THE BROOKINGS INSTITUTION

CONFRONTING THE LOOMING SHORTAGE OF WIRELESS SPECTRUM: A FEDERAL TECHNOLOGY POLICY IMPERATIVE

Washington, D.C.
Wednesday, October 20, 2010

PARTICIPANTS:

Moderator:

DARRELL WEST
Vice President and Director of Governance Studies
Director, Center for Technology Innovation
The Brookings Institution

Panelists:

PHIL WEISER
Senior Advisor to the Director for Technology and Innovation, National Economic Council
The White House

STEVE SHARKEY
Chief of Engineering and Technology Policy
T-Mobile USA Inc.

ADELE MORRIS
Fellow and Policy Director, Climate and Energy Economics
The Brookings Institution

ELLEN GOODMAN
Professor
Rutgers University Law School

RUTH MILKMAN
Chief of the Wireless Telecommunications Bureau
Federal Communications Commission

* * * * *

P R O C E E D I N G S

MR. WEST: Okay, I think we will get going. First of all, good afternoon. I'd like to welcome you here. I'm Darrell West, Vice President of Governance Studies and Director of the Center for Technology Innovation at the Brookings Institution. I'm pleased to welcome you to this forum on Confronting the Looming Shortage of Wireless Spectrum.

In its national broadband plan, the Federal Communications Commission called for 500 megahertz of new bio-spectrum in the next decade, 300 of which it wish to be freed up within the next five years. The FCC did this, because wireless broadband is growing at a rapid pace. There's been tremendous growth in smart phones, and people are using mobile devices for communications, health care, public safety education, and energy, among other activities.

Mobile communications is a key driver of economic growth, innovation, and job creation. But despite all of the new applications requiring wireless spectrum, there's been little progress on increasing the amount of wireless spectrum that is available. There are competing claims between radio and television broadcasters, internet providers, new applications, public safety officials, and the Defense Department, among others. So, it's been difficult to reconcile the competing claims on spectrum.

So, today we are hosting a conversation to discuss ways to move forward. What can we do to ensure that we will have the wireless capacity we need to meet both current and future needs? What should the process be for allocating spectrum? How do we balance between the stakeholder interests in pursuit of additional bandwidth? And what actions would bring the greatest benefit to consumers?

For opening remarks, I'm pleased to welcome Phil Weiser back to

Brookings. Phil has spoken at Brookings on several occasions before and always has very interesting things to say. As I'm sure most of you know, Phil is a senior advisor to the Director for Technology Innovation at the White House, National Economic Council. He previously was a law professor at the University of Colorado, and Phil has been overseeing the President's policies in the spectrum area and is working on an interagency White Paper on spectrum policy.

Following his remarks, we'll hear a variety of perspectives from several people. Adele Morris is a Fellow at the Brookings Institution in the Economics Studies program. She specializes in spectrum policy as well as a few other issues, and she is co-author with Robert Matheson of a forthcoming paper on The Technical Basis for Spectrum Rights: Approaches to Enhance Market Efficiency. I really like that title if you can deliver on the promise of that title.

Steven Sharkey is Chief of Engineering and Technology Policy at T-Mobile USA. Previously he worked at Motorola and long has been active in thinking about spectrum issues.

Ellen Goodman is a professor at the Rutgers University Law School, and she's author of a paper, Spectrum Auctions and the Public Interest.

Ruth Milkman, to my immediate left, is on the front lines of this issue. She is the Chief of the Wireless Telecommunications Bureau at the Federal Communications Commission.

So, I thought we would start with Phil, who will tell us what he and the Administration is thinking about spectrum issues, and then we'll hear from our other panelists.

Phil, welcome.

MR. WEISER: Thank you, Darrell.

I should first start by saying I'm indebted to Brookings on this topic, spectrum, because it was where I met Larry Summers, who was talking about spectrum at the Brookings Institute. So, this sort of led sort of a buff for a cause to my current position. And it is a unique opportunity to have thought about something as an academic and be in a position now when the policy window for action is happening. I want to start by -- explain a little bit of what the window is, then talk about why it matters, and then, third, what we're doing about it.

It's great to be here with many old friends and colleagues. Spectrum is on the agenda.

This week there was a program that, Kathleen, you were a part of in Virginia.

And tomorrow the FCC is holding a spectrum summit. And so we are getting an increasing level of interest, visibility, and excitement and for good reason.

The growth in mobile broadband is astonishing. I believe next year mobile broadband will out-swamp anyhow you measure it. But next year the devices -- smart phones -- will actually outnumber regular phones. And considering, like, as of 2005, you know, that was not on the agenda. So, within sort of a six-year period to have this revolution -- the third-generation internet is really upon us now, first generation being narrowband, second being broadband, third being mobile -- so, we are, the Administration, aware of this challenge.

The broadband -- National Broadband Plan was a critical sort of moment to map it out, and what we have done is launched sort of a four-part plan. For those who haven't seen the President's memorandum or the speech given by Larry Summers, that

sort of gives you more of a roadmap and details. The idea is to free up 500 megahertz in 10 years, to have private sector spectrum used more effectively, and one critical concept, there is incentive auctions -- I'll come back to that; second, for the government as a user spectrum to use its spectrum more efficiently and effectively; third, to have R&D in this area catalyzed in a well-coordinated, thoughtful fashion, because we're the, again, precipice of new technological revolutions; and, finally -- and some would say sort of, most sort of overdue to facilitate the transition to a next-generation net for public safety. Public safety, you know, some would say is really behind the technology curve in terms of devices being used for public safety, and there's a chance to fix that.

So, first, why it matters. And I think it's worth noting from the National Economic Council perspective that spectrum is a critical part of our innovation strategy. And a point that Larry Summers made when he outlined this agenda was government should be aware and looking for levers and opportunities where public action can facilitate -- can catalyze private investment innovation. That has happened again and again in the context of wireless spectrum.

The PCS auctions were a critical moment that catalyzed a wave of investment innovation around the 2G ecosystem. There were later auctions that catalyzed a 3G, and now we're approaching 4G, which some see as enormous possibilities, the success story wireless in this country with companies that are leading edge in something we can't take for granted. Other countries are freeing up spectrum in large amounts, because they want to have the rich ecosystem where technology is developed.

Different scholars have talked about the importance of a home market, if you will, for countries to develop, because sophisticated users who tried stuff can contribute to ongoing economic development innovation, and if we have a starved market for

spectrum, we are starving this ecosystem. And so as a matter of facilitating innovation investment, as a matter of infrastructure for other economic activity -- because this is an enabling infrastructure -- this is a national imperative. And then, again -- and I'll come back to this -- for public safety to have this infrastructure is also an enormous opportunity and national imperative.

So, exactly what we doing to pursue all this? There are several different fronts. Ultimately, this is going to require legislation, and a court challenge for all of us in this community is how do we make the case to Congress that legislation in this area is warranted and necessary.

One of the challenges of the spectrum is it's invisible. It's ethereal. It's hard to get excited about it if you're not one of the spectrum geeks in the room (laughter). You know, it doesn't get people all that worked up, and one challenge that, again, from a (inaudible) point of view is to explain how much economic activity is catalyzed by freeing up wireless spectrum. And this is a resource that is unique, something Larry Summers is fond of saying, because when you free up spectrum and then you are able to have an auction and the government gets some money, the government is getting money by doing something that catalyzed the economic activity. Most of the way the government gets money -- cutting expenditures somewhere else, raising revenue somewhere over here -- there are economic costs to what's happening. Here, there are economic benefits as a result of it happening, so the logic for looking for opportunity here is pretty great.

So, on the private side, there are a number of licensees who got their license over the years, many of whom got them for free. Many of them hold onto them, because they have them and haven't had a chance to monetize them. If you're an over-the-air TV broadcaster today and you want to give up your license and sell it to someone

who's using a mobile robot, you're not allowed to.

So, in Los Angeles, for example, we're stationed on the air that would make around $800,000 a year, and the spectrum that is being used could be worth a hundred million. But they're not allowed to make that trade.

