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NATIONAL BROADBAND PLAN WORKSHOP

SMART GRID, BROADBAND, AND CLIMATE CHANGE

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ANDERSON COURT REPORTING
706 Duke Street, Suite 100
Alexandria, VA 22314
Phone (703) 519-7180 Fax (703) 519-7190

PARTICIPANTS:

Panel 1 - Smart Grid

NICK SINAI, Moderator
Energy and Environment Director, National
Broadband Taskforce

MIGNON CLYBURN
Commissioner

COLIN CROWELL
Senior Counselor to the Chairman

NESE GUENDELSBERGER
Acting Chief, Spectrum and Competition Policy
Division

JULIUS KNAPP
Chief Office of Engineering

JON PEHA
Chief Technologist

MARK DUDZINSKI
Chief Marketing Officer, GE Energy

JASON GRIFFITH
Director, IT Telecom Engineering AEP

HENRY JONES
Chief Scientist, SmartSynch

JOBY LAFKY
Program Manager, Electric Vehicle Management
Platform Gridpoint

ERIC LIGHTNER
Director, Federal Smart Grid Taskforce
U.S. Department of Energy

ERIC MILLER
Senior Vice President of Solutions Trilliant

PARTICIPANTS (CONT'D):

DEAN PROCHASKA
National Coordinator for Smart Grid Conformance
NIST

Panel 2 - Broadband and Climate Change

NICK SINAI, Moderator
Energy and Environment Director National Broadband Taskforce

COLIN CROWELL
Senior Counselor to the Chairman

KRISTEN KANE
Director of National Purposes

MATT BAUER
President, BetterWorld Telecom

COLIN BUECHLER
Senior Vice President of Marketing LifeSize Communications

SKIP LAITNER
Economic Analysis Director, American Council for an Energy-Efficiency Economy

MAURA O'NEILL
Senior Advisor for Energy & Climate
Chief of Staff to the Under Secretary for Research, Education & Economics
U.S. Department of Agriculture

CHRIS WALKER
Former Director for North America, The Climate Group

SHERYL WILKERSON
President, Willow, LLC

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P R O C E E D I N G S

MR. SINAI: Okay, welcome, everyone. This is the energy, environment, and transportation workshop. I'm Nick Sinai and I'm the moderator of the workshop. And first, I'm very pleased to introduce Commissioner Clyburn, who's going to give us some opening remarks.

MR. CLYBURN: Thank you, Mr. Sinai. Good afternoon. You didn't get the memo from last week. I am very Southern and very interactive, so when I say good afternoon, I need to hear it back, just so you know. So, good afternoon.

GROUP: Good afternoon.

MR. CLYBURN: Thank you. I appreciate it. I am pleased to welcome you to the Commission's Broadband Workshop on Energy, the Environment, and Transportation. While much of the focus over the next several months will be on the core elements of broadband deployment and adoption, it is essential that the Commission's broadband plan account for national priorities beyond the traditional communications realm.

Congress understood this responsibility when crafting the Recovery Act, assigning to us the mission of creation a road map that recognized broadband's power to transform a vast array of public and private services.

I have a keen interest in today's workshop because of my extensive involvement for over a decade on energy policy at the state level. As a commissioner in South Carolina, I witnessed firsthand the importance of modernizing our nation's approach to energy. I believe firmly that our communications infrastructure can help accomplish that goal. As we will hear today, when it comes to thinking about broadband and energy policy, our first stop is the Smart Grid.

Smart Grid technology is designed to make our electrical grid more resilient and intelligent. If we take seriously the notions of energy independence and reduce greenhouse gas emissions, we must develop a grid capable of accommodating renewable power as a significant portion of our energy generation mix. The FCC has an important role to play in making this happen, however, we are but one of a number of important government players in this effort. At the federal level, we have the Federal Energy Regulatory Commission, the Department of Energy, the Department of Agriculture, the Environmental Protection Agency, and the National Institute of Standards and Technology, just to name a few. At the state level, public utility commissions throughout the country will be responsible for funding and regulating much of the Smart Grid.

Effective coordination among these entities' interest is paramount. We must keep our eye on the ball and always remember that at the end of the day each of us is part of a larger team working to help improve the lives of all Americans. With this in mind, I look forward to a lively exchange of ideas at today's workshop. No road map will be complete without understanding the implications of our plan.

These workshops are an excellent starting point in sketching out the contours of the many aspects of broadband policy. There is no better time than the present to tackle these crucial issues and I thank the participants, those joining us here in the Commission room and those in cyber space, for their interest and effort. Thank you very much.

(Applause)

MR. SINAI: Thank you, Commissioner Clyburn, for those inspiring remarks. We really welcome your leadership on these issues and look forward to working with you in the future. This will be great.

Thanks to everyone in the room for coming as well as those attending online. In fact, those attending online are demonstrating how they can engage in civic participation while also helping fight greenhouse gas emissions. For those of you who came in person, I really hope that you took the Metro.

So, I'm Nick Sinai. This is actually my fourth week of federal service at the FCC. Previously I was a venture capitalist investing in

IT, telecom, and clean energy companies, and as a VC, I was always looking for innovative companies, innovative technologies, innovative entrepreneurs, and I think innovation is a great theme for today. We'll hear about a lot of innovative companies both large and small that are working to solve our energy, environment, and transportation challenges.

We have two excellent panels today. The first panel will examine Smart Grid and focus on communication questions in the Smart Grid, and the second one will focus on broadband and its role in fighting climate change. And I just want to make the point that today's workshops are just the tip of the iceberg. We're working hard to understand how broadband and communications infrastructure and policies can support our national energy environmental goals and so we're looking forward to speaking with a diverse set of constituencies over the next several months.

So our first panel today is the Smart Grid and there's a lot of definitions of the Smart

Grid. In fact, sometimes it's hard to know what the Smart Grid means. And Congress wrote a broad definition, rightly so, in the Recovery Act. I'd say just about every definition I've seen of the Smart Grid, though, includes an element of adding communications to the electrical system. Google, for example, defines the Smart Grid really as three things: Sensors, software, and communications to the energy system.

And having worked both in communications and in energy, I think I'll point out a couple similarities to telecom and energy. Both of them are essential services that are fundamental to all Americans and their prosperity. Both telecom and energy have incumbent businesses that build reliable and ubiquitous networks for peak demand. But there are some pretty important differences from telecom and energy. It's been said that if you resurrect Alexander Graham Bell, he wouldn't know the first thing about a BlackBerry or an iPhone, but if you brought back Thomas Edison, he would recognize the system he designed and probably would be able to offer up some improvements.

There's been tremendous innovation in communications and perhaps less so in electric power. R&D spending, as a lot of us know and I'm sure we'll hear, has been pretty low. It's been said that pet food makers spend more on dog food research than the electric power industry spends researching electricity. One small example of this is that electric utilities have a simple way to know that transformers are blown: The angry customers call them and tell them that the power is out.

But fortunately, everyone recognizes that we need to rebuild our electrical system, and I think that's why we're here today. The Recovery Act authorizes the administration to spend $4.5 billion on the Smart Grid and we'll hear about that from the Department of Energy, and that's really just a down payment. I think the EPRI estimates the cost of building the Smart Grid at $165 billion over the next 20 years, or $8 billion per year.

As Commissioner Clyburn noted, the Smart Grid is a national priority. We need a grid capable of accommodating energy efficiency, renewable power, and electric vehicles. These are all critical if we are going to move to a clean energy future and lessen our dependence on oil.

So, enough preaching, on to the panelists. We'll hear from each panelist for some brief remarks, five minutes.

The rest of the session will be questions from FCC staff, the public, and online. We'll be passing around cards, so please write your questions and your name and we'll try and get to as many as possible. I'm sure this will be an exciting conversation.

So, our first panelist is Eric Lightner from the Department of Energy.

MR. LIGHTNER: Okay, well, thank you, Nick. And I'm happy to hear from your remarks that you've been reading some of the materials that DOE has been putting out on Smart Grid, it sounds like, especially with the research analogy and the one with Edison and Bell, the comparison as well, so that's good to hear. It means we're getting our message out there.

When you invited me, you told me I had five minutes or so. I really struggled with what I was going to say in five minutes, so there's a lot more behind what I'm going to tell you. So I'm going to spin through a couple ideas or a couple things that I thought would be good to present here today and I'll just get started in the consideration of time here.

So, I thought I would first throw out a definition, Nick, that as a matter of fact we worked very hard probably for about two years to actually define what the DOE was going to consider a Smart Grid. We started with the idea that that's basically taking the advancements in information technology, overlaying them with the operation of the grid, and integrating many, many resources much more effectively and efficiently into the operation to achieve multiple benefits:

Environmental benefits, cost benefits, and so on. So that was the initial idea. Next slide.

We took that initial idea and went out to the country, basically, and had several, several stakeholder meetings across the country to really try to figure out what was the definition of Smart Grid, what do people think it is.

And after about a year and a half and going all over the country, we settled on these, what I call functional characteristics of the Smart Grid.

So, by integrating all of the resources in the previous slide with information technologies, communications, that these were the functions we're really trying to enable, and that's what we settled on. Now, to go to a higher fidelity than that is where you really run into a lot of different options, a lot of disagreement, I would say, on how to implement these, how to enable these functions. So we stopped there and we basically said, that's going to be our definition. Now, what's the next step?

So, right in the process of defining that Smart Grid and what the DOE was going to consider to be a Smart Grid, along came the Energy Independence and Security Act of 2007, which authorized a number of things, one of which was the Smart Grid Task Force, which is what I'm the director for. And more or less this is a body, a group of representatives from multiple agencies, career feds for the most part, that really was established to coordinate activities in Smart Grid. I think Congress thought that this was going to be a very large, convoluted, complicated effort, and it would require a coordination amongst the many agencies. So I won't go through the functions, but basically it's a coordination function. Next slide.

A couple of the other things that was authorized, or one of the other things that was authorized in EISA legislation of 2007 was the Smart Grid System Report, and this was very much in line with the DOE's thinking as to what we really need to do next. So what the System Report is -- and actually, I brought a copy to show folks. This is the Smart Grid System Report that came out earlier this year and it basically takes that next step. Okay, we have the definition. Now, what are we going to do with that? How are we going to know if we're making any progress?

So, the System Report required us to report to Congress on what's the status of implementing the Smart Grid and we came up with a list of 20 metrics that we think are good indicators, good things to track, to be able to figure out if we're making progress. So, if we trend these metrics, we should be able to see if, in fact, we are making progress for establishing Smart Grid implementation across the country. So with that, I'll just go to the next slide.

And in following that -- so we had the definition, we had some metrics that we thought were pretty good at measuring it, and our next step was to -- why don't we start to fund some projects here? Why don't we start to lay the groundwork for what we believe will be the modernized electricity grid of the future? And that's where the ARRA funding came along and gave us the $4.5 billion that you mentioned earlier. And these are the programs that we will be funding. You will see here the bulk of the money has gone into the Investment Grant Program, and this is a cost-share program where the government will fund up to 50 percent of the implementation of off-the-shelf technology that will enable those Smart Grid functions in the definition slide that you saw.

We're also going to have about $700 million in demonstrations. These are very large-scale demonstrations of the integration of multiple technologies. So it's not just a subsidy, a cost-shared investment, it's really a scientific experiment. What really are the benefits and costs associated with integrating multiple technologies into the distribution grid? And then there are some other programs you'll see there that we're also funding. They have to do with outreach to the states in helping them to handle the many cases we feel will come before them for cost reimbursement on technology implementation. So, the next slide.

A couple of tools. We spent a lot of effort in trying to educate and really get the message out about what Smart Grid is about and this is where we produced the book that I referenced, it's Smart Grid: An Introduction. It's really a layman's term, read on why we need Smart Grid and what the benefits potentially are. And we've also created some other tools and those are here in this slide. So the information clearinghouse is really a result of -- and I know I'm over, but I'll end shortly here -- the information clearinghouse is really a tool, hopefully, we feel, that will be an online database of all Smart Grid technologies as well as pilot projects and demo projects and implementation projects that are ongoing around the country. So it's kind of like everything Smart Grid, a one-stop shop to go and get some information on Smart Grid. And this was a direct result from a request from FERC and NARUC that really, you know, wanted a tool that they could use to get information where they could learn about best practices and use that for future decision making. So that resulted from that.

And we've also developed a tool for the utility industry that we're currently working on called the Smart Grid Maturity Model. And this is really a self-assessment tool to help -- a decision support tool to help an individual utility to baseline where they are and help them make decisions on what kind of technologies to implement, to move themselves to whatever they're trying to achieve, whatever objective they're trying to achieve. And next slide.

And I'll just end with this. These are some -- basically ideas, some thoughts of where we feel broadband and Smart Grid can intersect, and I won't go through them. I'll just leave that for people to look at later, but I'll just mention the one, linking Smart Meter networks to utility control centers, home, area networks, and whatnot, so we feel like there's definitely some synergy there.

MR. SINAI: Great. Well, thank you, Eric. And I think we're going to dive into that topic and that idea in this panel, so that's a great intro.

Our next speaker is Dean Prochaska from National Institute of Standards and Technology.

MR. PROCHASKA: Good afternoon, everyone. Today I'm going to talk about NIST's role in Smart Grid and share with you some of our activities and plans for the future. To begin with, NIST was given, through the Energy Independence and Security Act of 2007, was given the primary responsibility to coordinate and develop the framework that includes protocols and model standards for information management to achieve interoperability of Smart Grid systems and devices. Next slide.

As we've been working in this program area, I can tell you right now that the need for standards is urgent and just one example would be the targeted deployment of Smart Meters. I mean, it's a huge dollar amount that's projected to be spent over the next few years. And likewise, some of that deployment is over way right now. But as Eric said, the ARRA funding, was talking about that a little bit there and that's also really accelerating the need for standards. Next slide.

So, in order to accelerate Smart Grid standards and interoperability, we've devised at NIST a three-phase planned approach. So Phase 1 is really identifying an initial set of existing consensus standards and also developing a road map to fill gaps. And so as we look at these standards -- there are standards out there today, so I don't want to tell you there aren't, but, at the same time, we need to kind of hone in on what is that set of standards that we need, and we're doing that in a consensus-based approach. In order to assist in that effort, we've also created a NIST Smart Grid Cyber Security Coordination Task Force.

