard. You just have to accept it and, excuse me if that offends anybody, but it gets to a point where, you know, this is not an easy business, and it's not, it's not checkers.

It is sometimes three dimensional chess, and we have to understand it. But I think in general with me, I found that the more patient I was in taking the time to explain to others who are not as familiar with the subject, the more familiar they were, the more comfortable I was with the approach I was taking, and that once I got their support, I could move forward. And to your point yes, Department of Defense uses a lot of different capabilities that it brings to the battlefield.

Some of it's commercial, some of it's purpose built satellites, and we've had to really take the time to slow down and just, in a lot of ways, think about how we're going into the next century, of how we want to go about things and we've been, well, I could say, confronted with new challenges that we did not foresee.

And it is really making us have to take a moment to think how we want to go into the future. And a lot of times people don't even take the time just to you know, breath in, think about what you're really trying to achieve and get again some momentum in that direction and with everybody's input so you could proceed forward.

Again, I think being inclusive, it's important... everybody trying to take time and understand each other and take the time to explain to people in a manner that's relevant to them versus trying to make this too mystical and, or too esoteric and in a language and approach to what you're trying to solve as the basic problem. I think everybody understands basically problem solving activities that you have to do on a day to day basis. And you just--we can bring some--our general day to day decisions we make in our life into the process by trying to keep it simple and not over complicate things.

Just really my thoughts.

KRYSTAL: Thank you. I'd like to take some time to go through some audience questions. I'm actually really pleased that we're getting not just a decent number of questions, but some really good ones as well. And so one that caught my eye right away is: do you consider the current US government spectrum policies as technology neutral i.e. that they do not inherently favor one technology to the exclusion of others? If you don't, could this be improved? I'll start with Jennifer. What do you think?

JENNIFER: So that is, um, I think it could be improved. I think that what we see--it kind of goes back to my original comment about national priorities and the bifurcation. The FCC certainly has a, a priority that is focused on a particular technology, wireless 5G. I think that's safe to say. And there are a multitude of other priorities, including 5G that I think NTIA would say are important. Is that technology neutrality? It's more--there's not a lot of use neutrality, but there may be technology neutrality.

I think Kim may be able to speak more to the satellite versus--I know we aren't really going to talk about versus terrestrial, but if you consider that technology as opposed to uh, you know, the old days of, um, GSM versus CDMA, which is really a technology battle. So I think it's a challenge.

I think that it's important again to have a unified national approach and we need to think about how do we get there. What is the best way to get there? Um, I guess I would, I would stop--I would stop there for the moment.

KRYSTAL: Alright, Kim, what are your thoughts?

KIM: So you know, I agree with what Jennifer said. You know, there are I think clear priorities, certainly on the FCC side. I think if we think back to some of the remarks that Ken made about how DOD is really focused on sharing and, you know, trying to develop more complex solutions, you know, I think to some extent it's an easy solution to just be like, oh, you know, what can we do to facilitate terrestrial 5G?

Okay, let's do that, instead of you know, trying to make a tougher decision that accommodates more services in the same spectrum in a truly meaningful way. And I'm not sure how we get there, but, um, you know, we would like to see more decision making focused on, you know, real opportunities for other services and not such a focus on terrestrial 5G. There are other important, um, you know, other important considerations as well.

KRYSTAL: Alex, how do you feel that they see this in Europe? Do you feel like there's a good balance between the various competing interests? Or is it different countries really prioritize one or two and focus on those?

ALEXANDER: Well, on paper, we have technology neutrality. In reality, we look to the technology which is available and build on that one. So therefore, we have a trend right now, and this is, I think, on a global scale, it's not only Europe doing that, that we're moving forward away from the technology neutrality, which allows a little bit more innovation if you, if you really concentrate on the main, uh, elements which are necessary to ensure that you do not have harmful interference.

So therefore we have still the opportunity to turn back. But even on the on the global scale, we're discussing more and more technology details which are just dealing with one specific technology. And there we need to be careful.

But on the other side you see as well, if you use just one technology, you have a better sharing of a particular band because you can share the capacity in many different ways. So you see, it has both medals--or both sides of one medal there, which you need to take into account.

But we need to from, from my understanding, provide really the opportunity for all the industry to use the sharing and their frequencies of--on a different approach and then also be open to different frequency bands, which allows their new, innovative applications.

And that is what we would like to have. We would like to have the best spectrum use in there, and we see that the trend is to using more wireless instead of less. So therefore, we need to find ways and means what is meant by sharing and how we can share the spectrum. That we will come to that point later on, I'm quite sure. Thanks.

