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Session 8: "Smart Grid: Impacts on Electric Power Supply and Demand"

Speakers:

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[Note: Recorders did not pick up introduction of panel (see biographies for details on the panelists) or introduction of session.]

Eric Lightner: Well, good morning, everybody. My name is Eric Lightner. I work at the U.S. Department of Energy. I am the program manager/lead coordinator for all Smart Grid activities within DOE in the Office of Electricity Delivery and Energy Reliability. Our role is multi-faceted. One of the main roles of our office is research and development in grid modernization technologies from superconducting wires to Smart Grid technologies to advanced energy storage devices; so the whole gamut of research to support modernization of utility infrastructure. That's really what our role is. Today's panel on Smart Grid is right up my alley, luckily, so I'll be able to answer any questions you might have concerning these activities and our experts up here will surely be able to handle any questions you might have concerning their activities as well. We have a very good mix of speakers this morning. We have a representative from a major utility here to talk about their Smart Grid plans and what they're doing to modernize their infrastructure. We have a consultant from Booz and Company, Christian Grant, who specializes in looking at the business model in moving forward for the utilities and for states on how do we implement Smart Grid effectively, cost effectively. And we also have a major vendor here from IBM, Michael Valocchi, who is involved in many of the

Smart Grid projects that were funded under the ARRA, from my office and I'll give a brief introduction of each. They'll give their presentations and then we will have questions at the end and apparently there's a process where you write down your questions on a card and they'll be collected and I'll read the questions to the panel. That's how we'll handle it so let's get through to the presentations first and then we'll answer questions. So first up is Bill Gausman. Bill Gausman is Senior Vice President, Asset Management and Planning for Pepco Holdings, Inc and I think I'll just leave it at that. I don't want to give too much and after Bill we'll be hearing from Christian Grant. Again, Christian Grant is with Booz and Company and he's a consultant to the industry and looks at business model development and Michael Valocchi from IBM so I'll give a brief introduction again as we move forward but I'll turn you over to Bill.

Bill Gausman: Thank you, Eric. Good morning, everybody. What I'd like to do this morning is just to give you a brief overview of our Smart Grid program, our vision that we've been working on for several years now and where we're at with the implementation and then discuss a little bit about the Smart Grid awards and the benefits that these awards are providing to our customers in the sense they'll be able to accelerate the projects and reduce the cost. And then distribution and automation which is a part of our Smart Grid program and I'll explain that more in what we see going forward. Just a brief overview of what Pepco Holdings is, primarily, we are a regulated utility. We have three independent utilities — Atlantic City Electric in Southern New Jersey, Delmarva on the Eastern shore that covers Delaware and part of Maryland, as well as Pepco here in Washington, DC and we have two subsidiaries at Pepco Holdings. In total, the three regulated utilities supply energy to about 1.8 million customers across the region. When we talk about Smart Grid vision, we think about it from the standpoint of the customer — how does a customer benefit? How do we provide the customer with a tool to be able to help them to manage their energy to make better choices on how they're using their energy and reduce their cost? It also adds

innovation, both on the customer as well as us. The technologies that we're looking at today will allow both our customers as well as ourselves to implement programs, analyze the way the electric system operates far better and different than anything we've done over the last 100 years. There are tremendous efficiencies to be gained, the ability to integrate different technologies. We know that with the new technologies that are coming out — the renewable energies, the electric vehicles — we have to be able to integrate them into the existing electric system without rebuilding the electric system and all these technologies, we're trying to take equipment that's been built and is based on theories and principles, that in some cases are 100 years old and make them operate like the modern technologies in the electronics world today; so having the ability to do that type of integration to change the way the electric system operates is a huge challenge but it also provides tremendous opportunities for everyone to be able to think of new ways of being able to do that and gain more benefits but at the same time managing these new technologies so that it doesn't overload the electric system and cause significant problems. Reliability always is at the forefront of our thoughts of how we design the system because without a reliable electric system, the technologies we're putting in will be useless. And then the whole area of data security, clearly we're entering a new world where in the past you had no communications, no access to the electric system components. The only thing you had to be concerned about was physical security. Now you have cyber security because all of the devices we're putting in will have to be addressable. We're putting in advanced communication systems. We're opening up the ability to be able to hack into the system so we have to look at how we implement these systems and the level of protection that's needed across the entire distribution system and all this has to be done in a cost effective way. From the customer standpoint, some of the benefits that we see being able to provide to the customers is being able to put the decision making into the hands of the customers. What we mean by that is that we're going to have tremendous amount of information

coming back from the meters on how each individual customer is actually using their electricity. We'll be able to feed that back to the customer, provide them information, share with them the details and not only once a month. In the future we'll look at it every hour and be able to provide that type of communication and information to customers so they can make better choices of how they want to use their energy, when they want to use it during the day. With the automation that we're building into the system, we'll be able to automatically reconfigure the system. Today, we wind up having to rely on customers calling in to tell us they're out. We have to send a dispatcher crew to be able to investigate, identify the problems and make the repairs. In the future, with the automation, the system will automatically evaluate an event that occurs on the system, determine what's the most appropriate action to take and will perform this action and restore customers without having to get any manual intervention into the process. The efficiencies that can be gained is better asset management by having the increased level of information coming back from the field. We know exactly the condition of the electric system; virtually every point throughout the electric system. What that does is it allows us to identify where we need to make enhancements instead of having to do an entire circuit. We can just do individual sections of the circuit so we can focus on the work that needs to be done, that needs to be performed — perform it at a lower cost and actually obtain higher reliability. The optimization is something that we see as a future activity that clearly is advancing quickly. And then the whole area of green energy electric vehicles, hybrid type of vehicles, especially the plug in hybrids, we're having multiple people come home off of the same transformer. Adjacent homeowners all plug in their vehicles at the same time when they come home from work. It's very problematic. It could result in significant overloads of the transformer, of the service cables supplying the homes. So we have to help customers to manage that to prevent those types of overloads. We see the process as evolutionary. This is actually a model that IBM worked on and we support strongly that it is a series of steps to be able to

reach the ultimate goal, what we call the optimization. With the DOE grants that we received, we've actually advanced a lot of this work so today, we're working on the first 3 steps. We're installing the centers, the equipment on the field. We're building the communication system and we're doing the integration and the integration is one that people tend to overlook. There's expectation that when you plug in a meter, you can immediately start on gaining all of these benefits. The real work is behind the scenes, doing the integration, making use of the data, knowing how to manage future volumes of data coming back from the field and how to make decisions on that data and turn that data into information that you can manage the electric system with. The next steps in the evolution are the analytics, having the programs to be able to analyze the data, to be able to make the engineering decisions, enhancements to the electric system and then they all turn optimization with the system that's working by itself. When we look across our electric system, we basically put it into four different domains: the customer's home, the home area network that's behind the meter, the Smart thermostats, other Smart appliances, how we're going to manage those. We look at the meter as being the primary point of contact to be able to help manage those facilities behind the meters. And then the distribution system is all the wires and poles you see in the streets. It's the automation that we're installing. The substation is the primary point where we start to install the much more sophisticated computerized equipment to be able to manage the electric system and then the transmission grid which is the multi-state high voltage lines that have been more advanced many years but today the advancements are light years ahead of what's been put in over the last 10 years. All of this, the key is the communication system and at the start of the home, the amount of data coming back from each individual home is relatively small but as you migrate back through the electric system, the volume of data significantly increases as well as the need for security and one of the important points that we identified very early is that if you look at these individual domains as individual activities, the security is going to become a