Tom Hazard pointed out that at the end of the digital transition, there were stations over the air broadcasting both analog and digital. That gave them their most carry right, because they had an over-the-air station. Some of the stations said could we stop our analog over-the-air transmissions, because the electricity costs of broadcasting over the air in analog is so much that it's not worth it based on whoever were getting as viewers over the air. From an economic perspective -- it was Adele who sort of laughed can note -- that's hard to take. Why can't you allow that win-win deal, and that is indeed what an incentive auction would allow. It's critical to say this is about creating opportunity for over-the-air broadcasters. There are lots of over-the-air broadcasters who see lots of opportunity in their current business model. They are looking at multicasting and doing interesting and creative opportunities with that.

As you recently saw, the demonstration of over-the-air mobile video, which is an emerging product available here in Washington, and those are terrific experiments, opportunities. And what's is great about sort of a market economy, people are allowed to make different bets on what technology they can develop and we'll see which, you know, way the market goes. What's not good about a coincidence spectrum is there are some people who are not allowed to take marketplace decisions into their own hands, because regulation prevents it, and that's costly, because there are others who desperately want access of that spectrum and aren't able to get it. So, there's an opportunity around an incentive auction concept, and it's good to see that in Congress there's a lot of appreciation

for that. A number of the key leaders on both sides of the House and Senate have said we want to see this happen. Senator Rockefeller has put out a Bill, for example, and others have as well.

Number 2, the government has to use our spectrum more efficiently. This is something where a lot of the agencies have had spectrum, and that's been the way they've managed communications. They haven't necessarily shared with one another, shared with the private sector users, looked to other modes of communication, and we need to do our very best to push hard to find opportunities. This is something where the NTI report that Larry Strickling I think talking at yet a different event this week is going to be talking about and that will provide more explanation. I think it's worth also noting that our chief technology officer, Aneesh Chopra, the first person to hold that position, is going to be able to play a key role here, because government has to be more thoughtful and effective about how we use spectrum. And part of that means needs for incentives for the government users. So, the win-win concept I suggested as to broadcasters and other licensees, such as Nova Satellite, who could take advantage of incentive auctions -- that's true for government users, too. The current law provides some capability of enabling government users to be held harmless -- The Commercial Spectrum Enhancement Act. However, it doesn't provide planning funds. It doesn't provide demonstration projects to show that the proposed, you know, change in their usage will work. And it doesn't provide any additional incentive to make it worth their while to go through this brain damage. So, if you want to see the maximum amount of action, it's important to give people the incentives so that they have all the tools and motivation to do it. You can say well, just put a gun to their head and make them do it, but I will say that if you're trying to have effective outcomes, what's the old expression: You can catch a lot more flies with honey than with

vinegar. And I think that's true in most contexts.

Public safety. The challenge remains for this country to put first responders in the situations that, let's say, Federal Express has, which is benefiting from an enterprise architecture state-of-the-art information communications technology. Whether it's effectiveness in their mission or interoperability in a time of crisis and emergency, we don't want to be equipping our first responders with, you know, a lot less than state-of-the-art, and this is a big challenge, because historically it's been a fragmented community where every single jurisdiction has wanted to buy their own equipment and build an (inaudible) network. And for those of you who know the world of 4G, that's not an efficient way to run a nationwide wireless broadband network that would interoperable and fully functional.

And so we have a challenge, and the Administration is focused on this challenge. We're working with all relevant parties together effectively. There are three federal partners from Commerce, DOJ, and DHS working with the FCC and their new emergency -- ERIC -- emergency response interoperability center. So, there is also an interest in Congress in moving forward on this, and we are doing all we can to support that. This is a unique opportunity with the LTE rollout to starting 4G, and with an opportunity for incentive auctions to create money we have an opportunity to pay for this to happen.

This is something that hasn't been on the table before. A lot of times people talk about the need for this. I've been at other conferences where that was talked about and worked on, but now we're saying federal money needs to help make this happen. And that, I think, creates some opportunities we haven't had before.

Finally, I want to say there's a whole other set of issues around spectrum, and other people are going to talk about it, and I want to say even though that's not

explicitly on the points that we've outlined, they are of crucial and equal importance. So when Adele talks about interference rights that are defined, I would say that's another way we use spectrum efficiently or not, and effective enforcement of those rights or lack thereof is another way to use spectrum or not, and so it's important that those issues get moved forward.

Secondary markets, another issue that the FCC has pushed on -- Dale Hatfield, a mentor and friend to many of us here, is -- I think I can say probably his proudest moment was that the FCC helped pushed the idea along.

Cognitive rating and opportunistic uses, another idea that the technology is moving along.

So, these are all also critical opportunities, and so as we move forward into a 2011 legislative cycle where we see a unique challenge, unique opportunity, it's important that the broader discussion about spectrum happens, and if there are legislative tools that are critical not only on the core points that we focused on but others, it's a chance for that discussion, spectrum measurements, and other points as people have talked about.

So, for those who are geeks like us about spectrum, this is an exciting time, and it's an important one, that people do make sure they push themselves to think through their ideas and be a part of what has so far been a very constructive discussion to move forward in critical areas for our national competitiveness in the future.

MR. WEST: Great. Phil, thank you very much.

You know, this is the only place where you're going to hear the words "spectrum" and "excitement" in the same sentence. (Laughter)

Adele, you have written on spectrum policy, and your co-author is an engineer, so I give the virtue of combining a policy expertise as well as a technical

expertise. So, what do you think we should do to allocate a spectrum, and what are the issues that go into use of frequencies?

MS. MORRIS: Thanks, Darrel, and thanks for having this session.

And, Phil, you set me up perfectly.

I'm going to talk about why there's a spectrum shortage and what we think should be done about it. And I am going to draw from the research I've been doing with Bob Matheson and, you know, we're kind of -- we're trying to bring both disciplines of economics and engineering together, because I think you need both sides of that to think sensibly about how to allocate resources more efficiently in this realm.

By definition, in economics a shortage is a mismatch between supply and demand, and it arises when a market doesn't clear. Prices aren't set such that demand and supply match each other. Well, this shouldn't be surprising to find a shortage in spectrum if there's not a market and there's no price that makes the resource clear. So, key to what we're trying to think about is, you know, if you're going to have supply and demand match each other, you're going to have to have a market, at least to some degree, and at least for a good share of services, and so how are you going to set that market up, and what should your articulation of spectrum rights look like in order for a market to actually work?

Now, we've got central planning as it is now. We know, through the history of economics, that central planning often results in shortages and this mismatch between supply and demand. We know that the FCC centrally plans which bands are used for which services, who's eligible to use a band, what kind of services they can provide, what the technical parameters are, where the base station sites are going to be, what the service area is going to be, how you can -- the distance between the frequency reuse, and what the

definition of “harmful interference” is.

The market doesn’t determine when unacceptable interference exists. And so of course you’re going to have potentially huge static and dynamic inefficiencies, and by that I mean not only is the resource inefficiently allocated right now. We have inefficient resources for investment and innovation for spectrum-using equipment and technologies.

So, I think this problem is only going to get worse. If we stick with command and control indefinitely, the shortage is going to gradually erode the economic performance of our economy. This is really a key resource to the economic future.

So -- well, what do you do? You need to make sure that people who control spectrum rights perceive the full opportunity costs of all the rights they sit on. That means that they need to be able to subdivide, aggregate, and transfer rights that they value less than what the next market demander would offer.

Now, right now the only way to do those transfers is through reforms that tend to be ad hoc, slow, and arguably rife with rent seeking. And in the FCC’s defense, it’s very difficult for the FCC to know. There are huge information asymmetries in these reform processes. Someone can claim and sound very legitimate in their concern about potential interference, of new services, or new approaches as to licensing. And you’re never going to know whether -- if you’re the regulator whether that’s true or whether that’s simply a competitive concern and people are using the reform process to simply block or delay competitors. So, the way out is through a market.

So, what we are developing in our paper -- and please stay tuned for that being made available shortly -- is to use what we call -- and this is, like, my geek showing a hyperspace -- the electro-space volume. The idea is you need to divide spectrum rights

along all the dimensions that matter. So, that means geographical locations. So you've got, you know, three-dimensional physical space; the frequency, so there's a bandwidth involved in those rights; a duration of time; and a direction of propagation. And for that you need your pointing direction, your azimuth, and your elevation. So, there are seven dimensions there. And the seven-dimensional hyper-space can be used to articulate access to a spectrum or a set of spectrum rights. So, you need a volume you divide into seven-dimensional space, and you need power rules about what power levels are acceptable outside your granted electro-space volume.