KRYSTAL: All right. Another question here from Mark Mulholland who--it's a lengthy question, but I think it touches on, kind of, the international coordination aspect of this, which I think is really important for how domestic policy is also made, because as much as we were talking about coordinating within a country, it's part of this much larger system of negotiation and positioning and diplomacy.

His question is, how does the panel view the value of technical working groups in the spectrum world, such as the Frequency Coordination Group, domestic space agencies, DOC, you know all of the groups we're talking about--International Space Agency coordinating groups, should these bodies include commercial space operators more? Is there sufficient coordination and overlap with the ITU regional groups? Essentially, is--how's everybody working together? How do you view the technical working groups and how they function? I wanna pick on somebody--alright, you're up.

JENNIFER: I'll jump in. So, I think the, the national space agencies do a phenomenal job of coordinating amongst themselves globally. I think they spend a lot of time and effort, and I think that it really advances the dialogue and they come very prepared and have done their homework.

When (coughs) excuse me, into the ITU and into all of those processes and I--and they're very strong contributors, I believe, into numerous national processes. So I think that coordination is, quite extraordinary and perhaps the highest among, of all of all that I have seen. And I, I personally think that's valuable. How do we, how do we, um, draw on the lessons from that? I'm not sure, but I would offer that that's very important.

I think the--if I could, just to go slightly to another angle, but still on the international and sharing--one of the things that we see, and Alexander mentioned this you know, the importance of spectrum sharing. So we're seeing this dialogue at the international level right? How to accommodate these different uses and share the spectrum.

What we aren't seeing is the sharing of the regulatory solutions on how to facilitate sharing. So the FCC and Germany and the UK, they may all do their own analyses and come up with solutions, but it's not usually put into the ITU regulations or resolutions how spectrum can be shared.

It's just here. You can use this spectrum for all these different uses. But if you're talking to an international community that doesn't have 500 engineers in the regulator, or 200 or 100 asking them to try to repeat what a couple of years of engineering proceedings at a regulatory agency have yielded, is kind of unfair.

It's holding back information rather than making information available to the global community on what the solutions are. And right now, US policy doesn't really support the export into the international regulatory environment, the regulatory solutions that we come up with domestically. Just the bottom lines, not the how-tos. And that's unfortunate because the success of the bottom line is highly dependent on the how to. And that's a real challenge we face.

KRYSTAL: Yeah, that's an interesting point, Jennifer. We had an event last year on the concerns for

spectrum sharing for weather satellites, and it's exactly right. There's, are we negotiating correctly? But also there's a full acknowledgement that some of this is going to be a technical solution. And are we figuring that out in a way that shares best practices across the industry?

I think that's a great point. Kim, did you have anything to add on this point?

KIM: Okay. Thank you, Krystal. You know, certainly you know, I also admire the space agencies and how they work together....I think as Alex said, you know, early decisions are better. And the more we talk, I think the sooner--and the more we share, like, detailed technical information, the sooner we can get to those decisions. And with respect, to Jennifer's comment...certainly, when we're looking at getting landing rights for satellites in countries, say in Latin America, you know, often, I get questions as to well-- Kim, can you give me, you know, give me a summary of the ITU--the relevant ITU regulations on how this could work? How can the satellite service share with terrestrial or, you know, maybe another allocation in the band?

So it would be incredibly valuable, I think for many countries as Jennifer said, to have, like detailed solutions in ITU resolutions. You know, and unfortunately, we see that in some cases, but not in others. And I think as we move towards more and more sharing, you know, countries do need the ITU to provide, you know, guidance and real solutions.

KRYSTAL: Ken, what's your take on this? I mean, the actual technical working group is itself--is that something that the DOD is happy with the process? Is there something you would change there?

KENNETH: Well, I'm going back to what Kim and Jennifer commented on. I very much respect what the science foundation community does in coordinating their activities, and we participate in some of those groups as well, occasionally. I think the essence of all this comes down to communication is the key.

And the fact that you've got working groups that are focused on a particular problem is a good thing. And could that be expanded? I believe so. It's just a commitment to go do it, and that becomes a priority.

The answer that's accommodating to all. Without knowing what other people want there's no way to ever figure out whether there is a compromise at all.

So you've got to sit down and talk with people in order to figure out the hows and the why of how you're going to get to an end goal. And I think another thing that I'll bring up that Jennifer mentioned--I mean, sometimes having a strategy or a national spectrum strategy or policy document, that kind of helps overlay where you're trying to go, then allows for those kind of technical groups, then kind of focus and row in the same direction.