problem. So we start at the very beginning to look across the entire electric system as one fully integrated system and we're building up not only the communication system to manage that way but we're also building up the security infrastructure to make sure that we can provide the maximum level of protection that's possible across the entire distribution panel and transmission systems. The grants that we received, which I just really want to acknowledge Eric and DOE for their leadership in really pushing forward these programs, they really are beneficial to the industry. It is advancing not only the work that we're doing but the vendor support that's developing a lot of technology to allow us to install the Smart technologies, is also advancing significantly and without these types of programs, that would not have happened. For ourselves, we received about $168 million of grant money that is distributed between Pepco and Atlantic City Electric companies and you can see up there that the primary activities that we're focusing on — the installation of Smart meters, the distribution and automation equipment which is what we call the ARS (Automatic Restoration Schemes) and then the customer controls of the Smart DLC, the load control — they're the Smart thermostats or the controls on your air conditioners that will be controlled by the Smart meters to manage peak energy usage during high energy prices. Dynamic pricing are the new rate structure that the Smart meters will allow us to implement to give customers the ability to reduce their energy bill by participating in the programs and shifting their energy to lower cost periods. These old programs that we've had on the books for several years, they all are being advanced because of the grants and that does two things. It helps us to modernize the electric system faster. The customer will start to receive their benefit sooner as well. I'll just put this chart up to show that the $168 million is extremely beneficial and why it's so important and why it allows us to advance these programs. Our total funding for the next five years is over $630 million for these activities so the $168 million is a significant help. It's what allows us to advance the programs to be able to implement the programs faster. We have a

significant commitment to this and we're moving forward in all the jurisdictions because we believe that these programs are all cost beneficial and really will benefit the customers in the long run. We look at it from a rates perspective because all of us are customers and the question always is, what's going to happen to my rates? This is a confusing chart but the line that I want you to look at is the black line. The black line shows the net of the cost and the benefits with the DOE grant. You can see that after the first year after the programs are implemented, the cost of the program will be zero, basically zero to the customer because of the grant money that has reduced the cost of the installation so much that our return is virtually one year after the program is implemented. It can't get too much better with that type of return. From there on, it goes negative; meaning that the customer is receiving a positive impact in their rates throughout the entire 15-year planning period. The black line is only taking into account the direct benefits that we see as operational reductions and cost. If you add in the benefits that our customer can receive from using lower energy by participating in these dynamic price rates and the different programs that are being offered, then the red line shows what the total benefit to the customer will be, both adding the company's benefits to the company's reduction and operating expenses as well as the reduced energy cost potential that the customer has for participating in the program and there you can see the much greater potential savings for the customer which is the red line. So really, it's just to show you that the programs, and that's why we are such a large supporter of these programs for so many years — the numbers work out. The customers can benefit and we'll benefit from the implementation of these programs. When we look at the automation of the electric system, here, we literally are using technology that has not changed in 100 years that the re-laying, the controls within our substations which is the top picture is a series of mechanical devices that you basically have to send somebody to the substation to look at a little red flag that pops up in their window when an event occurs and that tells you what the event was. Bottom picture is one of our newer

substations here in D.C., all microprocessor controls. Separately, the black relays on the top picture will all perform through that one box in the bottom picture, externally robust devices capable of many different features, capable of sending information out, being able to access them, gain information, helps us to really understand exactly what's going on within the electric system. When we talk about restoration, these are the devices that we'll be putting up in the field on the poles along the distribution line. We can't prevent a tree from falling. We can't prevent a piece of equipment from failing. What we can do is when there is an outage, we can restore the customers faster and that's what the automatic restoration system does. If an outage occurs for whatever reason the system will take the information from the field, the sensors within the field. It will identify exactly where the outage occurred and then it will determine what switches to open or close to isolate the damage and be able to restore all the customers that are not directly affected by the outage. That does two things: it gets a lot of the customers back in the service very quickly but then it also helps us to know exactly where the fault was so when we dispatch a crew to make the repairs, we can dispatch them more efficiently to the point where the failure occurred. The bottom part, we actually have a system that we've put in about two years ago to test and evaluate and over the last year, we had seven different events occur. Five of the events, the system automatically did the switching and the blue bar is the amount of time that it would have been out if we didn't have the restoration. The red bars reflect that actual time that the customers were out. In one event, we had about 1,000 customers out. We were able to restore over 800 of them in 50 seconds. That was a case where a tree came down. So we can't always stop the trees but we can do the restoration faster and be able to get customers back in service in less than a minute. It's a significant improvement of what we can do today. The two events that didn't occur, it didn't occur because there was an unusual condition on the system and we have safeguards built into the system that if all the switches aren't aligned just right or there are other events that have occurred, for safety

reasons we don't want that switching to occur. So in those two events it didn't occur but that was the correct action. It shouldn't have operated for safety reasons. Overall, we believe that we can obtain about a 50% reduction or 50% improvement in the restoration times. On the customer standpoint, there's just one graph of many different screens or data points that we'll be able to provide to the customers. This particular graph shows daily usage and when we put the Smart meters in, then customers will be able to see their usage. They can go online, look at it. In this particular graph, they're comparing the actual usage per day to the weather; so that you can see how your usage compares to the temperatures for the previous 30, 60, 90 days, whatever you want to evaluate. If you want more information, you can dive down into the data deeper. You can look at the individual days by hour or you can compare similar customers in your region. There are all kinds of different analyses that we'll be able to provide customers with real information on their actual usage and be able to help them understand when their major usage has occurred and help them understand how to manage it and reduce this usage in the future. Looking forward, the successful completion of this project is the ultimate goal. Our entire company is focused on implementing these programs, getting the information right the first time, giving customers the benefits that they're expecting from the programs. None of this is going to work without the customers' involvement and education. This is very complicated information. It's a totally different way that we need people to think about how they use electric energy and it's going to require us to really focus on customer education. As I've said, the major point is that none of this is going to work either from the customer's standpoint or our regulators unless we can show benefits and that is really the key. We have to show benefits to the customers. Our regulators have to see the benefits to approve the program. We have to get recovery of the portion that isn't cut above the grass and that is critical that we are successful in obtaining that cost recovery. As one

slide showed you, it is cost beneficial and we're confident that the regulators will support and they are supporting the implementation of these programs.

