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SMART POWER:
CLIMATE CHANGE, SMART GRID, AND THE FUTURE OF ELECTRIC UTILITIES

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P R O C E E D I N G S

MR. EBINGER: Thank you all for coming this morning. I'm Charlie Ebinger, the director of the Energy Security Initiative here at Brookings, and we are delighted that Peter Fox-Penner asked us to host this event for the release of his new book Smart Power. And I can only say as one who has used Peter's previous books in many classes over the years, I consider that we are very pleased that we have one of the true seminal thinkers in this field with us today, and we appreciate not only his participation as well as the panelists who I will introduce after his remarks. But we also appreciate very much the assistance we've gotten in putting this together from the Brattle Group. So welcome, one and all.

Peter, I'm not going to take a long time introducing you. I think everybody, by the show of audience here today, knows who you are and your distinguished accomplishments, so I thought we'd move right into our presentation.

MR. FOX-PENNER: Good morning and thank you all for coming today. Let me begin by thanking Charlie first for not reading my bio, but also for his leadership of Brookings' excellent and longstanding energy program and to say what an honor it is to officially unveil Smart Power here at Brookings.

I vividly remember my high school political science teacher telling me that there was a place called Brookings in a city far, far away that was unquestionably the foremost policy institute in the country, if not the world. I doubted everything that teacher ever told me, but I'm sure it was true then. Now I've spent 20 years in Washington working just down the street, and I'm sure it's true today.

I'm also privileged to have such a distinguished group of commenters here today, all of whom I've known for quite some time and have great experience and insight to share with all of us. I very much look forward to their remarks and to their feedback on the

book.

Along these lines, I must say that it is wonderful and appropriate to have my old friend and colleague, David Owens, as one of the panelists we'll hear from soon, because in many ways David is the unwitting godfather of Smart Power. About three years ago, David gave me and my Brattle Group colleagues an assignment to look at the future investment needs of the power sector. The realizations I came to while completing that report, which is still posted on the website of the Edison Foundation, sparked my interest in taking an even deeper look at the industry. So thank you, David, and thanks to the rest of the Edison Foundation for setting me off on the journey that has led all of us here today.

Now, most people in this room understand that electric power is one of the few truly transformational inventions in human history. Very few single technologies have done as much to improve public health and safety, productivity or our lifestyles. Most of us would find it impossible to imagine, much less live in, a world in which almost nothing occurred after dark, factories ran on water or animal power, and the only computer available to us was an abacus. Across human history an invention that boosted productivity by 50 percent was considered a revolution and the advent of electricity boosted productivity by hundreds of percent with 2 men doing the work of 10. And it goes without saying that the current revolutions in information and biotechnology would be impossible without the cheap, high-quality electricity supply we have today.

But for all this success, the power industry as we know it is heading into a period of change and threats that are unprecedented. I wrote Smart Power to reflect on this era of dramatic change and to try to avoid a protracted period of financial regulatory and operational turmoil. My goal was to write a simple, easily understood explanation of the forces confronting the industry and offer some modest ideas to help its transition.

Let me now briefly review the three enormous challenges facing the

industry today. First, national policies will soon place a declining limit on utility carbon emissions; a limit I hope is inactive within the next few months. This will cause the industry to change hundreds of power plants over the next 40 years at a cost of somewhere between a half-trillion and a trillion dollars. No one can say precisely what combination of low carbon generators will be installed where. In the book, I conclude that we will develop a diverse mix of power sources, including the greatly expanded but not exclusive use of many types of renewable power. What we can be sure of is that the scale of this investment program will be by far the largest in the industry's history, even larger than the industry's expansion during World War II when the grid was enlarged by 60 percent to help win the war for the Allies.

The second major challenge is the result of our national need to maximize energy efficiency. Maximum feasible energy efficiency is the single most important element of U.S. climate policy, and it is also our best option for rebuilding our economy and our employment in a sustainable manner.

But energy efficiency takes capital. Utilities are an excellent low-cost source of capital, but when it comes to funding energy efficiency capital, there's a bit of a snag. We are asking utilities to finance their own lower sales and profits. This source of conflict has woven our energy efficiency policies into a tangled web that slows our efficiency performance. Utilities do some energy efficiency, but not too much lest it damage their finances and reliability.

State and local governments also have great programs, but are highly constrained by budgets. Codes and standards are large contributors, but they evolve slowly. The way we untangle this web as we enter an era of climate limits has huge implications for utilities.

Finally, a technological revolution known as the smart grid will give all of us

much more control over our own power use, enable the greater use of prices that vary by application and time, and allow the integration of dispersed generators in storage units. For the first time in the industry's history, you and I will soon be able to see how much power we are using for each of our own applications and change our use in response to price signals and other grid controls.

These three challenges are by no means negative; they are positive and largely inevitable changes. What they do imply, however, is that the industry in its revelation must be restructured for a new mission and a new era.

One of the foundational points of the book is that for electric utilities, the economic structure, form of regulation, and business model are inextricably linked. I call these three pillars of the industry -- that is, the structure, the regulation, and the business model -- the industry's triad. The traditional industry triad consisted of utilities that were regulated mainly by the states using simple cost-based rates. Technologically, it was based on a passive one-way power grid with virtually no customer feedback or control. The utility business model that went with this triad was simple: Sell more and sell cheap.

Until recently, this triad admirably met the objectives we asked of the power business. During the past century, we needed our power system built out rapidly, robustly, and cheaply. This triad expanded the grid from a boutique curiosity serving a few wealthy mansions and factories in the 1880s into the largest machine on earth: 1.1 million megawatts of plant and 6 million miles of power lines managed at a very high level of reliability connected to virtually every home and business and soon automobile in the world's largest economy.

But today the demands we place on the industry are very, very different. The U.S. is a mature energy economy now and electric service is ubiquitous; it's taken for granted. The imperative now is to limit our carbon emissions, which means using power as

efficiently as possible and making it from low carbon sources. We need to give customers good price signals in the technology to respond to them to maximize efficiency, and we need to accommodate a continuing revolution in new generation and storage sources, soon including millions of electric cars.

As I say in the book, the new objective is not to sell more kilowatts; it is to do more, but sell less. To meet these very different objectives, the industry needs a very different triad, a new structure, new business model, and new combination of regulations and markets.

In the last part of Smart Power, I'd look at the possible future triads in view of all these factors. I don't see the options as simply either more deregulation or reregulation; instead I see two major pathways, each labeled by the ultimate nature of the utilities they produce.

The most likely outcome I see is that utilities become what I call "smart integrators." Here utilities move backwards from the customer and operate a bidirectional information-rich transmission and distribution grid something like the Internet backbone. From the grid portal in your house, now known as your breaker box, a largely deregulated industry will install and operate systems that monitor and control your power use. This smart integrator scenario will have more deregulation and much more complexity than today's industry. Also, at the same time public power may play an expanded role in ways we don't fully understand.

Now, the second possible outcome is that utilities go back to their primordial form and offer more complete energy management services rather than simply commodity power. In the earliest days of the industry, utilities did not just sell you invisible kilowatts and send their customers a monthly bill. One historian of the power industry writes: "Power company workers in 1882 were ombudsmen. Edison's companies not only

produced and sold power, they made light bulbs, all of the fixtures, wired the buildings, and installed the infrastructure to generate and transport electricity. Imagine Microsoft, in addition to writing operating systems, making every component of the computer and supplying the electricity to run them, wiring houses, and owning and running power plants. Such was the nascent electrical industry before the turn of the century."

In the book, I call future utilities that pursue this business model "energy service utilities." This ancient idea was first revived in the 1980s by Roger Sant, Amory Lovins, and others. When I interviewed utility CEOs for Smart Power, I was surprised at their widespread interest in this old and new direction.

Now, I don't pretend to know which of these two pathways will predominate, let alone become universal. In a sprawling and necessarily slow-changing industry, we could well see both models and many variations for some time to come. And, as I noted, the role of nonprofit and governmental utilities is also in flux. But even without knowing how this will play out, there are some steps we can take to make for a better transition. In the final portion of the book, I offer several recommendations I think are important to avoid what could be a difficult forward path.

First, it is important that we give the industry more clarity and better price signals by passing climate change legislation that puts an economy-wide price on carbon. I won't debate the various options here, and I'm sure other panels have and will, but I do want to speak out strongly in favor of getting this done right now. Electric utilities have long and cumbersome planning processes and very long-lived investments. Delays in setting our climate policies are delaying billions of dollars of investment of all kinds in all segments of the industry. We can't begin to design the industry's new triad until we now the concrete outlines of our climate policies, and the sooner we begin this mission the better.

As to my second recommendation, we need to expand the dialogue that's

now led by the Obama Administration about how we will maximize our cost-effective energy-efficiency potential and utilities role in this operation. Utilities are not the only mechanism for delivering energy efficiency, but they are one of only a handful that has the capital, skill, and reputation to deliver efficiency's full promise. If we aren't going to choose utilities to do the job, we need to choose and fund someone else who will. And if we are going to choose utilities, we must end the conflict between their shareholder profits and their energy efficiency efforts. There are many promising moves in this direction, but so far we have made only the first steps.

Finally, I believe that we need to vastly expand the tools, education, and resources to help utility regulators navigate this transition. In the coming era, the federal government will pass critical policies and standards, but the most difficult aspects of this transition will fall to the states and localities who continue to oversee the local portion of the grid and its pricing. Utility policymakers and regulators are smart and hard-working people, but very little that any of us in the industry have done at any time in our careers have given us the tools and experience to redesign the entire industry while we keep the lights on and all of our laptops charged.

Yet every state will be called upon to pass legislation and implement regulatory changes that are by far the most complex and economically significant since the birth of regulation. Moreover, thousands of smaller public utilities and cooperatives will find it a great stretch to analyze and implement many of these new policies and investments.

In the book, I suggest that the federal government fund an academy and an accreditation program for energy regulators, also open to public power and cooperative managers, and others. The academy would foster a greater understanding of the day-to-day challenges that the coming transition will force on regulators and customers and create a resource base regulators and others can call on for impartial, depoliticized analysis of

complex transition questions.