If everybody is rowing in a different direction, you go around in circles. When you're rowing together, you move faster, and I think the groups are always--any time you get together and and speak, and they take the time to listen, there's always goodness in that.

KRYSTAL: Okay, I'd like to move on to another audience question. Um, so this says, innovative space technology is being planned and coming on rapidly. User demands are also changing quickly. Is the current approval process at the FCC for space and Earth stations timely enough? Are there improvements that could be made? Kim, I think I'll start with you. I know that this obviously affects a lot of members in your--in SIA and in industry in general.

KIM: Thank you, Krystal. You know one thing, I guess there's multiple points in the process, and arguably the first step is to get your application on public notice. And that gives everyone an opportunity, review it and provide comments. But sometimes we find that applications languish. You know, maybe they're almost forgotten about, maybe there's active review going on.

But if there could be more of an active or a automatic system in place, where applications go on public notice in, you know, X days, maybe it's 30 days. Maybe it's 60 days. But if there was more of an automatic process that I believe the FCC has for other services, you know, I think that could get things started and moving for applications on the space side, you know, much more quickly.

KRYSTAL: Would anybody else like to comment? I'm kind of curious on Alex's position on this. I mean, do you feel like the process is fast enough in general, in Europe, I mean, do you feel like companies and other interests are adequately served? You know, I've heard comments like, you know, how can a new company know that it needs to get on the WRC agenda four years from now? What are your thoughts on that?

ALEXANDER: Well, at least I can speak from my own agency. We're flexible enough to find interim solutions without the WRC decision. It's not always--it's, it's always--the killing argument is you have to go to a WRC. Oh, so long, no I don't do it. But that's not what we want. I said it already. We want a spectrum out in the market to be used.

And therefore there are always solutions. Is our authorization system fast enough? Well, in certain cases, yes, in other cases, no.

Of course, what Kim said is something which that we are--a real concern for us, that we may use more automatic authorizations as well, and at least also some, some more sharing opportunities in there in order to make the right calculations. That means also on the other side, we need to have very highly sophisticated people who are able to provide the light, right content and the parameters on there.

And this is for the space industry, definitely something, for terrestrial users which are completely new to spectrum management, could be a new caveat and just the closing the doors again, because it could be too complex. So therefore, we need to be careful on that one. And from my understanding, yeah, we need to use more automatic systems. But we need to be careful not to exclude someone who's using that spectrum with it as well.

KRYSTAL: Okay, thank you. I want to move on to another question. This is from Theresa Hitchens.

First of all, she asked if the CSMAC--uh, I don't even know if you use that that way--the report Jennifer mentioned is available to the public. The answer is yes.

For anyone who's interested, I put the link in the chat. But the second half of her question: would changes that you potentially discussed here require congressional action to change current laws? You know how--what, how could we go about this? I mean, if there was real interest in updating and modernizing this process, what actually needs to happen?

JENNIFER: Yeah. No, thank you very much. And that wasn't what I would have said had I not had to dial back in. The more dramatic changes the real structural reforms would require congressional action. Whether, you know, some of the options were collapsing the FCC into the NTIA. Or collapsing the NTIA into the FCC.

Obviously, structural change congressional action required there. Creating a new agency that would take responsibilities from both the FCC and NTIA to manage spectrum. It would require statutory change because each of those agencies has statutory responsibilities. So all of these require it. So, what I think the CSMAC report, in my view, my personal view, tried to do was lay a foundation for discussion.

It's building blocks for policymakers to think about what would benefit the US, 21st century and beyond? And here are some things to look at. Each of the ideas has pluses or minuses. But let's have a conversation about those pluses and minuses.

Perhaps the congressional--this is not in the CSMAC report, but perhaps, you know, the GAO could do a study on how, how would there be benefits or what--how could we improve the process? Um, there are a number of different ways that Congress will wanna look at this. And, you know, there's always that challenge with congressional oversight. The FCC in this sense is a creature of Congress, and, you know, some of the ideas would have it be all consolidated in an EPA type or FAA type agency with responsibility for spectrum management. I'm sure that has questions of committees of jurisdiction, et cetera--but it's a dialogue that needs to get started. Where it ends, I don't know. And when it ends, I don't know.

But it's a good conversation to have because we should not accept just the status quo because it's the status quo. Let's see how we can improve things.

KRYSTAL: Anybody else have any thoughts on that? I mean, I think Jennifer answered the yes-no aspect of the question, but in terms of what you see is the next steps in terms of serving these interests while also participating in this complicated process, um, just kind of opening the floor on that one. Kim? Ken?