Developing standard and cyber security is also a critical focus. All the industry is focused on and we'll continue to play a big part of it and the technology that we're implementing today is changing what wire electric utility looks like. We're no longer just a wire company. We're a technology company and that brings tremendous amount of change management, re-training, education within our own work force but we have to address as well so that once we put the programs in we can continue to operate and monitor and maintain the systems safely. Thank you. *[Applause]*

Eric Lightner: Thank you, Bill. We appreciate that. Next, we'll be hearing from Christian Grant. Christian is a senior associate with Booz and Company. His group specializes in analyzing, managing strategic and operational and financial impacts of business decisions for utility administration. So, Christian?

Christian Grant: Thanks, Eric. All right, good morning. Thanks for giving me the opportunity to come and speak with you this morning. By way of background, Eric and I and some of his colleagues back at the DOE and some folks at the National Energy Lab have kind of an ongoing discussion for the last few months around the Smart Grid business cases that have been out there and some of the challenges that many utilities have encountered and I think it's important to kind of step back and think about the kind of evolution of Smart Grid because originally, it was pretty much focused on the whole AMR to AMI and now it's come to mean kind of everything to everyone which is good and bad. I think it's brought a mainstream for the media. There was a time when I don't think the President went a day without saying the words Smart Grid and it's really brought this attention to the forefront but at the same time it's also, I think, created a great deal of challenges for utilities and Smart Grid providers in the sense of uncertainty which is my topic for the day. I think Smart Grid has moved from periphery to the core of strategic thinking mainly for utilities. And that's created a lot of challenges given all the

capital, needs and demands that they have versus the capital that they have available to them. And so this uncertainty that's come about is really affected how they determine which investments and what their strategies going forward and my team and I have been really trying to work with some of our clients in terms of how it manifests itself. And so there are three areas that I'd like to talk with you about today in terms of three fundamental areas of uncertainty. One is from a market standpoint and who will make the money and how. I think that's a critical concern for a lot of people. I think there are a lot of companies that are coming in and a lot of utilities are wondering where is their revenue and how do you unlock it? Number two is regulation. This is a critical one and I think one thing to think about here is not only how regulatory compacts change but also what are going to be the intended and unintended consequences of these changes? And third, what needs to change and how can it be justified in a business case from a utility? And you can actually also apply this to a Smart Grid provider standpoint but it's what do I need to do to be prepared for this future? So one of the first things we looked at is the market and I think the way the market's going to change is if you look at the cartoon on the left and this is our conceptual drawing, it's pretty much of a linear market as we all knew it and grew up in, in a sense that regenerated electricity came to the transmission system, went out to the distribution system and hit the customer. And to be honest the customer was essentially lured. They weren't really customers. They were just kind of lured out there that had to be managed and I knew what their profile is and I make sure I can serve and I know what reserves I have to have and the data that I maintained was strictly to accomplish that task and the dollars flowed in the reverse direction. All right, the customer pays and it flows up and the system gets paid for and that's how our rates are justified and that's how our rates are determined as well. It rewards large capital projects. This system does and encourages scale and we've seen that. There's been an enormous consolidation in the industry over the years and it promoted vertically and it graded utilities. We just had one speak. But in the future, we

think it's going to go to a much more fragmented system and that Smart Grid will be a catalyst in that and that utilities will not only have the obligation to serve electrons but they'll have the obligation to serve data because that data will be seen most likely as the customer's data, not as the utilities data because everything that comes off that meter the customer could potentially want and want to be able to make decisions off of. And that technology, mainly the network-enabled technology is going to reduce significant barriers to entry that currently exist in utility industry. So you're going to see people that can come in and potentially operate on the unregulated side because the customer gives them permission to do so. And so the question that we think is out there is: is this going to favor specialists and force utilities to consider just specializing on their core competencies. We've seen in the past when utilities tried to get out of their core competencies and get in other businesses and some were successful and others were not but it definitely created challenges especially with regulators. And so if you look in the grid boxes on this graph you'll see on the right side that we think there are a lot of new entrants who are going to come in and so let's talk about these new entrants. We've already started to see a lot of them come in. They have very promising technologies and services but at the same time they're also very disruptive to the way that we know and interact with our energy providers. If you look at the big boys that are coming in — the Googles, the Ciscos, the Verizons, the Lockheed Martins — these people are very well-financed, very well-financed. They are very savvy and I mean savvy with respect to customer engagement, financial resources, as I said, government relations both at local state and federal levels as well as in delivering innovation. These are all things that historically utilities may or may not have been good at. You've also got a lot of startups and so it kind of begs the question who's going to be the Google of Smart Grid, right? And what is their impact going to be? If you look at Silver Spring Networks, they started up I think three years ago, two years ago and they've already taken 24% of certain market from Itron. They've secured $100 million financing in

December and then if you look at Tendril, they just recently received a wave of investment from GE so we're already starting to see partnerships because these startups have potential and they're exploiting parts of the Smart Grid. The utilities haven't been able to go after because they're very small in number and focused and then finally we have kind of the usual cast of characters. In fact, the gentleman speaking after me comes from one of them, from IBM and I don't mean that in a bad way. These guys know their business and they know it well but there are just a lot of people out there that are all coming after the Smart Grid business. And so there are a lot of potential impacts in terms of access decisions, investment priorities, resource dispatch, demand management, electrification and we could go on but where and how these new products and services will enhance and/or disrupt current practices is still being determined. That's probably kind of why we're all here and why I think people find Smart Grid so interesting. And for utilities or Smart Grid providers, I think they feel excited and anxious but at the same time there's a lot to sort out and also it's starting to motivate a lot of different kind of unusual partnerships. In some ways, you're starting to see people hedge by just partnering with people, some in the form of equity partnerships like we talked about between GE and Tendril but others in the form of just kind of a loose partnerships. I think Google has officially partnered with x amount of utilities and GE is the same way and you see a lot of these just happening and it's kind of like a hedge; but there's still one big unknown, I think from a marketing standpoint and that's the customer. Historically getting customers to change behavior with regards to energy decision has proved challenging to say the least. On the one side we've got technology advancing in this area like we've never seen before because we're starting to see the money from like the VCs, private equity shops and banks really flow into that area and so we're seeing a lot of advances happen much quicker than we have before and that's the left side of this chart and that's for you Air Force alumni. It's Air Force technology right in this ranking but then NASA development has been pretty popular and it's a good

tool. On the right hand side which you can see are some of the challenges that historically have happened. The top graph is from a California study of demand side management programs that we've put out there and basically, what it is, it creates a curve and at about 7% or 8%, you could invest billions of dollars and you'd never affect more demand, or matter how much you put these programs out there. It just goes straight up. The bottom graph is something that we created through a series of projects and it's about what it's going to take to get customers to change behavior. And basically, if you look at the XX, it's an incentive as a percentage of gross savings and the YX is the peak demand impact. So it's how much do I have to give up as the utility to incentivize some of the changed behavior? On the outset you've got those people who just believe anything for the environment or anything that green is good and they're going to leap at it but that's not as big a percentage of your population or customer base and you're going to have to start incentivizing people to change behavior and how much are you willing to spend and how much do they require in order to move up that curve and effect demand when you need to and at a certain point it just levels off. There's just only so much you can do. And then over time these people's values and needs change. You can go after it again but basically what we've seen right now is that there's unclear and untested revenue on cost structures because we don't know customers that well when it comes to understanding what it's going to take to change behavior. In fact, I have the opportunity to work at Masdar which is over in Abu Dhabi which is a sustainable city. It's being built over there and this is at the crux of their challenge. They're talking about reducing water consumption by like 80%, power consumption by like 50% and waste to landfill by like 97% or some huge number like that and what the key challenge is the person. How do you get them to change behavior? We can come up with all the technology in the world but if it doesn't align with the way we live, we're not going to use it and if you look at the example that I always use is our phone. Who had a bag phone like 20 years ago that you carried around and had it charge for like 10