Hopefully, it will also foster a greater sense of professionalism and purpose for regulators and their staffs who are, in my experience, generally underfunded and under-respected in their states and communities. There's a bit of a parallel here to what is occurring in the realm of financial regulation and markets. Economies all over the world are grappling with the reality that financial regulation must be retooled to oversee a vastly more complex and interconnected global financial network. In a similar vein, we must reprovision our energy regulators, giving them the tools and confidence they need to create and oversee markets wherever they can, and to regulate wisely where they can't.

In the book, I liken the task to renovating an airplane, but our electric power system can't be sent to the hangar to swop out its engine or its onboard computer. We need it in the air 24/7. Instead, we have to change the engines, most of the wiring, and all the control systems while it's up in the air filled with passengers, all of us. This is a challenge worthy of a great industry and a great country and one with enormous payoffs, but we must be realistic about the road ahead and equip our policymakers and regulators for the journey.

Let me close by quoting the book's last paragraph.

"In the end, a smart power industry will not be the produce of the oncoming revolutions and control systems or generating technologies, grand as they are. It will be the result of provisioning the industry for change. The intelligence of the institutions we create, not that of the hardware and software we deploy, will determine whether the industry that created the world's wealthiest and most powerful nation will lead that same nation to a sustainable and even more productive future."

Thank you again for being here today. I hope Smart Power makes a small contribution to the challenges that I've just discussed with all of you. I very much look forward to a continuing dialogue with all of you who I know have been working on this issue

with me for many, many years, and I look forward to a fascinating era of challenges and promises ahead.

MR. EBINGER: If we could get our panelists to come up, we will get underway.

MR. FOX-PENNER: I'll go down so there should be enough for you. I'll go down.

MR. EBINGER: There are microphones here if you'll connect yourselves up.

If that presentation doesn't generate a lot of discussion both from our panel and our audience, I will be extremely surprised. It's truly revolutionary and the implications of what it means, not only for our society, but for the world at large.

Let me begin by introducing our very distinguished panel. I'll introduce them all, and then I'll direct a question to each to get the discussion going, and then we'll turn to the audience for your input. And we have a good amount of time, so I hope everyone will feel free to participate.

Our first commentator is Patricia Hoffman, who is -- we're very delighted she could take time away from the administration today to be with us -- she is the assistant secretary nominee and principal deputy assistant secretary in the Department of Energy for Electricity Delivery and Energy Reliability. She has a very distinguished career and leads the Department's efforts to modernize the electric utility grid through the development and implementation of national policies pertaining to the electric grid reliability and the management of research development and demonstration activities for the next generation of electricity grid infrastructure technologies.

She is also responsible for developing and implementing a long-term research strategy to modernize and improve the resiliency of the electricity grid. She directs

research on visualization and controls, energy storage and power electronics, high-temperature superconductivity, and renewable distributed systems integration.

I wish I even understood all those things, what all those things mean.

She also oversees the business management of the office, including human resources, budget development, financial execution, and performance management. Before joining the Office of Electricity Delivery and Energy Reliability, she was the program director for the Federal Energy Management Program, which implements efficiency measures in the federal sector and the program manager for Distributed Energy Program.

She holds a Bachelor of Science and masters of Science in ceramic science and engineering from Penn State University.

Our second commentator is Reid Detchon, who is the executive director of the Energy Future Coalition. He previously served as director of special projects in Washington for the Turner Foundation, managing a portfolio of major grants aimed at increasing the effectiveness of environmental science and -- excuse me, environmental advocacy and encouraging federal action to avert global climate change.

He also spent six years at Podesta Associates, a government relations and public affairs firm in Washington where he was a principal in the firm.

Prior to that from 1989 to '93, Mr. Detchon served as the principal deputy assistant secretary for conservation and renewable energy in DOE. He previously was a principal speechwriter for Vice President George Bush, and he worked for five years in the U.S. Senate advising Senator John Danforth of Missouri on energy and environmental issues. It's a pleasure to have him.

He is also a graduate of Yale University.

Our third panelist, David Owens, is the executive vice president of business operations at the Edison Electric Institute and well-known to many in the electric power

industry. He has responsibility over the strategic areas of energy supply and environment and energy delivery, energy services, as well as the international affairs portfolio.

The group he leads focuses on a broad range of issues that affect the future structure of the industry as well as new rules for competitive markets. Previously to this current assignment, he served as EEI senior vice president of finance regulation and power, focusing on enforcement of industry representations on such areas as PURPA, PUCA, the Federal Power Act, and a number of other issues. Having worked on those myself, those are some of the most arcane pieces of legislation ever addressed by anyone.

Mr. Owens holds a B.S. and master's degree from Howard University and a master's in engineering administration from George Washington University.

Our fourth panelist, and a dear personal friend of mine for many years, is Barry Worthington, the executive director of the United States Energy Association where he directs the association's domestic and international activities. He has served in this capacity since 1988 and has turned it into truly one of the sterling organizations for discussion of both domestic and international affairs.

Previously, he served as president of the Thomas Alva Edison Foundation, and prior to that served in several capacities with Houston Lighting & Power Company, now known as CenterPoint.

Barry has written extensively on energy and environmental issues and addresses many conferences both internationally and domestically.

So let me start the panel, if I may, with Patricia. The development of smart grid technologies are certainly the key to retooling the utility industry. What are Washington's top priorities in ensuring regulatory challenges don't delay the adoption of smart grid technologies? A simple question.

MS. HOFFMAN: Yeah, he always has to start with an interesting question.

Smart grid technologies as we move forward, what we're trying to do is focus on energy management with the electric sector. So it's really managing our supply and demand from the highest level, so from the transmission level all the way down to the distribution level and to customers. So as we move forward, we need to make sure that the regulatory policies keep pace with the technologies and how they're being introduced.

Some of the ways to do that is by continuing to do the pilot programs, and also sharing information across the states on what some of the best practices and the lessons learned that some of the states have taken a very aggressive posture, and looking at how to manage energy, what is needed for consumers as well as to understand the cost of technology and implications of cost. And so what we need to do is continue to share that information across the federal government and within the states of what some of those best policies and practices, as well as take the lessons learned from some of the things that have already been implemented and be flexible enough to change some of the rules as we learn what new technologies can offer consumers, or efficiency of the electric system in general.

MR. EBINGER: Anybody else want to add anything on that? Okay, we'll turn to Reid.

Among the benefits of smart grid technologies is the ability to incorporate new distributed generation and electricity storage resources. The operating paradigm has the potential to shift to a much more decentralized system than we have today, as Peter outlined. How likely do you think this shift is, and what benefits will we see from this changing structure?

MR. DETCHON: Well, Charlie, thank you. I'm in the uncomfortable position. You told me to be lively, and I find myself having agreed with almost everything that Peter has said, and so it makes it difficult to be the provocateur here. I think the one thing that we didn't talk much about -- or Peter didn't talk much about -- are the security and

reliability implications of these changes. If you are smart -- and it took me several minutes to dope out what those hieroglyphics on the cover of the book are, and I eventually realized that on the right there's the outline of a car. And I think that what's really interesting about -- and Peter alluded to this briefly -- about the direction that we're moving in as to we are moving toward electrification of transportation. And that's going to mean more to the United States in terms of its energy security than anything we do with drilling by a long shot.

So I think that that's going to create some new regulatory challenges. It also makes the electricity grid, as if it weren't already, so fundamental to the security of the United States. And right now the grid is poorly defended and poorly structured to deal with deliberate interruption.

And so I think that the kinds of changes that were -- that Patricia's leading the way on, with more on the transmission area, with smart controls on the grid, are really going to be essential to not just the reliability of the grid, but our national security. And so I think that some of the benefits that we're going to see, Charlie, are that not only is the electricity going to assume an even larger role in American life and for that matter around the world, but we're going to have to be more smarter about how we control and defend it as well.

MR. EBINGER: If anybody has a further comment, feel free on each question to intervene.

Patricia?

MS. HOFFMAN: Well, since he's not going to be a lively, maybe I'll be a little lively. As we move forward and look at the security of the grid, we're going to have to look at what are our consumers' expectations? What is the expectations from the utility and the business model? Are utilities going to be more of an energy service company, being complimentary in looking at the customers? And what are we expecting out of reliability?

Are consumers going to accept momentary outages in the future? Are consumers going to be acceptable or accepting of longer-term outages? We have natural events that occur, hurricanes that have occurred in the Southeast. As we continue this debate, we really need to truly dive into roles, responsibility, and expectations: What does reliability mean in the future?

MR. OWENS: Could I comment, like --

MR. EBINGER: David?

MR. OWENS: -- say it from a very different perspective. First, I might take issue with the statement that the grid is a poorly designed grid. The grid was designed to do certain things and now we're suggesting in the future, in the excellent book that Peter has written, suggests a whole new set of challenges that the smart grid will create. And if I might just try to categorize some of those and then elaborate a little bit more on what some of the other respondents said.

If I look at the challenges that the smart grid will create, I think you can put them in two different categories. One set of categories relate to cyber security concerns. We all know that the smart meter, which is an integral part of the smart grid, is a computer. It provides for two-way communication, and we all know that there's an incredible amount of information that will flow back and forth from the customer to the utility that will help us operate our systems much more resiliently, will require us, in fact, to make our systems much more stiffer, and will require us to upgrade with newer technologies our systems. But that's on the plus side.

On the negative side, we create a vulnerability. So it means that we now have to look at what these new vulnerabilities that will be created in terms of cyber security. And there's got to be a whole new way, a whole new set of intelligence, a whole new way of oversight, and a whole new way of sensitivity that we need to have with respect to this very

evolving and significant issue called cyber security.

The second issue, I think, which we haven't had to deal with, is the issue of privacy. One of the great things about the smart grid will be that, as Peter points out when he described the two different models that the customer now will have a menu of choices, and there will be a menu of providers, particularly behind the meter. But in doing so, that means that you collect information from the customer, and the question becomes, how can that information be used in a way that will make the system more resilient and provide the customer with a broader array of options, and do it in a way where you really don't interfere with the customer's privacy? So privacy is a very significant issue. And I believe that there's a major gap and we haven't really dealt with that issue of privacy to the degree that we're going to have to deal with it now.