Phase 2. And I should point out there,

you can see that red line, we're just about to finish the Phase 1 activity right now. Phase 2 then will establish a public and private standards panel to provide ongoing recommendations for new and revised standards and looking out into the future, too, what kinds of gaps are we finding working with the deployment.

And then Phase 3 will be a testing and certification framework. You can have all the best standards in the world, but to make sure that they really work and you achieve true interoperability, you need some type of a testing and certification framework. Next slide.

As part of our Phase 1 activities to date, we've held now three public workshops. We've had over 1,500 participants. The vendor that we worked with to drive these first three workshops, they've issued now an interim road map that's already been issued for comment on the Federal Register. NIST has identified 16 Smart Grid standards. Overall, through the workshops, we've identified more than 80 candidates for standards. We've also identified gaps in these standards. We've now found close to 70 gaps and issues that have been identified, and that's a lot of territory to cover. So what we've done is we've taken a look and we've said, okay, you can't eat the whole pie at once, so let's pick out the 14 high priority items for immediate action. And, in fact, our third workshop, we worked with the standards development community to really kind of start developing action plans for these high priority items. Next slide.

And I should point out that at that Standards Development Workshop and looking at all of these Smart Grid standards, there were 22 different standards development organizations and utility user groups that were involved in that, so it's very, very significant. This thing is big. Anyway, so if we go to the next slide. We've got five minutes here so I'm trying to move fast here.

I won't go into the detail on these priority action plans, but if you kind of look at about the sixth from the bottom, you can see where it says PAP, number 2, that's Wireless Communications for Smart Grids. So that's an area that we've found that we really kind of need to hone in on as a high priority action plan. Next slide.

We talk a little bit more about this Wireless Communications for the Smart Grid action plan, so we're working with government agencies and including the FCC on this one. And so we've identified a need here that -- and also working with all of the other stakeholders in the Smart Grid community, we need to really assess the capabilities and strengths/weaknesses of the different wireless technologies operating in both licensed and unlicensed bands. And at the end of the day, what we want to do is develop guidelines for their use on different Smart Grid application requirements.

And just to kind of speed through this, let's go to the next page and talk about some of the upcoming milestones. So, NIST will be rolling out a Smart Grid Interoperability Framework

Document coming up and we'll be rolling that out in September at Grid Week. And then in addition, the Smart Grid Standards Panel contract actually was just awarded last Friday and so we had -- so that was a big announcement. That contractor will help us drive the standards panel that we are creating and, again, we expect to have that first meeting November the 17th. And then likewise, we'll start working through the Standards Panel and with this contractor to develop a testing and certification framework.

MR. SINAI: Great. Thank you, Dean. Next up we have Mark Dudzinski, excuse me, from GE Energy.

MR. DUDZINSKI: So you can go to the next slide. Well, Thomas Edison actually founded General Electric. And I can assure you that there are businesses inside of General Electric that he would clearly recognize today and haven't changed that much, but if he looked at the Smart Grid, he clearly would not recognize most of the things we're doing in terms of making the grid more efficient and providing automation in the Smart Grid.

Now, when GE looks at the Smart Grid, we tend to look at the benefits that get delivered because benefits are what utilities actually calculate to justify deploying Smart Grid infrastructure. And we look at in these very large buckets -- demand optimization, this is all about demand response to reduce investment in transmission generation, delivery optimization -- there's about 10 percent loss between the generating plant and the consumer. And we think we can eliminate about 20 percent of that loss if we controlled the grid better, so it's worth about 2 percent efficiency, on the generation side about 4 or 5 percent reduction in emissions. Asset optimization: Making the products and the equipment and the grid more reliable. Reliability optimization is making the grid more reliable with the consumer, making sure the power's on. Grid management is all about enabling the grid to accommodate much higher penetrations of renewables, both wind, solar, and other intermittent renewable sources. And GE is involved, actually, in providing to the electric utilities around the world the software and equipment automation to do all of those functions. The last one here is PHEVs. Electric vehicles will absolutely need to be charged at the right time to keep from having to add a generation facilities transmission infrastructure and distribution infrastructure. Next slide.

To get these benefits delivered, from a communications viewpoint, we're trying to solve as a supplier this problem of volumes of data and speed of data. And there are a lot of applications out here, like metering, where you have large amounts of data, but the requirement is not so strong to have really timely information. The same is true for information on diagnostics for equipment that's operating in the grid. At the other end of the spectrum, however, things like protection and grid configuration, these activities have low requirements for data, but the requirements for speed and determinism are very strong. In cases you need milliseconds kind of communication, speeds, if you're going to actually coordinate protection in the grid using a wireless technology, and you can plot, really, like on this graph, many more applications on bandwidth versus speed that you need to deliver the functionality we need in a Smart Grid. Go to next slide.

When you look at all these options that we have, you know, utilities typically have at least three, sometimes four, sometimes five different communication infrastructures necessary to operate the grid today. Of course, we're expanding the scope of what we're asking utilities to do to deliver Smart Grid functionality. You know, we're asking them for improved security. We believe in GE that you can ensure security on dedicated space or non-dedicated spectrum on private or public infrastructure, but for sure in applications like protection and grid configuration where the time to deliver the message is essential, you know, there having dedicated spectrum certainly helps in terms of having a deterministic system for managing the grid. We oppose, in most ways, mandated use of any dedicated spectrum. We think that would obsolete present assets that are already deployed and for sure it would slow down deployment of the grid, and we're all about trying to increase the speed of deployment.

We think this is a unique period in time where you get a lot of new business models coming. You can go look at Microsoft or Google and you can see that they are positioning their products and their services around Smart Grid functionality. So there's new business models coming and I would propose to you that we don't know most of them today and therein lies one of the, I think, critical things here for the FCC to look at: Can we use bandwidth or spectrum to accelerate deployment of the Smart Grid? Today, utilities are limited in the amount of capture they get on the assets they deploy. And if you allow them to have different business models for accelerating income, they would actually have more capital to deploy Smart Grid faster and so support, actually, dedicated spectrum for utilities -- the electric utility industry, but we don't like to make mandatory these things.

MR. SINAI: Great. Thank you, Mark. Our next speaker is Eric Miller of Trilliant.

MR. MILLER: Great. Thank you. Pleasure to be here.

Okay, we'll talk extemporaneously. Trilliant is an integrated Smart Grid network provider. We have -- we're based in Redwood City, California. We have over 200 employees. We are -- deployment over 1 million endpoint true Smart Grid, 2 endpoints in the ground, which I believe is the largest deployment to date in the world up at Hydro One in Canada, a very extreme and rural area in terms of temperature and performance, so we have a good base of experience going back several years in this.

We provide integrated networks that cover everything from the utility end at the true broadband and grid level all the way down into the home, which we have several different technologies that we apply to solve the problem comprehensively, and I'll talk a little bit more about that in a moment.

Overall, as Eric mentioned, we really believe that we see where Smart Grid is headed is that it's not just about metering where maybe it's come from in the past, that there are other users, like grid communications, real-time grid communications, and drivers, like energy efficiency in the home, getting energy information, not just real-time controls, but information on energy usage, energy prices into the home. And when we start to look at the network and communications that we need for that, it really drives a very different model than you might have seen because those users are very different kinds of users from a security perspective. It's important that we not have a homeowner be able to log into their thermostat and access the grid. Even with -- and visa versa, you don't necessarily want someone who's operating the grid to be going in and controlling someone's home. So there are some very significant security and performance boundaries that need to be created and maintained, and an architecture that is able to do that and also do that in a standard space way, and that's very much what we focus on.

What's -- and we believe that to do that, no one technology is going to be able to solve all problems from the grid. We really focus on what we call a multi-tier architecture, so starting from the utility fiber network and going down. First we have a -- we believe that there needs to be a true broadband tier to pick up those millisecond latency kind of things that Mark mentioned that are true grid reliability. And at that level you need guaranteed quality service, guaranteed security, and you need -- the thing that Smart Grid really changes is now instead of just having that capability at a few substations, we need that potentially everywhere on the grid, down every feeder line, to operate reclosers, to be able to get power turned on faster, or regulate voltage in order to maintain -- improve efficiency, quality of service, and, ultimately, probably the biggest one as we move to advanced electric vehicles, that can potentially put tens of kilowatts of power in the grid at any one point. Those are going to have to be very carefully -- and managed in a great deal of coordination with the grid or it, quite frankly, will really impact the reliability of the grid in a negative way versus a positive way. And so some of those are going to require true broadband capacity and true minimum latency.

As we then move down to the second tier, what we call the neighborhood area network, and that's meters, in- home devices, things where you still want to be able to -- you know, a few seconds, you want to be able to press a button and see something happen, but you don't necessarily need that millisecond, and cost is a much bigger driver. We can't afford to spend a lot of money because there's going to be literally hundreds of millions of these devices out there.

So that tier is what's called maybe your advanced metering infrastructure is kind of a common word for that.

And then once you get into the home, that can sort of be a blend of that metering tier or maybe moving into a true home area network. In that case, there are important boundaries, again, around security. We don't want someone in their home to be able to access the grid network, and so it's important to have some market boundaries there.

The key that I see with all of these is bandwidth is going to become critical at each of these levels. Just performing a meter read or just adjusting a thermostat, that doesn't, frankly, take very much capacity, but if you want to give someone current rate information on what their time of use rate schedule is and you want to push that out to customers an hour before your event, that actually takes two orders of magnitude more bandwidth than just doing the meter reader, the demand response. And so it's very easy -- another one we find at the broadband here, just controlling a substation doesn't take a huge amount of bandwidth. But if that operator would like to have a video feed to be able to see what's going on in that substation, see if it's on fire, see if there's somebody inside, a fairly modest request, well, again, now all of the sudden you need megabits worth of capacity in order to do that. So, as we've found with the Internet and telephone and all sorts of -- and cell phones, as we increase the needs in, seemingly as a user, very incremental and logical things, we add more like orders of magnitude to the capacity we need, not just 10 or 20 percent.

And so we need to build these networks in a way that they can really expand and extend over time, and that's the key is to build the architecture so it can really grow over time.

Finally, in terms of public or private spectrum, we really see and we hear a lot of utilities saying they want and need an end-to-end private network. It doesn't necessarily have to be private spectrum, but a private network, to insulate this from the Internet. This is a grid-critical function. We can't have, you know, a global worm take down our electric grid, so we need -- we really believe in end-to-end private networks. At the broadband tiers, it's kind of the middle tiers in the network, private spectrum, we believe, would be very helpful. We think 1.8 gigahertz would be the right one. That's what Canada is moving to. It could become a real North American standard and we think there would be a lot of value. This is a national, critical -- you know, Smart Grid is a critical national asset, and we believe that's an important and valuable way to go.

Today, we operate in public frequencies and, frankly, it works okay, so it would be helpful, but not essential. Thank you.

MR. SINAI: Great. Well, thank you, Eric. I'm sorry about the slides. We'll get those up on the website there and thank you for speaking.

Next up we have Henry Jones from SmartSynch.

MR. JONES: Yep, so I'm here today to argue for the use of eminent domain for utilities to capture land throughout the country and to build their own road and freeway infrastructures so that they can have unimpeded access to their assets. And also, they'll need their own highway patrol system to monitor this new network. And -- wait, I'm sorry, that's not my thought.

Actually, I'm here today to discuss the need for utilities to build and manufacture their own vehicles and their own electric grid equipment. Building your own vehicle seems like it's a very simple business, so I'm sure that utilities can stay free of government interference if they go into the vehicle building business.

All jokes aside, the good news is that allocating scarce resources just for utility purposes is not necessary. Having utilities do things that are freely and commonly done by other industries is not necessary. The good news is that we already have a Smart Grid broadband network made out of multiple Smart Grid broadband networks. They're all available and they've been used for Smart Grid applications for years now, and that is the Public Wireless Network and that is what I'm going to spend my next few minutes talking about.

So I want to just talk about three key elements of these Public Wireless Network: They're secure, they're reliable, and they're scalable. Those are very important attributes of the Smart Grid for the communications element that Nick talked about earlier, and I'm going to add one word to each of those as we go through that make it an even more important attribute for each of those -- each attribute for the Smart Grid. Go ahead.

Proven Security. Go ahead. Next slide. This is just one snapshot. This is AT&T's, their architecture for Wireless Network Security. This is not their proposed network security architecture. This is not their future network security architecture. This is their 15 years in the field, proven, never been hacked network security architecture. Go to the next slide.

Scalability. Proven scalability. Next slide. This is just one snapshot again of AT&T. I could have mixed up my carriers a little bit better than I've done. Please excuse me, especially if there's anybody from Verizon, Sprint, or T-Mobile in the audience, but this is the global network operations center for AT&T. Please note that bullet point at the top: The addition of all the possible meters in the United States, all the electric meters, all the gas meters, all the water meters, doing five-minute interval of two-channel data throughout the year, the daily burden that that would add to just AT&T network is just 0.0002 percent. We can talk about 10 or 100. We can talk about another order of magnitude, two orders of magnitude, three orders of magnitude, four orders of magnitude, five orders of magnitude more traffic that the Smart

Grid would generate and it would still not really impact the networks that have already been deployed and are used throughout the country. Next slide.

Reliability. Proven reliability. Everybody knows that if I want to get on the phone right now, I really don't have any question about whether that's going to be possible or not. And also, after a disaster, I know that the networks that are working hard to get their networks back up are these networks. The reason for that is that they pour billions into making their network reliable. Why? Because that's their number one marketing slogan: Most reliable network, most reliable network. They're pouring billions in it on a yearly basis. So if we go to the next slide.