minutes and then it didn't work? And back then if you had said, "Oh, the cellphone is going to change the world," you would have laughed at them. It'd be like, "This thing is a brick. I'm not carrying it around." But now, we can't live without them so I think the question for utilities is do you want to be the iPhone or the App? Do you want to be responsible for trying to figure out what customers want or do you just want to provide the data so that someone else can figure that out? That's a great challenge and what Bill said is correct. He's in the technology business now but the question is where does his technology business end and others pick up? And I think that's a question that utilities are really struggling with. The key part of this is going to be the regulatory world. So now let's transition to that secondary of uncertainty and what we've seen over the history of regulation especially in the utility business in this country is that you not only have to worry about the intended consequences but you really got to worry about the unintended consequences. First of all, we need to appreciate the challenge that regulators have. We're talking about significant change to the current world. Look at the challenges that we had just trying to change our health insurance, the established health insurance world. This is a challenging thing to do to implement change. In addition, this is a very well-politicized issue so it's not just going to be based on business rationale and market economics. It's going to be based on other interests. I've got three examples up here. One is moving from traditionally structured to dynamic pricing; so this means you pay for exactly what you use because a lot of people would like to get it that way. In fact, utilities would love to go that way to be honest because it's economic efficiency. There's not a socialized grid structure but the challenge is does it create rate instability? Are you going to have a picture of someone who didn't understand that if I leave off four TVs on an August afternoon and keep my computer on and do these other stuff and crank up my AC, then I'm going to get a $5,000 bill for that day? I just didn't understand that that's going to be the front page picture on the newspaper and the commission's going to be down hard on the utility. That would

probably happen. If you go to the far right, like right now you interact with a utility through a monthly bill. Well, what about if you owned all the data and you were able to give it to somebody? And now you get different reading off your Internet based meter versus the meter that Pepco hangs in the back of your house and you go to court to challenge it? What if the court rules in favor of that Internet meter? Where does that leave Pepco? These are all unintended consequences that you could logically walk through and some of them are very extreme examples that I've intentionally positioned that probably aren't going to happen. However, it does kind of peak your interest or should peak your interest. There's a lot out there that could potentially, when you kind of mash it all together, that could lead to something we didn't understand what's going to happen and I think one of the good examples is what's happening with cyber security and our interoperability standards versus recovery. I think we've seen a lot of utilities slow down a little bit, especially those that didn't win our money because they're worried that they're not going to get recovery and they're going to wait until nest comes out with the official standards and they'll all invest once those standards are published because they don't want to be on the backside and say, "Well, we were trying to be a lead utility and now we're just saying we can't get recovery because we don't have the right standards embedded in our technology." Another example would be RPS standards. We've seen a lot of regulators who are now going to be put to the test. We had the first lift in a lot of our RPS standards in the past year. A lot of them went directly to rates and commissions are struggling with why our rates are going up as a result of RPS standards and so it's going to test their metal — how committed are they to all of our portfolio standards and for those politicians because they've got to get re-elected when the rates go up. That's a tough issue for the local politicians so this is hard to do because our electric utilities are regulated at the state level so it's very local politics. So again, this creates more uncertainty if you're a utility. As we talked about before in terms of what the market's going to look like in the future we think the market structure could

potentially end up looking like ERCOT so anybody here from Texas? You guys might be on the lead edge because right now it favors an integrated utility. We think the future world is going to be unbundled or you might just want to be a transmission company or distribution company or generation company because that's what you do and you do it well and no one else can beat you at that game and the fact is you don't want to get in to all these other businesses because that's just too hard and that makes sense, right? Specialization is kind of the flow of market forces and it forces a lot of strategic questions that have to be answered for utilities and Smart Grid providers alike in terms of where we're best positioned. Which products and services do we want to go after and bundle together and which platforms are going to allow us to grow going forward? These are all key critical questions that regulators are ultimately going to control. In order to influence the regulatory process, I think there are going to be some interesting alliances and coalitions that are going to have to be put together. Otherwise, regulators might be doing it to utilities as opposed to utilities working with regulators and there are examples of that throughout history. And so I think you're going to have to start seeing interesting alliances. They're not official alliances but coalitions working together to build support to reduce friction and speed effective regulatory solutions. It's also going to be about building, creating and expanding the necessary industry in market protocols and processes collaboratively for economic efficiency and also just to make it easy for regulators and legislators to say, "Well, yeah that makes sense because you're kind of already doing it." And a good example is actually what Eric and his team are doing with the Smart Grid data clearing house. This is just kind of Christian speaking but if you can share amongst the winners to ensure that the utilities that are going through right now and are deploying right now. They have to capture the benefits that they said they were going to capture. Otherwise, there might not be a second wave of Smart Grid funding because if you look at the stack of capital needs for utility on the generation, transmission and distribution side, if Smart Grid proves not to reduce demand

effectively, why would you want to invest in it again because you just said the technology's not ready? Right? And I'll go with the technology as it is. I'm going to put my capital to use their. So it's kind of critical there. So the first piece that I think Eric can do is share best practices amongst that group to ensure you do get that benefit captured. Number two, you've got the bigger population of utilities that haven't started in mass their Smart Grid deployments so providing that same data for them so they can help overcome their kind of net present value challenges in their business case, like getting the good actual data as opposed to theoretical data will be critical; so that's one piece of just how industry can work together to help themselves. As we advance and talk about the utility, let's talk about the business case. Business cases are very challenging. First of all, benefits *[inaudible]* is hard. A lot of these benefits seem squishy. They're not real easy to monetize for the utility and deliver to shareholders. They're very easy to run back to the customer in a lot of cases but they're still hard to quantify in a dollar amount. They show up in business process, for example like reliability. How do you go in and figure out what can come out of your reliability budget? For example, if we use Bill's example of the tree fell, the system responded, and they were able to respond in seconds as opposed to minutes or hours. Well, what can come out of my reliability budget now? For operating companies, when you get down to that level it's very hard for them to distinguish because they've got reliability standards that they've got to achieve and this is a change again so it's somewhat of a culture change. The behind the meter stuff is even more challenging I think for utilities to quantify. How do I quantify customer behavior change? How do I put that into a business case? How do I benefit from it? How do I bring that back to my shareholders? At the same time, how do I monetize that for my customers? If we talk about pace and time to achieve benefits, I think it's important to think about that it takes time to get this stuff deployed and these are large capital deployments. RS helped a great deal but at the same time it's just tough to get the capital financing there so you end up having to chunk up your projects