Utilities, routinely, collect usage information. We know a lot about our customers, and we've been in a compact with our customers not to divulge that information, but we recognize, as well, with the smart meter and elements of the smart grid, that there are providers that could probably do a lot better on some of these services than your traditional utilities Peter correctly points out in the book. But the issue of privacy is a very significant issue, and it cannot be ignored.

With respect to electrification -- and I do agree with Reid on that -- I think one of the great things about what the smart grid will do is it will provide for greater electrification. And one of those clearly is in the transportation sector. It will help our energy security with respect to getting focus off of oil and permitting us now to have a newer technology to battery storage and other options, to rely increasingly on electrification.

It will also, however, say to our customers in the home that there is now a broader way of electronic products that you can rely on and we're going to make sure that those products are efficient. We're going to upgrade the efficiency. I mean, did you know

that your two DVRs use as much energy as a refrigerator? Or did you know that the X-Box that your child plays with uses substantially more energy than any appliance that you have in that home? Well, those are the areas that we really need to begin to improve. And that's, I think, what the smart -- elements of the smart grid will help us do.

I think we have to look at the tremendous benefits that will accrue, but I also think we have some challenges that we haven't had to deal with before that we now will have to deal with in a very significant way.

MR. EBINGER: I'm going to come back to you, David, and give you your first question, since you were responding to another one there.

Another game-changing benefit of the smart grid, as you've just outlined, is the increased interaction between utilities and their customers. How are utility executives approaching and preparing for new smart-grid-centered business models such as the smart integrator and the utilities services model?

MR. OWENS: Well, the first thing I'm going to do is make it mandatory that they all read Peter's book.

MR. FOX-PENNER: Thank you.

MR. OWENS: Once they read the book, they're going to say, now, David, what model should we take?

And I'm going to say I really don't know. And I think he raises a lot of intriguing issues. He's absolutely right, traditionally, we have not provided a broad range of services behind the meter; we've always provided our services in front of the meter. Now there's this opportunity to provide services behind the meter.

If I look at the goals that my members have, one of those clear goals are keeping the lights on, a reliability.

The second goal is we want to make money. Now, we can achieve the first

goal of keeping the lights on because we've always done that, which service is behind the meter. But can we make money if we're seeking to provide an array of in-home services that others may at least be better equipped to do than we are? And I have a big question mark there.

Can we make providing energy services -- and let's say being an energy-service utility -- can we be a profitable entity? And can Wall Street and others say that is a great investment invested in that utility? I don't know. We tried that before, and we weren't very successful because we deviated from our core business. We have to stay close to the core.

But what the smart grid does, which is more distinctive than what we had in prior periods -- prior periods we called that the energy service company that diversified into businesses that they really had no business being in. Here I think that there are a lot of businesses that will be derived tied to the electric grid. And so I don't know. I don't know whether -- I don't know what model will be preferable to our industry. I would say they'll probably -- some companies will probably pursue one model and other companies will pursue a different model. But I think the fundamental question, really, is what is the regulatory model?

Because we respond to public policy. We respond to regulation, and right now it's just not clear to me how that regulatory model is going to evolve. It's not clear. A lot of the activities on the smart grid are going to occur at the distribution level, but a lot of the rules on the smart grid are coming from NIS through the FERC, through the Federal Energy Regulatory Commission, through the federal government. So I don't know. I really can't answer the question.

So we could probe what Peter's saying in his book. We have set up a retreat. We've set up a series of scenarios in June where we're going to have -- Peter's

going to participate, we're going to have some regulators, we're going to have third parties, we're going to have our member company, 25 participants, in 2 different dialogues so we can probe this vital question because it's very significant.

This is very different than any other period of time, at least in my opinion. I think that this is a game changer. The smart grid is a game changer, and the regulatory policies are transformational. So the business model has got to be very, very carefully thought out. Peter gave us two extremes. I think it may be someplace in the middle.

MR. EBINGER: Thank you. And finally, Barry, on our first round, the smart integrator and the utilities services model allow utilities to place energy efficiency at the core of their mission and operations. How strong are the incentives for utilities to invest in building energy efficiency competencies, and what role should the government play in promoting energy efficiency investments?

MR. WORTHINGTON: Well, the utility industry has in some cases significant incentives, so I think you have to make a distinction between efficiency, which very often means increased consumption versus demand reduction, or reducing peak versus conservation, which is simply using fewer kilowatt hours. Utilities in most cases have plenty of incentives for demand reduction in terms of not having to build additional generation, which is a tough job right now, no matter what fuel force you want to use or what technology.

For efficiency in the broad sense, they certainly are incentivized because electrification and increase consumption can increase kilowatt-hour sales, can increase revenue, and can increase profit. But I think there are incentives in place for that. I don't see any incentives for conservation. When you look at conservation of just simply using less, I don't see any incentives for that.

A lot of this isn't particularly new. You know, 30 years ago, Houston

Lighting & Power, that company had a pretty aggressive energy efficiency/conservation program which ended up in reducing peak demand substantially, but increasing kilowatt-hour sales on an annualized basis. So I think you have to make that distinction to start with.

Just a couple other points to make, I think in terms of smart grid deployment our industry is not quite there in terms of communicating what the value to the customer is. And I say that in total agreement with David. David's our industry guru on electricity, and I agree with everything he said even if we disagree off the record, to show we're in agreement.

But I think, you know, if smart grid to me means that my dishwasher is going to turn itself on and off at 2 o'clock in the morning, that's not enough. And I think all regulators, state regulators, are going to be very careful in looking at what kind of investments we're making where there's a clear value to the utility, there's a clear value to the smart grid vendors, no question of that. But where is the value to the customer? And you have to be able to maintain the convenience. A lot of people don't want their lives any more complicated than it already is. So is the option is to, you know, deal with these devices and deal with time-of-day pricing, a lot of customers don't necessarily want to do that.

So I think we, as the industry -- and it's not a job for the regulators, it's not a job for the government. It's a job for us in the private sector, in the industry, to communicate where the customer is going to gain value from smart grid. Because if we have substantial price increases and the customer doesn't see the value, then our regulators are going to have a very dim view.

The one thing I'll add, and I don't intend to be provocative, but in terms of the enthusiasm for electric vehicles, and we all know the value that's out there in terms of energy security, reduced oil imports, the environmental value, and so on and so forth. But I would offer up a little bit of a contrarian view in terms of enthusiasm, and just from a pure

business standpoint. When you look at the international oil and gas industry, whether international oil companies or national-owned oil companies, you're talking about the largest capitalized industry in the world. You're talking about an industry with incredibly high revenue, incredible cash flow, and incredible profit far beyond what the electric utility industry currently have. And so if you carry the enthusiasm for electric vehicles to a point of saturation, you have to ask yourself, are these very well-financed companies that are sitting here today with a lot of cash on hand, are they just going to walk away and give the electric utility industry their business?

I'm not so certain it's going to be quite as easy as what some more enthusiastic people might think.

MR. OWENS: See, I would respond this way, and I don't disagree with you. One thing I didn't comment, and Peter really does identify it in the book, I see a whole new set of partnerships evolving. And I see a partnership, if we have a greenhouse gas footprint, we have a goal that our President said a 80 percent reduction in greenhouse gases by 2050, the electricity sector burns coal, 50 percent of our energy, we're responsible for 32 percent of those greenhouse gases. The transportation sector is responsible for 28 percent. Sixty percent between those two sectors. Why can't we have a partnership?

Why can't we have a way where we reduce our dependency on oil at the same time that we promote a great technology for the American public? Why can't we have it so that we can promote energy storage where we would, through battery technologies and so forth, we could have a third partnership? And it just seems to me that that's what's going to happen. It's a win/win for the utility industry; it helps the utility industry flatten out its load curve; it provides for more efficient use of energy; it reduces our dependence on foreign oil; it helps to expand our expertise in energy storage, creates a whole new vibrant industry; creates tremendous jobs. And if you go into the home, why can't we as well do

partnerships? If we're not great behind -- services behind the meter, well, why not partner with Google and others, who has activities that they can do?

So what I see evolving are a series of partnerships where we could work together to enhance a business.

MR. EBINGER: Peter, do you want --

MR. WORTHINGTON: Charlie, just on that point, because I think that that -- David's raising really what I think is -- it goes to the heart of the challenge that we're going to deal with in a regulatory environment, which is where does competition occur? Right now the utilities pretty much have control over these partnerships. If you want to build a wind farm, you go to the utility. If you want to build solar on your roof, you go to the utility. And I think that the question of where the permission is going to lie and what the opportunity for competition is, either in advance of the meter or behind the meter, is one of the critical regulatory questions we're going to have to deal with.

How is Google going to come into the home and interface with that breaker box? What's the utility's control over that, and how can the regulators encourage that without doing any damage either to the utility's business model or to its reliability? I think that this is a really serious question on both sides of the meter.

MR. EBINGER: I think Peter had some comments he wanted to make.

MR. FOX-PENNER: Thank you. Thank you, Charlie, and thank you, panelists. The couple of comments on this first round, first of all, I think Pat was being a little too humble, really, in her description of what the Department of Energy is doing I think to encourage energy efficiency and encourage the adaption of the smart grid. A couple of things I know they're doing that I think are very constructive, they've created a clearinghouse for all smart grid pilot projects so that regulators can look.

There are 43 different pilots of all different types happening across North

America. They test different things, they get different results. They're very hard to align. They're creating a clearinghouse. They're funded the State Regulatory Association more so than it's ever been funded before to do planning and studies. They're pushing smart grid standards, and they are, as I mentioned in my remarks, starting to promote this dialogue about the role of utilities, but this is a big question that will take many years to sort through.

And one of the things I'm really appreciative that the panel is illustrating, perhaps better than my own remarks, is that the nature of the regulatory challenges in this era of great promise, these regulatory challenges are complex.

David mentioned privacy in cyber security. Those are complicated issues just by themselves, and those are big pacing or gaiting factors for the adoption of the smart grid.

Another one that I think Reid mentioned is the electric automobile. I could not agree with him more strongly that it is great for America's energy security that we can move off imported oil, oil in general, to electricity as a source of our motor fuel transport. But it is a huge new role for the industry to supply all of our transportation as well as everything else.

