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P R O C E E D I N G S

MR. EBINGER: Ladies and gentlemen, I'm Charles Ebinger, the director of the Energy Security Initiative here at Brookings, and on behalf of Brookings, we're delighted to welcome our distinguished panel today. I don't think the panel needs an extended introduction, so I'm not going to make one.

But we, of course, have Jim Rogers, who's just recently stepped down as the head of Duke Energy. Jim has been a leader in the field for many, many years, and I'm also delighted to note that he is a trustee of the Brookings Institution, which we are delighted. And next to him is Mike Chesser, former CEO of Great Plains, a Kansas City based utility, and a leader, having been on the board of directors of Epry and a whole host of utility institutions.

I think a man who was noted when he was when he was CEO for paying special attention to -- not that they don't all do this, but special attention to the needs of his consumers, and having won great praise from a number of groups in his service territory for the leadership role he took on many positions.

And then, Ron Binz, who I'm also delighted, along with Mike, to note that he also has recently agreed to be a Nonresident Senior Fellow of Brookings. A longstanding background in Colorado and especially noted in his regulatory capacity. Of course, most recently, unfortunately, nominated to become the new chairman of the Federal Energy Regulatory Commission, but in the wisdom of our wonderful Congress, he unfortunately was not confirmed in that position, but is now serving as a private consultant to a number of utility clients.

The format today will be that I will make just some very brief introductory comments setting the stage for where we want to go today. Then, each of them will have seven or so minutes to kind of highlight some of the challenges they see confronting the

industry. But the purpose today is really to hear from you. This is designed to be a free-flowing forum with questions from you about the future of the utility industry, things that are of concern to you, or points you want to make.

I do ask when you do make a question; please make sure it is a question with kind of a question mark at the end. And we ask, before you ask your question, if you would please make sure you identify yourself. We are being webcast for the event today, and we are also on Twitter. And the feed, if you want to know that is #FPEnergy is the hash tag.

It's hard to believe that it was nearly, if my math is good, 36 years ago that we had the passage of the purple legislation, which of course, for the first time, a sale of the historic role of monopoly utilities in the United States by introducing the concept of independent power generation. And since then, of course, through a number of FERC orders and a variety of other pieces of legislation, we have seen, of course, the transmission sector also torn asunder with the development in some markets, at least, of ISOs and TSOs.

And now, we are at the point where we see utility distribution also, the traditional modes of utility distribution also coming under assault under the rubric of distributed generation with things such as rooftop solar and other forms of DG.

Clearly, the utility industry is under great challenges. As Jim was reminding us at lunch, by 2050, nearly 70 percent of the current non carbon emitting -- I think I'm correctly quoting you. Right?

MR. ROGERS: Non carbon emitting.

MR. EBINGER: Non carbon emitting generation plants have to be replaced at a prodigious potential cost, since a lot of the plants that will be replaced, as well as, of course, coal fired -- a lot of coal fired generation. A lot of these plants are, of

course -- have already had their capital structure written down, so they're going to be replaced, very likely, by new plants that will have a higher, albeit different capital structure.

So, we have a number of questions before us today. And without further ado, I will turn it over first to Ron Binz to make some remarks. And I've asked him particularly -- he doesn't have to do it right now, but during the course of the discussion, key question mark is, does the traditional mode of utility regulation fit the changes that are occurring in this tumultuous industry? Ron?

MR. BINZ: Thank you, Charlie, and hello everybody. I see lots of friends in the audience. Thank you for being here. Let me begin by saying I acknowledge that I'm from Denver, Colorado. I acknowledge that there was a big football game on Sunday, and so I've heard, and I would choose not to talk about it.

The subject we're on today is huge. It's very complicated. It's even hard to define the terms around it. But when approaching the utility of the future, I'd like to ask each of us to think about what the grid of the future is going to look like. So, let's go out far enough that we can jump over today's current controversies about $5 natural gas this week, when it was only $3 six weeks ago or something like that. Let's just skip over that.