into potential ways that you would not like to and it makes achieving that IRR threshold and NPV positive business case hard because you can't get all the benefits you want because you can invest in everything at the right time. So for utilities there's also the change internally. I think Bill alluded to this earlier, what do I have to change in terms of people, process and technology? We see technology as the driver and by transitioning from a wires company to a technology company, what does that mean for us? It's going to mean I'm going to have to have increased automation, more tech savvy employees. I'm going to have to have customer in the loop decision processes. I'm going have to create device to the device processes. What does customer operation going to look like in the future? So instead of you calling your utility and telling them you have an outage, what if now your utility calls you and says you have an outage and will be back up in three minutes? Right? I mean the world is going to have to change and what do I need to have internally because there's a cost to achieve and how do I estimate what that cost to achieve is and get into rates because that's the only way I make money? So as we look forward, I think the way to kind of start tackling this is to look at risk. To limit these uncertainties is to look at risk. First, we identify the risk. We've identified what I think captures 80% of all risks and these risk areas, technology, consumer acceptance, regulatory structure, new entrant priorities, internal responsiveness and financial resource availability. But you need to look at them over time. When are these risks going to appear and how do I tackle them? And then take that approach and figure out what opportunities are greatest today but track *[sic].* You've got to be vigilant because today's opportunities are tomorrow's threats so as a utility or as a provider going forward, I'd like to leave you with nine questions related to the initial three areas of uncertainty I started with. So in terms of who will make money and how, I think these three questions are critical to ask. What technology trends and profit drivers are shaping the future and who are the current emerging players to track and what do customers value and which behaviors are they willing to change? I think on the regulation side so

that you can understand how regulatory compact changes, I think it's important to understand who's pushing what? Who will be advantaged? And what coalitions are needed to get what you need done? Because you might end up having some unusual partnerships. By answering those two sets of questions, I think then as a utility, you can figure out what you need to change and how it can be justified in a business case so you can figure out, work your current position as relative to others because starting position matters. It does matter. Where you are today versus others matters. What are the business model requirements for enduring success and what are the most critical enablers and obstacles? And they're going to change over time. That's even more challenging. So I'd like to leave you with those questions. Hopefully that'll stimulate some good discussions on our next session and if you have any questions, please feel free to contact me at your will. Thank you very much for your time. *[Applause]*

Eric Lightner: Thank you, Christian. Our final speaker, I'm pleased to introduce is Michael Valocchi, Vice President and Partner of Global Energy Utility Industry for IBM Global Business Services. Michael manages leads a team of over 2,000 consultants for IBM and has over 100 energy utility clients on a global basis and just a little information, IBM is one of long time partners in the Smart Grid's base. I started talking about the Smart Grid over eight years ago, I'd say and thinking about how information technology, how communications technology will lead on to be very impactful in changing the way electricity grid is operated and managed. They're one of the founding partners of the industry alliance we started I'd say six or seven years ago. Back then it was four members and it remained four members for a long time and now we're over 120 members and going global. So with that, Michael?

Michael Valocchi: Thank you. Well, it's easy. What they said, I agree with so can we just go to questions? It is actually kind of fun when look around the room, Eric and we've got a full room. I wonder what the natural gas side is and kind of interesting, we go back four years ago. I think we'd have four or five people here and natural gas

would be overflowing. I've been in this industry, like Bill, before actually people cared about it so it's kind of fun. In reality, I agree a lot with what was said and there's a little bit of overlap but I just want to really have some basic tenants so what we see is a hypothesis going forward. One, the business model is going to evolve. What Christian said, we do see the evolution, the notion, we talked a lot about the integrated utility and that's more of a U.S. discussion because frankly, outside the U.S., there aren't many integrated utilities left. I mean Europe has moved to disaggregated bases. China is already disaggregated. Japan disaggregated about four or five years ago. Australia is in the process of disaggregating so the industry model's evolving. I don't know if I could tell you exactly where to but it's evolving. The customer value model is definitely evolving. The relationship and more importantly the value of the consumer brings to the whole energy value chain is evolving and we're seeing that today in little bits and pieces and we're going to have a new energy consumer emerge from that; someone that I'm not sure we know what they look like today so that's going to evolve. And then segmentation is going to be done on a whole different manner from a consumer perspective and that's also part of the regulatory debate because every time I think you use the word segmentation, a regulator hears discrimination and it's hard to move it back and say, "We mean discriminate. No, no I mean segmentation." And this discussion is what is segmentation? Why is it good for all segments of the consumers and not just the high end consumers? And then lastly which I think is important. What you folks are challenged with is the information data sources are going to change drastically. Where you can find data in the energy value chain is just so different today. It's going to be widely different two years from now and why they're different a decade from now so how is it we think about supply curves and demand curves differently? We're thinking about taking data all the way down to a device level. Does that change the job that EIA does? That's just an interesting kind of thinking because of the granularity of the data. So just go through a couple of things. Like Christian, we hundred

percent believe the industry model's changing and a couple of points that I'll make here, not to go over some of the points Christian made but the consumer will be much more integrated into the value chain not just the end point I think as we've seen in the past. The other thing is I think we're seeing extension of different players and different technologies as part of that value chain so things like a device or a home area. A network really needs to be considered as part of this. Information services and Eric's right, that's really one of the reasons IBM really got excited about this six or eight years ago, is because of all this data and the information and we think that's really the change that is taking place here. So not only were we seeing a two-way power flow on all that. It's just this information and the value between each of these as the industry model changes. I was so excited to see Bill use the step chart so we hundred percent believe in this. We've got devices at the bottom and it's interesting because here in the U.S. when you said devices, you really did mean meters but when we looked outside the U.S. and Australia it wasn't about meters. It was about devices and nodes out there on the distribution grid. In Denmark it was about devices out in the distribution grid and proven reliabilities. Now I include Smart appliances, Smart thermostats so it's really what's the hardware? What's the instrumentation that's sitting out there across the value chain? And then this whole interconnectivity — Bill brought it up that this integration issue is bigger than I think most of us really imagined. I think we imagined it was going to be big. Another reason we got into this is because we knew the integrations issues were going to be big but just this whole merger of operational technology and information in technology really has kind of changed this whole interconnectivity type of a discussion and it's actually inside utilities has brought groups together that necessarily didn't talk as much as they did in the past. And then this whole intelligence piece and I think we're just at the tip of the iceberg there. We're starting to get some of the presentation layers and the gentleman from Texas knows that the portal just opened up last Monday down in Texas so now you've got a different level of presentation. Bill was