Now, I think there are very practical ways to do this, but fundamental to the electro-space approach is complete freedom to do whatever you want to do within your electro-space volume. Given that the power rules that apply to that, you need a minimum level of energy outside your electro-space and potentially a maximum energy within there that caps potential, very squirrelly properties that come from very high power levels.

So, if you have that, if you want to provide some kind of service, the government shouldn't be telling you what service you can provide. You can have complete flexibility in determining what the market demands.

So, this would allow immediate access to new technologies. Innovation can -- innovative systems could be deployed immediately. You could easily respond to market forces. There would be less demand for high valued spectrum, because people with other options could move elsewhere, and it would provide more value for currently underutilized spectrum. And it would also make determination of who's responsible for interference very clear. Either -- I mean, you know what your electro-space volume rights are, and it's clear to find out whether or not you're abiding by those very simple rules.

So, there are a few questions. I know there's a lot of details to be worked

out here, but I think there's no good way for a market to really allow flexible reactions to market forces without something that looks a lot like what I've just described.

Now, there's some important research to do, and I'll give you a few of the questions that we really need to work on.

One of them is how you accommodate services with large economies of scale. Is a flexible-use environment like I described going to result in chopped-up rights, and what do you do if you have services that need a broad swath perhaps at low power, for example?

What do you do if you need to make other regulatory changes in the future? This isn't specific to the electro-space volume approaches. Any kind of reform you have to, you know, think about what would happen if you need to reform again in the future.

And what are the potential cost downsides to allowing a fully flexible environment, and might it make interference more expensive?

But we can be thinking about these issues. There are technological solutions, and I strongly believe there are policy solutions that could allow markets to operate, and then if the market clears, there's no shortage.

MR. WEST: Thank you, Adele. I love that concept of electro-space volume now. That's a sexy concept. (Laughter)

Steve, you work for private industry. You've been working on these issues for a number of years. What do you think the best ways are to handle spectrum issues?

MR. SHARKEY: Well, I guess -- can I just say that I agree with everything that Phil said and leave it at that? (Laughter) Yeah, really, I guess this is -- you know, I have been working on these issues for a long time, and they have been critically important to a company like T-Mobile that is always looking ahead towards the next generation of

technology, next generation of services, and how we're going to accommodate that, because freeing up spectrum does take a long time. It's a, you know, often a 10-, 12-, 15-year process from the beginning when we start to think about we're going to need spectrum to the time that it actually becomes licensed. So, it's been really rewarding to see the leadership that the FCC and the Administration has taken on these issues. I think it's the first time that we've ever seen the Administration get out solely in front of making this a priority, recognizing the need, and putting some stakes in the ground that are going to be very difficult to achieve and will take a lot of time. So, there's some risk in putting out those, but, you know, the importance of making it a national priority and putting the correct focus on it has been incredibly important.

Phil talked about it. The National Broadband Plan really laid it out well on the growth of data, and the -- it explodes across the data we're seeing. We're in the middle of aggressively rolling out our HSPA Plus network. 21 megabits per second will cover from 200 pops by the end of the year. And with that we're seeing the customers really react, you know, and it is -- like Phil said, it's the new generation of smart phones driving up data, but it's also the tablet PCs, the computers that draw data sticks. People are used to having information where they want it when they want it, and as more and more video services are taking more and more bandwidth, all the devices now practically come with the cameras, and you know, so there's tremendous demands be placed on the network.

So, I think the National Broadband Plan and some of the steps the Administration has taken have really gone a long way to make the right move to messages towards freeing up spectrum. And it does have to be the right spectrum, because it matters where -- it's got to be spectrum that's found below 3 gigahertz -- is where we roughly draw a line on mobile spectrum. But in that, the lower -- generally, the lower the better for

providing coverage. The point of this is getting services out to -- and hopefully the National Broadband Plan is a priority for services for rural areas. So, making sure that there's a mix of low band spectrum with very good propagation characteristics for covering those rural areas effectively, and higher band spectrum that can provide capacity in more urban areas.

And I think that, you know, the FCC identified a number of places to start and has got some good initiatives there. I'll talk a little bit about some of them, and I think the one thing that we have to recognize is that there is not one approach that's right for any particular band. It may be that -- in freeing it up. We've talked about some of the -- getting the incentives right is important. Working with the licensees that are in those bands to transform that spectrum. There are services, that you'd be accommodated either through different technologies or to figure out ways that we can share with them to make that spectrum available.

But just a few that the FCC has teed up, some of the MSS spectrum. The FCC is looking at the MSS bands as how heavily used they are. There has not been a lot of update of mobile satellite services in general. We have been trying to get ancillary terrestrial use of that spectrum for probably 10 years now, and it hasn't progressed to date. So, you know, we do need to look at how do we relax some of the rules around allowing terrestrial use of that spectrum and reallocating some of that spectrum for more terrestrial use if there really is no satellite demand and scaling the amount of spectrum available for that.

Broadcast spectrum. The FCC has teed up the idea of getting access to more of the broadcast spectrum. We saw with the first digital dividend how popular that spectrum has been.

700 megahertz band -- it is very good spectrum. Good spectrums are

covering large areas and, you know, getting access to additional broadcast spectrum will be important. Incentive options that Phil talked about are a great way to try and move forward with that. I think we have to be sure that in pursuing incentive options we don't give up some of the other tools that we have available to repackage that spectrum to free up more swaths of it to make it as useful as possible for other services.

Government spectrum. One of the things that we're really looking at and, you know, as we're trying to free up some 500 megahertz of spectrum, there is going to be some look at government spectrum. It's often been a difficult process in looking at this. You've got split jurisdiction between NGIA overseeing the federal government use and the FCC overseeing the non-government users. So, you've got those agencies that need to work together.

But I think more importantly would be to create a forum where the industry can work directly with the government users to figure out what really will meet their requirements. You know, Phil talked about the need to make sure that government users have money and resources to do planning, to move to new generations of technologies, to help free up spectrum for the commercial sector. There's long been a distrust between government entities and the commercial sector as we've tried to work these problems together. But I think from T-Mobile's perspective, we were one of the -- we were the first company to really -- to launch services in the AWS spectrum. That spectrum at 1710 and 1755 came from government users, and we found that the way to really clear that spectrum quickly was to sit down with the agencies to work with them, to explain how our systems work, where we can operate up to their coordination zones or up to where they use it and that that was the way to really work through those issues. You know, once decisions were made, there was more willingness to sit down with the commercial sector and, you know,

work in detail and let the engineers work out how to do that. It would be great if -- you know, what we really need is some kind of process to allow that to happen early on.

We did a spectrum scan a few months ago, looking at a 1755 to 1775 megahertz band, which is a continuation of the AWS spectrum but still used for government entities. And, you know, as we would expect and I think as the government users would acknowledge, use in the band is light. The way you look at it in any particular size, time, or location. Now, it doesn't mean that those services aren't important, but there is a lot of opportunity for accessing spectrum when the government agencies aren't using it. And there's a lot of new advances in technology that could help us to share on, you know, both time and geographic basis. And if we've got a cooperative relationship, we can, I think, work those problems very effectively.

So, let me -- I guess I'll end with that. I think the important things though are to create a process here where you do get the incentives right for all the parties, that there's a balance, but there is a trusting relationship that can develop between the parties. And you do that through communication, sitting down working face to face with those entities, and trying to work through some of those technical details. Even in light of some policy-base it would go on.

Thank you.

MR. WEST: Thank you, Steve. As a T-Mobile Blackberry use, I like that idea of 21 megabytes per second of speed. That'll make my ESP on surfing much faster. (Laughter)

We've heard Phil and some other people make the pitch on behalf of incentive options. I'm just curious. Is this the way to go? Are there other things we should be doing?

Ellen, what's your general perspective on spectrum issues?