What's the grid going to look like 20 or 30 years from now? There are certain characteristics, I think, which we will agree on. One is that it will be low carbon. I know there's a religion debate in this country about the reality of climate change, whether is anthropomorphic and so forth and so on. I'm asking you if you have to -- actually, if this becomes a belief for you, that's okay. But just move out 30 years and imagine a grid in which the electricity generated and consumed is zero or near zero carbon on average.

The second thing that you want to -- I'm going to ask you to imagine is it will be a connected, webbed grid in much the same way that the Internet is today. I

believe that the application of IP technology to the electric grid will transform electric consumption in a parallel, but different way than the way the Internet has remade news gathering, entertainment, purchasing, and banking -- about anything we do. Just think how fundamentally those -- the IP technology has changed that.

A similar transformation will happen to electricity. Although we can't always decide what that will look like, it will happen. So today, you hear about the smart grid. You can set your thermometer in your house -- your thermostat in your house while driving your car and talking to your wireless connection to your grid. That sounds kind of corny or hokey, and I agree that it is.

You can't justify an overhaul to the grid from the ability of being able to change your thermostat in your car. On the other hand, if you imagine that every device in the network, every refrigerator, every hot water heater, every generating plant, every steel mill is communicating with every other thing, including some central orchestrator who makes all of this work together -- if that's the image that you hold over the grid of the future, then you can start backing up from that and deciding what kinds of changes are going to be required to get there.

So, I'm going to just mention in my seven minutes here, a few of the characteristics of that grid, and begin to back in to the implications for today's actors, today's utilities, today's financiers in that market and today's consumers in that market. If you believe that the grid will be clean with respect to emissions, and I mean here mostly carbon dioxide emissions, although other are included, as well. You have to admit or acknowledge the presence of large amounts of low energy or low carbon resources, and that generally, although not exclusively means renewable energy.

Renewable energy comes with the characteristic of not -- of interruptability or non constants, and that must imply that the grid is able to absorb those

kinds of inputs. That will be a grid with significant amounts of storage, but also price responsive demand. So, those are the kinds of things which we have not historically thought of the grid as being able to do.

Base load generation of today is notoriously inflexible, especially coal and nuclear. They are inflexible. They are not able to respond quickly, or at least to the degree to which we will need to absorb intermittent resources like large amounts of wind and solar.

Now, oftentimes, today, intermittent resources are cast as a problem. You know, the sun doesn't always shine. How many of you have ever heard that as someone who's discounting the future of solar? The wind doesn't always blow. Well, that's not news to anybody, including all of the engineers of utilities who are learning how to grapple with that. So, it's a characteristic, but I wouldn't consider it to be a block on any of these technologies happening.

Xcel Energy in Colorado is doing a magnificent job of balancing a system with an 8,000 megawatt peak with 2,200 megawatts of wind. They've learned how to run a system using that. And Colorado is not even connected to the other states in any serious degree. It's kind of an island that way; not much transfer capacity.

The utility of the future, the orchestra leaders of the future is going to learn how to balance an entirely different sort of grid; one where you've got very many inputs. I mentioned earlier water heaters and freezers. Why did I mention those? Because those are variable demand, and they can actually be shaped. They can be brought on when you need demand, and they can be turned off when you don't need demand. Imagine aggregating all of the freezers and electric water heaters, and for that matter, thermal space condition in the country. That becomes effectively a very giant battery which you can put in power or take out power.

So, that's the image that you need to think about. Today's utilities are a long way from that reality. And as I will talk about later, today's regulation gives very little incentive to utilities to evolve in the way society needs for them to evolve.

As being -- I'm a former regulator and I'm kind of like a former smoker. Okay? I'm very passionate about the shortcomings of today's regulation, and I've got a lot of ideas about where it might go. And that's a large part of what my consulting practice is dedicated to.

Bottom line: Society needs to regulate utilities with an eye towards motivating them to do the things that society wants out of them. That's a pretty obvious concept, but a very novel one when it comes to utility regulation. Thank you, Charlie. I appreciate it. I look forward to discussion with these two fine gentlemen to my left, although they're actually on my right.

MR. EBINGER: Right.

QUESTIONER: Far right.

MR. EBINGER: Mike?