showing some of the analytics that they're starting to do on merging weather data and usage data and we think about where we're going to go and that's what we think the analytics side of this is really we're going to see an emergence of a whole bunch of new players from whether it'd be mathematical, engineering but just really bringing some consumer analytics that we haven't really seen so we really have as an industry worked bottom up; is what devices and then let's keep moving down. Now we're certain to work top down. What type of intelligence and analytics does my consumer want? Okay now, how do I bring that all the way down to a device? And that's why we're seeing the emergence of some of the home area network and some inside the home because the consumer needs that type of information. The value model that we see is between the consumer and an energy provider. I'm going to use the word energy provider versus utility because I don't know who that energy provider is going to be. One of the things when you use the word utility on a global basis, you're pretty much, like today get to nine different business models. Without even thinking about it, we got integrated. I've got a transmission or I've got a distribution. I've got energy services. Just going off on a little tangent, the UK model — the retailer is the one who's going to put the meter out there. The data and the communications are going to be done by an independent company sitting in the middle of all of this. Wow, that's kind of different than we would have ever done it here in the U.S. so that's why we use the word energy provider versus utility. In a traditional value for a consumer was as a utility you provide electricity and you get money back. That's pretty much it. I mean there's not a very sophisticated relationship. In the future, without the data it's not only going to be money back. It's going to be information. There are going to be pieces of data that is as Christian said, the consumer owns but as a utility I want that data. Now I want also to change some behaviors so what the consumer does back for me is more than just paying me a check every month so all of a sudden it becomes a lot more of a complex relationship and now if I start to believe that there's some intermediaries coming in to play, now suddenly the

relationship puts their party providers in there but I still want that data and information so to me the value model is not going to get complex. I think it gets a lot more robust. This isn't about new players coming in and stealing existing value. I think the value pool is getting bigger so therefore there's room for new players to kind of pick off pieces of different value. The other thing from a consumer perspective, right now my data isn't really worth much. I mean I've got a monthly bill and I've got some usage data; not really worth much to the outside world. If we go to where Bill's doing it with Pepco, two years from now my data's worth a lot because there's a lot of robust information that anywhere from a security provider or somebody else may want access to and that's where you're going to see people coming to consumers and saying, "I want to get a hold of your data." So I think not only the customer is getting demanding, the value model's getting a lot more complex but the good news, I think it's getting greater. The other thing that our research says is that not all consumers want the same level of interaction and that's kind of one of the issues we've got in the industry right now, is we are giving a lot of technologies to all the consumers but there's that bottom piece of this chart, what we call the passive rate pair; somebody who really doesn't care, who really is just looking at the rates on a monthly basis and just sort of just passive about it. Now granted that number four years ago was 60% in our survey. A year and a half ago it's down to 30%. We'll do the survey again this year. I assume that it'll come down a little bit but I think that number stays in the 20 to 30% range where people just don't care and now I've got some others that want different types of information and data and are expecting different things. If I'm a frugal goal seeker, I'm looking for things to save money. It's really what I want. Just give me some tips and information to do that but then I've got the Star Worth who have a little different need...maybe higher reliability, maybe it's minutes versus number of outages; but they've got some more sophisticated needs so how is it we start to really focus on the consumer and you heard this sprinkled through Bill's entire talk. It was around the consumers. It's one of the reasons we really had a

good working relationship with Pepco because it's all about the consumer. What is it they want? And now let me bring the technology and it's interesting because the technology keeps evolving. So I'm just going to pick on one area which is the home area of technology. There's one thing I do disagree, Christian. It's interesting — Silver Spring. Silver Spring's actually been around for six years but the mainstream people haven't heard about them until two or three years ago because it took them honestly, three years to prevent the technology. I mean what's kind of a different thing this industry is a lot of the players have been in the backdrop just trying to prove out some of the technology and we're just going to see more and more of this and I think it's hard as an industry to shift through that. so one of the things that we see with the home area technology is that may be a way to help with the segmentation, so it may be a way to personalize within the segmentation so if I've got a meter now I can go inside the home and move; going back to my previous chart, move around different segments all the way from just pure pricing broadcast. Just give me some pricing signals and that's where you'd see maybe some of the frugal goal seekers that would just want, "Give me a signal and I can save money all the way up to this whole notion of automation consul where I can manage it," so from an energy Star Worth you now give me ability to manage whether it's environmental reliability, pricing or anything else from a home perspective and this is what's interesting, going back to Christian's chart, is just in this little niche there are a number of players here that a lot of us have never heard of. Yet, there are some big players coming into this market as well so we're going to be down to this granular level of evaluating technologies along the way. So overall what we see is this new capability in order to find a relationship. That's a lot different. We see this is moving towards what we're calling a participatory network where the consumers involved will just publish a paper around business models. Their focus is on a concept called the multi-sided platform where the Smart Grid in essence becomes the platform by which we're going to see innovation in all different areas and Christian's question

around who makes money, it may be everyone. As we've seen in other industries, the person who builds a platform may not necessarily be the one who makes the most money off the highest returns of that platform. So we're thinking about a new model here where consumer wants to do some things. They want to conserve electricity or energy. They want to do some self-generation. They want to be environmentally friendly — reduce some of the carbon footprint. The utilities that you saw from Bill's presentation is there are a lot of things that utility needs to do from the health of the grid and from a remote sensing and just really a matter of prediction of demand and supply so what we see is just the infrastructure coming together into this participatory network where technology, and not technology as we think about it from just hard technology, but just analytical technology. Technology that's probably shorter in life, technology that's probably dispersed much further out into the overall value chain all the way into the consumers' hands. This is going to drive a different type of network and there are a couple of things that I'll leave you with. One, in this audience position, the data that as I said before is going to be a lot more granular and a lot more timely than it's ever been. So how is it we fundamentally change how we look at future demand curve and things of that nature? I don't think we've gotten to that part of the debate yet. Secondly, there is technology risk out there and the technology risk is not that "Oh, this is going to fail." The technology risk is what you're going to need to evaluate against pretty stringent criteria around the technology, whether it be standard security, inoperability — things of that nature. I think that's important. And the last thing is the whole notion of what are the advanced analytics that's going to drive us to the next level of innovation. The question I get asked the most is tell me what the killer rap is and that kind of the question. I've heard that on blubbering levels. Just tell me what the killer rap is from a Smart Grid perspective and to me, we're going to get to that around the analytics and frankly, Eric, if I knew that answer I wouldn't be here. I'd be somewhere else. That is a question that I

think we need to keep asking ourselves but to me it's going to be around the analytics. So with that I guess we'll open up the questions. Thank you. *[Applause]*

Eric Lightner: Thank you, Michael. We appreciate that. We got a lot of questions so we're not going to have time to go through them all, obviously but there are several similar so hopefully I've picked out the ones that are representative of the ones I've received here. I'm just going to open up to the panel on these questions and I think some of your responses will be quite interesting. The first question basically is something that's been a big issue, I think from the onset of the Smart Grid efforts and that is cyber security. As we move towards more of an automated, connected infrastructure, what is the cyber security risk? Is that they're all be increasing vulnerabilities in the system or the opposite? Are we making the system more secure? We're going to let Bill start with that.