And at one place this will impact is at the local level. EPRI has done studies that show that you can put about one electric car in the average suburban cul-de-sac and not overload the transformer that supplies that cul-de-sac. But once you get more than one car charging at one time, you've got to change the transformer, and that's expensive. And that's for only one or two cars. What if everybody comes home at 7 o'clock and wants to charge their car up so they can go back out to soccer practice that night? I plug in my cell phone to charge it the minute I walk in the door. But we'll either have to be changing our distribution system quite a lot so everybody can charge things any time they want, or we'll have to be mediating who can charge when with rules or with prices, and we're not talking

about small prices. We're talking about significant price differentials that keep people from going to their soccer practice.

So these issues will have to be sorted out by regulators, and it won't be as simple as establishing a market for them, although markets will play a very, very important role. And sorting out where markets work and where they have to be modified, and certainly always overseen and policed very carefully, will be the work of the next generation of industry leaders and regulators.

MR. EBINGER: Okay, we're open to the floor. If you would, please, there will be mics coming around. If you would please identify yourself when asking a question, and if you want it directed to a particular panel member, please say that and then after the person it's directed to answers, we'll give anybody else on the panel who wishes to comment, opportunity.

Yes, we're over here?

MR. WALD: Thank you. Matt Wald, New York Times. I hear people talk about a price on carbon as a prerequisite for all of this. Given the experience of European pricing of carbon and American pricing of sulfur dioxide, where the markets were, to use a technical term, "flaky," what makes us think that a cap and trade system will establish enough certainty for a utility to decide to build wind instead of coal, a carbon dioxide scrubber or reactor instead of coal? How could you make a price calculation and investment decision if the future price of carbon is as predictable as the price of carbon is in Europe or the price of sulfur dioxide has been here?

MR. OWENS: Maybe I'll start. That's an excellent question. It's -- I'm going to give you a complicated answer. I'm going to try to divide my answer into elements.

When you look at the whole issue of reducing greenhouse gases, I think there are three fundamental themes that have to be looked at. One of those themes are

mitigating the impact on consumers. Another theme is making sure that we are economically competitive. And a third theme is the issue of fairness. Those are all the things that the legislators, our Congress, has been battling with.

In the cap and trade system -- and I'm going to speak from the utility sector's viewpoint -- we are concerned initially with how do we mitigate costs on consumers? There are two costs: There's the cost of compliance, and then there's a cost of moving to greener and more efficient technologies. The cost of compliance, there's a debate about whether you give away permits -- that's called allocations -- or you auction them. If you give them away free, obviously it means that the costs of compliance is not going to be significant on consumers. We favor you giving them away free.

The European system also had some element in that, but they went to a more competitive system. If you give away the allowances free, there's still a shortage, so then you auction, and the auction because of the shortage will create the price of carbon. Okay, so that's the first premise.

Now, how do you make sure that that price is high enough so you can stimulate greener and more efficient technologies. Let's talk about what those technologies are. The technologies could be renewables. Well, we already know that we have energy tax credits, we have production tax credit, we have investment tax credit, but we have to make sure that those tax credits are sustainable over a long period of time so you can make the investment. We have a five-year -- I believe it's five-year -- energy and production tax credit.

The second thing you want to look is other technologies. What are the other technologies' baseload? Nuclear is one technology. How do you give a price signal high enough to stimulate nuclear, but at the same time protect that little old lady who can't afford to pay an electric bill? There's a concept called a price collar. You make sure the

price can't go too high, but you also don't want it to go too low. You want the price to be just right so it stimulates investment in technology and it doesn't hurt those who can't afford to pay.

So that's what the theory is right now. You also want to make sure that those states that are heavily coal-dependent are not disadvantaged from those states that are green: the states that have wind, the states that have tremendous solar, the state that have tremendous geothermal are winners. So you want to make sure that you don't have a tremendous wealth transfer from the coal-dependent states to the green states. That's the complication of it.

The price of carbon is key. The market's got to set the price of carbon, and I believe the markets set the price of carbon, but it's disciplined to a price collar.

MR. EBINGER: Peter?

MR. FOX-PENNER: Well, Matt, in my day job, as you know, me and my colleagues at the Brattle Group are economists for power companies and energy companies, and green energy start-ups, and we have offices both here and in Europe. So we have seen both the European carbon trading system close up and seen all the discussion of a system here.

As economists, we think that the problem of carbon emission permit price volatility is very much addressable. It is not such a severe problem that it compromises the idea of a cap and trade system. The European system was perhaps not started up in the best way possible, but lots of lessons have been learned from that, and great lessons were learned from the sulfur dioxide experiment here, which is generally viewed as a success.

Today we think that emissions markets can be designed that don't have excessive volatility, and all the evidence we see from both very traditional electric utilities all the way to green energy start-ups is that they're financially sophisticated. They understand

that there will be some volatility. That does not impair the long-term price signal in any way any more than the volatility we see in natural gas and coal, and all other fuel prices impairs the long-term price signal.

For decades, utilities have had to make decisions on building one sort of power plant versus another power plant, a decision that they'll live with for decades with uncertain volatile fuel prices. And they've learned to study those patterns and make their decisions, and the financial markets help them hedge and indeed sell long-term price certainty. And I think that will very much happen in the carbon markets, so that I don't think that this is a problem that impairs the idea if climate legislation is designed well.

There all are other approaches that also send price signals, but this one I do think will work.

MR. EBINGER: Reid, did you want to --

MR. DETCHON: Just two brief comments, Charlie. The first is that I think what was significant out of what you heard from David was not if, but how. There's a recognition in the utility industry that this change is coming, and that they need to be in a position to make their investment calculations with some knowledge of the future.

And so to that point, Matt, the idea of carbon price volatility as being an impediment is kind of like confusing weather and climate. If you went to build a home in New York in the middle of August, you'd say, well, I don't need a furnace. But you would be making a bad decision. And, similarly, the price of carbon's going to go up and down, but if you're a utility and you're thinking about how you're going to invest for the next 20 to 40 years, as Peter was saying, you're going to be thinking not so much about what the price of carbon is today or tomorrow, but what that long-term ramp is down toward 80 percent reduction. And that's what's really driving your investment decision. That's what the utilities need to know: What's our destination going to be? We'll figure out the price volatility in the

mix, but we need to know if 20 years from now or 40 years from now we have to be 80 percent out of carbon, we're going to have to make our investment decisions on that basis regardless of what the specific prices are.

MR. OWENS: I'd like to make a comment because I think I'm missing something here. If we want the least-cost path towards a low carbon future, why do we need to continue all the tax benefits that everybody in the industry gets of one form or another, once we have a price on carbon? Because it would seem to me that, ideally, once you set a price on carbon, you know, if the cheapest option is wind or solar or whatever, they'll come in the market. If they aren't, they won't. But why do you want to continue the production tax credit and investment tax credit once you have a price on carbon?

It's very likely that if we have a collar, I would argue, at a certain level, you will never bring on a CCS. And you may say we shouldn't bring on a CCS, but I would pick up kind of the view on the oil industry and mention, you know, with all the countries in the world that consume coal, if the U.S. became a leader in CCS technology --

MR. FOX-PENNER: This could be a great export market.

MR. OWENS: -- but I don't think it'll come on at $20, $25 for carbon.

MR. FOX-PENNER: Yeah, let me respond to that. I think we have to be practical. I'm not saying you're being impractical, but if you have $100 a ton for carbon, it will stimulate all technologies. But you and I know that $100 is going to be reflected in rates. And there's something called a regulator who gets their job by keeping rates low. So you will in no way convince a regulator, if I were a utility, and I am, that you know what? Let me raise my electricity prices by 300 percent so that we can get all these technologies that you won't see, but you're grandchildren will see in 2025, because that's really what we're saying here.

So it's a balancing act that we're trying to achieve here. We're trying to

create certainty in investment so I can make investments. If I'm running the company, I need to know what those price signals are so I can make the right investment. I also want to make sure I stimulate those technologies, so I'm going to have to have some quasi-government involvement. It may mean that I have to tax my industry if I want carbon and capture and storage. It may mean that I do have to have production tax credits for solar technology, but once that technology is mature, I might take away those tax credits.

It's a balancing act that we have to -- and really, the reality is that customers pay rates, and rates are very political. Fair enough.

MR. EBINGER: Okay. I think we have a gentleman back here?

MR. JUNGJOHANN: Thank you. My name is Arne Jungjohann with the Heinrich Boell Foundation. I wanted to pick up the ball where Reid and David left it before, and the main part of the discussion we talked really about, how can we teach these old dogs new tricks? How can we transfer utilities to do a better business with energy savings? And you guys mentioned actually new organizations, new companies going into that market, and I think the difference that I pick up from you was that David said, you know, how can we do a cooperation with before the meter and after the meter, and Reid said something about competition, bringing competition in the market.

And my question to the panel, overall, is how can you actually enable more nuclears coming into the market so that the old dogs maybe also get competition from the new dogs and learn some tricks of them?

If you look at Europe, for example, at some other countries that are going aggressively for renewable energies on a decentralized level, you realize that there are projects like from Volkswagen, the German car company, that is planning to establish 100,000 miniature power plants in German basements for regular people to participate, and they want to create with that a big Internet power plant so to say to be competitive against

other big players.

How can we enable in the markets over here that kind of competition that is food for also the old dogs?

MR. OWENS: Well, maybe I'll start, and I do agree with Reid's comment that we do need more competition. And I'm suggesting to you, let's kind of take the system apart. Let's talk about all the things in the home. The things in the home the utility doesn't provide. The things in the home others provide: Home Depot provides them, Wal-Mart provides them, and so forth. All of those are going to be our competitors because we've talked about a whole new way; we're talking about smart appliances.

We don't build appliances. Others do. We're talking about a meter that talks to the appliance. Yeah, we'll install the meter, but the components of the meter somebody else does, okay, so there's going to be competition. Right now 6 percent -- what do we have today, over 10 million meters? Smart meters? None of those are produced by electric utility companies, that's competition. Those are new competitors in the business. So I see every aspect of the business being far more competitive than it is today.