If you compared the other possible investments in different types of Smart Grid technologies, they're not insignificant. They're -- millions of dollars in 2008 went into different types of ways to communicate with equipment on the Smart Grid, but billions went into investing in ways to communicate better, not just with new equipment, but in education, in conferences, in the infrastructure, in a complete global ecosystem that now supports over 4 billion people. Four billion devices are already using our future Smart Grid broadband network in the United States. And so the key thing when you think about decisions that you're making today is what are those decisions going to look like in the future. So if you just extrapolate just a few years out into the future, what's 2012 going to look like when LTE, which these networks have spent billions to buy broadband spectrum to provide for, which is like having a bundle of T1 lines stuck in your pocket, which would be like having a bundle of T1 lines to every single Smart Grid device, what's that going to look like? It's going to look like $120 billion of investment will make it look like. And that sort of investment is significant and in 2012, what decision is going to look smart for us? I think it's going to be using the Public Wireless Networks. Thanks.

MR. SINAI: Great. Well, thank you very much. The next speaker is Joby Lafky from Gridpoint.

MR. LAFKY: Thank you. I'm going to be focusing entirely on electric transportation, which is obviously just one facet of all of the things we have to deal with here.

I think electric transportation is a little bit of a special case and it's a little bit worth special consideration because of all of the parts of the Smart Grid, it's the one place where customer use of electricity is about to change radically; that most of the solutions and techniques that are being discussed are about making what we have now more reliable, less expensive, more predictable, more ecological.

Electric vehicles is the one place where we actually have this big driver whether we want it or not -- whether we, the industry, want it or not -- coming towards us that's going to change the character of how electricity is consumed. Next slide. Unlike maybe some of the previous supposed waves of electric vehicle adaptation, I personally believe this one's for real.

There's a lack of external bias or distortion driving the deployment of electric vehicles. The vast majority of the -- if we could go back -- the vast majority of these folks have no particular government leverage over them to compel them to move to electric vehicles. They're doing it because they think the market is ready for it. The tricky thing there is that similar to the deployment of air- conditioning in the South, when that first became popular, this is a tremendous increase in the electric consumption of a particular customer's house. If you average together all the loads in a house, they're between 1 and 2 kilowatts. There are certainly peaks above that, but the average throughout the day is about 1 or 2 kilowatts. An electric vehicle, when it's charging -- and they can take hours to charge -- by itself can be a couple kilowatts. So a house with an electric vehicle can double its average demand while the car is attached. Next slide. Next. I'm not a fan of the animated slides.

The positive thing about electric cars is that while they're a huge load that we don't have any flexibility about supporting, they're also tremendously accepting of adjustment about when the power flows into the car. If you interrupt a person's flat screen television because it's inconvenient to provide the electricity, the consumer really notices and really objects, but if you turn off charging an electric car for five minutes part way through a three-hour charge session, there's really a good chance that the consumer won't notice at all. So the balance of how much you have to incent a person in order to get them to participate in some sort of demand/management/flexibility sort of program is really different. You don't have to necessarily pay them to tolerate an inconvenience. If you're smart, if you have deep visibility into the state of the vehicle, deep visibility into the behavior of the user, you can obtain the charge curtailment, obtain the degree of management you need to satisfy utility requirements without the user even being aware that they've experienced a curtailment. Next slide.

Most of the time when people talk about load management applications, the first thing people think about is simple curtailment, is giving the electric utility a big red switch that they can slap when they're in a critical peak event, when they're up against the wall on running out of resources, or when they're about to pay for a class of resource they really would rather not get into. And if you have deep control of electric vehicles, if you have low latency, tight integration down into an electric vehicle, you can actually do a lot for utilities beyond simple peak smoothing. You can do things like provide renewable integration, system regulation, spinning reserves, all of these various things where the utilities really never had a large body of load out in the grid that they can micro adjust. Utilities currently pay to micro adjust the output of things like gas turbines and hydro to balance grid production with grid consumption, and electric vehicles represent a unique opportunity where by feathering the consumption of electricity up and down within a large population of electric vehicles, the electric utility can perform these grid management/grid stability tasks on the consumption side instead of the production side, and using assets that the consumer paid for instead of assets that the utility or power production company had paid for. Next slide.

The tricky part here is that if you want to really do fancy things like provide frequency regulation to the grid or make up for a power plant that's gone offline suddenly or do load shifting while hiding the fact that you've shifted the load from the user, it doesn't work to have a one-way transmission network that just sends an emergency broadcast that's 6 bytes long to every car out there that says turn off right now. You really need high resolution per vehicle, moderately high bandwidth communication to the individual vehicles. Otherwise, you can't play these games to provide the substantial benefit to the utility while hiding the inconvenience from the user.

There are several different approaches that are being deployed right now that people have actually rolled out and are using right now, but it really doesn't work to talk about there being one perfect solution. Going down this list here, the AMI network is the first thing most utilities want to talk to. They feel they've made the investment in a network, they'd like to leverage this network, but semi-AMI networks have insufficient bandwidth to support another application. Semi-AMI networks are structured in such a way that it's difficult to add additional classes of devices to them if they have available bandwidth. So AMI is appropriate in some situations and it's inappropriate in other situations.

Another classic communication is premises: Ethernet premises, Internet. If you have a bunch of Starbucks -- a bunch of charging stations at a Starbucks, it probably makes sense to just plug them all into the Internet that the Starbucks already has and get on the network and do smart charging that way, but there's classes of places where neither the AMI network nor the premises Internet are the appropriate solutions for integrating charging stations or vehicles with the grid. And in those situations we have to start thinking about clever alternative solutions much like were talked about previously. And that's all I have.

MR. SINAI: Great. Well, thank you, Joby. Our final speaker is Jason Griffith from American Electric Power.

MR. GRIFFITH: Thank you, Nick. Appreciate the opportunity and good afternoon to everyone. Go ahead and go to the next slide.

Give you a little bit of a view of what AEP is about. AEP is an investor-owned utility headquartered in Columbus, Ohio, 5.2 million customers, cover 11 states, 39,000 megawatts of generation, we operate close to 39,000 miles of transmission lines, 212,000 miles of distribution lines. And the other thing I want to point out about this slide as you look at the service territory is we require entire coverage of that service territory. So, when you talk about commercial services, and I will a little bit later, there are areas in that service territory today that's not covered by 3G technology much less by 4G, LTE or WiMAX. Next slide, please.

This slide talks a little bit about the evolution of the electric utility system. As you can see, before the Smart Grid things were pretty simple in how it's connected and how the power is produced and transmitted. And of course, after the Smart Grid, it's very interactive, many stakeholders, a lot of requirements for telecommunications going forward. Next slide, please.

Part of that is the operational challenges to the utility business is, you know, customer demands more control over energy consumption. Renewable energy is increased by a factor of 1,000 over the past decade and we feel it's now doubling each year.

The distributed generation is variable and often not available when needed and out of control of the utility operator. And, of course, the plug-in hybrid electric vehicles is coming as well. So, we feel the Smart Grid as a whole is the key to mitigating these impacts. Next slide, please.

AEP's Smart Grid initiative here, it shows it's three tier and both serves benefits to the utility as well as benefits to the customer. And the energy efficiencies and the distributor resources, and then, of course, the Smart Grid is what we felt ties that together. Next slide, please.

Talk a little bit about AEP's goal. As a goal we'd like to have all our 5 million meters connected by 2015, but that's contingent upon rate recovery of providing those Smart Meters. Provide customer time-based usage information, allow utility monitoring and control of the delivery of electricity at the meter, enables demand response, and, of course, communication foundation of AMI can be -- or can play a role and distribute automation in a Smart Grid. Now, it's been brought up that there's certain type of networks that you may use for AMI may not scale or may not be able to provide the DA, and that's true. It depends on the system that you're deploying.

A little bit about the ones we have in place today. We have 10,000 meters in South Bend that's deployed.

We're looking at all of Texas, 1,000 (sic) meters. And then we have a model city, Columbus, Ohio, of 110,000 meters that we're working on. Next slide.

When we look at how to provide connectivity to the Smart Grid, and I think all this is consistent across all the utilities -- coverage, availability, bandwidth, latency, dependability, affordability, security--and we don't want it to depend on end user power source or an end user-controlled subscription service, we believe that there's options both private and unlicensed as well as commercial when providing these services. Next slide.

We feel that there is a need for dedicated spectrum. We have growing needs in SCADA, voice dispatch, AVL -- automatic vehicle locations -- plus mobile data for the field workforce that continues to grow with AEP today. We also have the expanding need of the Smart Grid and DA. We feel the dedicated spectrum is much less likely to receive interference and you do have a remedy procedure if you do experience interference. We also feel that we're going to have a need for bandwidth in areas that we serve, that it is not served by commercial service today, and we know that through experience, through SCADA, our mobile workforce that we have in place today. Next slide.

We do support using the 30 megahertz at 1.8 gigahertz for some of the reasons that have obviously been stated already. Next slide. I would point out, too, that at AEP today we look at that for internal use only, not providing any commercial services.

We do have some issues or concern about that, using that spectrum. It must be optional. We don't want to strand any investments that we've already made. We also don't want to delay decisions on the existing ones that we're trying to put in place and we don't want to have to give up spectrum that we already use today. AEP has a very extensive 800 megahertz (inaudible) system that we support our workforce on today and to try to roll out that same system at 1.8 gigahertz would be very costly, so it would need to complement what utilities already have in place. Thank you.

MR. SINAI: Great. Thank you, Jason. So we're going to turn to the question-and-answer piece of this panel. Please feel free to pass your questions written on the cards. If you could also put your name on it, that would be great. And we'll also be taking questions online.

I'll kick it off with a question and then would love to get the rest of the FCC staff involved. Let's start with commercial networks because, to date, this has mostly been a private network and most utilities have looked at doing this mostly private licensed and private unlicensed. What's wrong with commercial networks? What's right with them? What are the benefits? And I know this depends on application, so let's focus on meters, because everybody knows and understands Smart Meters, at least as the initial application we chat about.

I'll just turn it over -- I don't know if, Eric or Dean, if there's an official government position on this.

SPEAKER: No, there's not.

MR. SINAI: Maybe we should just turn it over. I mean, we have a great dichotomy here between Eric and Henry, and so it'd be great to hear a little bit more about why you think commercial networks may not work, Eric, and then Henry, why you're seeing some success there.

MR. MILLER: Okay, sure. First of all, I mentioned -- actually, at Trilliant, we actually offer digital cellular modems that go in electric meters, primarily commercial industrial meters, and have for many years, so we have a lot of experience. And also a number of -- some of our AMI networks used digital cellular backhaul in some cases in the field today, so we have a lot of experience with it. And I would say, first of all, I think where it works at an individual meter, in an individual location, and if you have coverage, I think it actually works just fine. There's no problem with that at all.

I'd say where we have challenges with it is when you start to backhaul 1,000, 2,000, 3,000 meters trying to get onto a single cellular line. We find, quite frankly, that there just isn't the bandwidth there to move the amount of data by the time you concentrate several thousand meters.

And with networks, that's the way you achieve the economies and the complete coverage is by relying on a network that you can mesh out into those obscure -- into those more rural areas where you may not have cellular. And there we feel that we just -- we need more bandwidth and we need more -- and lower latency. The other thing is, we don't really find that we get the latency, that round-trip time that we need to really provide a true interactive performance. So, I think in certain areas it's good.

If you happen to have a -- there may be areas where it can fill a coverage gap, you know, or an individual home, or you happen to have coverage and nothing else around.

So I think it absolutely has its place. But in terms of the broad -- we don't, at this point, see the economics there to put it in every single thermostat and every single meter everywhere, and we don't see the bandwidth to sort of do that backhaul, that broadband backhaul layer that I talked about earlier.

MR. JONES: Okay, so obviously I have a slightly different opinion. I'm clearly a public wireless advocate for those of you who aren't paying attention, but there are three things I like to point out.

The first is cost. As of some new announcements that were made by public carriers earlier this year, there is cost parity between connecting each meter, individually, directly, the same way that my iPhone connects to the public utility as any other alternative in the space. The costs are all the same. So, the economics are there to connect directly, and on top of that you get security and so forth. It's pretty clear that these networks are quite capable. If the city of Manhattan can all get online and check their stocks and their sports scores and so forth, it's really not an issue of bandwidth and so forth on an individual device perspective. So cost is at par.

I should point out that cost is at par today and those networks get 1,000 times as much per kilobyte transferred for Smart Grid as they do per kilobyte transferred from my iPhone. Let me repeat that. It's 1,000 -- they get 1,000 times more per kilobyte for their Smart Grid traffic than they get for their iPhone traffic. So they have some wiggle room on their economics to go further south in the future.

So, the cost, bandwidth are taken care of, but I think the really important thing is emphasis. I had the mixed blessing of having a front row seat, because SmartSynch is based in Jackson, Mississippi, of the aftermath of Hurricane Katrina. The people at the Emergency Management Center did not care about the utility Smart Grid network. They care about this network because the doctors, the nurses, the gas truck drivers, the cops, the firemen, all the first responders, they all needed this network up. This is the network that people care about running every single day all the time. So having a separate network -- if they'd been told at Emergency Management System, well, we're going to have to focus on getting our network up first, that wouldn't have gone anywhere. And so when we think about how to work together as telecom and as electric utilities, the right solution is to work together to make sure that these network towers get electricity as soon as possible and that those telecom companies know where that 5 percent of the coverage area is that's not covered and they can work together with the utility to make sure that they get 100 percent coverage, and that wherever that utility needs to go, because it's a meter read or because it's a natural disaster, they're all using the network that everybody's counting on having available.

MR. SINAI: So, who's right, Dean?

MR. PROCHASKA: I think everyone's right. You know, again, I think it -- as I had indicated earlier, we have a priority action plan that NIST is sponsoring right now working with the Smart Grid community in defining what are the wireless communication needs for Smart Grid, and basically it would turn out to be a user guide. It wouldn't be something that there would be a standard for, but it would be a user guide for utility or whomever in the Smart Grid community to say what kind of technology should I deploy for this specific application? And as part of that effort, we'll have utility companies, transmission providers, you have distribution, bulk power generation folks involved and engaged in that. So, I think we'll get a real fair assessment of what are the requirements, and, again, it's going to differ by application. And then at the end of the day, it's really going to be up to the person deploying or utilizing these technologies. Do they want to deploy a new network or, you know, what's going to be more economical for them?