Bill Gausman: I don't think there's any question that the risks are increasing when you're changing from a dumb system that had no remote capabilities to a system that has multiple facilities that have remote capabilities. So from a risk standpoint, that absolutely is a risk that we have to evaluate and from our standpoint, we're trying to learn from all the other industries that have similar technologies to be able to integrate the methods to mitigate those risks as much as possible. I think it's one of those situations that we're going to do as much as is practical to be able to implement and continue to monitor, do testing, regulate, to see how you're performing. I know there are a lot of government agencies that are looking at it to develop the standards to implement, to integrate security into all future devices. There's a lot of work going on in this area but it is a great concern for everybody at this point.

Michael Valocchi: Yeah, I would agree. It's there. We're opening up to different risk but risk isn't bad. It's just a cost of the evolution of the technology and as Bill said, there are a lot of other industries that have dealt with these issues throughout the years that we can learn from. And also, one of the things that we look at is there are levels of

risk. There are levels of risk around the data from a consumer perspective, from an operational perspective and they're not all created equal. We protect things at different levels. We all know we protect different data of our own at different levels because of the impact it would have and one of my issues every time we have this discussion around risk, it all comes to cyber security and we think about it all one level and it's not. Some of the things we've got to protect at a Defcom, whatever. Some of it is you have to protect it but it's the risk of it being penetrated. It doesn't really hurt us and I think that's where the discussion will keep going because there are ways to protect it. We just need to be cost effective about it. The only thing I would add is that security is already, I think, our primary concern for utilities just from my hard and critical infrastructure aspect. So it's not like they haven't thought about this before. This isn't they're new to the game of hardening critical assets and I think at the core of it, that's probably the DefCom level type security that we're discussing when we bring in the kind of the data side of it. I think the lessons we're going to learn from other industries are going to put us in the path of success so I think in the media it's been played up as a critical challenge. I'm not trying to underplay it but at the same time, I don't think it's the silver bullet that's going to bring down Smart Grid.

Eric Lightner: Okay. There are also questions concerning data privacy which is similar in a way to cyber security and a lot of the questions were how might the data privacy issues be handled or be addressed in implementing technologies for Smart Grid applications?

Bill Gausman: That is a big issue. From our view, we will not release customer's specific data without the approval of the customer. There's data that we use obviously within our organizations to be able to evaluate the performance of the electric system, dealing with customer billing. But even within the company, we restrict access to customer data to organizations or individuals that have the need to access that data so it's not only external. It's internal restriction to the customer data. We believe that if a

customer wants us to share their specific data with a third party for whatever, for home area networks or help them to manage it, we're going to do that and we're designing a system to be able to hand off that data to a third party. Our concern is that there are a lot of agencies and organizations that they want total access to the meter. They want to come in through our system and actually be able to download the data directly from the meter, perform functions through the meter and we believe that there's a way to do that but direct access is not the correct way because of mainly security reasons to allow access into the network from multiple parties would, I think, significantly increase the cyber risk associated with that. But we absolutely do believe that if a customer wants a third party to manage the data for them, we will provide that data, hand it off to them. They could perform functions but it'd be a handoff between the third party and we would perform the functions for them — operate the meter or devices behind the meter. That is a more secure way of doing it. Bill said the magic words which are, "Who owns the consumer data? The consumer owns it," so I think you're going to see more of that and probably a good point is it's kind of Enron. "Well, give me all the data." Well, until you get the consumer's buy in, we shouldn't be doing that. Some of the lessons I think we'll learn from some other industries is we do this all the time. We release some sensitive data to different parties because we feel like as a consumer, we can get something in return for that. So back to my initial thought is that our data will be valuable. There will be people coming to us to release the data. Some of us will release it. There are going to be mechanisms. Tax has been a little bit different. We'll handle things differently than say, the PGM markets. The mechanisms will figure that out. The other thing I think we could see is some oversight. If you think about where we are from a say, credit perspective, we've got bureaus that have this high level protection if you will. So I release financial data but I kind of feel comfortable because I've got a credit reporting bureau that I know in the end, if it hits that, then I've got a backstop. You could see something like that. I mean that could be an interesting business model that gives us a

back stop and makes us feel comfortable. But I think in the end the consumers' data is going to be pretty valuable and that they're going to start to want to give it out. Yeah, currently this is regulated to the state levels so the inconsistency of regulation is about this because I think certain commissions are going to be a little bit more sensitive to it than others. Just get great challenges for those entities that operator cross states so you're going to have different solutions for different service territories, which is just from a cost standpoint is just a bit challenging.

Eric Lighter: Ryan, I wonder if the grocery stores have a similar privacy policy when you use your grocery store card.

Ryan: Exactly.

Eric Lightner: You know exactly what you're buying.

Ryan: Yeah, the data that the energy consumers is going to hold, it's going to be as every bit as valuable as that supermarket data because my God, it's going to tell you so much about lifestyles and things like that that the uses are going to be phenomenal.

Bill Gausman: Just wait for commissions to start tagging your water usage, too.

Ryan: Right.

Eric LIghtner: Okay so we have another good question here. It's really to the innovation of renewable and new applications like electric vehicles so in your opinion, do you feel the Smart Grid is a necessary component and increasing penetration of renewable at the distribution level or the translation level or do you think Smart Grid applications is a necessary thing for recharging electric vehicles as they start to penetrate the market? Any thoughts on that?

Bill Gausman: I think there are two reasons why the Smart Grid is there to help the integration. One is from a reliability standpoint to be able to help manage the charging of that equipment. Obviously there are other ways of doing it. The electric company has the direct contact with each customer. The Smart meter would be the mechanism we believe to be able to communicate to the chargers within the homes or

at other locations — out on the street or wherever it might be. Also, the Smart meter gives you the capability of providing the different rate structures so that there could actually be. Incentive-type rates that would incent customers to do the charging during the middle of the night when the impact is more on the capacity on the electric system. If you think about the use of renewable energy as partially own of the larger amount of wind energy in many regions is available at night which is a problem for us to manage it throughout the electric system because the load is generally down so being able to shift the charging of elective vehicles to the off hours at nighttime could help actually facilitate the use of the renewable and not have to restrict them with demands. So I think there are two reasons that are directly associated with the electric vehicles that will help to bring those products forward.