And we're encouraging that. But I think there's some aspects of that business where we're a little bit smarter than so many other competitors, and that's all I was saying. When it comes to the business of keeping the lights on, that's called reliability. We're smarter than Google. When it comes to the business of cyber security, I think we're smarter than a lot of the other players, so in those areas I'm saying maybe we should be the ones that are controlling that particular aspect because that's our business responsibility. That's why we're regulated industries because we have that imbedded responsibilities.

But all those other areas, I do agree with you, bring on the competition. But I also need to make sure that that competition is validated because if I'm putting that little black box into my system, I want to make sure that black box is cyber secure. I want to

make sure that black box doesn't come with some portals that can penetrate my SCADA systems and disrupt my electric service to customers and create a major national threat. That's what I've got to -- that's why I have to make sure that there are rules that permit me to be a participant in it, not a dominant -- well, I would say a dominant one if it's cyber security, and I would say a dominant one if it's reliability.

But I'm all for bring on the competition, and I think we should have it, and I think we can create some partnerships.

MR. WORTHINGTON: I think that we're in some kind of a similar position what we were about 30 years ago when we started on this regulatory/deregulatory debate. And the real issue is to think through again what the business model of the utility is and what the relationship is that we want to have between the consumer and the utility, and how the governmental process through the Public Utility Commissions intermediate that dialogue.

And I don't think it's at all clear. I think Peter's right to say that there's a lot of different models that can come forward. I think that what David was just describing might lead one to say, well, why wasn't that kind of a public power model? That sounds a lot like just providing the necessary ingredients for a stable and reliable system. What -- if we want to have this blend of public and private utilities, how do we want to compensate the private utilities? What do we want to reward them for? Right now all we reward them for is selling more power, which actually is not in anybody's particular interest. That was a good model when it was devised, but it's no longer particularly useful.

Amory Lovins is fond of saying what the consumer wants is a warm house and cold beer. And that's about right, too. So how do we reward the utility appropriately for delivering what consumers want at the least cost to the consumer? And I might just say, David, this is -- and I'm not trying to pick on you, but you said consumers care about rates. They don't care about rates, they care about their bills.

MR. OWENS: Yeah, right.

MR. WORTHINGTON: And so that's the difference between --

MR. OWENS: I would agree with you.

MR. WORTHINGTON: -- the sales and efficiency. You know, and if -- there are different models. Utilities could end up being providers of energy efficiency and go back to the Edison model that Peter was talking about. How do we make all of your life better and do it at the least cost, and figure out a regulatory model to compensate them for doing that, which it does not do now?

MR. FOX-PENNER: Right.

MR. WORTHINGTON: Or you disentangle the whole thing. There's a lot of people saying, no, utilities are fundamentally ill-equipped to do this. Nobody would accuse people to go into the utility industry and doing that because they wanted to be entrepreneurs? So how are they going to be able to think of all these new things, and how are they going to open the doors to Google and Apple and duh, duh, duh, duh?

I think that's a perfectly good question. I don't know the answer to that. And if you start to disentangle that, then you have a real regulatory challenge about how you maintain the reliability that David rightly talks about. But you also allow consumers to have the kind of access to new technology that the system really does not easily promote today.

MR. EBINGER: You need to put your hand up.

MR. FOX-PENNER: Let me add to this muddle by saying you can tell this is a very important and a very difficult question. I spent a lot of time on it in the book. But there's two dimensions of this that I am hearing here and I think about.

One dimension is, I guess you would call it the vertical structure question. There are lots and lots of companies starting up in the United States, some of them well established, that are selling competitively end-use technologies, efficiency technologies,

demand response technologies, and they're going their best to work with utilities because they need to. The utilities are running the grid and supplying the power in most places. So we don't have a shortage of them and that's a good thing.

What becomes more and more complicated is how utilities charge those companies with the customer in the center for the services that go back and forth when they get complicated. If you're sending power back into the grid at different times with different levels of a liability and so on, that has to be priced fairly in terms of what the grid pays to absorb that. That's a complicated regulatory and pricing question.

The second dimension of this that I also alluded to is this question of energy efficiency. I work with many of those start-ups and they're great people. And a lot of them are very dedicated to green principles and advancing the environmental agenda, but very few of them have the capital base to finance the energy efficiency of their customers. It takes thousands and thousands and thousands of dollars to retrofit the average American house or apartment, and they just want to go in and put in their one particular box and make their money off of it. So who is it who's going to really partner with that homeowner or that building owner to install the rest? Well, if it's the utility, then the utility has a very special relationship with that structure, and mediating between that relationship and all these competitive people who want to drop in particular technologies, but not take on the whole mission of energy efficiency is really a national policy/climate policy question.

MR. EBINGER: Yes?

MR. DETCHON: Charlie, Pat was trying to get in.

MR. EBINGER: Oh, Patricia?

MS. HOFFMAN: I just wanted to make one comment. I think the pace of how things develop is how fast the utilities embrace innovation and acceptance of new technologies as well as how they pair it up with innovative financing mechanisms and other

capabilities that I don't think we begin to -- have begun to really investigate where the role of the utility is. But as we add technologies and as utilities embrace technologies as well as ways to provide additional services to consumers, we're going to see different models really take off.

MR. BERRY: My name is Pat Berry, and I'm a lawyer with Baker Botts, a law firm here in Texas. And we've represented Houston Lighting & Power --

MR. OWENS: Berry, I remember.

MR. BERRY: David, I remember you when Houston Lighting & Power wasn't Houston Lighting & Power.

MR. OWENS: That's right, I remember you as well.

MR. BERRY: Edison Electric Institute.

MR. OWENS: You look great.

MR. BERRY: Well, you do, too. You haven't aged a bit.

MR. EBINGER: He looks the same.

MR. BERRY: My hair's gotten a little grayer.

I would like to first compliment the Brookings Institute for putting this panel on. This is one of the most fascinating discussions that I've heard. We represent CenterPoint. CenterPoint was one of the companies that was lucky enough to get one of your grants, a $200 million grant, for its installation of smart grid, acceleration of its smart grid program, which consisted of both a meter system as well as hardening of the grid.

One of the things that should be said, and it's not been said so far, is that the Department has released $4 billion of funding. Just yesterday you announced a number of training -- worker training programs, and that amount of money, as Eric Lightner likes to think, is an awful lot of money to get an awful lot of data. And I think that we need to be reminding ourselves as our business people remind all of the people going out and talking

about smart grid, we're going to be getting a lot of data from this investment of money. And a lot of things may not be what we think they're going to be. But I just wanted to make that point as an introduction to the question about what kind of benefits -- and, Barry, you made the question, how do we show the benefits to the customer?

In the Texas market, in the ERCOT part of Texas, it's fully deregulated. And so CenterPoint which used to generate power now just distributes power. We think our customers, Barry, are going to have -- we anticipate they're going to have competition with the retail providers, whether that's going to be wind, whether it's going to be nuclear, whether it's going to be a combination of more highly efficient gas. And we think that that's a totally different situation than a fully-integrated system. And I'd really like to get your comments on that.

MR. EBINGER: Anybody want to take that?

MR. WORTHINGTON: Well, I agree that when you speak of the electric utility industry, you're really not being clear if you don't make the distinction between the regulated and competitive generation markets, because they're very different. And in terms of technology selection, customer acceptance and so on and so forth, it's a vastly different area.

To reinforce my point about industry communicating, you know, CenterPoint has had a very favorable customer reaction so far to their smart meter deployment. On the other hand, Encore has had a very different experience, dramatically different experience.

SPEAKER: That's right.

MR. WORTHINGTON: And, you know, part of the situation with Encore -- for those of you who might not know, Encore is a distribution utility, principally Dallas, but a lot larger than just the Dallas area -- they deployed their smart meters and had, you know,

hundreds and thousands of customer complaints about the price. And, you know, darn it, that smart meter must have been what drove my bill up. And no one mentioned that it was the coldest winter in the history of Texas. You had more snow in Dallas than you ever, ever, ever had in history. And I wonder if the cold winter, unusually cold winter, historic cold winter, had something to do with customers' bills going up or was it the new meter?

And, you know, again, it's our problem with the industry of not being able to communicate as clearly as what we obviously need to about what the benefits of this are.

And your point about the information that's generally come out of what Pat's doing is dramatic. And that, you know, that may be the opportunity where we can learn exactly how to articulate what the benefit to the customer is going to be.

MR. OWENS: Let me, if I just might echo again what Barry was saying. We've done a terrible job of educating the consumer about the benefits of the smart meter. We really have. He pointed to the example in Texas. There's a probably more compelling example in California. There's an evolving example in other parts of the U.S. What it said to EEI is, we better get out there and we better start talking to customers, and we better have a very aggressive communication campaign so we can simplify this issue and get feedback from the customer. It can't be one-dimensional.

Some customers say I didn't ask for that meter. Why are you taking out my old, mechanical, electromechanical meter, putting in this digital meter? I didn't ask for the meter to talk to my appliances, so why are you doing that?

So we've got to be able to explain this to the customer. And I don't want you to know when I watch TV at 2 o'clock in the morning. I don't want -- that's privacy. So we've got a tremendous education that we've got to do with the consumer and we're equipped to do it.

MR. WORTHINGTON: And couple that with the notion that the customer

might not want this meter, but he's going to have to pay for it whether he wants it or not.

MR. OWENS: Yes.

MR. WORTHINGTON: And also keep in mind that, you know, for 120-some years the customers want simply to flip a switch and the lights go on, the refrigerator stays on. They don't really care a whole lot about anything other than their appliances work --

MR. OWENS: The beer is cold.

MR. WORTHINGTON: -- and the beer is cold and I can afford the bill that comes once a month. They really don't care what the technology is; they don't care what the fuel is. Largely, they may have a preference, you know, in their heart for wind over coal, over nuclear or whatever, but, by and large, the vast majority couldn't care less.

MS. HOFFMAN: But I think where they're going to care is they get a bill that's retroactive. Now they may be able to get a bill that's predictive, at least more predictive and more accurate. And I think where we're heading is not to be so reactionary in the system, but be more proactive in what's happening in the system to improve reliability and improve service to customers.