MR. CHESSER: Well first of all, Ron, I want you to -- you know, don't feel so bad. I'm from Baltimore. And we didn't even make the playoffs this year after winning the Super Bowl, so I'm not sure who should feel worse.

I have to say, you know, the title, really of the seminar is The Future of Electric Utilities. And I have to say, having spent my -- most of my career with four or five different utilities, I come down very optimistic about the potential for utilities to not only thrive, but to also evolve into a more exciting kind of a company. You know? We were talking at lunch --

You know, one of the fellows at lunch said, so, how do you attract people into utilities today in this uncertain world where we're not sure where they're going, what

the financial health is going to be and so forth. And I say I've never had an easier time attracting the best and the brightest because of the world that Ron just described. I mean, think about moving from a one way system to a two way integrated network and all of the software and the communications and the electronics. And people are you know, coming out of college really excited about participating in that.

So to me, I think the key will be -- and this is a fundamental belief that I have, is companies that succeed over the long-term have a sense of a higher purpose. You know? They're not just looking at earnings next quarter or earnings next year, but they're thinking about you know, how can we make the world better?

And that's sort of been the legacy of utilities for over 125 years. You know? Always looking for ways to improve the life of our customers; always looking for ways to improve the community, the economic development, even the low income challenges the communities have. So, if utilities keep a focus on that as we go into this new world, then I think they're going to succeed.

Obviously, they're going to have to change the way they approach the marketplace. They're going to have to recognize focusing on the customer, that there are people out there that have better value propositions to offer than utilities do, with distributed generators, energy service companies, those type of services.

But on the other hand, there are customers that really want to get their services from their local utility. They trust the brand. They trust their reliability. So, it's not really an either/or situation, but where utilities have to be much more inclusive on how they approach the business.

The other thing that I think is interesting is, there are going to be lots of opportunities for utilities to provide services that maybe they uniquely are going to be able to provide. You know, the classic example, that as we've seen play out over the last

five to seven years is raising funds and capital in the public markets to fund energy efficiency in our buildings. There's huge potential, still untapped potential for improving the efficiency of our buildings.

In fact, you know, I was hearing the other day from someone at the NRDC, they did a study in a city that said two buildings side by side that look exactly alike, have the same use, one uses two to three times the power that the other does. And if you look at all of the avoided costs, avoided generation costs, the environmental benefits and so forth, energy efficiency should really be our first fuel of choice. And utilities are uniquely positioned to help advance that, raise capital and earn a return on that capital.

Another somewhat less obvious solution, but again, it gives you a flavor of how utilities can play in this future market is what I call community solar. So, right now, there's a lot of people putting solars on the roof, and they're incurring the cost of installing it, the maintenance, all of that.

You know, there's another way to approach that where a utility would find a spot on their system that needed to be reinforced; an expanded substation, new feeders and so forth, and instead, install an array of photovoltaic cells, maybe 50 megawatts. And there is technology available today where the utility could carve out a specific cell and have that be attributed to an individual residential customer and basically lease that cell to them, credit their bill for every kilowatt that's generated by that cell at 70 percent of the cost and all of the avoided headaches of rooftop solar. So again, that's just an example of some of the ways that utilities going forward, being innovative can participate.

I think the grid, as we talked about, is going to be a huge enabler. It's going to play out over time. It's not going to happen overnight, and it's going to cost quite

a bit to make this transition. I mean, when you're thinking about going -- you know, all of the software, all of the communications, all of the electronic devices that have to be brought to bear to make it truly a two way integrated network, and you combine that with the fact that you know, like all of America's infrastructure, the grid is aging.

A transformer manufacturer told me the other day that the average age of a transformer in an American substation today is 40 years. You know? We depreciate them over 30 years. They're not intended to operate that much longer. So we have all of those costs -- embedded costs that are going to have to be phased in over time, and it's going to be very important that all of the participants, including the distributed generators, participate in paying for that cost.

So bottom line, you know, the big question is, in this kind of a world, how are utilities going to make money? What's going to be the financial health of utilities as we go to this kind of a transition?

And again, I believe if we're true to that higher purpose of focusing on what's best for our customers and what's best for the community, and we're seen as doing that, then in the end, we'll be treated fairly. I mean, there's a traditional utility process that I think still will apply as we go forward.