Michael Valocchi: And I think one of the things we're talking about is the electric vehicle becomes another part of that value chain and how do I integrate into it and stealing one of Christian's terms — unintended consequences — I've done a project in Denmark. They wanted to up the electric vehicle you use to 20%. So it's interesting because they're renewable is right around 50 or 60%. When they started to think about this people are going to come home at 5:00 at night, plug in and all of a sudden they would be buying power off of the grid which would be in essence coal fire generation out of Germany. So they would get the 20% electric vehicles and probably drop their renewable down by 10% so one of the things is backed. What Bill was saying is developing the technology to make sure that they're charging when it makes sense not just from cost perspective but from a renewable perspective. And you can do that and to me, you don't expect the consumer to do that. You're going to have to give them some intelligence to do that because you what? If you say, "Charge it at night," the first time you forget to do that, you come up the next morning and it's not charged. The next night you're coming home and plug it in at 5:00 but there are technologies. You can do that and not just do it on a price point but what we're doing in Denmark is do it based on

where the renewable power is because that was one of the unintended consequences that hit us. And the other piece to think about is what if you're driving out of state and you need to charge? If we don't go to a charging station model, like a gas station model and you're just going to plug in in like your buddy's house or wherever you're going, how does that get charged back and does it get charged back or do you just give your buddy money for the power you took off and hit his bill with? How does that trace back? Does your car's IP address trace all the way back to your original utility and how does the economic efficiency happen there? And without a Smart Grid there's really no way to do it because I think one of the benefits of an electric vehicle is I can kind of bypass the gas station and I can just charge at home. I can charge at work. I can just kind of charge where I am and you need this. You bid with this grid out there, data wise to make that transaction happen so it's just a great GM car, right? You can go anywhere you want and it goes back to your bank, right? So it's the exact same flow.

Eric Lightner: Okay, Christian, you talked about a lot of uncertainties from successful business cases to regulation, policies, inoperability standards, cyber security—a number of uncertainties, as I think all the speakers did. What about consumer education? Is consumer education an uncertainty? Is that a big challenge moving forward?

Christian Grant: So I think the challenge here is it's the ability to turn energy into like a commercial product, like anything else that we consume is consumer's own and I think a lot of times historically, we've talked to customers and educated customers about energy almost like a teacher does in classroom and so it's not very kind of interesting when you get the printed form here, the advertising piece in your bill and it says, "Hey, you can do this," and most people, they don't read them that much. And so it's a matter of "How can I integrate energy management?" So let's say all of us sitting here are all Pepco customers and Pepco has a peak right now and we all get a text message that says, "I'll give you a $10 gift certificate to the Gap, your iTunes account or

the Cheesecake Factory and for the next three minutes you let us go in your house, raise the temperature in your thermostat three degrees and raise the temperature in your refrigerator three degrees and do a few other things in your home but you have three minutes to respond because I need to know because I got to bid into PGIM." And we all said, "Yeah, that sounds good." That is in my lifestyle. I didn't have to do anything. It runs into my lifestyle versus the old, go back 10 years, I got to drive to Home Depot. It's Saturday morning because they're handy, not the high efficiency light bulbs in my den. I'm not getting up early to do that, you know what I mean? So I think it's a matter of that type of customer education but I think it's also a question of its utility education of the customer that also has to happen or the energy provider education that the customer will understand what runs into their lifestyles more naturally versus what doesn't. So Eric, does your boss still use the EC, the red button analogy stuff?

Eric Lightner: Yeah.

Christian Grant: I mean that's kind of what it is, is how do you put some intelligence to make this easier for the consumer? Because you're never going to really get them educated to the level of what we want them to do so how do you make it easy? And I think that problem's actually going to be confounded once we realize how tight water is because that's another big area where we're going to have to start educating customers on "You can't take like a two-hour shower anymore." You just can't do it. We don't have enough for it.

Eric Lightner: Okay I think we have time for a final question. There were several questions that concerned for automation on utilities side. How would Smart Grid technologies really help improve or hinder reliability?

Bill Gausman: The technologies that are being proposed will improve reliability in a couple of different aspects. One is what I talked about as far as helping the system to be able to be restored after an outage much quicker but also, because of the

information that it will give us we'll be able to aggregate the customer load behind a transformer and be able to evaluate that—

[BREAK IN RECORDING]

Male 1: For automation on the utility side, how would smart grid technologies really help improve or hinder reliability?

Male 2: The technologies that are being proposed will improve reliability in a couple of different aspects. One was what I talked about as far as helping the system to be able to be restored after an outage much quicker. But also, because of the information that it will give us, we'll be able to aggregate the customer load behind a transformer, and be able to evaluate that load and know when that transformer is starting to approach its peak load or peak capacity. We'll be able to take actions to replace different portions of the distribution system, from the transformer to the wire, proactively before it becomes overloaded, which will lead to failures on the hottest day of the summer. So there are a lot of different aspects of reliability that having this type of information will allow us to make better decisions in our planning process, so as to be able to proactively: go out, make modifications to the electric system, operate it more efficiently, really utilize the full capacity of the system, and ultimately reduce outages across the entire distribution system.

Male 3: I think the other key piece is … this is where I say it's difficult to monetize for the utility or the energy provider. So you should be able to design your grid more cost effectively once you start learning from your data, 'cause right now a lot of the grids (or a lot of the circuits) are designed … they're kind of gold plated for this sake, just kind of in case. And what the design standards put together (and I know that Texas Utilities in particular has learned a great deal from their initial deployments of smart grids just from a design standpoint) is they can cut costs, and then you get the grid management benefits in terms of … you can make sure that you don't put your assets in harm's way by just operating them so that the transformer top might blow on a hot day. You can

detect that now, and you can set that asset up for success, which means all your assets should live longer. Doing some kind of economic analysis, the potential benefits of really effective grid management are huge. And I think what we've seen in some of the clients that we deal with is that to kind of trend away from the original ,what I would call typical, [EMI] business case going to the commission. And you're starting to see a lot of management business cases going to the commission. And they're starting to pay for their meters (the end point of their grid automation business case) as opposed to the start point of their "behind the meter" demand management business case. 'Because some of those technologies on the "behind the meter" stuff, that's really kind of warming in certain area and it's a tougher hill to climb from an NPV standpoint, 'cause you got to pay for that meter somehow and how am I going to get a few hundred dollars in benefits back to pay for that meter on the "behind the meter" side? It's just a tougher business case, and so I think you're going to continue to see more business cases go that route because there's a lot of unrealized potential on the grid automation side.

Male 1: And the final point is: the debate's been the opposite, globally. May I look at Energy Australia? Their whole business case was around grid operations, and they didn't put meters up. They put "power sense" devices that are about this big, and they put about … I guess, 5 to 8,000 of the devices out there on their grid, because it was all about reliability. In Denmark, it was the smaller systems of about 400 of these devices, and it was around getting them safely down. So it's interesting because now we're prone to debate more in the U.S., but globally, it's actually going the other way now: "Now if I've got those devices, now I've just got to find a meter," more from a consumer perspective. One thing I want to add, 'cause it's a great point, is that, because power is relatively cheap in this country, smart grids are a tough financial business case to sell, just because the numbers are just tough. And so, as power gets more expensive (in other words, once we actually recover from the recession and we pick back up wherever we were going), at some point in time, power's going to get more expensive in

this country. Smart Grid cases will get a lot easier, both on the grid side and the customer's side, because customers will want it. One of the toughest sales to customers is to "change your power consumption." And in some parts of this country, if you double people's power bills slowly over a year they might not even notice. I mean it's just cheap power, relative to the rest of the world, and so until power gets more expensive, the kind of motivation for change is a little bit more difficult, both on the utility and the customer side.

Male 1: Okay, I think we're out of time and I hope you'll join me in thanking the panel.

[Applause]

END OF RECORDING