So as we move forward and look at benefits, we're going to have to bill the benefits to each part of the system. Most people focus on meters, but as we're investing across the whole utility, we're adding value to understanding better what's happening on the system in real time versus -- and also being predictive so that we can better get ahead of what's -- potentially what could happen on the system versus reactionary.

MR. EBINGER: That's right. Did you want to add something?

MR. FOX-PENNER: I just wanted to mention that I heard something different in the question, which was the issue of vertical integration or whether you have retail deregulation as you do in Texas, and the CenterPoints and Encores don't really get

into the selling of the kilowatt hours themselves. We have that in about, oh, maybe a quarter of the country now.

MR. OWENS: Right.

MR. FOX-PENNER: And the other three-quarters have the traditional model where utilities continue to sell you the juice.

In a way, the two -- the future business models that I set out in the book, are the evolution of what we have today: the evolution of the so-called deregulated markets, although they're still quite heavily regulated and policed and for good reason, but the evolution of those kinds of markets will be the smart integrator; and the evolution if utilities stay in the kilowatt-hour business and we don't go to that sort of deregulation, I think they will be forced, in a way, into the energy services utility.

So in a way, my two business models map into what is often called deregulation, or retail choice and nonretail choice states. It's in some sense the future of those two, but I don't like those two terms. I never did because I thought they were both misnomers. But, as I mentioned in my remarks, I think the most likely direction is towards the greater reliance on markets, something more towards the P.J. Emer Texas model, as and after smart grid technologies get deployed because they unlock a lot of the benefits of that model.

MR. EBINGER: A question here in the front?

DR. HASKELL: Hugh Haskell from the Institute for Energy and Environmental Research. I'd like to move the discussion a little bit into the area of psychology. One of the things that we're looking at when we're going to increase efficiency is consumers -- how consumers are using their energy, and this involves behavior modification. And, in general, people don't want to do that. They don't want -- as we've said here, we want the switch to go on and we want the beer cold. We don't

care how it gets that way.

So we don't want to change the way we act in order to get this increased efficiency, but there are ways to do it. And I think the psychologists have investigated this, and one of the ways is instant feedback; if we know exactly what's happening when I turn that switch and I get something telling me that this may not be the right thing to do.

I wonder -- and I just went to my limit of my knowledge of this, and so what I'm going to ask is, is what are we doing to investigate how effective some sort of behavior modification techniques involving the smart grid and the smart meters is being done to help the necessary behavior modification that we're going to do?

MR. FOX-PENNER: Some companies are doing what we call pilots. I'm aware -- I'm not going to mention the companies -- a number of companies are doing pilots. And, for example, one set of companies are saying let me look at price signals. One of the things that Pat said is that you're going to be able to see a little bit more in real time -- and I really don't know what I mean when I say "real time." Let's just say you'll be able to see your energy prices that reflect as close to possible what it's costing the utility to provide you that energy.

So one utility did a pilot and said let's see if low-income consumers, let's see if they change their behavior if we put in a smart meter. And let's change the rates so that now the customers don't get what we call average rates, they get rates that really reflect what it's costing at those different times of the day. And they said that will -- we will see if we -- if the customer will respond differently. And you know what? The customer responded very, very differently. In fact, they saw that the low-income customers, there was a tremendous shift in how they use energy, to their benefit. So the bills were lower rather than them getting a tremendously much higher bill. They got a lower bill because they understood now, by seeing those rates and seeing what appliances were consuming what,

they were able to adjust it to fit their lifestyle, but, importantly, they lowered their bill.

So many companies are doing that today. Other companies decided that they have a better understanding of their customer base, and they haven't done those experiments. But a number of pilots -- we're learning quite a bit from pilots.

MR. EBINGER: Patricia?

MS. HOFFMAN: I think it's important to understand consumer behavior because it is a key part of the equation in getting the smart grid right. I don't think all these utilities understand the customer base, but one thing that we are maturing to is not one size fits all. The customers are different and they have different expectations. Some really want to get into the weeds of things whereas others want a hands-off model. And the way were going to get smart grid right is to recognize the flexibility that must be provided to customers with smart grid technologies and matching them up to what they're looking for.

So making sure we understand what customers want -- and we can provide those services with multiple tools or options, whether it's a Google platform or a smart thermostat -- you provide multiple tools depending on a customer's interest as well as rate structures.

I would even go beyond just tools, but flexibility among rate structures, depending on how the customer or what you're trying to achieve.

MR. EBINGER: Reid?

MR. DETCHON: I agree with what has just been said, particularly Pat's comments about needing different models. But I think that Barry's onto something, which is that, as Jim Rogers says, energy is a back-of-mind issue. People don't want to think about it, as you indicated.

I think that one model that's going to come out will be a software package that essentially will be a one-time installation with the customer. And you say, what, you

know, what's your lifestyle like? What do you care about? What do you want to have controlled and what don't you want to have controlled? And it seems very likely to me that once we get smart appliances and so on that software can bring these together, reduce your overall energy consumption at no cost and comfort to you, but that you don't have to engage with it on a day-to-day basis. You'll make a decision once a season or once a year, or maybe just one time, period. And then the whole thing will operate out of sight and make your house more efficient.

MR. EBINGER: Peter?

MR. FOX-PENNER: I just wanted to mention a couple of things on this topic. It's an extremely hot topic in energy research. It was researched in the '70s and then it fell away as energy got cheap, and now there's a renaissance. I think the American Council on Energy Efficient Economy just held a conference or behavioral aspects of energy use, and it was really, really, extraordinary.

I also want to echo what the panelists just said, which is that there's -- in what we're learning there's a divergence between people who really want a lot of that instant feedback and want to get hands on, and people who -- the majority of people say, in Jim Rogers' words, "Energy's a back-of-mind issue." I got so many things to worry about, so many things my cell phone can do already, I don't really want to have to program everything in my house.

And so we need to figure out a way to bring this application to them and to get them to be willing to pay for it without them viewing it as just more headache for them.

MR. EBINGER: We have a question in the back and then we'll -- to the front. Yes?

MR. GENOA: Yes, thank you. Good morning. Paul Genoa with the Nuclear Energy Institute. This is a great panel.

Barry, this question is probably for you, but it plays off the last question. Clearly, we were talking about this today because we have over 100 years involved in electric systems to meet human behavior. And we all get up together, we basically do the same kind of things together, we go to bed together, you know, and we get a diurnal kind of a change. And we have developed the electric system we needed. So we have peak demand and we've got baseload demand. And so now what we're doing is realizing that because of that somewhere between 60 or 65 percent of our generating capacity is really underutilized. Maybe we can fix that with a smart grid; maybe we can convince people not to use peak power by changing their meters (inaudible; audio interference) BlackBerrys, everyone should turn them off. But anyway, the bottom line is that what we're trying to do now is change human behavior so that we can operate this system.

Now, maybe we have so much invested we're stuck with that and we have to do it. But if you could for a minute, Barry, think about a remote community that's being built in our country, or a remote country that really is developing, could there be a model that instead of developing that way you would essentially look at forecasts 20, 30 years what the demand would be, develop baseload capacity to meet that demand, and when you did -- when the electric demand dropped off, you would just merely use that electricity either to produce fresh water that people need anyway or hydrogen through electrolysis? Because both of those essentially are ways to store that energy and might that not be a more efficient process going forward?

MR. WORTHINGTON: Well, I think those kinds of developments are taking place, and one of the best examples that I would give is in a number of different countries in the Mid-East. They are developing those file of community where you do have more control over, over demand, and you do have alternative uses for power.

You know, the promise of energy storage, I think, is really if there is -- you

know, we all talk about there's never -- there's no silver bullet. Well, energy storage could happen to be in the silver bullet.

SPEAKER: That's right.

MR. WORTHINGTON: And you have a whole lot of climate issues, you have a whole lot of problems that go away if you're able to store electricity that can't be done effectively on a large scale.

Now, and three's a lot of development that's being done, DOE's putting a lot of money into storage technologies. I think, myself, that's what the key is to the base.

The other thing I would mention is, you know, even though we've been working hard at energy efficiency for 40 years, practically, 35 years, you know, in the United States we have not developed any kind of an energy efficiency ethic, which is certainly more common in Europe, it's more common in Japan and some other countries.

And, you know, if you look back over this same time period, we have done a wonderful job of getting people not to throw their beer cans out of their car windows. You know, nobody litters anymore, you know, compared to 35 years ago. Because of Smokey the Bear everybody knows don't accidentally set off a forest fire, you know, and you look at what we've done just in smoking cigarettes. I mean, you know, you can't smoke in a public building anywhere now. It's dramatically changed people's behavior, but we haven't got there with energy efficiency yet. And maybe we need a Smokey the Bear for energy efficiency.

MR. EBINGER: Okay, we have one here, and then we'll --

MR. FELKER: Hi. I'm Edward Felker (inaudible) with Energy Guardian & Wire. Getting back to electric vehicles, there are two assumptions/presumptions, going on with the discussion there, and one is that the utility energy has the capacity to charge vehicles with its unused capacity overnight.

The other is that we will reduce our dependency on foreign oil, that, you know, that all that, the oil that we need, will be made here. We will just cut out the part coming in from overseas. Could you address those two assumptions, and whether, you know, the likelihood that either of them will come true without some other massive change that we're not talking about here?

MR. OWENS: Let me try and address at least the first one and just maybe correct a little bit of what you said. At least I tried not to give the impression that the infrastructure is there to accommodate a widespread transition or transformation to plug in electric vehicles. The infrastructure is not there. It means that we've got to make a major investment in the infrastructure, and all elements of the infrastructure. And there's got to be some clarity about how we do that.

And I believe Peter or someone made the reference of the need to upgrade distribution transformers. If everybody came home and plugged in their vehicle with a 220 plug, the demand surge and the requirement that would be imposed on that utility are substantial. So we do have to make major new infrastructure investments.

And we are working with DOE, we're working with the automobile industry, we're working with Congress to get some clarity on the kind of investments that could be made with some support from the government, because that's a job-creator and it's a business transformation.

With respect to the dependency on oil, I can only speak from the electric industry standpoint, and I commented on two aspects of it. I said it will reduce your dependence on foreign oil, which clearly it will, and it will, in fact, enhance our development of other technology such as nuclear, which produce no greenhouse gases.