KENNETH: I'll just make a basic statement. I think, generally anything you could do to speed up the process is good... whenever possible. Maybe some of that's via automation, artificial intelligence.

Some of these new emerging technologies may be able to help facilitate some of it. But then there's other instances where I think that it takes time and thought, and we can't be impatient in the name of haste.

Cause you can get into a bad decision real quick and you can't get out of it. So just because you're fast doesn't make it good. Quite frankly, I mean the bifurcated process served the DOD well. Do we always get everything we want to know? No, who says you're supposed to?

But at the end of the day, we've been able to look at this and through the process and reach agreements on a lot of instances. I think that, you know, obviously national security is something that is--when you go to war, it's a dramatic affair. Nobody wants to go.

But if you weren't preserving certain spectrum or certain things that allow you to go when you need to go, then you'll be starting from ground zero. And that's not feasible either, given where we are in this global world we live in. So there's obviously some sacrifices you have to concede that are part of being the country we are.

And maybe that's a little bit myopic and narrow, but at least based on where I'm coming from, but you don't always get things for free. It takes time and it takes effort and it takes commitment and take sacrifice. And we just have to acknowledge that. Again, maybe the poli--national, national spectrum policy or strategy still takes that kind of dialogue, so then allows whatever regulatory structure you come up with supports that. But without that, you're going to leave something on the table. That's just my opinion.

KRYSTAL: Kim, what do you think the next step is? Obviously you're all engaged with the various agencies, but from a practical standpoint, what's next?

KIM: So that's an excellent question. I agree with Jennifer that it's really important to have the dialogue started.

I think there's certainly longer term actions that are going to take a lot of time, as Ken has mentioned, but we're starting those discussions now. But it would be really wonderful if there were interim measures that we could take in the meantime that could start, you know, start moving us in the right direction.

We've tried to identify some of those, like within the FCC's Work Advisory Committee, like, you know, pushing towards more consensus building there. But I'm not sure how we increase the consensus or the work across the federal and non-federal side, you know, in the meantime, but it's certainly something I think that we should all think about.

KRYSTAL: Sure. And I'd actually like to ask Alex as well, you know, in Europe is this a set process, or is it something that changes? If someone doesn't like how it works, do they have an ability to suggest that change, or is it pretty, pretty well worked out at this point?

ALEXANDER: Well, yeah, that is now something--I would say from the European Union, we have this constant review process of their overall framework on it, and therefore we're constantly thinking about how we can improve the process.

Up to now, the process is rather stable because of our, in Germany, because of our general laws there. We do not have this division between the federal and non-federal, we only have the division between everything which is related to spectrum and spectrum for the military. So national security purposes. All the rest is covered by BNetzA.

Therefore, we have this discussion internally and not inter-institutional. So therefore, you may have to see that there is always a different approach which you can consider and you can look outside how it is made. Well, in the UK, it is different and in France you have still also other institutions for different purposes, very small ones as well, but to a certain degree, very efficient as well because very fast acting. So therefore you can always have these advantages and disadvantages.

But you need to, need to have these constant collusion of the arguments, I would say, and then also the consensus building process which is coming up to the right decision at the end. But you will have the decisions and the discussions every time, either inside one agency or outside.

And yeah, we're just currently in a process in implementing the new EU legislation regarding telecoms and in particular, their own spectrum as well.

That will change some things regarding our way how we approach spectrum in Europe, and that will include also some further work inside our agency in Europe. But overall, and this is with the view to the ITU, it will stay the same.

KRYSTAL: Okay, I'd like to actually combine two questions. And so what we have here is one question that's saying, what are the prospects for new tech reducing the demand for spectrum or congestion? Or will we still have a spectrum scarcity for the foreseeable future? And there's also a question that I think is more basic, but I think it's something that people care about. Like, not everyone understands this. How close are we to running out of spectrum? Do we have a huge problem now? And then what are your thoughts on part of the solution being how technology can help solve this technology problem, if that makes sense. Alex I'll just go ahead and turn it back to you. What are your thoughts on this?

ALEXANDER: So thank you. No, I don't think we're running out of spectrum. What, what we see right now, we just opened the doors to a new level. We just saw that we're moving up in the spectrum. The space agencies are already there. But we see that the terrestrial technology is coming up there as well in the millimeter wave area. So we will see that there is also spectrum available for different purposes. And the technology development now indicates that we will have some further opportunities there as well. Of course, this will take time. As always.