So I think that it's going to end up being a mixed bag, but I will say coming from 25 years in telecom and most -- a big hunk of that in the wireless, I mean, you know, why -- if the wheel is invented already, I'm not sure why you'd want to reinvent it, but there could be some cases as we go through this priority action plan that would say there are some latency requirements that we cannot meet with commercial networks.

But again, there's control centers

you've seen already. These are the security experts. But again, at the end of the day, it's going to be up to the individual distribution company or whoever will be using these.

MR. SINAI: Great. And Jason, you're the customer, so you probably have a perspective on the utility and the challenges of public networks.

MR. GRIFFITH: Yeah, I do. And AEP being very much a rural electric provider, you know, we have some urban areas, but a lot of rural areas, I do have a position. I agree with some of what Henry is saying. AEP is open to commercial services. We buy a lot of commercial services today both landline and wireless and we use it for a lot of applications. Certainly if we're talking about AMI meter reading, if the coverage is there, certainly that would be our first choice. When you talk about cost, we also believe that we're just a small bit of data that's riding on the commercial network. However, our experience has been when we go out for RFP and we bid these systems, the ones I talked about, Texas, the one in South Bend that's deployed, and, of course, the one at AEP Ohio, is our experience has been is they cannot get to that cost that makes it cost-effective. When we compare it to RF Mesh or other type solutions, they have yet to get it down to where it's desirable. So cost is still an issue as far as we're concerned.

The coverage issue is a much bigger issue. And I beg to differ, I don't believe he's been very many places with his BlackBerry on the AEP service territory other than maybe the travel routes and the major cities. There's many areas in AEP service territory that you will not get cellular coverage -- 2G and 3G -- if you get off in the areas where we have substations, electric transmission lines, distribution lines. And because of that, AEP today still owns and operates an extensive microwave system as well as a travel wireless network.

MR. SINAI: So how does that change as LTE and WiMAX and other technologies -- does that mean that you can reach more rural customers with public networks or does it mean that you'll always have a subsection being on private?

MR. GRIFFITH: Well, I think there's been a lot of progress in the last few years. You know, if you look at features (inaudible) perspective, the land mobile radio as well as hardening of the sites, the commercial providers have been pushed to improve their systems for public safety. Some providers have done better than others. With respect to LTE or WiMAX, I don't really see that changing the things going forward. If we don't have coverage today with 3G technology, what makes us think that we're going to have coverage with LTE or 4G in the future? The business case is just not going to be there for commercial providers to provide that in those areas.

MR. SINAI: Great. Well, maybe some of my colleagues can jump in. I have lots of questions, but why don't you jump in, John?

DR. PEHA: To a couple of you, I guess

Henry Jones gave a number -- I'm an engineer; I like numbers -- 0.0002 percent increase in AT&T's network traffic if all AMI traffic is carried. I'm guessing, and correct me if I'm wrong, that that's traffic on the backbone. But if you've done that calculation you could probably also comment on what kind of traffic loads that puts, say, in the last mile where I might be a little more nervous about congestion problems and I'd ask if it's really so small. On the other side, Eric Miller also had a number, which I like, that your example was if you announce a price that would increase the amount of data traffic -- I think by two orders of magnitude, so, again, you must have figured this out -- I'm thinking, I don't know, 500,000 bytes per household over minutes or an hour, you know. On the other hand, is that really so much traffic? Where would I expect congestion -- would I expect congestion from that?

MR. JONES: I'll go first.

MR. MILLER: Okay.

MR. JONES: So, you know, one of -- the

root number that you can start using for your calculations is that for daily 15-minute interval reads for residential meters it's about 30 kilobytes per month. It's about a kilobyte a day. When you think about it, you're just talking about a few numbers; it just isn't that much data. So, that's a kilobyte a day we know that a standard -- if you pull down CNN.com on your iPhone, that's going to be substantially more than that. It's going to be possibly half a meg, at least somewhere along the 50 kilobytes to 100 kilobytes just in a few seconds. So, looking at -- for one web page, what we're talking about for one meter in a month, so the amount of available bandwidth, even at the last mile, there's not much of a challenge.

So, I can work more numbers if you want, I just -- that's the kind of root number to start working from.

MR. MILLER: Yeah, I think if you are talking just about metering, I think we all agree, the basic meter data isn't a lot of traffic. It really becomes when you start having interactivity with customers and when you start looking at, again, things like video feeds on the grid, it's really the non-metering applications that really drive the bandwidth. That's what's, I think, categorically different then when we start talking Smart Grid versus advanced metering. You add these whole classes of users that have much more demanding latency and much more demanding bandwidth requirements.

So we see -- you know, at the home, I don't think -- we're not talking about megabits at the home. I think relatively modest capacity at an individual home is going to be fine. Again, what comes -- again, just to agree with AEP, we don't see complete coverage at the home in a way that we could build a complete coverage network, which our utilities ask us to do one at a time that way and, at this point, either economically. And so with (inaudible), again, in a backhaul, you end up aggregating those meters. You really do get megabits. You do start to see constraints on capacity and you see constraints on locations once again in terms of even for backhaul, you don't necessarily have coverage where you need it in order to be able to provide that capability. And I would say I don't want to throw too many stones because, I mean, there's a lot of good things about that technology, but I would say in our production AMI networks we have out there today, the majority of our outages come from the public cellular network, and that is where 9 out of 10 times we miss data, it gets lost in that network. And I'm not saying they're unreliable. Our customers have very, very high expectations for reliability, but that is, when we track it down, typically what happens and there's not much we can do about it because it just kind of disappears into an ether we can't -- it's hard to engineer around that the way we can if we put in a dedicated network.

MS. GUENDELSBERGER: This morning, actually, we had a panel on the public safety broadband and the requirements. It sounds like whatever they were talking about in terms of security, liability, coverage, and survivability, I am hearing the same theme during this panel.

If the issues are similar, are the solutions similar? And if we are looking into public safety broadband network needs while you are looking at Smart Grid needs, are there any cross work going on or the solutions, you think, will be somehow similar or different?

MR. MILLER: I'll comment. I think that they're different, actually, because there's two -- one of the critical differences between a utility application and almost any of the others is the difference around mobility. I mean, not that utilities don't have mobility need, but when you're talking about connecting grid assets and meters and things, you need, in some cases, more capacity, but you can take advantage of the fact that they don't move around. You know, if you need to hit the meter in a building, you don't have to have coverage in the parking lot, you just need to be able to provide conductivity to that meter. And what that means is you can give -- if you have technology that can take advantage of that, you can provide much greater capacity at a fraction of the cost versus mobility technologies are great for mobility because they provide coverage over an entire area, but that's not the problem utilities face. Utilities need to get coverage everywhere they need it, but if there's an open field, they don't have to provide coverage there. And so that -- there's a tremendous amount of -- there's an opportunity to really take advantage of that difference between the two applications and deliver much more performance at a much lower price point if you have technologies that are truly adapted to the utility marketplace and the utility business drivers. And we see the challenges with LTE or these others is they're fantastic for mobility, but that's not exactly the problem utilities have.

MR. GRIFFITH: I think with utility you have multiple systems we're talking about. You have the systems that are the last mile that we're talking about for the gridSMART and then you have backhaul systems. When I look at deploying a system from a utilities perspective and I want to minimize the cost and the cost to the rate payer, the ideal situation would be that I'm using the same system to provide SCADA connectivity to the substations. I'm using the same system to do mobile data, to talk with my field workforce, which would be mobility. Similar, very, very similar, to what public safety would require, not so much in building coverage, but certainly within the fields, in the parking lots. And then we have the fixed coverage that we would need, which would be substations, meters, et cetera.

You know, ideally, the ideal situation would be that we would run that on one network. That's what we'd like to be able to do. To date, we have a system that we do just land mobile radio on and we're looking for solutions and opportunities as we build out the Smart Grid. You know, we operate very extensive microwave systems, we lease a lot of circuits from the carriers, AT&T, Verizon, others. So, I think, as much as we can, we now need to pull that, certainly from a backhaul perspective, and utilize one network, if we can, to bring those services and applications back in to the home offices.

MR. SINAI: We've been talking a lot about wireless technologies, both unlicensed deployments and using public carriers. What about wired assets? Utilities have some fiber and some wired assets sometimes and there's a commercial broadband network out there as well that people serve. Are those viable alternatives for any applications?

MR. GRIFFITH: Yes, we do use them today both owned and commercial from a backhaul perspective.

MR. MILLER: Mark?

MR. DUDZINSKI: That's used in metering, it's used in protection. Wired, hard-wired fiber assets are very commonly used where you need some deterministic solution for doing grid control. So today, you have a mix of solutions, really, is what's going on. AEP is a great example because it's so big and broad, but even a small utility today is very likely to have a set of wireless and wired and fiber solutions to get, you know, sort of that curve of bandwidth versus determinism accomplished.

MR. SINAI: Great. Now, GE makes a lot of windmills --

MR. DUDZINSKI: A tremendous number of wind turbines, yeah.

MR. SINAI: Wind turbines. Are we going to have fiber to the wind turbines? I mean, do we -- to integrate these renewables do we need to have a lot of broadband to them?

MR. DUDZINSKI: They're -- yes. The wind farms today already have control systems that are tied back to generation dispatch centers, to the ISOs that run the grid, and those are done either wireless or by fiber. There's large amounts of data that's coming in terms of what the anticipated electrical delivery from that wind farm is every 15 minutes. It's a -- actually, this is an important point, I think. When we just talked about meters we sort of missed the idea on what bandwidth is really required here because it's not actually an average bandwidth that worries you in terms of running the grid. The grid runs in 15-minute intervals, is scheduled at 15-minute intervals. So if you want to go and understand what the load is doing, and let's say you decide to do it by looking at the meters and you have a million meters, what it means is you need to read a million meters. You need to do some kind of calculation. And if you want to control a million load points, you need to send out signals to a million houses if you have a million under control. I mean, that's sort of the worse-case example, but what it sort of means is that you have a narrow window of time when you need a lot of bandwidth to get a lot of data through, and then another narrow window of time where you need a lot of bandwidth to send a lot of data out, and in the middle, you've got a process. And so, I think to -- if you just want to collect meter data, it's relatively simple, but if you want to progress to the point where you have distributed generation, rooftop -- you know, millions of rooftop solar deployments, millions of endpoints of the demand reduction capability, then you sort of have this bandwidth problem, which is magnified from where we are today and gets harder to solve by just integrating the pieces that we have today.

MR. SINAI: What about electric vehicles? I would be interested in your perspective, Mark, and certainly yours, Joby, on how electric vehicles change the communication complexities with the grid and as it relates to bandwidth and security and privacy.

MR. DUDZINSKI: I think for electric vehicles there's definitely a timeframe over which you need to think, okay? So GE makes -- invests in companies that makes batteries. We're building a new battery factor -- for full disclosure here -- in New York, and batteries don't like to be too discharged or too charged. They like to operate in this medium range. And because of that, actually, it's unlikely from talking to the car manufacturers that they're actually going to give the utility the ability to discharge the batteries any time in the future because of the warranty implications.

So, what you're seeing now is the start, maybe for years or so, the control around charging vehicles will be when you charge, not if you discharge, but when do you charge. And there's two different studies here, one by NETL, one by Duke. And what they show is that if you don't want to give up all the benefits of electric vehicles in terms of building more infrastructure and greenhouse gas emissions, you need to charge at night. So, to charge at night, you can do it in many different ways, but it sort of is going to drive us toward demand -- we think demand time, demand use, time use, metering, so that you give some kind of incentive to people that charge at night or you penalize them during the day. But there's going to be some kind of mechanism here, we think, because it's a compelling argument they'll only charge at night.

The discharge part is farther into the future and it's unclear, actually, the timing and when the car companies would actually let you have access to that battery because of the warranty implications.

MR. SINAI: Joby?

MR. LAFKY: A couple points there. I completely agree that no one's going to be discharging their car battery back into grid in the foreseeable future. It's not just that you have to stay between 20 and 80 percent to prolong cell life. It's that however you manage the battery packs, they have a limited number of cycles. And the car companies, in my experience, will do anything they need to do to keep the cells from cycling without the odometer advancing. They're on the razor's edge of balancing their warranty commitments with the life of the battery and anything anybody does, something that wears out the battery without advancing towards the termination of the warranty, it's bad for them. And that's really -- I think it's off the road map of most people's planning for this thing. I completely agree.

However, the vast majority of the benefits you can provide to a utility are achievable without actually performing a discharge. To pick the example of frequency regulation, which is balancing the real-time production and consumption of electricity on the grid, if you had a population of electric vehicles that were all consuming electricity at 80 percent of their peak capacity, we're pulling power off the grid at 80 percent of the maximum their charge equipment was capable of performing, you could perform what's called a down regulation request against these cars and order all of them to increase power consumption, which would have the effect of sopping up surplus electricity that only existed on the grid in that moment.

Conversely, you could order all of the cars to decrease their charging rate and perform the equivalent of up regulation. You've -- when you do that, you've created the appearance that you've generated electricity from a utilities management system, but you haven't actually pulled any power out of the cars. And if you have -- I'm repeating myself a little bit from earlier -- if you have deep visibility into the characteristic of the battery, the state of charge in the battery and the user's behavior patterns, you can provide this. You can have them be charging at 80 percent instead of 100 percent so that you have that flexibility without inconveniencing them in any way, without having them sign up for, oh, I can't drive between these hours, or something like that.

To address the point of time of use charging, that is a far more tricky topic than just shifting to charging at night. We've talked to a bunch of utility customers and some of them, absolutely. Like, boy, as much charging as you can move to between 10 p.m. and 5 a.m. or something like that, that's what we want. Power is effectively free for us between these hours.

Let's move all the charging then and we're happy.

Other utility customers, just depending on the generation stack in their particular market, they've turned so much stuff off at night that they don't actually have much surplus capacity and they're happy to have done this turn off. It is economically advantageous to them to stick to this "almost all the generation assets are turned off" policy in the middle of the night. And it's actually cheaper for them to charge electric vehicles on the shoulder, to charge them in the sort of late evening where the critical peak -- that's the wrong word, but where the worst peak has gone away because people have turned off their TVs and office buildings are shutting down, but they haven't gotten to the point where they're actually powering down a bunch of base load yet.