MS. GOODMAN: Okay, well, I -- the first thing I want to say is I'm happy to see that there is so much energy in Washington around this issue now. It's not the first time there's been a lot of energy, although it does seem to be more intense now. But, you know, I think we shouldn't forget that in 2002 there was a Spectrum Policy Task Force report which came out, which really, you know, I think reads now still pretty current in weight, (laughter) because not much has happened. Or you can say it was very corsifacious. But I think it's very important to build on some of the insights that it gave us.

And so I guess I'll get to the incentive auction question by way of just kind of giving my report card on where we are and what I think are the three spectrum imperatives.

So, one is the supply freeing up the spectrum. Very closely related to that is the second one, which is coming up with better management techniques, which includes defining the entitlements; includes some other things, too.

And the third, which I think we haven't talked about and which I think there's too little discussion of but there's going to have to be a lot of focus on especially when we talk about reallocating the broadcast spectrum, is on values. And so, you know, typically in spectrum we talk about efficiency and innovation and those are probably the foremost values in spectrum management. But there are other values in communications policy, things like universal service and access, and when you talk about broadcast spectrum, there is localism. There are all sorts of things that are baked into the use of that spectrum, that when we reallocate it for other services I think we don't want to completely obscure what those values were and how they get expressed in spectrum policy going forward.

On spectrum supply, I think the incentive options are a really good idea, and clearly that's how we're going to make progress on putting out more spectrum. I don't think they're a panacea, and I agree with Steve that we shouldn't forget about the other tools in the toolkit, because they do privilege exclusive rights regimes over others. They privilege auctions over other forms of allocation. Auctions are obviously attractive, but they aren't the only way to allocate spectrum. And they also resolve the inventive payment as characterized by some as a windfall, which may be politically or equitably unpalatable and may muck up the works in some situations.

The second way -- another way to free up spectrum is, as Steve suggested, by repacking and rebanding. That's proven to be quite cumbersome, especially if you look at the 800 megahertz Nextel rebanding swath proceeding in part because of what Adele pointed to, because we don't have really clear entitlements. And so I think spectrum entitlements -- it's so crucial to define them not only to make markets work but to make the administrative process work, because it's hard to give a party the equivalent of what they've got when you don't know exactly what they've got and when there's tons of context about exactly what it is we have.

So, on spectrum management, which is the second imperative, I just want to say a couple of things about where we need to go and sort of my sense of where we are now.

On defining entitlements to radiate energy and be protected from undesired signals, which is interference, it doesn't seem like we've made a lot of progress since 2002, and I think that's as much a problem of engineering as it is of sort of policymaking. At least, that's my understanding -- is that the engineers don't have consensus on -- it seems to be very tough to come up with a formula. So, we need to do

better there.

Another thing that people talked about for a long time is about registries. Like we have land registries, we need registries of spectrum rights to create more transparency, to facilitate markets, to create more accountability, especially when there are a lot of, for example, unlicensed users and there's very little accountability for interference they might cause. There in the recent white spaces order, which came out last month, there seems to have been quite a lot of progress. I think that was a real sign that this -- the idea of having a registry was brought to fruition and seems to be something that will have more currency in the future.

Another problem of spectrum management is, as Phil said, enforcing entitlements. Once they're defined, how do they get enforced? There's been historically little attention to that, because in my analogy as to a highway, if you've got a very lightly used highway and you make everyone stay a mile away from each other, there are going to be very few crashes. You're going to have to invest very little on how you resolve conflicts between drivers who have crashed into each other, because you'd structured the system in such a way that they just won't. Once a highway gets more intensively used, you're going to have a lot more accidents. You kind of want more accidents in the sense that that means that resource is being used more efficiently and you need some way to deal with the resulting conflicts. And so we are just emerging from this very lightly used highway into more intensively used resource, and we should be seeing -- hopefully we'll be seeing -- hopefully we will be seeing more spectrum conflicts, because that's what intense, efficient use results in. And they won't be so problematic if we have tools to resolve conflicts after the fact, which we really don't have now. They're a good conflict resolution either in the courts or at the FCC.

Two other points -- well, I've just got one other point in spectrum management -- is zoning, so that's an area historically in which we've had a lot of expertise. That's really what spectrum management has been, which is zoning uses. And we want to move into a period where zoning is mixed with these other tools. And I think white spaces -- the white spaces order also is very promising there, because it really shows how you can mix -- I won't get into the details, but how you can mix a zoning approach, separating in compatible uses with a much more flexible kind of mixed-use environment.

The last point on spectrum values, which we could talk a long time about, but I'll just say how this -- I think how this arises in a concrete way. So, the broadcast spectrum from which we're hoping to get, what, 110 megahertz?

MS. MORRIS: 120.

MS. GOODMAN: 120 megahertz. Twenty percent of that is licensed to noncommercial broadcast stations, TV stations. So, that's about 6 to 24 megahertz in each of the 210 television markets. So, they've got a lot of spectrum, and it's not clear that they will respond to the same incentives as commercial broadcasters and that an incentive auction structured in a generic way will have the desired result of getting all those who are using spectrum inefficiently to give up their spectrum, because noncommercial actors have a host of other goals, other than maximizing revenue, and they also have constraints in terms of what they're able to do. So, if something -- so, as a matter of incentives, it's worth thinking about how you might apply the values that are instantiated in sort of that spectrum reservation for noncommercial use. How do you translate that into a new spectrum allocation in the new broadband future in order to get them to play, in order to get them to give up their spectrum?

But also as a public policy matter apart from being incentives, there are --

in addition to efficiency, there are values like universal service, market failure -- right? -- ways in which markets will not provide all the communication capabilities and services that we want. And as we move to the third-generation internet, which is a mobile internet, are there are any of those values from -- this is a pre-internet -- pre-internet values that we have in our original broadcast spectrum allocation -- are there any that are worth reclaiming and preserving in the mobile broadband future, and how do they get expressed in the new spectrum management regime?

MR. WEST: Thank you, Ellen, and thank you for reminding us about the wide range of values that are relevant for spectrum discussions.

Ruth, the FCC. You are on the front lines of the wireless bureau, and I know the FCC is holding its own event on spectrum. So, could you give us a sense of what you are thinking about at the FCC?

MS. MILKMAN: Sure. And I think it will sound similar to what Bill said. He was thinking about what many of you said you were thinking about.

MR. WEST: Oh, no, we want conflict here. (Laughter)

MS. MILKMAN: Oh.

MR. WEST: So, I'll get --

MS. MILKMAN: Right.

Thanks to Brookings for hosting this, and thanks for your participation tomorrow in the spectrum summit.

What we're trying to do at the Commission is unleash the potential of America's spectrum resources. It's exactly Adele said. There is a lot of value locked up in spectrum that needs to be unlocked so the spectrum can be put to its highest and best use. And the word -- the terms "highest and best use" can have a multitude of meanings, as

Ellen is pointing out. We need some spectrum for public safety. We -- and sometimes we're focused on economic value in gaps, in the economic value of the current use.

And why are we doing this? We're not just doing it because we're spectrum wonks (?) and we think it's really fun. I mean, we are, (laughter) but because it's these policies that make possible innovation; the mass of investment we've seen in the country's wireless networks and other networks that use the spectrum; the kind of innovation that we're hoping for with the white spaces, policies, and competition and consumer empowerment. You know, that's what we're trying to do at the end of the day.

Various people have mentioned protections for explosive increases in spectrum demand, what we're calling these days the spectrum crunch. We're looking at, by 2014, mobile data traffic 20 to 50 times higher than it was in 2009 according to estimates from various sources, including Yankee Group and KODA research and Cisco. We -- I think the chairman has -- Chairman Genachowski makes a point frequently that broadband is the future of mobile and mobile is the future of broadband. There's been a staggering increase in demand for wireless services and consequently for spectrum. And over the next decade it promises to be explosive.

Already adoption of mobile broadband is flowing at rates faster than we witnessed for wireline internet technologies, and we're expecting, as Phil said, that smart phone shipments will increase. In fact, we're projecting they'll exceed shipments of laptops and desktop PCs combined.