But if you look into the past and backwards the history of the 100 years of the ITU, you saw always these most likely spectrum crunch and what they, what happened was that technology moved up in the electromagnetic field. So nope, there is still enough spectrum available. Will we see more

intense discussions on the most valuable spectrum, which, where equipment is already on the market because people and companies would like to have immediate solutions on their wireless needs? Yes, that could definitely come up.

There we will see more discussions and more sharing opportunities most likely, but maybe also some other technology solutions. I just mentioned here 5G network slicing, it's still an option. And, I haven't seen so many indications or implementations of it, right now, but it's still a very interesting option there as well, in order to bring together those spectrum users on a very small part of the spectrum as well. Overall, that's my view on that point and then I leave it to the others as well...Thank you.

KRYSTAL: Ken, what do you think about this? I mean, obviously you work with systems that are incredibly important that we ensure continuity of service, GPS, weather, we've touched on several of them already. What are your thoughts on the current, you know, situation?

KENNETH: I just want to make sure it wasn't Kim. She could speak, she can answer for me, though. No--on that note, I'm, I'm with Alex, again I mean, I look to where we come from and where we're going on our trajectory and obviously, looking over my time in the Department of Defense, you know, it's become increasingly clear to me that technology has been the key to everything.

Our ability to deploy, our ability to operate has been increased substantially with technology. And as we advance technology, it brings about a lot different capabilities and opportunities. And I think, as Alex noted, we're in a moment where we're at there is, you know, an urge to get everything to market very quickly, based on what we have on the table. Now, that creates an immediate issue that you have to contend with. But that doesn't have to mean it's going to be like that forever.

And as the--as we go up towards more higher frequencies and even into optical, it's going to allow for a lot more things to be completed, to be done, and you--you won't have the same issues that you have now. May have some other ones, but you don't, you don't have the same ones. That's how I kind of foresee it.

JENNIFER: Krystal, can I jump in?

KRYSTAL: Yeah, absolutely Jennifer, please.

JENNIFER: Thanks, so I think the point that Alex made is really important. It's going to really be the question of congestion in the, in the spectrum where there is commercially available equipment. There's an ample opportunity for R&D to be able to exploit lots of future bands of spectrum higher and higher up. But in terms of the near term, it's the congestion in the lower bands, and technology does offer a potential easing of that congestion if we look at the application of AI and other sensing capabilities, to automate some of the sharing solutions.

So you take the delay of the human in the loop to solve coordination or geofencing or other solutions, and you make it, you know, you apply the AI and you get to an automated speed of coordination that makes spectrum sharing just change dynamically, um, in terms of its enabling more services to use the same spectrum. I think that that holds great potential and it's something that I know we and others certainly are looking at.

KRYSTAL: And Kim, I'd like to hear your thoughts as well. I mean, I think this is something that people want to know, you know, how urgent is the issue and where are the biggest problems now and where might the problems be in the future?

KIM: So we found ourselves running out of spectrum, but we were running out of Ka band spectrum in developing our latest broadband satellite. And so we turned to Q and V bands, the 40 and 50 gigahertz bands, for Gateways, for our latest satellite, and you know, that's been really exciting. I think we've really been on the forefront of using those bands commercially. Certainly, you know, equipment development takes time. We've been able to leverage work that DOD has already done and advancing the equipment. So I think we do have, like, other spectrum to move to.

I think one thing that's been frustrating for us in making use of those frequencies is they're shared with terrestrial 5G in the US and we find severe limitations in where we can locate our earth stations, you know, that may not really take into account where the terrestrial 5G may truly be implemented. You know, we're pushed to incredibly rural areas where we maybe may not be able to get fiber connectivity yet, you know, is it realistic that we need to preserve the, you know, vast parts of, you know, practically every county in the country for, um almost I don't know, global or continuous 5G coverage. So we'd really like to see a better balance that takes into account the realities of both services needs and deployment requirements.

KRYSTAL: OK, so I'm going to go ahead. I have a question here. Some of you might be able to see it. We promise that we're not here to get into specific battles within this so I'm going to change this question slightly when I ask you, but I do feel like I have to ask it...So the original question is, would any of the panelists care to share their opinion on the FCC Ligado 5G decision that was made earlier this year--I'm not going to ask you to answer that question, but I would like to talk about the process of how that decision was made. And so without getting into the details there, I would like to see if anyone has comments to say, you know, there was a lot of coverage of this.

Some people were very happy with that process. Other people were not. And there has been a lot of pushback on it, obviously, and that does touch on what we're trying to talk about here. And so I will open the floor.

I'll see if I have any takers, but again, I want to talk about the process of how the public and others are able to input into that decision. Do we feel that that process is adequate or not? I don't see anyone taking off their mute. Jennifer?