Now, other panelists may have -- they may want to add to that, but that was how I was responding to it. We can rely more on domestic sources, on cleaner and greener

sources, and creating a greater technologies.

MR. WORTHINGTON: I hate to disagree with my good friend David, but I challenge the assumption that you're going to reduce foreign imports. And every president of the United States since Richard Nixon committed that we're going to reduce imported oil, the volume of imported oil, and oil imports have doubled. And there's a really, really basic, very simple reason why that's the reality. And that is in global commodity markets low-cost production wins every time.

And so I don't care whether you go in the route of electric vehicles or natural gas vehicles, as Boone Pickens and others have advocated. You know, we're importing about 12 billion barrels of oil a day now and producing, domestically, about 8. Those are round numbers, down a little bit from what it was a couple of years ago.

If you took 2 billion barrels of oil out of the transportation field market, why does anybody assume that oil is coming from foreign import instead of domestic production? Because domestic production in every case is higher-priced than the import. And so, you know, the notion of unintended consequences, you could end up by reducing, controlling consumption in transportation, you could end up moving your percentage of imports from 60 percent to 75 percent, unless you take some type of a political policy, legislative action, where you do an uneconomic, unmarket-based approach that puts a trade barrier up for imports.

But given the world economy the way it exists today, if we reduce gasoline consumption by the equivalent of 2 million barrels a day, odds are that's coming out of domestic production, not out of imports.

MR. DETCHON: Just briefly, I just want to suggest that it doesn't matter, that really the issue we have to deal with is what's the role of oil in the economy and particularly in the transportation sector? And if you look at the difference between the effect

of the oil shock in the '70s, or shocks in '70s versus the run-up in prices we had the last couple of years, the impact of the latter was much less because, systematically, we have reduced the role of oil in the economy, and that's to our benefit. And that's how you achieve security.

It's not that we're going to get all of our oil from Texas versus Saudi Arabia any more than we get all of our steel from Pittsburgh rather than Japan. Who cares? The real issue is what's the impact on the security of the country and the economy either from a disruption or from sudden upticks in prices. And the key to that is reducing the use of oil overall across the economy. The more you move toward electrification, in effect what you're doing is you're diversifying the fuel sources for the transportation sector. And that's to our benefit.

MR. EBINGER: Peter?

MR. FOX-PENNER: I was just going to say what Reid just said. It can -- it's a bit of a talking past each other to say that because it is a global commodity market, that is, oil is a global commodity market that as we reduce our oil demand because of due to the electrification of transport that we will necessarily reduce the percentage that we rely on imports. We may continue to have a large percentage of imports, but exactly as Reid says, the less oil we use in total, the more secure the country is, the stronger our employment base will be here, the more energy-secure we will be.

So it's not about reducing the percentage of imports; it's about getting the country off oil and onto low-carbon sources of energy.

MS. HOFFMAN: And I'm going to add to that in saying that the important thing is diversification, whether it's our energy, you know, our generation mix as we talk about that, or our transportation sector. But the security comes from that diversification, and it's very important to have.

MR. EBINGER: Exactly.

I have to jump on the bandwagon here with Barry and his earlier comment about the domestic will in this being not playing dead. And do we really think the Persian Gulf oil producers are going to play dead as they see their market sizably eroded? I mean, what is the chance that they decide to collapse the price of oil? And so we're going to have a high-cost transportation sector.

You know, people are not focused on this, but recent projections are predicting that in 6 to 7 years Iraq, which all we think of right now as a country in political turmoil, can be a 14-million-barrel-a-day producer. You know, you can make a case that if we slash our oil use and others maybe in the OECD countries do, too, that the price of oil is going to go down. It's not going to go to $150 dollars a barrel; it's going to go down. So we're going to have locked ourselves into a higher-cost option than we might have otherwise.

It's also interesting when we say we've got from a balance of payments point of view, clearly we want to reduce our dependence on oil, the imports, no question about it. But this idea that I hear constantly on the Hill, well, you know, we got to reduce our dependency on the Middle East. We don't get most of our oil from the Middle East, that's the great unknown fact on Capitol Hill. You know, we're getting it from such dangerous countries like our neighbors in Canada and Mexico, and West Africa that we have geopolitical interests in. This debate I think has gotten very, very skewed.

I also want to point out with all -- I agree with Patricia's point that we want to diversify, but let's get real. We have 246 million vehicles on the road today. How soon are we going to have 20 million electrics? Now, that would be great, but you're talking about a very small percentage still --

SPEAKER: Right.

MR. EBINGER: -- that are going to be on the road. You also, even when electric cars come into the market and, you know, reach a price point where people are really seriously interested in them, I think you've got to ask your point: How many of us are going to junk our conventional cars just to buy a new electric? There are some people who always want the new gadget, but, you know, most of us --

MR. OWENS: We'll give you cash for clunkers.

SPEAKER: What?

MR. OWENS: We'll give you cash for one of those old cars.

SPEAKER: That Cash for Clunkers, that was the most costly, ridiculous program ever perpetrated on American energy policy.

MR. OWENS: I just wanted to get you excited.

MR. EBINGER: But anyway --

SPEAKER: We need another panel.

MR. FOX-PENNER: Anyway, we have to move on. I think we had a question here.

MR. TEMPCHIN: To change direction a little bit with his injuries in discussion, Rick Tempchin, Edison Electric Institute.

I wanted to go back to something that Barry said. I think every meeting I go to like this people talk about the public information campaign, the Smokey the Bear for energy efficiency and energy efficiency ethic. Congress authorized but didn't appropriate money under EPAC for this. For all the panelists, how do we do this? Everybody seems to think it's a great idea. Personally, I agree with it. How do we get a -- you know, we had Ready Kilowatt. How do we do this again for energy efficiency? How do we get an energy efficiency information communications campaign out to customers, customer education?

MR. EBINGER: Reid?

MR. DETCHON: Well, I'll be contrarian here. I don't think it's a great idea, I think it's a silly idea. The idea that we're going to persuade 300 million Americans to change their behavior in order to save a few cents on their electric bill I think is ridiculous. If people wanted to change their behavior, they would change their behavior. And the reason we've done all these public information campaigns is because of the structural impediments in the system that prevent utilities from being motivated to do efficiency. They don't want to cut their sales.

So what do they do? They send out a lot of flyers and say turn off your lights at night. Okay, well, that's really helpful, thanks a lot.

I think until we get the market signals right and motivate people with economic changes that they can make and save money, as Patricia was saying, you know, low-income consumers change their behavior radically. Even high-income consumers will change their behavior if they can do so without affecting their lifestyle. But I don't think that telling people that they're wasting energy does any good.

MR. EBINGER: Anybody else want to comment on that?

MR. FOX-PENNER: I'm not going to touch it.

MR. EBINGER: I have a question back here, on the side there.

MR. BOND: Good morning. Drew Bond with Battelle, and, great panel, thank you for hosting. And Pat, I'm very glad to see you. I'm a big fan of both and have worked with both closely.

So my question is, we talk about the electrification of transportation, and as I hear these conversations in a number of places, the one sort of place where the breaks tend to get put on pretty heavily to the conversation is the area of transmission. And, you know, so I spend time working in sort of conventionally what's the valley of death, that space between technology development and investment. And it seems to me when you think

about electrification of transportation, it's really sort of a canyon of death where you get into this morass of, you know, three regional grids, lots of -- you know, 50 public utilities, lots of localities, lots of NIMBYs.

And so my question is, how do you -- how do we address that issue? I mean, it's a very complex issue, and if we really want to electrify our transportation, if we wanted to get to a smarter grid, can we do it on the backbone of what we have today? Do we need more right-of-way? Or can we simply upgrade using existing right-of-way?

MR. EBINGER: Patricia?

MS. HOFFMAN: I'll start. With respect to that, a lot of people want to give a very high generic answer to those type questions, and I really go back to the devil's in the details. Some parts of our systems, we will need to upgrade our system. We will need investment in transmission. We will need storage. We will need investment in the distribution system. But that investment is going to differ depending on the region, depending on the generation mix, and depending on the demand and the price of electricity.

And so one of the things is we need to add more sophistication to the discussion, or in-depth analysis, to really tease out what are the requirements as we move this country forward. So if somebody wants to put multiple, you know, hybrid electric vehicles on the system, what is the requirement for that part of the system? But it is very unique in different parts of the country that I think we need to get -- actually get more into the details of what's going on versus saying we're going to do one answer that will fit all, because it's multiple solutions.

MR. OWENS: Let me take a crack at it as well. I'm going to come at it first I'm going to be critical. I don't think we need to do a bunch more planning studies. I've been involved in so many transmission planning studies it's ridiculous. It comes down to -- and PP used to say it's all about sighting. It's really about cost allocation, who pays. That's the

biggest issue. We can use existing right-of-ways and the smart grid will do that, but if we're talking about integrating renewables, you can't use existing right-of-ways because they don't exist. So you've got to build more transmission.

And we all know that building transmission across state boundaries, unfortunately, many of the renewables are located in areas where they're not close to load centers. So it means you've got to build transmission and you've got to build transmission across the state boundary. So somehow, you've got to streamline that process of bridling transmission, and you've got to clarify that the benefits -- and you can demonstrate the benefits can flow very broadly to consumers. That's called cost allocation.

The FERC doesn't want to touch the cost allocation issue because it's a very complicated issue. I have difficulty dealing with my members on this issue because they all have different views on it. We've got to solve the cost allocation issue, and you've got to have the states agree -- and DOE, I thought, did some superb work in this area -- that you -- if the states don't make a decision on that essential transmission to integrate those renewables or protect reliability, then the federal government can step in and have federal limited domain authority.

We tried that in EPAC and we failed. We tried it again in bills in Congress; we'll probably fail again. But until you deal with that impasse, you will not, in my opinion, enhance the transmission system to have the level of efficiency that all the panelists have talked about.

MR. DETCHON: I'm in the unusual position of being in agreement with David on this one and we're seeing the potential legislation in the Congress right now, similarly, that this would be a step in the right direction. One thing it would do would be it would elevate the planning function up to at least the interconnections in Toto. So you'd have half the country each doing the analysis together, and that would lead to better

planning, I think, for interstate lines.