And then beyond the smart phones, we have new classes of wireless devices that have the potential to become ubiquitous, like data-hungry devices with larger screens, like tablets, connected appliances, the internet of things -- all of these devices want access to spectrum, and you can, you know, get them to use peco cells and pepto

cells and WiFi where it's available, but, you know, at some point I want to take my iPad on the Metro and I want it to work. (Laughter)

MR. SHARKEY: Especially at Baltimore, which is where that dead zone is. (Laughter)

MS. MILKMAN: Exactly.

So, you know, what happens when everybody has a smart phone and an air card and we have wireless capabilities in devices like cameras, and every American owns a lot of devices. I mean, I'm sure you all have this issue. I was counting laptops in our house. We only have three people living in our house. We have six laptops. You know, that's -- and I was telling other people about this and I was kind of embarrassed because we have six, and somebody else was saying well, you know, there's only three of us, and I think we have eight, and I just sort of we have the work one, we have the school one, whatever.

Spectrum has an importance to this mobile broadband ecosystem that I think can't be understated. And just to take a step back, mobile broadband is a transformative technology. It's not -- it comes along maybe once in a generation, and I think we're very lucky to be on the front lines and watching it happen. It's a general-purpose technology. It enables positive change in energy and education and civic engagement and scientific research and development -- and, of course, entertainment, which is probably how most of us are experiencing it.

Wireless technology is important for reaching distant or rural communities, and people have a growing expectation that they want to connect wherever and whenever they are, and sometimes it's not just sort of a nice-to-have; it's a need-to-have if you're a doctor and you need to pull up, you know, an X-ray or MRI or something to treat a patient.

But there's no guarantee that mobile broadband will reach its full potential, and among the risk factors, the greatest is that we don't have enough spectrum to meet demand. And I agree with what Adele said. We have a situation where the market cannot clear, and it cannot clear in part because of what Phil said, which is we have regulations. And even though the Commission has made great efforts over the last 25 or 30 years to move to more flexible-use policies, we're sort of caught midstream, so we have bands like the PCS bands and the AWS bands where, yes, there are technical rules. But, you know, if you decide you rolled out 3G and now you want to roll out 5G, be our guest. It's -- you know, nobody's stopping you. If you want to disaggregate the spectrum, partition it, lease it to someone else, you can do that. On the other hand, we have other bands where you can't do that, and in the -- well, the satellite bands, they are to be used for satellite with the ancillary terrestrial component rules, which have turned out to be very constraining, and we haven't seen much terrestrial use and at the same time people are wondering whether the country really needs three NSS bands and six -- sort of like providers, whether can maintain an SS capability and still repurpose spectrum for terrestrial broadband.

In the broadband, in the broadcast space, it's what Phil said, which is if a broadcaster wanted to sell the spectrum for mobile broadband use, today, couldn't. Couldn't do it. But it's not just that; it's that the license is licensed in a geographic area, and under rules that affect everything else -- licenses across the country. And so there's this tremendous daisy-chain effect, and there's not a way to fix it and to repurpose it without substantial FCC involvement in repacking.

And we're sort of at the -- you know, we looked at the stuff and we see okay, we're bringing on spectrum at about this rate and we see demand going up like this, and we have a really big gap. What are we going to do about it? We have a bunch of tools

that we can use, and we want to keep using those, but we also thought we really need a set of new tools, and some of them are tools to help the federal government manage its spectrum, but the one that I am fondest about talking about, of course, is incentive auctions, because I think it's a tremendous opportunity to create a lot of value, to divert some of that value to incumbent licensees, to give them incentives, to clear spectrum faster and with less disruption than would otherwise happen. So, we're looking at, instead of auctions, you know, general -- hoping for general incentive auction authority, looking at it in particular, sort of have our eye on the MSS bands and the TV bands. And in the TV bands, what we're thinking about is not just the ability to turn in licenses but the ability to channel share, again, for incentive or a share in the proceeds or potentially to move from the UHF to the VHF spectrum, perhaps losing some viewership but retaining must-carry rights, getting an infusion of capital that might strengthen the ability to do programming. And so, you know, other people have other ideas about what broadcasters should be able to do that would clear spectrum while maintaining free over-the-air broadcasting, we would love to hear them where it's sort of at the beginning of this process and hope to be talking to lots of people about lots of things.

So, I could talk about incentive options all day long, but Darrell says I only have five minutes, so I'll stop.

MR. WEST: Okay, that was a great summary.

Why don't we open the floor to questions or comments. I'm sure there are people here who actually have ideas for you, so we'll start right here. There's a person with a microphone coming, so if you can give your name and if you're with an organization now, let's --

SPEAKER: Well, I'm Ted Ligman, and I have worked in satellite

communications, but (inaudible) cable TV, so I do know a little bit about the subject. But I don't know if it's part of this discourse, but (inaudible). You know, if you go -- if you look at the emerging countries, they didn't have a wired infrastructure, so they leaped over that right to a wireless infrastructure. We do have a big wired infrastructure and a very strong wired infrastructure, and we have the technology to expand it. But it seems, you know -- it's like the automobile industry of the (inaudible) for automobiles, so they built highways. You build highways for automobiles. More automobiles, you need more highways, et cetera. Well, now, everyone is using an automobile. And the same thing is happening now as you -- (inaudible) spectrum, more people on spectrum, need more spectrum, and everyone is forgetting what this really is all about. If there is wired plan, it can be used not to cause (inaudible) situations. You can't drag a wire with your car yourself and look around. But there are situations where spectrum is being used and could be used at a wire plant.

The other aspect of this is the psychological and sociological aspects of it. It's nice to have TV, but watching TV on a three-inch screen or listening to classical music on a poor radio -- you know, it's sort of a little bit of dumping of the American way.

MR. WEST: Okay, can we get to your question 2.

SPEAKER: Question two is, are the psychological and sociological factors being consumed also?

MR. WEST: Okay?

MS. MORRIS: I'll take it.

MR. WEST: Sure.

MR. SHARKEY: Well, we can -- both -- if you want to start, go ahead?

MS. MORRIS: Sure. You know, you've got to decide what's the role of government, and in general in the allocation of resources, natural resources included, we

don't tell people what to demand. If they demand wireless services and they want wireless services and they're willing to pay for a market-based price for wireless services, in my view is it's not the government's job to tell them to use wired services. Likewise, the key is allowing the price to ration the resource in an efficient way, and likewise I would say the same thing. If I want to watch a two-inch screen, it's not the government's job to tell me not to do that and to do something else. As long as I'm willing to buy this thing and hone my eyes trying to focus on that little thing (laughter) 12 inches from my face. So, I think it really goes down to what do you think the role of government is in the allocation of the resource? In my view, it -- this should be much more of a free market than what it has been.

MR. WEST: Steve?

MR. SHARKEY: You know, I think the other thing is that you'd have to look at the benefits of it, the economic benefits of it of being able to do business more efficiently, you know, not be tethered to a wire for everything that you do. And there's a young girl (inaudible) paper to talk about the benefits of wireless infrastructure and provide, you know, building a competitive economy and what that does for it.

When you mentioned automobiles and as we've rolled out more and more infrastructure for automobiles, people use more, you know, use more transportation. But, yet, that's been one of the big growth engines of the country also, right? I mean, we had a big government program to roll out roads to facilitate just that. So, it's a very similar kind of thing.

And, you know, wired infrastructure I don't think is forgotten. It's actually a very key part of the national infrastructure that we need and benefit from. So, getting fiber deployed -- in fact -- and that's part of the National Broadband Plan. They fiber out to communities, to anchor institutions, and that enables the transportation of an awful lot of

data and information and can really facilitate then the wireless tail that goes on that to make sure that the information is -- gets to people when and where they need it, not that they have to go to some central location to get it.

So, you know, I think it's -- I mean, it's a good point. It's well taken. I just -- I do think it fits together in a pretty cohesive package.

MR. WEST: Okay, Jim with a question over here. There's a microphone coming up.