JENNIFER: So to talk about process, and, I think Ligado could be illustrative of a challenge, right, that I spoke to before, which is you have two agencies with two responsibilities. And so you have that bifurcated jurisdiction that I said before, and what you have governing how they resolve issues is a memorandum of understanding between the two agencies of how they will coordinate, and that is public, it's on the--it's on the website.

And, um, of how they will govern, or how they will try to resolve issues, how they will coordinate. But the bottom line is that the FCC, and this is what we saw at the end for--from the federal government side at least, has unilateral jurisdiction, unilateral decision making. So the MoU is nice, but the MoU doesn't commit to consensus, doesn't commit to escalation, doesn't commit to what do you do when you don't agree? And, perhaps that's a gap.

But also, I think the non traditional communication, sorry the non communications commercial stakeholders, I think, um, were challenged by the process as well, right. So when you look at, I'll pick on the aviation community, when you look at the aviation community, whether it's the helicopter association or the aerospace association, they're not the traditional, um, players at the FCC.

So that's, again, that's a new stakeholder community, many of which have never even gone to the FCC before, when you look at some of the players. So it's, it's again, it's about creating a more inclusive and broader understanding of the equities and the stakeholders, and again that gap in that consensus building between the two agencies if we're going to continue forward in this bifurcated structure, thank you.

KRYSTAL: Thank you. That is exactly the kind of discussion that I was hoping to have. Does anyone else wanna make a comment on that? Otherwise I'm going to move to the next question. All right, so this touches on the same question a little bit. So the question in the comment is, is the public interest adequately served in the current system? And I'd like to add to that.

So when we talk about transparent process, we talk about something that new groups can get involved in. Part of it is a lot of people don't even know that this is a problem for them. And so one of my questions to the group is, do you feel like the current processes, both internationally and nationally, adequately represent not just the specific interests but also broader interests? Are we coming up with solutions that really are overall optimizing spectrum? Because there's, there's groups that are affected by this that aren't at the table, and it's not because they're not--they can't come to the table. In many cases, it's just because they don't know they need to be there.

And you know, as an example we hosted, co-hosted an event at the NOAA Weather Satellite conference over a year ago, and I will tell you, I think we gave people heart attacks because the number of scientists--also the fact that we had a very large room of people who are very concerned about this, and again they have representation, but it just goes to show you that many people affected by the use of spectrum are not necessarily involved in how spectrum is allocated. So I'd just like to hear your thoughts on, do you feel the process is robust enough to represent broad public interest here? Kim, what do you think?

KIM: Perhaps one example of a range of interest could be c band and looking at repurposing some of that spectrum in the US. Certainly, you had the satellite companies that were very involved in the terrestrial 5G folks, but there were many, many people that rely on the programming that's provided over those satellites and they were able to be involved because they were the licensees of

the Earth stations at least, but it was something that was new to them. And, certainly not something that they would normally participate in.

But I could see how other users where they don't have a license before the FCC, they don't have an opportunity really to get involved in the process necessarily while it could have a serious impact on their business, or personally. So I don't know that I have a suggestion for it, but certainly, I think the folks that don't necessarily have a license are certainly, you know, more left out of the process than you know, those that do have a direct link to the agency.

KRYSTAL: Ken, what do you think? Do you mean--as, again, as an agency that is directly responsible for a lot of public good technologies and satellite, do you feel like the process is robust enough and really represents all of the interests?

KENNETH: I think we can always improve. I could just speak to myself, uh, knowing that there's--some, a true warfighter out there somewhere that's relying on communications to occur. And he has no idea about spectrum allocations. He just wants whatever piece of equipment he has to work and work in a manner is timely and efficient and effective.

And you know, do we always do the best job of explaining how things work and do we bring them into the solution all the time? And does it always benefit the greater good? We try. And that is the goal. You just accept the fact that we just need to improve the process--expand where it makes sense. I mean, I think that, again, there are things that we're looking to do in the future.

As Jennifer mentioned, automation, AI, maybe all that helps take some of the decision--and human in the loop out of it and makes it more seamless. But until we get there, I think we always can expand the tent, so to speak, bring in more players. And, as best we can, be patient and explain to them the process, get their input to see how we could make it better.

KRYSTAL: Great. Jennifer, what do you think? You've been around doing this a long time. Do you feel like everybody is represented?

JENNIFER: There's always a constituency, so I'll pick radio astronomy, right. So there's the agency that cares about the national science--I think it's the NSF, right? That's the radio astronomy representatives. But the downstream beneficiaries of what the radio astronomy sites generate, I don't think they're represented. I don't think they're understood.