And in Seattle, a percentage of the time, as they miscalculate and misschedule, the price of electricity goes negative for a little while sometimes on the shoulder, sometimes in the middle of the night. It's such a complex problem to pick when the cheapest time is to charge and it's such a changing equation of when the cheapest time is to charge, even within a particular utility service territory, that we believe the right answer is real-time control; that the customer, in most circumstances, delegates to the utility, you know, I need my car to be charged by 5 a.m. or 6 a.m. I need it to be fully charged. I need 20 percent of my capacity within an hour in case I want to run out to the store right after I get home, but beyond that, you decide. And that produces the maximum financial benefit to the utility, which means the utility has the maximum incentive to provide back to the user, but without ever pulling power out of the battery.

MR. SINAI: Okay, one comment.

MR. PROCHASKA: Just one comment, Nick. I think you were asking a little bit about the communication needs with the electric vehicles, and kind of what I've heard, up to this point, you look at kind of the peak loads of the day for the electric power generators, so people are going to be charging later in the evening and they're plug vehicle is what I'm hearing. And in terms of a communication demand -- so if that constant communication back and forth of when to charge my vehicle and when to back down a little bit, it sounds like all of that's going to be happening kind of later at night. So just like there are peak usage periods for power generation, likewise the same is true with telecommunication networks. So their busy hour typically would be in the morning and now it's kind of at noon and in the evening, like rush hour, but late at night, there's going to be a lot of excess capacity, so I just wanted to point that out, and back to your question in terms of communication impacts.

MR. SINAI: Great.

MR. CROWELL: I think that's true. I've just got a couple comments. I think, Joby, you're right on when utilities elect to charge. It's only true as long as the penetration of electric vehicles is low. As soon as the penetration starts to rise where it becomes appreciable part of the energy consumption, the utilities, if you look at NETLs study, I mean, basically they've got it charged throughout the night to meet the load requirement.

And then my other comment here is doing frequency regulation or these ancillary services requires communication in a very short timeframe. These are millisecond adjustments in the grid and the generation amount on the grid to keep the frequency and voltage from fluctuating too much. And so these are -- the command and control needs to be very quick, you know, almost deterministic in terms of the amount of time you have. So it's correct you can do it, but you need a bandwidth suitable to give you that surety that you get the command out there and get it executed in the time that's allowed and necessary.

MR. SINAI: Great. Why don't we have a call-in jump in?

MR. CROWELL: I have a couple of observations and then I'd ask you to comment on them. You know, as we go through this process, and obviously we're, I guess, just past the midway mark through these workshops on various subjects here, and we contemplate the next several weeks and months in crafting a National Broadband Plan to deliver to Congress, when we look at broadband issues historically, we typically look at what I refer to as unserved areas and underserved areas. And unserved areas are generally easily understood because those are areas of the country which do not have broadband today. Underserved areas can be thought of as underserved geographically: Part of the geographic area has some deployment, but it's not ubiquitous. It might be underserved with respect to speed, so it might have some broadband, but it's a relatively low speed. It might be underserved with respect to adoption and subscription rates for various factors due to socioeconomic issues, affordability, computer literacy, so on and so forth. So if we can keep in mind unserved areas and underserved areas, and our charge of coming up with a National Broadband Plan, it strikes me one of the interesting things about the Smart Grid, if you go to the grid itself and you go to the transmission and the generation side of the equation, it typically comes in areas of the country that are highly rural. In other words, the long transmission lines go through rural areas, the solar farms are generally in rural areas. I know, perhaps with the exception of Cape Wind, you know, the wind turbines generally show up in more rural areas of the country. And it just strikes me that to the extent to which there's a high broadband need, perhaps, from those generation sites in those rural areas, that there is a sort of a virtuous coalescence of the needs of the electric generation mission with the broadband deployment mission in those areas that might be beneficial to a national plan.

When looking at underserved areas and you look at those areas of the country largely urban and suburban American where speeds might lack, and as we talked about various people mentioned how critical bandwidth will be even for the smart home of the future, and if you look at the applications just over the horizon, the bandwidth needs will be greater at people's residences and small businesses. Those underserved areas that lack on subscription and adoption and deployment of higher speeds, one of the things that it strikes me from a consumer standpoint, there are obvious benefits to the Smart Grid for consumers: Managing their electric bills, lowering their costs if they manage it well, the benefit of applications. But because it's so broadband-dependent, if you don't get broadband, it's sort of a double whammy because you don't get the benefits of broadband and you're not getting the benefits of the Smart Grid either. And if you're in a rural area where you don't get the deployment, where 4G networks perhaps might not go otherwise, where 2G and 3G haven't yet reached, or you're in an underserved area in urban/suburban areas, you're missing out on two revolutions simultaneously.

And so as we look at the National

Broadband Plan, I would just ask if people could just comment on that and just comment a bit on what the impact would be of greater broadband adoption and affordability and bandwidth on Smart Grid adoption and accelerating innovation in the electric market.

MR. LAFKY: I couldn't agree more. If we had dependable broadband penetration to the same rates that we have home telephone penetration, then people building load management systems could reasonably implement load management on top of public broadband. People get a little anxious about building something that grid reliability is going to depend upon on top of consumer broadband, but the truth is that if you have 600,000 subscribers who are being load managed over their, you know, in-house Ethernet, it's fine if 2 percent of them mess up and unplug the wrong cable and take their devices off the network. You just overdrive the remaining 98 percent by a few percentage points.

But with the huge swaths of the country

that have cars and are going to keep buying cars, to use my little piece of the world as an example, but don't have broadband, don't have meaningful penetration rates if broadband were forced to consider other approaches that are a lot more expensive, it would drastically change my business if everyone in rural America had ready access to cheap broadband in their home.

MR. SINAI: Great. I want to make sure that -- please, Mark.

MR. DUDZINSKI: So we, you know, we sort of recognize the idea that a telco and a utility could actually get married here around the broadband space and it could be a marriage that happens now because of the state of deployment of broadband in a lot of the rural communities. You know, the utilities own a lot of vertical assets and telcos can actually use those vertical assets for deploying broadband technologies. And that marriage is something we've actually been trying to make happen in the marketplace, but it's not so easy. But as a marriage, it clearly would work.

It would let utilities and telcos share in some way the cost of deployment. It would bring the benefit of not only the Smart Grid to the homes of the rural communities and broadband, but it also enables you to put a lot more generation on the farms, okay, to let farmers have biomass generation, wind generation, solar generation, gas, landfill gas, all the kinds of renewable kinds of generation we're talking about, that kind of infrastructure would enable a utility to manage those distributed generation assets like they can't do today.

And so it's actually, I think, the three pieces. You get broadband, you get the broadband service, you potentially get broadband to the home for the consumer to manage electricity better, but you also enable this renewable generation in the distributed grid which today, for the most part, we don't do. We tie renewables to transmission in general. It's not ubiquitous in distribution. Okay, so I think you get all three if we can figure out how to make it work.

MR. SINAI: Make sure -- Juli, I wanted to give you the last question. We're running out of time here.

MR. KNAPP: No, I would just build upon some of the questions that we had already. I think as we think about the National Broadband Strategy, and -- it would be very helpful to get feedback as to what are the most important things for us to think about and do? Is it making sure that we get broadband out into the rural areas? To make sure that people have access everywhere? Does it help a lot if we've got a Smart Grid, but only half the people have access?

So, I guess, any reactions you might have now or we've been at times handing out homework assignments to some of the panels to get back to us with what are the specific things that we should be most focused on as we look at developing a national strategy?

MR. LIGHTNER: Well, let me just say that, you know, someone we don't have represented here are the rural co-ops and they would say, if they were here, that there's -- going back to the previous question as well, that there's a lot of applications, a lot of Smart Grid functionality that you can implement, actually, with a Dumb Grid, is what they would say. So, there's a lot of home energy management solutions you can implement without having broadband to the home.

So, I think, you know, you've really got to think about how best to -- what's going to be the most cost- effective thing to do? I think this is something that the regulators in each state will struggle with as far as cost recovery, that there's a lot of applications I think they feel they can take advantage of now without adding a large amount of cost to the equation. But, again, there are certain applications that require a lot of data that you won't be able to take advantage of unless you have some sort of broadband connection. Like, for example, one of the things that wasn't mentioned here was, and I think this is on the mind of every regulator in every state, is that is it enabling a higher penetration of renewables? You know, right now we have a lot of portfolio standards that call for anywhere from 10 to 20 percent of renewables by such a date, and I think without Smart Grid and a lot of broadband communication that you won't be able to get to those higher penetration rates because really what you're looking at is balancing in real-time loads, like plug-in hybrid cars and other loads, to really raise that level of renewable penetration that you'll be able to support.

MR. DUDZINSKI: So I actually think that there's a lot of benefit that you can calculate about deploying broadband more ubiquitously here. You can go and actually look at how much grid efficiency we could deliver if we had better communications. You can look, as Eric said, how much more renewables could we put in the grid if we had better communications? You know, you can calculate an emissions reduction because of these things, right? We can calculate a consumer benefit in terms of lower energy costs because of these things.

So, I actually think there's a monetary return based on -- to the country based on how you decide to act and how you decide to allocate bandwidth here. And I think we could give you a list of ideas and places where you could go and actually make an economic analysis and get a better understanding of really the impact to the communities here.

MR. SINAI: Great. Well, that's a great place to wrap up. We're looking forward to continuing the dialogue. I'd say this is just the tip of the iceberg really because these are the kinds of conversations that we want to continue to have with all types of constituencies.

(Recess)

MR. SINAI: All right, let's get started. The second panel is "Broadband and Climate Change," and we have a number of great panelists and interesting technologies that we'll learn about that can help fight climate change, from videoconferencing to telecommuting, smart transportation, green telecom, and green IT. And here at the task force, as Blair Levin says, we eat our own dog food.

So we are -- we have a panelist who, rather than flying in and harming the environment, is showing up via hi- def videoconferencing. So we're going to start with Chris Walker, actually, who's the former director for The Climate Group.

MR. WALKER: Thank you, Nick. It's interesting, obviously you don't have someone here that represented a group called The Climate Group and not actually talk a little bit about climate change. So, you know, there's an overarching need for speed, and what I mean by that is that there is a -- I'm on a task force right now for the National Academy of Science and it's called "America's Climate Choices" in the report. It's congressionally mandated and will come out in January. And it's been interesting to -- not being a scientist myself, being in the discussions because the dire state of the science on climate change, it's quite a depressing group if you talk to a group of climatologists right now.

So there's certainly a need to speed to get the technologies out there as fast as possible. So I just wanted to throw out that temporal component there that we need to act and we need to act in a large scale and we need to act soon.

I was asked to comment on the Smart 2020 report which The Climate Group and GeSI, which is the Global E Sustainability Initiative, which is a group consortium of ICT -- information, communications, and technology -- companies had put together and that was released last November, but I was specifically asked to talk about the U.S. supplement on it. Both of these can be found on a website called Smart2020.

The idea of the report was to serve up a quantification of the potential -- you can go to the next slide -- a quantification of the potential for the ICT industry to play a role in reducing emissions, and just the point was not to be about the ICT industry's own footprint. Most certainly, that's important. It's actually dramatically growing. It's about 6 percent per annum, a growth rate on (inaudible) emissions. But basically today it's about 2 percent of global emissions and, by 2020, it's projected to be about 3 percent. But this is about the other 97, 98 percent of emissions. And the findings were that an increased ICT use in the U.S. could potentially cut annual C02 emissions between 13 and 22 percent and that would save annually about $140 billion to $240 billion on fuel and energy costs.

Now, just to put that 13 to 22 percent in perspective, if you look at Waxman Markey, they're looking at, for instance, about a 20 percent cut in emissions by 2020. And what China, for instance, is saying before even China will come to the table, it's requiring a 40 percent cut in emissions by 2020. So this would be a great place to start, in a sense, because this is the low hanging fruit if you look at the McKinsey cost curves, et cetera, it's about the energy efficiency side.

And what do we know? Broadband can play a greater role in facilitating energy efficiency. As I mentioned, there's this temporal requirement. We need to do this timely, we need to do this in an accelerated fashion, probably unmatched by any other type of technology deployment we've ever done. There are all sorts of analogies to the cellular growth in the '90s or the Internet growth, et cetera. Probably need to do it even much faster than that to actually have the required impact that it would need.

And we need to develop the measurement tools, the mechanisms, because how do you actually account for an avoided emission. Right? It's very hard to quantify and deliver and so it's something that needs to be thought through. Next slide, please.

So the report ID'ed four main ICT opportunities for the U.S. and as you can see here on the chart, it's the Smart Grid, it's the road transportation, it's the smart buildings, and travel substitution.

Now the global report, the Smart 2020 global report, added to others that BCG when they did the U.S. Supplement decided to leave out because they weren't as significant in the U.S. as they were in other parts of the world, and that was logistics and machinery.

And you can see just by the numbers here, huge potential, numbers of potential savings, between 140- to $240 billion annually. For the Smart Grid it's 15- to $35 billion; road transportation, 65- to $115 billion; Smart buildings, 40- to $60 billion; and total travel/transportation, between 20- and 40. And the idea is, just to give you some examples, for instance, on the smart transportation, there was -- UPS is well publicized for its "no left turns," for instance, initiative, right, where it uses GPS technology to map out routes well in advance so that drivers don't have to make left turns, which actually consume a lot more fuel. And so by mapping out these routes, UPS saved 28.5 million miles annually, which results in roughly 3 million gallons of gas and C02 emissions reductions of 31,000 metric tons just by not making left turns and planning out its routes in advance before the drivers get in the trucks and deliver.

So just -- I see actually I'm running out of time so I won't go through other examples; we can talk about them.

But in the report it actually highlights a lot of these examples of how different companies have acted and move forward on some initiatives where the ICT industry with existing technology could play a role. Next slide, please.

And actually I just wanted to address, these were actually recommendations on a policy basis that the report makes, but I wanted to actually address a question that Colin had asked. Greater broadband adaptation, what effect would that have on emissions? Well, the effect would be we won't get anywhere near this potential of the 22 percent if we don't have greater broadband penetration, so that's the 10 million or so homes that do not have access to broadband currently as well as the 40 million or so homes that have decided not to play or participate, so to speak. So the underserved and unserved markets would have a great effect on potential emissions and right now that would be -- we would keep this more in the 13 percent realm if they were not to play.