JIM: I did a broad-base study of spectrum allocation since World War II in the United States, and the basic conclusions were it's -- the government giving more than a hundred billion dollars in spectrum months away to incumbents without compensation to the American public, and the key to this successful transfer. We can't just give the national parks away. People would be in a rage, for example -- was that it was done under the public (inaudible). So, as Darrell said, your political scientists, you know, the public is incredibly floored by this issue. I think there's (laughter) (inaudible) as you had made very, very good livings, study of this issue exceptionally good by this. Classic case of, you know, special interest, policy, probably couldn't care less, incredible amounts of money as a -- this logic has played itself out again and again. Folks on this panel look real -- a good will, excellent credentials. Whatever you say has been said many times in the last few decades, same pattern from the -- again and again. As Ellen described the 2000 to special task force report? The rhetoric is very similar to what is coming out and Market Forces. If you don't -- in the last decade a lesson I think we also gave away tens of billions of dollars of spectrum rights to incumbents without any public compensation, and the only way we're going to get to this 500 megahertz allocation is by giving away tens of billions of dollars more of the public rights to spectrum without compensation, because it's --

MR. WEST: Okay, what's your question 2?

JIM: So, the question is, this is the history. How can this time be different? How are we going to make -- there's so much emphasis on these win-wins, which are -- the self-respect is win-wins, but there are really clever approaches to hide these transfers from the public to these other entities. So, how can we prevent that from coming in?

And then just last, related to that, last year at NPIA I had to serve as a watchdog and I had a whole series of FOIA requests to track and control maybe a half a trillion dollars worth of public assets in the form of spectrum. And despite all the rhetoric about transparency coming out of Larry Strickland's office, at every point when I ask for controversial information, they won't give it to me, they stonewall, you know. They just ignore the law, because they're outside FOIA and nobody cares about FOIA. Nobody would pay attention to it. And this is, you know, a long-term pattern. You had it under the Bush Administration; it's happening now --

MR. WEST: Okay, let's --

JIM: Unless you solve these problems, we're going to have these same types of transfers, so how do we prevent that from happening?

MR. WEST: I would just -- repeating ourselves. So, where the change -- what -- he needs a historical mirror here.

MR. WEISER: So, this is the why-is-this-night-different-from-all-other-nights question. (Laughter) Already wise under the wicked sun -- sorry, couldn't help it, so.

So, there is an issue that you have put in a particular frame you called win-win pulling the something over our eyes, and here's what I'd say. The broadcasters, the mobile satellite, other folks that have their spectrum currently have the choice to continue

using it in their restricted use. The alternative that we're suggesting is give people an alternative where they would have to -- and a set of options -- share some of the proceeds that they'll get. Some would go to the Treasury.

Now, one could say -- and I don't know if this, Jim, is what you're saying, those guys shouldn't have got it in the first place, let's just take it all from them. And take it all, because it's public property. That's, I guess, one alternative someone could say. And I think the challenge that I would say that we have is can we be pragmatic about finding a path forward, and a pragmatic path forward is to be looking at things from a win-win mindset. On government spectrum, some could say can't you just make the agencies just give up spectrum. We know they're not using it efficiently. Well, first of all, I don't know that. I think there's a lot of work that we'll have to do to come to conclusions.

And, secondly, the reality is to tell someone to find that out, that is, to prove that they're not using it efficiently with a budget that they don't have is a lot to ask. However, if you give them the budget and you give them the tools and they can find alternatives, you can create win-win. So, I don't think this concept of win-win in the government spectrum context or in the private licensee is pulling wool over people's eyes. I think it's real.

Will it be different this time? It depends. It depends on whether people understand spectrum, and, Jim, your point about spectrum being so inside baseball is a good point. I, with a friend of mine, wrote a book on telecommunications policy, and we began the book by saying the problem with telecommunications is it often is an inside game that can't be understood or explained by others. And our goal was to try to explain to people what the stakes are. And that's what our goal of this community is -- is we have to explain to people what the stakes are and how this time can be different. So, I do think it

can. Will it be different? As Ellen said, there is a greater intensity this time. Hopefully people realize the stakes for the nation's history are significant. But only time and history will tell.

MS. MORRIS: Can I say anything about that?

MR. WEISER: Sure.

MS. MORRIS: So, implicit in your question, Jim, is the distributional concern. You're worried that spectrum rights giveaways to corporations don't benefit the general public in a way that may be extracting those rents and using those for taxpayer purposes would do.

JIM: I didn't say not benefit, but my insurance benefits from a check and go to the --

MS. MORRIS: Right. So, I think two things. And this may not comfort you very much at all, (laughter) but this is how economists think about the distributional effects of a resource allocation, which is essential our problem here. So, if you give these rights away to corporations, corporations don't have welfare. People have welfare. So, who does that welfare go to? It goes to the stockholders of those corporations. Those are people. Those are citizens. Somebody's benefiting. Some real people in society are benefiting through their ownership of widely held issues coming from those same corporations. So, that's one thing.

The other thing, too, is we have a progressive tax system. So, there is on the order of 3 percent recapture for taxpayers of the profits that derive from these resources back to taxpayers. So, the distribution -- the actual, ultimate, economic incidence of these policies is maybe not quite as bad as you think.

Now, I'm not defending -- look, I worked for the Treasury for nine years.

I'm the first one to say we should raise revenue cost effectively. But I wouldn't get my knickers in a twist (laughter) about optimizing the extraction of rents upon devolving flexible rights, because I think the welfare benefits to the broader public are going to be trumped by that flexibility and the innovation that comes from it.

MR. WEST: And you explained consumers. See, everything is consumers getting more spectrum out there --

MS. MORRIS: Well, that's the -- that's what I meant by the last --

JIM: -- before the lack of competition can also benefit consumers.

MS. MORRIS: Yes, yes.

MR. WEST: Okay, well, we --

MS. GOODMAN: Can I just weigh in on this --

MR. WEST: Sure.

MS. GOODMAN: -- because I think this discussion illustrates the problem we have with values, because, you know, I think that -- Jim is representing in perspective, which is widely held, which is not the economist's perspective, which is that the people should be compensated for the use of this resource, and for too much of the history, the spectrum has been given away, and now, you know, we're auctioning it. But what about all these guys that got it for free. And I think it's really tied up things like NSS. I mean, this notion that some entity is God's spectrum to do a particular thing, and now they want to use it for something that's much more economically radical and would provide more welfare, but they just shouldn't be able to do it, because they didn't pay for it.

It's sort of deeply routed in the psyche. Even though there's a very -- your response from the economic perspective is right on, but this -- these values conflict, and I think they -- it's one of the reasons why these proceedings get so drawn out, because

everyone weighs in on who and what's fair and who's entitled and what should the payment be. And if we could have a more frank discussion about how these values conflict and what the other values are and define the entitlements better so that, you know, it's clearer kind of what pound of flesh you're getting and what pound of flesh you're not entitled to we'd be better off.

MR. WEST: Okay, we have some other questions right here in front. Yeah, there's a microphone coming up.

SPEAKER: So, Joe Marxie.

MR. WEST: It's on.

MR. MARXIE: Just had a much simpler question. It had to do with the must-carry right. I was wondering: is the contemplation separating must-carry right from natural transmission?

MS. MORRIS: No, and if I suggested that, I didn't mean to. I think our thought is that with channel sharing the broadcaster that had a must-carry right would continue to have a must-carry right even if it was losing less of the capacity and that if it moved from a UHF to a VHF channel, it would continue to have a must-carry right, as well as a retransmission ability to negotiate retransmission comes up.

SPEAKER: Well, I know, but has the thought of separating the two been discussed at all?

MS. MORRIS: Ah --

MR. MARXIE: I know there's rationale behind it, but --

MS. MORRIS: Many people have discussed it (laughter) in many contexts.

MR. WEISER: Let me say one thing that is worth explicating for those who

didn't quite catch it. The concept of broadcasters having multiple opportunities is worth parsing out, so one is you can do HDTV. You can do multicasting. You can do mobile video. We're suggesting another option. You can be a host for a previous over-the-air broadcaster who says I want to do one standard (inaudible) channel and have a must-carry right. So, you would have in this world two must-carry rights in the same six-megahertz channel. The one who owns the station operates it, and then the tenant, if you will, would also continue to have the must-carry right.

You asked another question. What if I said I'm going to (inaudible) entirely, but I want the residual must-carry right for some period of time. I don't know if you'd want to say forever but some period of time, and that's not an idea that we've either -- the government has endorsed, but it's an idea that, you know, others, including academics, have talked about as a piece of it. As this thing go through legislative process, different ideas will get talked about. I think the critical one that we would suggest is that there be a sort of opportunity for different models in broadcasting to be embraced and welcomed that would maximize efficient use of the resources.