It was kind of like with the weather, that the downstream--I always get confused downstream upstream--but the beneficiaries of what that spectrum use does, the non-consumer beneficiaries the not, you know, I don't think those are understood or adequately represented. I think the ham operators do an awesome job of representing themselves, and they are so many. But scientists, I don't think they're an active participant in the processes, and the universities that are doing R&D. So when the FCC--you know, it's important when the FCC is looking at changing experimental access to spectrum, that those groups participate.

And it's important therefore--it's back to that simplicity discussion we had at the very beginning that Kim teed off, which is making things accessible so people understand what the regulators are

talking about so that they can see. And then where is that communication done? Where is that publicity of that information? What is the obligation of the regulator to reach out into communities like they did for DTV transition? They did a great job reaching out into every community to educate. Not saying this is that level, but at some point, what is the obligation to go beyond the Federal Register notice? Because I don't know about most people, but if I weren't in my job, I wouldn't subscribe to Federal Register notices.
(laughter)

KRYSTAL: It's such a good point. I mean politics--you know, what we do here is very inside baseball for a lot of people, and they need to know these things. But you're exactly right. I am guilty of subscribing, but not always reading as closely as I should sometimes. Alex, I'd like to get your thoughts on this. I mean, from a European perspective, do you feel that everyone is represented? Do you feel that your process is able to address those needs and that that you actually hear them to begin with?

ALEXANDER: Thank you. The process itself is definitely able to cope with it. The question is, how do we reach everybody who's interested in this subject? What we can only do is going out to the public, inform them and invite them.

We're doing that because we're working on the ministry of transport and they do a lot of public events, describing also our spectrum things. The agency itself is making their work public, as the FCC is doing, but then we're back to the question we have before regarding plain language. So we need to really sell what we're doing, and it's not always easy. And of course, the general public is sometimes more interested in different subjects than in allocating spectrum.

They would like to use the motorway, and didn't want to know about how it is built. So therefore, we need to be careful there too. But from my understanding, of course, everybody is invited to show up in their preparatory works. If they have a good argument to bring forward or a good idea for the educational spectrum, why not?

So that's--this is really open. But it's sometimes really difficult to describe what we do in our normal work in such a simple way as it also needs to be very short. But because usually if you use simplistic language, it's much longer than the information.

KRYSTAL: All right, so we have just about 10 minutes left, and what I'm going to do is...I'm going to just take a quick glance through the Q and A and see if there are any more rapid fire questions that we can address. We've had a really engaged audience. We keep getting questions, just keep popping up. We're not going to get to them all, but I'm going to answer a few more and then I'd like to offer opportunity for final comments to the group.

And so let me go through here....I noticed one for Jennifer. There's a, there's a two part question: What is the difference between the advisory committee's Full Service Spectrum Agency and Unity Agency? You can answer that if you choose. And then the second question I think is relevant to

everyone, is the bottom line here that consolidation is needed to enable better sharing of spectrum?

JENNIFER: Do you want me to take that first question?

KRYSTAL: Yes.

JENNIFER: So the difference between the Unity agency and the Full Service Agency--the Unity Agency would combine all of NTIA and FCC, the spectrum components and the non spectrum components, into one new single agency. The other, the Full Service Agency, would combine only the spectrum related functions, meaning spectrum allocations, spectrum licensing, all of the different aspects related to the use of spectrum. So that is the difference, leaving the non-spectrum functions in the NTIA and FCC. So that, that's the difference. What was the second part of the question which I know goes to us all?

KRYSTAL: It was, well, it was about consolidation. I mean, do you feel that consolidation in the process is an important part of what needs to happen?

JENNIFER: I'll just continue and then turn it over to-- I think a conversation about it is very important because we are no longer working in the way we were in the past with spectrum being stovepiped. The spectrum sharing reality that is confronting us requires a cultural shift, a confidence shift and a real trust in the regulatory framework. And I, I think there needs to be a conversation. How do we get to those three things? And it may involve a consolidation, a new agency. But we have to start that conversation.

KRYSTAL: Kim, any thoughts on this? I mean, do you see consolidation as one of the key ways to try to move forward or are you open to a lot of other solutions as well?

KIM: So I think at a minimum we need to communicate and make decisions together on the WRC front. If there are other ways to do that besides consolidation...it may be easier to create a new advisory committee, you know, shared between FCC and NTIA than make some of the structural changes Jennifer is talking about. But I do think we need to move forward and certainly on the ITU front, we don't wanna be making decisions within three days at the last minute before an important regional meeting and meshing together FCC and NTIA views at the last minute. That's just not serving anyone.