And I'll stop there. Thank you.

MR. SINAI: Great. Thank you. Next we have Sheryl Wilkerson, who's president of Willow, LLC, and formerly of the FCC.

MS. WILKERSON: Thank you. First, I'd like to commend the chairman and the FCC commissioners and staff on holding this wonderful series of broadband workshops. And it's nice to be back and it's nice to be able to participate today.

I was asked to provide some brief remarks on the increasing role of vehicle communications, particularly intelligent transportation, and also vehicle communications as it pertains to electric vehicles. Slide two, please.

First, as the FCC drafts it's Nationwide Broadband Strategy, I encourage it to take into consideration the future needs for deploying a nationwide interoperable network that will allow vehicle safety applications to provide data both to and from vehicles, but also from vehicles to roadside initiatives. It's clear that there are some significant benefits that can be had from these applications, including safety, mobility, environmental, and also some convenience applications.

Second, I'd like to emphasize the important role that vehicle communications will play with respect to driving the demand and interest in purchasing electric vehicles, particularly with respect to the variety of data, voice, and mileage use applications. Slide three, please.

I believe there's a need for a public/private partnership, we've heard that before, to help deploy a number of the applications that have already been created and established by a number of companies in the ITS sector, but they still have yet to be deployed. It will require collaboration with agencies like the FCC, but also the Department of Transportation and also telecommunications carriers and, of course, the vehicle manufacturers. It will require some harmonization with the state and local governments regarding their unique procurement and practice policies. And most of all it will also depend a lot on the variety of technologies depending on the specific conditions and requirements of our public rights of ways and interstate corridors. But nevertheless, I think our interstate highways are ideally suited to foster deployment in this area. Slide four, please.

The Department of Transportation, I wanted to point out that they have an initiative underway called the IntelliDrive Initiative, and basically it's a revamp of what was called the Vehicle Integration Infrastructure Initiative.

And what's important about this is that

the goal here is to provide a transportation system that provides a fully connected driving environment utilizing a host of advanced communications, including dedicated short-range communications. And one of the important aspects of this is that they're looking at a wireless networked environment. It will include DSRC, but it will also include some other advanced services. There are a number of trade associations, like ITS America and consortiums such as Omni Air, that are looking to foster deployment of these applications. Slide five.

This isn't new to the FCC. The FCC allocated, almost 10 years ago to date, 75 megahertz in the 5.9 gigahertz spectrum. And since then there have been an enormous number of safety and mobility applications that have had a number of test trials and concept tests through various states that can show huge benefits in the capture of real- time data to improve traffic incidents, vehicle crash avoidance and intersection collision, but a number of applications to reduce air pollution and to reduce our conservation of fossil fuels. Slide six, please.

Again, I believe there needs to be a qualified operator that has yet to be determined or some form of private partnership that will help facilitate and build off this network with favorable terms. I'd like to point out, too, that what's going on abroad in both the European Union and the FCC, they have both allocated 5.9 for dedicated short-range and ITS applications and in Japan, they've allocated 5.8 as well as 700 megahertz.

I'm running out of time here, but the remainder of the slides, slides 7 through 12, show how vehicle communications can make electric vehicles more attractive by providing -- helping us provide data services such as a remote battery monitoring and range determinations. There's the ability to push the usage from the vehicles to the driver. There will be applications that potentially will prompt the drivers how to take advantage of their electric vehicles by possibly even adjusting the accelerator or giving them specific information about the nature of the road conditions.

I think that's it. Thank you.

MR. SINAI: Great. Thank you very much, Sheryl. Next we'll hear from Matt Bauer from BetterWorld Telecom.

MR. BAUER: Thanks, Nick. BetterWorld Telecom is -- well, what I'll do is I'll talk about BetterWorld for about a minute and then the larger opportunity that we see the telecom industry and community in general has in terms of an opportunity to really reduce carbon footprint and the cost structure of businesses and nonprofits.

BetterWorld Telecom is the leading, triple bottom line carrier in the U.S. focused on organizations that have a social and environmental mission. Our solutions encompass all the business carrier grade products from local through to MPLS services and we put that all on one bill and give the business or nonprofit one number to call, so it's a very close relationship with them. Next slide. I'm thinking to myself, go down a couple -- and to the next one.

And woven into our company and everything we do, our environmental impact plan. You'll see a number of the points here. It starts with our efficient corporate design and our low carbon footprint, everything from paper reduction, where less than 20 percent of our customers now receive paper bills, to greening our supply chain. We're the first carbon-neutral telecom carrier in the U.S., or probably North America, certified by a number of other entities as well. We've been focused on green communications solutions, and I'll talk about that in sort of the second half, and that translates on the next slide to our customer base, which have really been a lot of organizations that have taught us the important parts of the environmental and social debate that's going on in the U.S. and in the world today.

So, I'd like to expand that on the next slide then to a book that I recently read called Human Scale, and a perfect quote for today's discussion, "The madness of American transportation leads to only one conclusion: No solution of the transportation puzzle is possible until work and home can be put back together." So it's difficult to, on the next slide, to imagine bridging that gap physically right now, but virtually, we have a great opportunity in front of this.

And this slide demonstrates really a problem and opportunity and some of the numbers are commensurate with what Chris said earlier. Seventy-five percent of the carbon output of the U.S. right now is through buildings and transportation and about 2 to 2.5 percent of the global -- down in the lower left portion of the screen -- of the global footprint is ICT, and that 97.5 percent is really the opportunity for us as an industry, as a telecom industry, to attack that 75 percent. Next slide.

So what has to happen is substitution must occur in the areas of transportation and buildings and travel and so on. And the World Wildlife Fund issued a report a few months ago that goes even more aggressively than the GESI report in saying that if we adopt significant telecommuting and virtual meeting practices within the next 30 years, we can reduce the carbon footprint of the U.S. by 30 percent -- I'm sorry, by 50 percent. And the next slide shows a graph of how that occurs.

Now, this is very busy. The one that goes the highest and the highest trajectory, you can see in the blue, is if we just continue on as we are today. And if we adopt greater telecommuting practices, we're able to cut the carbon footprint in half. And on the next slide it shows the same as far as for air travel. And the impacts are huge because you're physically removing elements out of the equation. And right now about 3 percent of the U.S. workforce telecommutes a majority of their time. If that went to 40 percent, we're talking about 453 million barrels of oil a year, 150,000 people a year that avoid accidents or death through collisions, total economic benefit of $800 billion. Next slide -- sorry, we missed a slide. There it is. So take my word.

Then the next slide is -- this is a good news slide -- everything is there today. We don't have to invent anything, we don't have to build anything, we don't have to create anything. This is more of a social issue than a technical issue. So the products are all out there today. We're hearing about some of them as well that enable remote work, work anywhere, flexible mobile workforces. It's a $256 billion opportunity for the industry, so there's a lot of good news in there. Next slide.

So, we went and did a ground-level study with the Bainbridge Graduate Institute starting last year and ended this May, and it produced a report that we titled "BetterWork," which is available at betterworktoday.com, and a lot of other information and resources about this. And we studied organizations that have successfully done this, like Sun, which is also in the GeSI climate group report, as well as CISCO and others, and the results are staggering as I go over just a few seconds here. Just Sun alone saved almost $70 million in real estate costs and almost 24,000 metric tons of C02 just in 2007 as well as CISCO and Best Buy and others that have had a significant amount of impact through that.

So, wrapping it all up, when you look at this next slide here, looking at planet, people, profits, all of these items fit. You have less telecommuting, less buildings, you have a more satisfied workforce, and this has all been proven out in these studies as well as higher profits and a huge carbon savings. And it's a huge opportunity for the industry, like the commercial building industry has done -- in the last slide, sorry -- with the lead standard, we need to transform the telecommunications industry the same way. I apologize for going over.

MR. SINAI: Great. Thank you, Matt. And next, our next panelist is actually walking the walk, so to speak, is Colin Buechler, a senior VP of marketing of LifeSize Communications.

MR. BUECHLER: Thank you very much and thank you for letting us join from balmy Austin, Texas. I'm hoping we make a lot of progress on this since we're about to go on our 61st day of 100 degree weather, so we really need the help down here.

I was asked today to talk about video communication's role within green IT. Next slide.

Gardner defines green IT as the optimal use of information and communication technology for managing the environmental sustainability of enterprise operations in the supply chain. As many of you know, companies today are seeking green IT solutions. Corporate responsibility dictates companies take an active approach to carbon reduction. The challenge is within today's global environment, they need to try and do that while living within current budget constraints.

And one of the best ways to reduce carbon emissions is to remove the need for those emissions.

We believe video communications is a key green communication technology, but broadband is the enabler. You cannot have this experience without a strong broadband network. Next slide, please.

Video communications has come of age. This is not the 1964 World's Fair, as you can see. Really high definition is the key. It's been the game changer. It creates an immersive, natural interaction, technology is transparent. It feels like I'm there with you guys right now from my side and, hopefully, is the same from your side.

Also, network ubiquity, what's changed this is this is not ISDN lines. This is over the open Internet. We can do HD video under 1 megabit. We can have 2X the quality of your DVR at 768K. And then third and finally is the dramatically improved price performance. We can provide this capability now for under $5,000 a node and we continue to improve that.

There's also been a lot of discussion around video communications versus telepresence and are they two different things. They're actually the same thing. Telepresence is an enhanced experience on an HD video communication architecture. You can create and enhance that experience through a little thing, cognitive and aesthetic changes around lighting, color, sound, but it's all built on the same HD architecture and enabled by the same broadband networks. Next slide, please.

So what we're trying to do in the industry, the video communication industry is trying to do, is drive that change with anytime, anywhere collaboration, really focusing on three areas. First is removing the need to travel. Gardner has estimated by 2012 videoconferencing will have removed the need for about $3.5 billion of travel. Just today I saved a half a ton of emissions by calling in rather than flying out there to join the meeting.

Second, and more importantly, is expand this to include everyone. A lot of the discussions around video communications tend to focus on the largest companies and very high-end installations in board rooms and executive rooms, et cetera, we really believe to make this work, it has to expand to include everyone and really enable connected communities, rural schools, rural hospitals, small business.

If you went to www.lifesize.com today you could see a video that appeared on the NBC Nightly News last week where we connected a soldier into the delivery room to watch his son being born. And that's the type of technology -- that could be from 6,300 miles away in Iraq, so we really see this is for everyone, everywhere, to experience this, this telepresence experience.

And finally, I believe Matt was mentioning, it really empowers the teleworkers. The population of teleworkers is expanding from 20 to 34 million by 2008, and this is the type of technology that allows a teleworker really to be there without actually going there. We have many of our engineers work from home and participate in all team meetings and know the people and work very strong, collaboratively without ever leaving their house. Next slide.

And finally, I think we pushed a presentation to you, but finally, this is not just about the largest enterprises. One of our partners, BT, has eliminated more than 860,000 face-to-face meetings saving at least 97,000 tons of C02, but small companies like Vanguard Truck Lines saved over 135,000 pounds of C02 in a year for just 3 executives and saved them 288 days of productivity as part of that.

National Geographic, in 6 months alone, has saved over 48,000 pounds of C02 in one office alone. And as they said, being green is more important to them than money or travel savings and HD video is the green technology for them. Next slide.

So, finally, we believe we're on the cusp of a visual communication era, one that can save time and money and also help to protect the environment. Thank you very much.

MR. SINAI: Great. Thank you, Colin. That was fantastic.

Next will be Maura O'Neill, who's the senior advisor for Energy and Climate and chief of staff to the undersecretary for Research, Education, and Economics at the USDA.

MS. O'NEILL: Great, thanks. I'm actually wearing two hats today as we do in agriculture. One is agriculture, which is still the largest employer by industry in the United States, but also rural America, and particularly the rural utility services, so I'll talk about both of those as I go through.

I'm going to talk about three things: Best practices; data collection, monitoring, and control; and lastly, but most importantly, money, both what the opportunity and what the need is for broadband in helping us solve this climate challenge.

So I'd first start with best practices

and I would continue on Chris' note on how temporal and how important time is. The fact of the matter is that we know that there are a lot of best practices out there that could be used, but people just don't know about them. And you aggravate that by the lack of access to broadband communications in rural America and the dissemination curve, the adoption curve falls off dramatically. So, the first is best practices. We think there's huge opportunities for the AG industry to play a major role both in adaptation, mitigation, and sequestration, but that's only going to come if we get that information, it gets disseminated in a timely fashion.

And the second, which is -- I'll get to in just a second -- we get feedback so that that can become a continuous cycle. In particular, we run the largest adult education program in the country through our extension services, so we have 9,000 physical agents out there. But as our last presenter said, we really need to morph that. And so we have a big initiative called E-Extension and giving farmers and people in rural America -- for example, one of them is we have a decision tool that's really an interactive decision tool for carbon management and evaluation called COMET, and it calculates the soil carbon change and greenhouse gas emission changes from various scenarios. So as a farmer, you can go on -- or a rancher -- and you can say, well, what if I did these change in practices, what would they do to my carbon footprint? That's incredibly important. And we think it's these kinds of dissemination tools that are intuitive, that are easy, that aren't built by -- well, maybe they were facilitated in the backend by modelers, but they are, in fact -- look much more like a videogame in their user interface than a techie economics tool.

So, the first is the need for this best practices and the continuous loop around it, and that's essential for broadband if we're going to bring all of the variety of resources to climate change.

The second, which we spent most of the

first panel talking about, which is data collection, monitoring, and control. We clearly understand the value of Smart Grids. I was, in the mid-'90s, first on the leading edge of running a Smart Grid company in the -- no, first on the leading edge and then the leading edge. I'm glad that we made, actually, that transition. But as we saw in the panel before, it's enormously complicated thing, but clearly plays a very, very important role in terms of climate change not just in terms of energy efficiency, but network administration for load shaping, for spinning reserves, for metering, and being able to really fine tune the system and really squeeze out a lot of the energy, but also in terms of modeling and in terms of better information.