To get back to one point Ellen said, I think it's worth underscoring. The government -- sort of a support for excitement about incentive options includes an excitement about continuing over-the-air broadcasting in this country that provides all the content in new and better forms, and one of the things that's notable is some of the stations, like the one I mentioned who might sell the 6 megahertz and then become a tenant, will get recapitalized as a result of that.

Some of the stations there are fledgling, because they're trying to make a business model work that's hard to work. This can give them new opportunities to make their business model more effective.

MR. WEST: Okay --

SPEAKER: What's her question in the --

SPEAKER: Certainly as we look at incentive auctions and what works for that, it's a fair point to look at --

MR. WEST: Absolutely.

SPEAKER: -- those kinds of different models of --

MR. WEST: Yes.

SPEAKER: -- various spectrum for something like that.

MR. WEST: Okay, there's a question in the very back.

MS. PIGMAN: Hi, Eliza Pigman, *National Journal*. I don't have an expertise on spectrum, so this will be a layperson question. When you're reporting about this, you hear the mantra over and over again that there's a shortage with spectrum. But the more I say about it, the more it seems like, there's a red tape problem and not necessarily a shortage of spectrum. Maybe if, Phil, you could respond to that first?

And also has the White House come out with a position on the D block whether it should be auctioned or just given to the public safety officials. I mean, let's be honest about the political imperative. It's been nearly a decade since 9/11 happened and there's still an (inaudible) a safety network. There are levers to pull to make that happen, and they haven't happened yet, so.

MR. WEISER: Same question (inaudible) position. We are looking at an integrated strategy. It's worth saying, because it gets underscored. It gets overlooked too much. Making this reality happen for public safety is not nearly about, you know, how much spectrum public safety has. It also is about getting funding, which hasn't happened before. It's about figuring out effective government strategies so you have coordination at

levels that in the past haven't happened, and we want to make sure we have an integrated package that approaches this in a thoughtful way.

On your first point, it was red tape versus scarcity. So, the short answer is we know red tape and artificial restrictions are a critical problem. That was one of the core observations of the Spectrum Policy Staff Task Force. It is inarguable. We are putting ourselves in a competitive disadvantage to other countries that don't have that. Whether that is the lion's share of the problem, the exclusive part of the problem, or just part of it, we don't fully know yet.

We're about to face -- I heard it at this 4Gs conference -- a swami. Was that what they're calling it or tsunami?

SPEAKER: Swami. Swami.

MR. WEISER: A swami. Imagine the force. A magical tsunami. A swami tsunami who doesn't know it's going to hit us yet, (laughter) and so there are other solutions they can try to create more bang for the buck in Spectrum -- cell splitting, although, you know, there's limits on how that can work. Digital compression technology -- we've pushed that pretty hard, too, so this is going to be an interesting thing. The demand for mobile data, some say, is close to insatiable. We're going to need to push with all those we can and keeping our arms sort of behind our back on this red tape -- isn't good competition or economic strategy, so we're hoping we can at least address that piece first and then we'll see.

MR. WEST: Okay, we have another question in the very back.

SPEAKER: I represent the swamis here.

MR. WEST: You need to --

SPEAKER: Okay, I'm sorry. They really want me to record this. I have a

very practical question. I represent a small business that won the rights, the license for 700 megahertz B in Louisiana and Puerto Rico, and the business is finding it very difficult to find the market and the partners that are interested in developing these properties, although they are told that they are valuable. How to get a valuation is very difficult and murky. So, what is the future for a small business, people who put their money out there, big money for little people, and have this problem with the opaque market?

MR. WEISER: That's a question for an economist. (Laughter)

SPEAKER: I don't want an economist. I want somebody to tell me how do you get a partner?

MR. WEST: So, you want to talk to Steve afterwards do you think? (Laughter)

Any thoughts on that?

MR. WEISER: One thing I'll say, which is not a real answer to your question. It's a different question you could have asked that I'm able to answer. (Laughter)

SPEAKER: Must be Washington. (Laughter)

MR. WEISER: I must be learning. So, there is one thing that's worth highlighting in the secondary market space that I think is extraordinarily salutary, and if you're going into this business, Sharla over here can talk to you.

Verizon as part of 4G rollout has made a fairly aggressive stance of we're not going to do 4G everywhere right away, so we're going to let your partners leverage off of our spectrum and certain of our platform technologies. That kind of enterprise model to welcome small businesses in rural areas is something that we certainly view as a healthy development because one of the things that folks in the Congress are asking and one thing that we and the FCC are really concerned about is rural American 4G. 4G can be

incredibly impactful in rural America, but it's going to take a focus, and the large carriers may not have that focus on day one, so how does that focus happen? One scenario that is promising is this particular model. That doesn't adjust to your situation, it's a different situation. But why you raised the thought in my mind, I thought I'd mention it.

SPEAKER: Why is there a more open market. That's what I'm saying. Why can't people get honest evaluations?

MR. WEISER: So, what I'll say on this and again, there are others who know more about this. Spectrum Bridge has tried to create a registry and sort of a private side and facilitate secondary market transactions and valuations. That is a still emerging effort. I have heard others make the point you've made, that it hasn't become as robust. An ecosystem with a much buying and selling -- I don't know why there hasn't been more of that. That's a fair question. But certainly over time as more use of more spectrums out there that's flexible and more spectrum can be traded both over longer term and dynamically. That market has a huge opportunity to be part of the overall economic strategy that we see as wireless. It's used, you know, again more efficiently, because right now there's some artificial limits of some spectrum that doesn't get treated as flexible use. Again, not a complete answer to your question, but --

MR. WEST: There we go -- Puerto Rico, Louisiana -- anybody interested to see that? (Laughter)

Okay, there's another question right there.

ALEX: Hi, my name is Alex. I work up on the Hill. And in trying to, like, figure out what the future of mobile broadband is going to be, the question I have is actually a composite between the value-based judgments and the things that some of the FCC's already done. And that would be the national purposes section. So, the question I have is

what's the responsibility of government to try and encourage market development for devices that might lead to more adoption in places where that may not normally just naturally happen, right? Not just the health care IT sector but, you know, like B broadband for education, for public safety. And what about levers that we can try new to make sure that this adoption happens at a rate at which it keeps prices down so it has more minorities and people who are normally economically disenfranchised and move under broadband for a local spectrum. Like, how can we do that in a way that functionally enables them to gain access to it at a cost that they can --

MS. GOODMAN: So, that's a great question because, as you're pointing out, we're not in this to create mobile broadband for mobile broadband sake. We're in it, because mobile broadband has a tremendous effect on education, on civic engagement, on public safety, on energy.

We have some focus and we have a team of people still working on the National Purposes working with other federal agencies, the Department of Energy, the Department of Education, on specific things that can be done.

We also have a focus on adoption and addressing the barriers to adoption whether it's cost or simply seeing the value of the device whenever -- I think we're really just starting to go on those efforts, that we would love all the help we can get. Happy to talk to you further about it.

MR. WEST: Over there?

MR. McCARTHY: I'm Mark McCarthy with Georgetown. I want to pick up on a *National Journal* question. We really have a looming spectrum crisis (inaudible), and all people who sort of looked at this issue from an engineering point of view projections from mobile broadband (inaudible) say that even if you allocated or made available

somehow all of the broadcast spectrum, all of the world's satellite spectrum, it's only a small fraction of (inaudible) for that matter. And the issue that was in -- a new way to fix this problem is with a more vibrant piece of network. Bring the signal closer to the end user (inaudible) as soon as possible. Is there any thought among the government officials about that kind of (inaudible) work and that kind of (inaudible).

MR. WEISER: So, a couple of points first. I think Steve mentioned this point, we're saying again; all wireless becomes wired at some point, so your question is could it happen sooner. For those -- I've red Mark's paper for the Aspen Institute. I would recommend it. Its very thoughtful paper.

Second, what should government deal, and I'll come back to Adele's point, which is that government should create conditions that enable Market Place experimentation and judgments. So, I don't have any a priori views, right? We're going to be over there broadcasting in 10 years. I don't know. People say you my not have a future. You could say as persuasively, no. You're going to see people do over there broadcasting and over-the-top video on the internet and cable is the one who's businesses with might have a challenge?