Texas actually does a wonderful socialist job of this, even though they claim to be a big free market state. They just tell people what they're going to do.

But I think the other two interconnections could use that kind of integration, the cost allocation, and if David can only deliver his members, we will get it through Congress this year.

MR. EBINGER: Can I ask a question? If we got it through Congress, I mean, I guess we had some of that authority in the Energy Policy Act of 2005 --

MR. DETCHON: And it got challenged in court.

MR. EBINGER: Right. Is this the situation to clarify, you think we need to challenge all the way up to the Supreme Court?

MR. DETCHON: Supreme Court won't take the case.

MR. EBINGER: They won't.

MR. DETCHON: No.

MR. EBINGER: So it'll stay in the lower courts.

MR. DETCHON: You got to do what Reid said, you've got to have new legislation.

MR. EBINGER: Okay.

MR. FOX-PENNER: Anybody? Yes, sir?

SPEAKER: I kind of see the transmission as the easy part. I think of the New York City, the Northeast, and the high-density urban areas, big opportunities for electrification in transportation. I'd like to ask Peter for his perspective on the unique utility model for the high-density urban areas, financially strapped, but opportunity rich. Thanks.

MR. FOX-PENNER: Well, the urban areas are where the investment utilities are -- predominate. There were energy efficiency opportunities, are certainly the

strongest, and it's a place where if, basically, the policymakers wanted it, utilities could integrate downstream.

Those are also the places where there is quite a lot of commuting over set distances by auto, and I think it's three-quarters of all Americans drive less than 40 miles round-trip a day, and that's in a car that was charged up and got a 40-mile range on electricity. It works very well in an urban area where you can charge it, maybe over while you're sitting there during the day, slightly charge it up, and then drive it home and charge it overnight.

Those are definitely opportunity-rich areas, but they also are areas where public power has a strong history and where municipal governments, you know, the municipal governments in many of the big cities of the United States are leaders in energy policy and energy efficiency. So I do think we should sort out who's going to lead and get -- start to maximize the opportunities in this era of change.

MR. EBINGER: Yes, sir?

MR. BROWN: Thank you. I'm Scott Brown with Exelon Corporation, and we've done a lot of work with Peter and a member of David's organization.

Peter, my question's to you a little bit. I heard earlier on a lot about the value of markets and smart grid and the need, because in the end they are consumer choices. You know, when we look at post-EPAC 1992, which you document in the book, I think you can argue that the input or the establishment of markets in the wholesale marketplace led to huge improvements in efficiency and improvements in environment when we moved away from commanding control and went to market.

Can you talk to -- and I'll give you one that expands a little bit. You talk about the two and a half miles in the book. Can you talk about how you think the market gets maintained there for those consumer choices and type of things that regulators should

think about when they walk through those two and a half miles?

MR. FOX-PENNER: Well, there's quite a lot to that question, Scott. First of all, one thing I'll say that I think is easy and maybe wasn't clear, is that I pretty much take -- assume that the wholesale markets that we've established almost everywhere in the country pretty robustly continue. And in all these wholesale markets there's quite a lot of trading activity that's overseen by the Federal Energy Regulatory Commission. There's still a fair amount of integrated utility activity and plant ownership, which I also think will continue.

But as Scott mentioned, those markets have been -- are working better and better and better. And we've now done studies for Exelon and for others that show that you can actually measure the benefits of those wholesale markets.

The question, really, that the book deals with and that I think the industry has to deal with is what to do at the retail level. As I mentioned earlier, we have two different models going in the country now. We have retail choice in a third or a quarter of the country and the rest of it with traditional service. And there, Scott, we have these two pathways. I think the more likely one is that we will introduce more deregulation or more market forces. And, in particular, what's different about this era, there's two things different about this coming era of less regulation: One of them is that the products are going to be much more complicated and, in some sense, valuable, much more choice.

It isn't are we deregulating commodity energy sales? You can have, you know, 24/7 service at your house, yes or no. There's going to be much more that you can buy. You can buy -- you'll be able to buy control over some of your appliances and differently than you buy the commodity of power. The commodity power of night and the day will be different products and so on.

So while I do think there will be less regulation of all of that, it -- less price regulation of that, there will still be a very big role for regulators that that's this very complex

transition for regulators to establish these markets and learn how to oversee them well.

MR. EBINGER: We can take one last question. The very patient person in the back.

MR. NIX: Hi. Michael Nix, PJM, and thanks for the comments there, Peter, about the wholesale markets. We appreciate that.

Smart grid, as we're going forward on this, Peter, a comment you made earlier reminds me of this, and something that Patricia had said. So at a conference at a couple of weeks ago -- David, you'll like this -- we are doing a number of these pilot projects.

MR. FOX-PENNER: I didn't want to mention a conference --

MR. NIX: Patricia, it was either a comment -- it was on a panel that had Microsoft and a number of other technology providers. They were talking about 36 different customer classes they had seen out there.

Peter, you had mentioned something about how consumers don't want to have more decisions to make. That's pretty much how --

MR. FOX-PENNER: Some. Some consumers.

MR. NIX: A lot, most consumers --

MS. HOFFMAN: Mm-hmm.

MR. NIX: -- don't want to have more decisions because they're saying, okay, I've got my cell phone, you know. I'm making decisions on that.

This is a matter of two-way communication, all right. PJM thinks that. We get a lot of that from what DOE tells us. This is two-way communication between your electric meters and your appliances in a home or your place of work.

Do we take this forward? I look at the cell phone. It's more expensive for me to have this cell phone than it is to have a land line, but, I mean, I'm scheduling lunch here, I'm putting on the web, I'm getting e-mail, all this kind of thing. I'm getting more benefit

from this cell phone than I am from a land line phone. All right? Do we market this?

We're energy wonks in here. We're going to take advantage of this, but what we hear a lot, what PJM hears a lot from regulators is this is going to benefit part of the community. Well, we want it to benefit the great majority of the community, and right now we see it benefitting the energy wonks, you know, the people in this room.

Do we market this the way we market the cell phone with, okay, this is a neat, cool device, and it benefits you? I never heard anybody complain about cell phone rates, really. Everybody's got one. Is this the way we go forward in marketing the smart grid?

MR. FOX-PENNER: I don't think so. I think there are some parallels to cell phones and telephony and -- but, in general, I think electricity's different than cell phone service. It's much too integral to our health and safety. We need it continuously. My cell phone drops calls all the time. If my electricity went out as often as my cell phone service drops the calls, I would probably be pretty unhappy and I'd probably have some messed up appliances. I want to say it doesn't.

And I also want to say that I'm reasonably okay with my cell phone service, but it's a different thing. So I think we need to be attentive to the differences as well as the similarities.

MR. EBINGER: We're out of time, and I wanted to give both Peter and any of the panelists, if they had any final comments they wanted to make.

MR. OWENS: I'll put a plug in for Peter's book. I've known Peter for a lot of years. He can't put a plug in, but I can.

MR. EBINGER: Speaking of which --

MR. OWENS: Oh, I'm sorry.

MR. EBINGER: -- before we move to Reid, speaking of which, Peter will be

outside right after the meeting signing books for those of you that want to get them.

MR. OWENS: But I would encourage you to read it. I think it's very thoughtful. And the question that was just raised by Scott I think is the fundamental question, and I think Peter's book does begin to probe it.

We're in what I would consider to be a substantial transformation of our distribution system. The customer now is going to have a whole menu of choices. We're going to have distributive resources. We may have plug-in hybrid electric vehicles. And I think Peter's book tries to lay out what the model should be for the company and what the regulatory challenges are. I think it's going to be great for society. So I'd encourage you to read it.

MR. EBINGER: Reid?

MR. DETCHON: I just wanted to come back to a point that I think got neglected in our conversation that maybe wasn't the sexiest thing in Peter's book, but may be one of the most important. And that was his proposal at the end about providing new mechanisms for training and certifying regulators. I think that we have a system in this country where -- obviously it varies by state, but you certainly have a different quality of state regulator in a New York or California versus Alabama or Wyoming.

And you will have some states where the regulators are elected and some states where they're appointed. You have staffs -- many of them have been in place for many years, but maybe aren't as current as they need to be with the changes we're talking about -- grew up regulating in a different age. I think that we need to think, if regulation is going to be such an important part of this transition, we need to think about how we do a better job of preparing our regulators to regulate.

MR. EBINGER: Patricia?

MS. HOFFMAN: I just want to close with adding a comment on the last

question, and that is smart grids about building a platform. It's building a capability in the United States that will evolve into many things that we haven't even begun to think about with respect to interacting with consumers, with respect to how to manage our energy system, with respect to how to deal with the peak in the United States. It may not be wholesale power flows; it may be managing peak more at the retail level than at the wholesale level.

So the smart grid is a platform that we will build off on the future, and it is a necessity to provide transparency of information, information to consumers as well as information across the United States among our ITOs and ISOs and RTOs. And that's what is the capability we need.

MR. EBINGER: Barry?

MR. WORTHINGTON: I would close by saying that pretty much everything that we've talked about this morning is all based on how the regulatory functions work at the state level. And many of the policy changes that are going to be required are going to take state legislative action, and we haven't mentioned that. But energy has always been about local politics, and if we -- and I say that to reiterate that we need to be bringing the consumer, the customer, along with us on this ride.

And, you know, regulators react a certain way to customer complaints, whether it be prices or poor service quality. State legislators react in a different way than regulators do. They're much more on the front line. They're much more dealing and talking with the customers, consumers/voters. And we need to keep that in mind that we look at all these dramatic state-level regulatory changes that are going to play out, and energy's always been local politics.

We did a seminar in Macedonia years ago, and this guy, who was probably a communist, banged his fist on the table and said we could run a damn fine power system

in this country if just the politicians would leave us alone. And my response would be why would you be the only one in the history of the world that got to have that arrangement?

MR. EBINGER: Well, I want to thank Peter and the panel. I think that's -- and the audience for your very good questions. And thank you very much for coming today.

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CERTIFICATE OF NOTARY PUBLIC

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

/s/Carleton J. Anderson, III

Notary Public in and for the Commonwealth of Virginia

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