We have started a network of protocols around AG and climate change called GRACEnet that monitors carbon, monitors emissions all across the country. We're now just beginning -- but it's a big secret. We're beginning to talk globally about doing that. Clearly, broadband has to be available to enable that to really be optimized for all the micro climates there are around the U.S. and around the world.

And lastly, money. It makes a lot of this happen or it takes a long time to not happen if we don't have it, so I'm really excited that the rural utility services, which are the people that helped finance bringing electricity to the farm back in the '30s, has stepped up and said, yes, investments in Smart Grid will be an allowable use. They're waiting for NIST to actually come out with some of the standards so that they'll know, yes, this is the time we should be financing and somebody sprinkled holy water on that, but they are very excited about the ability to do that. They finance about -- currently, they've financed about $39 billion and so it can be a significant player both in terms of Smart Grid technology in terms of renewables and in terms of energy efficiency.

So I just welcome and thank you for the opportunity to participate in this panel and also welcome a continuing dialogue with everyone on this panel and in the audience as we go forward in optimizing broadband and other ways to reduce the negative effects of climate change. Thank you.

MR. SINAI: Great, thank you, Maura. We're looking forward to continuing to work with the USDA.

Next up is Skip Laitner, who's the economic analysis director for the American Council for Energy Efficiency Economy.

MR. LAITNER: Thank you, Nick. And my congratulations, compliments to the FCC for a rather smart collection of workshops. I think we'll do a lot to unfold the huge opportunities both productively and competitively for the American economy as it tries to maintain its prosperity in the global economy, but then, yes, to think about smart ways of reducing greenhouse gas emissions and the like.

My topic, very quickly, rather than focusing on technology, I thought I might use the opportunity to bring home a -- sort of scale an opportunity, so I'm exploring the notion of how big efficiency -- next, advance, please -- in other words, looking at efficiency as it might catalyze further opportunities for investment.

Efficiency, what do I mean by that? First of all, it's the cost-effective investment in the energy we don't use in producing our nation's goods and services. Yes, it certainly has the familiar things of the installation, smart lighting, compact fluorescents and the like, but also includes things like combined heat and power, recycled energy development, small-scale distributed energy, but then the unexpected, and here we're talking about, already alluded to, the opportunity for information communication technologies to really bring forward a secondary value, which is energy productivity.

Normally, we think of it as the ability to help us make better decisions, provide more timely data in a real- time sense, but it has a surprising ability for increasing overall energy productivity. And then finally smart infrastructure and smart development of high-tech, high value-added sectors. Their very presence means a low use of energy generating a large return in terms of employment. The common denominator to all of these things are productive investments and informed behaviors increasingly enabled by semiconductor, broadband, and ICT technologies. Next slide, please.

So I thought I would quickly provide a backdrop of a report we released just last year and I was thinking -- Brian Hala, who's a chairman of National Semiconductor, on the dais with me, has released this report, I thought a very timely comment. He said -- and I'm one of those few people in the room that I suspect remember eight party lines where I could say, Operator, give me BE7-9277. That was in the 1950s. And Brian said, "That's how far Smart Grid has come today." We're still in the 1950s about thinking about systems and opportunities. One of the ways we need to think about this opportunity is how to open up. Yes, how to provide synchronized protocols and standards, smart investments, but to do so in an open-ended way that doesn't foreclose or prematurely shut down technologies that might not be available to us today, but very conceivably tomorrow.

Next slide. So, the study I was looking at is the story of three lines that we released in May of this year. That top line is what the economy would look like had we not changed any of our technologies forward looking from today through the year 2030. That middle line says, yes, we are going to become somewhat increasingly productive over time so that we're not going to use nearly as much electricity as we could be using, as we would be using, had we not become more productive over time, but the bottom line is really the telling story. What we refer to as a semiconductor, broadband-enabled efficiency scenario, we have thought in terms of investments that might drive productivity gains through broadband, through semiconductor-enabled technologies, that would allow us to use as much as 27 percent less electricity by the year 2030, even accounting for the additional electricity that would be used to power those technologies, that 97 percent we heard reference to before. Next slide please.

What we're really talking in terms of under the semiconductor broadband-enabled scenario, the market would require investment, productive investment, I might add, of $500 billion cumulative over the period 2010 through 2030. In other words, an opportunity to build a market. The energy savings to consumers and businesses under that scenario would likely grow to $1.3 trillion over that 20-year time horizon, cumulatively, a significant return for businesses and consumers. Our estimates suggest that this higher level of energy productivity would stimulate a net average increase of jobs on the order by half a million jobs a year over that 20-year time horizon, but then, more critically, it would allow from the electricity sector alone, this enabled productivity investment to reduce greenhouse gas emissions on the order of 400 million metric tons a year. Yet, these returns are available if and only if we choose to develop and invest in this critical resource opportunity. Next slide, please.

In other words, in the comment of Maynard Keynes in the forward of his book, The General Theory of Employment, 1938, he said, and I think this applies appropriately, "The difficulty lies not with the new ideas, but in escaping the old ones."

So, again, in order to foster this opportunity, how might we move forward with a broadband plan that, yes, offers the right protocols, the right incentives for deploying smart investment and productive behavior, but in a way that remains open-ended and open to new technologies that have yet to come before us, but that could increasingly enrich our economy and our global environment? Thank you.

MR. SINAI: Thanks, Skip. Thank you very much. So, I'll start off and I'll ask a question. I'd also like to encourage participation online. And in the room, if you have questions, please write them down. I'll have people coming around and grab them.

I heard some interesting comments about obstacles and so I'd love to -- and getting caught in old ideas, so I'd like to direct a question to Colin, Matt, and Sheryl about what are the obstacles, be they technical, market, whatever?

What are the obstacles to adoption of these technologies?

MS. WILKERSON: I'm happy to start. I think with respect to the areas that I talked about in intelligent transportation, DSRC, as I said, was implemented -- was allocated and the service rules were literally 10 years ago come October of this year, and it's not for a lack of will and dedication and determination from the vehicle, from the manufacturers and others in the industry. There are applications out there. They are working. They've had numerous trials with various states. The problem is how to actually deploy it. Who are the players? Who can fund it given the economic crisis? What are the limitations within the particular state?

So, those are some of the challenges. I think DOT currently has a proceeding underway looking at the proper business model for how to deploy this infrastructure. It was in their Vehicle Integration Initiative Infrastructure proceeding just August of last year and there still is no resolution of those issues. So, there's great skepticism and there's angst both at the state and local level. I think the -- I believe that there's going to take a combination of efforts to actually try to deploy this. The issues are very difficult, as you've seen and heard here today, but the applications are there. There's just going to have to be some incentives for the marketplace to come up with a business plan or model that will work. The consumers will have a role in selecting which applications they will need and want to purchase. There will be benefits to the state in terms of the kind of information that will be aggregated from the various roadside units and whatnot, but then there's got to be proper incentives for the industry to actually want to deploy these applications.

MR. SINAI: Great. Colin.

MR. BUECHLER: Yes, I think another obstacle for an experience like this is price performance of the communication technology. There aren't many rural hospitals or small businesses or homes that are going to spend $300,000 for a high-end telepresence suite. And I think as that price performance -- most of the infrastructure is there, but the communication technology on the edge is still being created.

And as price performance continues to improve and customers continue to adapt that experience, you know, the primary obstacle is just going to be behavioral. And what we find is there's an initial resistance to trying newer technologies, but those early adaptors and companies that are using this, roll it out and quickly start to adapt it and the demand gets very, very high and it becomes almost natural for the way people communicate.

For example, I struggle on conference calls and speakerphones. I stare at the speakerphone in front of me expecting it to look back at me at some point. So really, as price performance improves and we're able -- and as the broadband network expands throughout the country and as price performance improves around the communication technology, I think we'll see the total benefit continue to increase.

MR. BAUER: Piggybacking on that, I think that the perception -- as we're a carrier out there, you know, carrying the bags around going into businesses and nonprofits, talking to them about their telecom services, the perception of cost is very interesting because the opportunity is to actually impact the cost of the rest of the business much more -- or the nonprofit much more than the lien item for communication. So, when you look at lessening building costs, increasing productivity, lowering health care costs, all these items, it goes off the scale and the cost savings become enormous. So, the management styles just haven't caught up. And I think the adoption of technology, for the first time, we're probably 10 years behind where technology can be deployed in the enterprise with what we're seeing out there. Most people have a traditional setup, probably 80 percent still use POTs lines and DSL or something along those lines, where you have all these applications like what Colin is talking about, which are really much closer than people think, it's just the carriers haven't adopted this as a selling technique to be out there teaching people how to fish. So, instead of just selling what's right in front of us and "me too" type of activities, to go out there to organizations and say, well, look, you can change how you work and improve all your metrics, and especially when it's a challenging time for costs and technology and for the environment and all these things are -- all these indicators go the right directions when you deploy a flexible workforce that has a lot more technology replacing physical transportation and buildings. More social.

MR. CROWELL: Just on the question of the telecommuting and the ability of people to work from home, and Matt mentioned, you know, this quote of, you know, the madness of the transportation, you know, rush and getting home and work to join together, we look at the productivity gains to the companies and you look at the, you know, kind of quality of life and the twinkle in the eye of the employee who gets to, you know, work at home and, you know, perhaps be closer to family life and avoiding that traffic, that rush hour, and we talk about the benefits of it. One of the things that I think we all should look at as we look at a national broadband plan and we look at what the country needs going forward is to also underscore the urgency with respect to this infrastructure in unserved areas and underserved areas.

We don't know what the future holds this fall and we don't know exactly what might unfold in coming years, but the social cultural morays that hitherto have perhaps restricted more people from working from home are going to be challenged greatly if we have a swine flu outbreak this fall, this winter. And if you're a small business whose employees either don't have access to broadband at home or your employees don't subscribe to broadband at home, there will be productivity losses. And so there's an urgency and there's a risk to our economy by not having the investments made in the infrastructure, in not having the plan for adoption, in not integrating these.

And so I was wondering if you -- if people could comment on not only the benefits, but also what your sense of urgency is with respect to underserved areas and unserved areas going forward for this as a national infrastructure?

MR. LAITNER: If I might just open a comment, I had a fascinating discussion with a principal of an elementary school in Lake Zurich, Illinois, just about six months ago. Underserved area and she was interested in being able to take advantage of this very technology, both the videoconference and teleworking, but she didn't know where to begin. Three hundred thousand dollars is about right. She couldn't afford that in her budged, but she said to me we have an underutilized educational facility. We only use it part of the day. What if I could get health and education -- or Department of Education to help us figure out a way to bring a system like that in so we use it a bit when we need it, but then make it available to the community at large? It becomes an operating laboratory. It helps her figure out system transitions, the things she has to do, how to become a better manager, and, she says, as a manager of teachers and of students, I need better skills and what it means to control, manage, facilitate, or encourage a different way of looking at the world. She didn't know where to begin.

The opportunity is there if we can make

those resources available to someone like her. She would be really intrigued about moving forward with that kind of an opportunity.

MS. O'NEILL: Let me just add, I couldn't agree with you more. I think it is a public policy decision that's in front of us. You know, that's why I mentioned in my remarks about the decision we made as a country to bring electricity to the farm when it wasn't exactly the most "cost-effective" thing to do at the time. I know the Northwest was built on the federal government coming in and financing some big hydro facilities and we had no place to sell that power, so it would have never actually been happening, but the Bonneville Power Administration invented what is most of our transmission technology. So I also think while we all remember Tang as one of the things that came out of the race to the moon, in addition to technology, I think we also shouldn't underscore -- we shouldn't forget that if we make this big push, there's an enormous amount of innovation and benefits that come to our economy and to our lives way beyond just missing that commute. And I think we need to start having that dialogue so people understand how important this is to accelerate it in just the way you've described, Colin.

MR. BUECHLER: Yeah, the other thing I would mention, if I could, is it's not just an inside company communication vehicle, a lot of these technologies. There's a lot of local communities that are trying to figure out how to create greener wired networks. I know Case Western is one in Ohio that's looking at that, and the value continues to expand. It's not just in teleworking. As you get broadband video into the home, you can see health care applications for it, you can see personal communication applications for it, there's a quality of life issue that you can participate with your family while still being able to compete in the global workforce. All of these elements compound on themselves and also contribute to addressing climate change.

So, while companies themselves can begin to start to figure out how to manage their cost structure and their carbon emissions, I think there's a key role for government to start to think about not only how to allow people that may not be able to afford that, but how to allow communities to engage together on that. There's a network externality effect. The more nodes that participate,the greater the value is for everyone.

MR. WALKER: If I could just add, also, I come out of the insurance industry. I spent 15 years in the insurance industry and I would see, actually, an element here on resiliency, too. Business interruption being a very big concern, for instance, for a lot of businesses and for the insurance industry as well and perhaps there would be some tie -- relationship to risk management aspects.

MS. WILKERSON: I'd just like to add one point even though it wasn't the topic of my presentation is that there are some really wonderful role model companies out there. For instance, there's a company called Verity in North

Dakota that provides service to some Fortune 100 companies. And part of the reason they're there is because there's broadband and one of their requirements is that 100 percent of the people who work for them are eligible to work from home. And one of the interesting statistics about this company is that 60 percent of those employees did not have broadband before they went to work for the company.

The other point I'd like to make is that there have to be really creative business incentives for companies to provide that kind of technology. One of the interesting factors is that in order to get a job there, you have to have broadband, so many of the -- the first question they ask is do you have broadband? If you don't, you can't work there.

And secondly, finding creative opportunities for companies who can allow their employees to use the broadband when they're not working. So, one of the interesting aspects is that now those -- the children in those families who didn't have -- the 60 percent of those families now are empowered to use the broadband services and networks that the companies have facilitated in their home.

MR. SINAI: Kristen.

MS. KANE: Just a quick follow-up to the point you just made, Sheryl. All of you, and people throughout the day and on other days this month of August during these workshops, have argued very compellingly for the need for significant government investment in the connectivity itself.