KRYSTAL: Alright. Scrolling through here...There's a lot of questions that would take longer to answer than we have. If anyone wants to comment on the possibility of regulating laser comm, you're welcome to, but I'm not going to put it out to the group. Honestly, one of the things I want to say before we go into closing comments is we see this as kind of an initial conversation. I think there's been a lot of interest in revising processes and really taking a hard look at spectrum policy in the US since the last WRC and ahead of the next one. So we wanted to just host the for-- you know, a conversation out loud.

I'm happy to say that this is not just something that's being pushed by industry, although I've been thrilled to hear from Kim and Jennifer today about that, as well as Ken's thoughts and Alex's.

But there are other conversations happening, and so for those of you who are interested, I encourage you--there's a public forum that the NTIA is hosting....I think it's September 20th. So, this is really just meant to be the beginning of that conversation. And I did get a private message saying this is the most interesting conversation on spectrum they've heard.

So I think we've done at least a decent job of making this conversation accessible to an audience who may not focus on spectrum. What I'd like to do now is go ahead and take the opportunity for each of you to just sort of give us closing thoughts. I'll tee up a question, but I open this to the floor if you have something that you think we haven't covered.

Essentially, it's if you could change one thing about the spectrum policy process right now, if you were in charge, you know, what would that be? Or if you want to make a different comment, that's fine too. Kim? We'll just go around the room.

KIM: Okay, thank you. So I would love to see a concerted effort to make tough decisions that meaningfully accommodate multiple services and technologies. You know, in a more fair, thoughtful way.

KRYSTAL: Alex, what about you? If you could change it, something here or internationally, you know, you're king for a day of the ITU world, what would you do?

ALEXANDER: Oh, my God. No, what I would like to see in the future is really something that we have turn again spectrum strategy to a long term vision. So something where we have really something, which are the guidelines, and not to a short term decision making process. This is something we need to have for the ITU as well.

We should not turn the ITU into a short term decision unit. That is something which is going totally in the different--a very dangerous direction, from my understanding. And we have now some tendencies we're doing these spectrum decisions and spectrum strategy just for mid term, in a very bad sense, and not for long term.

And we need to have this understanding that spectrum is a long term, um, a long term doing, and therefore we need to do it, really, for, for those who are interested also in the future, and we can't, can't change everything within one year or two. Sometimes it takes longer times, and that is something we need to take into account all the time. Thank you.

KRYSTAL: You're speaking my language, Alex. That's one of things we are so interested in at Secure World. It's one of the reasons that spectrum is so important to us, but we're still figuring out how we can best be helpful, because for us, it's about exactly what you're saying. You know, how are we overall making these decisions? Are we managing in a way that makes sense?

I leave the negotiations of 28 gigahertz to those who understand it far better than I do, but I also know and understand and want to support this concept of the vision. I think that's a great way to put it. Ken, what are your thoughts?

KENNETH: I kind of second what Alex said. I mean again, I started off by saying I'm a very simple individual trying to keep things very basic. It all starts I think with the commitment on a cultural change towards how we look at this, and it's gotta be directed in a way, in a manner that everybody understands.

Maybe the national strategy is the way forward. I mean, once you know where you're going, how you get there, become--and why you get there, it becomes a lot easier. Without some general understanding and taking the time to speak it out, talk about it, elaborate on it.

It makes it much more--

KRYSTAL: Oh you're cutting out.

KENNETH: I think that one thing I would do if I was king for a day, it was--communications is the key.

KRYSTAL: Thank you. Jennifer, obviously, this is something you deal with day in and day out. You know, I've yet to see a spectrum panel where you or maybe the other Jennifer in some of the other places are not involved. And that's great. I mean, in some ways, that's a resource of the community. But, you know, what do you think is most important? What really should we be focusing on right now?

JENNIFER: So if I were--I'll do czarina just to be different--I would like to see an integrated national spectrum strategy that was perhaps binding on the US regulators and their processes and guided our participation internationally. That is what I would focus on.

KRYSTAL: All right, well, that's a simple answer. I like it. So again, thank you to all of my panelists, I think this was an incredible discussion. And we will be providing a recording of this later. So if anyone feels like, hey, they heard something great, and they want to go back to it. Don't worry-- we're going to have a record of this. I know I certainly will be. Again, thank you Jennifer, Ken, Kimberly and Alex. I felt this was an incredibly lively conversation, and it was great to see everyone's faces.