We don't know. We don't have to know in government. I think the best policy is that it facilitates marketplace activity that will try to manage spectrum either with closer fiber-intensive or less fiber intensive. And by giving more spectrum and more flexible-use opportunities, that will enable the best possible uses to emerge over time. And right now as we sit here, the one thing I guess I'll say with any confidence is I don't know what it'll actually look like, because when people in 1980 and '82 and AT&T were talking about what wireless was going to look like in the year 2000, they felt that there would be about 1 million users. They thought so little of it that literally the CEO of AT&T couldn't

answer the question at the divestiture and press conference whether or not they were keeping wireless with A&T or the Bells were getting it. And they were off by a factor of a hundred, and they paid $11 billion, you know, literally nine years later to buy wireless from a (inaudible). So, I don't think we have to know. I don't think we can know. But what we should do is try to create the conditions that the most innovative and effective use of the resource can happen.

MR. SHARKEY: And I think as an industry we are doing that. We are putting down a lot more fiber. We are, you know, building out that network to support the wireless network. And we are doing innovative things to try and offload capacity from the -- you know, from the primary network that uses license spectrum. We have widened, you know, the products going to WiFi access points whenever they can to help limit the demand on more license spectrum. So, you know, we do try to be as efficient as possible and we're coming into the fourth-generation technology, which boosts efficiency and data rates. So, there's constant innovation in how we, you know, meet that growing demand.

MR. WEST: Right there.

MS. WARREN: Jennifer Warren, Lockheed Martin. And this question -- yeah, let's try again.

MR. WEST: Special microphone --

MS. WARREN: Jennifer Warren, Lockheed Martin. The question is really for Phil and Ruth, and it goes to the voluntary incentive options. I think it sounds like a great tool for the FCC to have in their toolkit, but there seems to be an expectation that there's going to be a gap between -- a financial gap if you like, surplus -- between what the broadcasters establish as their sell price and what the actual buyers buy, and that there'll be a benefit to the government with sort of extra revenue. Well, why is there that

expectation when we think of broadcasters, despite some lack of transparency maybe in what the fair market value spectrum is if they ever figure it out and establish and maximize their floor, I guess, for their spectrum. And, (2) should they be able to do that, or is there going to be some mechanism to ensure that the government does get some value out of it as opposed to it all-going to the broadcasters?

MR. WEISER: Well, see, you have the bookend question to Jim's question in a way. Let me --

MS. WARREN: I have no biases.

MR. WEISER: Didn't Jim say the bias -- he had a new perspective. What I would say is a couple thoughts. One is remember my L.A. example. A broadcast station is making $800,000 a year total revenue. The spectrum is the hundred million. Jennifer's question would be well, why shouldn't they get the whole hundred million? And I think the answer is under current law, their rights, their right to use the spectrum is only worth $800,000 a year in revenue. So, I think from a congressional perspective, giving them all the value is not something that there's likely to be a lot of appetite for, (laughter) to understate the point.

The next point is, I would say, whatever Congress does, Congress decides, and Congress is going to have to think through this issue. One option is, and somebody else has said, let the FCC make all the rules and they'll have to decide. (Laughter) Congress has been known to do that on occasion, and that's a prerogative they have. Or Congress can say other things, like there'll be a split of the value that comes in the auction with experts saying go here (inaudible) going there.

I will tell you from an economic standpoint, the number one goal is to facilitate more effective use of the resource. And whatever money can come to the

government to support critical mass purposes of public safety first claim is clearly important to us, but it's also critically important that arguing over certain details of this not stop what is a critical job of economic progress.

MS. MILKMAN: So -- of course I'd be perfectly happy to have all the authority delegated to the FCC. (Laughter) And in the months to come, we have a lot of work to do to explain to people what we have in mind. Have a secret weapon, Evan Corral, who has been thinking about this issue for a very long time and has a lot of good ideas about how to define a competitive bidding mechanism that will cause broadcasters to reveal their true valuation, and their true valuation can be the $800,000 or it can be the $800,000 plus a little more, because they actually like being a broadcaster and it would take them a little more than that to get out.

But under the system that we contemplated, and we'll be getting a lot of help from outside experts to design this, broadcasters would be competing with each other for the ability to clear their spectrum in various ways, and that is what will drive the price down to a point where we expect we will have substantial revenues that can be devoted to whatever needs Congress in its wisdom sees fit, whether it's deficit reduction, public safety, the FAA, whatever Larry Summers said we should be doing.

MR. WEISER: (Inaudible) first claim is public safety; second, sort of advanced infrastructure like NextGen -- that's the FAA; and, third, deficit reduction.

I would say one more thing. The important use of voluntary is very important. This is up to neutral broadcasters, and what they need for incentive auction is obviously a critical idea. They may say we want the right to say you have to have reservation price and you could lay on top of that percentage split or you could do an either/or. Those are all out there, and for those of you who are economists, who put some

thought into this, let us know. This is not a simple thing to get our minds around, and Congress is going to have to think about whether they want to get their minds around it or delegate it for the FCC. And --

MS. GOODMAN: Or a combination.

MR. WEISER: Or some combination.

MR. WEST: Okay, I think we have time just for one last question. Go right here.

SPEAKER: My question was the incentive options. So, one of the issues around that will be sort of holdout problems, because it's a very complicated thing to pull together and aggregate enough of the spectrum. Somebody could just decide the -- kind of hold out till the end. The FCC's dealt with that, for example, in the microwave clearing process in terms of sort of setting out a time frame so that the earlier you're willing to participate, get more rights or, you know, more incentive, if you will. And if you wait till the end, you get little or no incentive. Are those the types of things that, you know, you'd like to see. I mean, I think that would be a critical problem to solve with incentive options.

MS. MILKMAN: There are a couple different ways of addressing holdouts. One is 120 megahertz is an aspiration. It's a very ambitious goal. It is possible that we won't get there, and it's also possible that we'll there in most of the country but not in every single market if we have a hold-out, as you describe.

A second thought is that someone who holds out might risk losing out altogether, because there are other broadcasters in the area that can offer spectrum up.

And the third point, which I think we've talked about before but which I just want to make sure everybody is clear on -- if we clear a bunch of channels, we then repack everybody down so that we have clear, contiguous spectrum. So, the FCC has repacking

authority. We, you know, don't want to take licenses away. We want to have a voluntary system, but the FCC has historically on more than one occasion moved -- told licensees that while they can continue to operate in the same geographic area, they are now going to be switching to different frequencies. And consumers don't even have to -- consumers wouldn't even know, because it would still appear as the same channel on their dial.

MR. WEISER: So, two points -- it's worth noting that the Administration's proposal's not identical to the broadband plan. We don't have a number in ours, because in part we want to have the opportunities for people to make their decisions, and so the number could be lower than that if less people wanted to play, or it could be higher if more want to, because it's, you know, an efficiency calculation I think we are committed to, and I think veritably there will be a robust over their broadcasting after this opportunity is done.

The second is where we're packing, it's important to the FCC to say this but I will mention now. This is going to be a kind of situation where as you're forced to move, the cost of moving will be paid for.

MS. MILKMAN: Yes.

MR. WEISER: You're not asked to kind of do this out of your own pocket. You have a right to be broadcasting over the air. You don't have a specific right to where you are, like, you know, channel 44, so you move to a channel like 33, so, like, you know, channels like whatever -- 36 through 50 might be able to be freed up. So, that is how repacking would work, and it's a lot more valuable, as you know well, to have the sort of clear spectrum that's, you know, altogether as opposed to scattered. So, that's how repacking works, and as I said, if someone is having to move, they would be reimbursed so that all the cost they would incur would not be out of their own pocket.

MR. WEST: Okay, I think we're out of time, but I want to thank Phil, Adele,

Steven, Ellen, and Ruth. And thank you for helping us make Spectrum sexy.

* * * * * *

CERTIFICATE OF NOTARY PUBLIC

I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

/s/Carleton J. Anderson, III

Notary Public in and for the Commonwealth of Virginia

Commission No. 351998

Expires: November 30, 2012