And my question is, as we contemplate and develop recommendations for this national plan, are there really specific incentives that we should consider recommending to Congress in terms of motivating and expediting the adoption of the kinds of technologies you mentioned? I mean, are there tangible things that you know of at the local level that have worked effectively or that you're contemplating would work well in the marketplace or for adopters as well?

MS. WILKERSON: I'd be happy to provide some examples from some of the field trials that have been provided in various states, but I think one of the compelling areas in intelligent transportation is that when you talk about broadband, a lot of the dialogue focuses on the underserved and unserved areas. And in particular, if you look at the fatality rate in rural areas, I believe there were 37,000 fatalities in the U.S. last year and I believe the great majority of those are in rural areas. So, getting these applications out there even though they have short range and high bandwidth is really important. I think there are other public safety benefits outside of education, but real tangible economic benefits that will come from health care -- to health care by being able to eliminate those crashes in the first place.

MS. O'NEILL: I just have one suggestion. I just came from being chief of staff of a U.S. senator, so I listen to a lot of people talk about what it would take, but clearly accelerated depreciation on this equipment can play a very tangible role in penciling something out from being -- just not making the hurdle to significantly making that hurdle. And so what I'd also say is that because I believe time is of the essence, I think if you time it such that that is a declining schedule over time, I mean, not so high that the industry can't ramp up to actually provide and the standards not be in place, but if there's an incentive that says if you wait until next year, it isn't as good, I think you'll see significant accelerated adoption.

MR. BAUER: And we're seeing that there are a lot of incentives in place already. I think it's an advocacy issue that we have that, you know, for one example, back to Colin's point of an underserved, underutilized, distressed area is, you know, virtual call centers, like what JetBlue has done with their -- they have one of the highest rated call centers in the business and they're all working from home. And it's the kind of model that you can get training out there and there are a lot of places that already have broadband that you could put people to work, so it's a great jobs program, but then also in terms of bringing broadband to other areas and then to address issues as they come up.

One interesting one last week was the BART strike in San Francisco that almost happened. It was about the -- we have one of our offices there and it was, you know, about to be paralyzed and they averted it, but we put an op-ed in about all the implications and how businesses and nonprofits and organizations can start readying themselves today. Swine flu is another one. We've been working with the info two-on- one networks across the country and they're all ramping up to try and be -- have capacity to handle all these calls, and they all have call centers. Having remote access, having employees that work out of their homes is a much easier way to address that, especially as the flu potentially takes hold.

MR. LAITNER: I have three

recommendations in quick order. First is from the utility perspective. In my former life, I was one of those expert witnesses in the regulatory proceedings, rate-making proceedings, and I am convinced that we need some form of decoupling. That is to say move away from the standard rate-based approach to utility making. Give the incentive to invest in their customer's value in which they earn a return on their value, return not on the power plants, transmission lines, that are part of their rate base.

California's done that. Yes, California has a budgetary problem, but they are also one of the more energy efficient states in the country because they have offered a good bit of incentive, so some form of decoupling, but also understanding the need to perhaps redirect the making of the corporate charter. If you think of yourself as a utility, I am a cranker of kilowatt hours rather than an entity whose job it is to deliver value-added on behalf of my customers for which I earn a return, a profit, so remaking those chargers and perhaps redefining the generally accepted accounting principles to move away from traditional rate- based thinking to more flexible investment patterns. So that's one area of recommendation.

But the second is we shouldn't be afraid of standards. Yes, we need standards to ensure an operability communication among various technologies at different times and across different platforms, but we also need standards to identify levels of performance. And in that regard we already have heard about the renewable portfolio standard, but there is also an interesting proposal, the Energy Efficiency Resource Standard.

You've heard my suggestion that broadband technologies generally have the ability to increase our productivity such that electricity could be 27 percent reduced from 2030 projected levels if we allow that smart productive investment to move ahead. And a signal needs to be given to the market, not just a carbon signal, but a signal of performance, and I think you'll be surprised at the level of responsiveness that this country is ready to initiate if given a clear, persistent policy signal that ratchets up slowly over time that the market understands that there is a new dynamic coming.

And then finally, I think we need to think of this policy as, yes, a critical way of addressing climate policy. If there is a climate imperative, this becomes among the huge opportunities to address that imperative in a way that maintains robustness and prosperity.

MR. SINAI: Great. Thank you. How does this change if there is a price put on carbon? Can any of these technologies, besides benefitting from the uptake, can they recognize credits? How do you measure the additionality? I know this is a little bit of a question of looking to the future, but I'm curious because this will be a debate in the future of how do we recognize a whole wide variety of technology. So it doesn't necessarily have to be videoconferencing and telecommuting, but there's a whole range of technologies that can help accomplish things from an efficiency standpoint, and how do we think about the measurement and information and credit if need be?

MR. LAITNER: A good question, and it's a critical question, but I don't think we need to be afraid of being so precise that prevents action from occurring. Rather, if you'll go to our website, aceee.org, we have a proposal for the Energy Efficiency Resource Standard in which we suggest that you allow real-time information to take the utilities, in this case the electric utilities, their last two historical years of kilowatt hour and suggest that they begin ramping up so that their energy use is a half a percent less the next year, maybe a percent and a half the year after, and that can be monitored real-time in ways that don't require you to really stick it to the information level of the individual customer. We can stay systemic, but we can also learn from that. And as the information becomes a little bit more facile, a little bit more flexible, a little bit more real-time, as that learning occurs, then we can begin thinking about different ways of measuring where we need to be a bit more critical. So, I think we can start in a broad course way, get the momentum built, learn from that experience, come back in about five years and rethink what we've learned, and perhaps provide a different way forward given that learning that moves ahead rather than thinking about a locked-in standard today, much like the Energy Star standard is for computers and other -- they renew that about every four or five years based on the learning that occurs and on the technology that evolves. And in a similar way, I think we would do well to move ahead in that format.

MS. O'NEILL: We think that there's a huge opportunity and (inaudible) as the Waxman-Markey bill has said, but it's only going to work if there is a credible monitoring and verification system that is consistent over time and so we understand that at least from the AG's and Forest's basis. And so we have accelerated our own work to develop methods that could give the marketplace consistency and reliability in the same way we've done with the AG Statistic Service, so that we can be looked upon as a resource for that. There's clearly a lot of work to be done and we've not -- we haven't just started, but we've accelerated our work in that area.

MR. WALKER: First of all I fully -- sorry.

MR. CROWELL: I also think most companies will need guidance from the standard bodies because most of the larger -- or regular corporations are dealing with technologies that are now starting to cross different budgets, different functional budgets within a finance structure. I think one of my fellow panelists had mentioned this where when you start getting into travel avoidance, you start -- and if we start getting into offering credits in other areas, those are no longer managed outside of the IT budget. And so what institutes an avoided trip and how do I think about accounting for that is something that I know a lot of financial organizations are starting to think to themselves, but looking externally to help provide the standards and guides by which to measure it within their books.

MR. WALKER: I was just going to add, I agree with Skip on the need not to allow the perfect being the enemy of the good and particularly on energy efficiency. I mean, it is the low-hanging fruit. McKinsey pointed that out as the first place to start, for instance. And so what we need to do is figure out ways to methodologies that does it credibly that we can actually readily account for things. And I think, you know, examples abound on how, you know, some of the methodologies arose on offset projects back in the early 2000s with, for instance, the Climate Trust out in Oregon, where they looked at how to develop new methodologies in kind of breakthrough areas that at the time people weren't necessarily saying, well, these could be valid offsets. They developed the methodologies, trial and error, and then they came up with ways that were credible.

I think also Japan is a good example to look at because of the top runner programs they've done with their energy efficiency on projects -- products, I should say. The idea is that you always push the envelope so that you always -- you don't have the product at level for energy efficiency be kind of the least common denominator. It's always the top rung, so whoever sets the highest energy efficiency becomes then the bar the others have to meet, and so, therefore, you're always raising efficiency.

MR. SINAI: Great, we have an online question here. Colin, I think this is directed towards you. I'll read it. "We have focused on underserved areas with no or limited access to broadband. This does not address how well the existing broadband networks would support mass adoptions of solutions like HD videoconferencing. Is the broadband network capable of supporting these applications at scale even in the most connected cities?"

MR. BUECHLER: I think that's a great question. I think the infrastructure is there for a dramatic increase in existing traffic and usage. I think as this becomes mainstream, carriers will need to look at the existing infrastructure and there's going to be a required upgrade over time as the traffic increases.

I also think it's the job of communication technology companies like ourselves to reduce the bandwidth required to have those communications. And so I think the combination of making communication technology more bandwidth efficient, a lot of the initiatives around Smart Grids and networking to be able to manage the traffic more intelligently, are really the two near-term opportunities and to expand that capability to other areas. But I do believe as the traffic starts to increase that you will start to see a little bit more strain on the existing networks, but I don't believe we're anywhere close to that today.

MR. SINAI: Great. Thank you, Colin. Chris, I also wanted to give you an opportunity. You had mentioned you had some other applications you wanted to talk about. I didn't want to cut you off if you did want to talk about them.

MR. WALKER: Well, I mean, the idea -- and they're all highlighted in the report -- but the idea was there are a lot of good examples. As an organization, The Climate Group, we were storytellers. The idea was to tell success stories of what has worked so that others could follow. It's about getting the information out so that is not a reinvention of the wheel each time.

So there's been a lot of very interesting examples, you know, the potential application of ICT technologies. I know there that one example that's highlighted in the book talks about San Francisco and the idea with putting sensors in parking spaces so that a driver could actually be told when there would be opportunities for -- when there would be empty spaces, for instance. And that was projected to decrease driving about 30 percent in the city because apparently most people are just driving around and around the block looking for parking spaces. So, just the opportunities there to apply the technologies, you know, to tell those stories, highlight those examples, and I think for the government, actually, to take those examples and kind of broadcast them out so that others can follow, I think would be really useful.

MR. SINAI: That's a great point and having good narratives helps with -- as we think through the broadband plan.

I just wanted to give everyone a final opportunity to comment. If there's any last things you want to say and I think we'll wrap it up.

MR. LAITNER: I'll give one last example moving from Smart Grid to smart infrastructure more broadly and it was already referenced by Sheryl, I think, on the transportation system. But there is a fascinating report by the National Transportation Operations Committee, a bunch of engineers who found about 272,000 traffic signal systems in the United States, and they figured that if those systems were equipped not only with LED lights, but smart communication capability, that would allow us to optimize the flow of travel so that red lights would turn red when they needed, not arbitrarily at 4:00 at night where you've got to sit there for two minutes when no traffic is coming when you're trying to get to the airport type of thing. They estimated that that would save between 5 and 10 percent of our nation's gasoline use, just by optimizing a better flow of travel beyond what we've already heard here today. That becomes a critical infrastructure opportunity to grow on. That economy of scale and scope could really go a long way to extend the capacity for these other discussions we've heard here today.

MS. O'NEILL: I just wanted to make our offer again on behalf of USDA to help in any way we can (inaudible).

MR. BAUER: I think that there -- you

know, assuming that climate change is real and there are certain tipping points that could occur here and that seem to be already happening, I would recommend that we position and message short-term opportunities that don't require any massive development or are too high-end for the average constituent to swallow, to put things out there right now that people can do and that they can start acting on on this day, that every business, every organization, every government agency can start making changes in addition to the longer term items that we're talking about and that are going to require years of development and are probably a little bit too high up in the clouds for most people to digest.

MR. SINAI: Sheryl.

MS. WILKERSON: I just had a couple of points, took a couple of notes here. One is I think in the previous panel talked about the varying capabilities for consumers to be able to call their utility to tell them that they need to charge their car up if they're going 70 miles --

no longer going 70 miles, but they're going to go 200 miles tomorrow. I think one important factor is we really -- good technology is invisible. I know I'm not going to want to call my utility company at 3:00 in the morning when I get told that I now have to go, you know, 600 extra miles. And we need to really take a hard look, consumers, as we look at batteries and the host -- consumers don't read their manuals. Who reads their manual when they get their car off the parking lot? Who reads their manual when they get their new mobile phone? Consumers need -- the technology needs to be smart and it needs to answer a lot of those questions and there needs to be partnerships and collaboration between all the partners, whether it's the vehicle manufacturers or the utility companies, what have you.

I think also, too, the utilization of these smart probes and applications have the potential to really impact how we look at our vehicle emissions and standards regulation. If we use this data which is real-time world data, we could eventually change how we look at how we regulate emissions. We might no longer need simulated driving conditions in laboratory tests when you're looking at the life of a car, the emissions for the life of a car for the full life of it.

And I think lastly I mentioned the DOT. The FCC and the DOT have worked collaboratively for a long time. I know that they're -- the IntelliDrive timeframe is around 2013 when you have 180 or 170-some-odd days to do your report, that I encourage the collaboration between those sister agencies to help bring about some of these energy and public safety benefits to the public sooner.

MR. BUECHLER: A few things. First, I want to thank you all for letting me virtually join you in the panel today, and I would say I think there are few initiatives as important, I believe, as the broadband initiative when we look at not only climate change, but just increased productivity within this current economic climate.

And I truly believe that as that network gets expanded, time and again, the American workforce and consumers have shown the ingenuity to create applications beyond what we're measuring right now, beyond the carbon emission avoidance that I was quoting from some of those customers. And I really believe that the only thing -- there's a couple of obstacles that we talked about before, but none larger than the expansion of the broadband network throughout the country.

And so I wanted to thank you all for letting me join you. If there's any questions that you have, I believe my e-mail address is on the slide, and also there's a gentleman named Joe Magrill from LifeSize who's there with you who can answer any questions as well. Thank you.

MR. SINAI: Thank you, Colin.

MR. WALKER: I also want to thank you and I guess I'll just end by how I started. There is an urgent need for action. Time is vitally important. The climate science, as I started off, is really dire. Everyone you talk to, the models, everything has happened faster and stronger than predicted and so, therefore, what we need to do is be able to adapt now as much as possible to technologies that we can ramp up in time, but we need to get things rolling immediately. So thank you.

MR. SINAI: Great. Well, thank you to the entire panel. This has been fantastic. I think there's a lot of great things for us to think about and we look forward to continuing to work with you.

(Whereupon, the PROCEEDINGS were adjourned.)

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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.

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