And think of it as three concentric circles. So, in the center, you have the customer and the community. If you truly are doing a good job in taking care of them, and the middle circle, the political circle, the media, other stakeholders will appreciate and recognize that -- and then, once that equity is built up, regulators will be -- respond and want the utility to stay in business and earn a fair return.

Two quick examples. Back in -- at KCPL, back in the 2005 timeframe, our regulators were actually asking us to build a coal fire plane, if you can believe that -- that recently. And we needed the capacity in the region, and we were the ones that

financially were able to do that.

But rather than just take the instruction from the regulator and say, okay, we're going to do it, we decided, well, let's have a community conversation. And we brought in everybody. We brought in low income advocates, which by the way, you know, I am -- hopefully we'll talk about this later -- I believe that the lost customer in all of this conversation is the single mother who wakes up every morning trying to decide whether she's going to pay her electric bill or put food on the table. You know, that's again, part of the higher purpose that the utility has to focus on, as it works its strategy.

But anyway, so we brought them in. We brought the environmentalists. We brought politicians, technologists. And we had a year-long community conversation. And coming out of that was a comprehensive energy plan that was bought into by all of those constituents and supported by the newspaper. And it required significant investments built into cold plan retrofitting some of our existing plants, building energy efficiency, building wind. Rates went up 40 percent, and we were able to achieve that, pass that through.

And today, we're getting a reasonable return on all of those investments. But we only did it because the community believed that this was something that was in the collective best interest of the community instead of something that was dreamt up by utility planners in a back room.

We did something very similar with energy efficiency, where we went out, going to the market, raising capital with the support of all of those constituents and helping buildings retrofit and homeowners retrofit their buildings. So, you know, that kind of an approach, a different mindset for utilities driven by their higher purpose, is what I think is going to allow utilities to continue to thrive as we go about this new world that Ron talked about.

MR. EBINGER: Thank you, Mike. Jim?

MR. ROGERS: Good afternoon.

I'm going to start out by simply saying I agree with everything that's been said, but I want to put my spin on it.

MR. EBINGER: Here we go.

MR. ROGERS: And my spin goes like this. I'd ask you to think in a more macro way for a moment. If you look at demand for electricity in the United States today, it is essentially flat across the country. Some would say anemic growth. You could make a case, there's actually going to be a decline in the use of electricity, even though we're continuing to do electrification of more processes in the country.

But when you look at the technologies, there's a huge productivity gain in the production, in the delivery and in the use of electricity. So, I think one macro challenge that we all have to think about as we think about the future is a flat to declining demand. There's been a decoupling of the growth and demand for electricity from growth in GDP for the first time in our history. And I can talk more about that, if you would like. But that has decoupled, and it's going to have profound implications for the way forward.

The second thing is what Charlie referenced, is by 2050, virtually every power plant in this country, with the exception of our hydro plants, and assuming they don't extend the license for nuclear from 60 years to 80 years are going to be retired and replaced. It's almost a virtual blank sheet of paper in terms of how do we design the generation next going forward.

Now, the significance of that is, if you believe that climate is a problem, and I do, is that if we shut down the nuclear fleet of the United States, that represents 70 percent of the carbon free electricity. And the question is, what are you going to replace it with? Are you going to replace it with nuclear, or are you going to replace it -- we have

an abundance of shale gas -- shale gas, which has 50 percent of the carbon of coal. Significantly more emissions than nuclear.

And so, one of the big challenges and question marks is, as we redesign the generation fleet in this country, what will the mix be? And how will we incent the building of the mix? Because the power sector is the most capital intensive industry in the United States. And as a consequence, we have to attract significant capital in order to replace this generation fleet.

The second thing I would say is, or really the third point, declining demand. Retire or replace all the generation -- is if there's a wave of technology that's transforming every aspect of our business. I see technologies today that could reduce our land loss, which is high as eight to nine percent -- could drop it to two percent. That would be a significant savings going forward for consumers, if that can get done.

I see efforts to transform our grid from analog to digital. That won't happen overnight, as Mike was saying. But at the end of the day, going to digital simply means we have two way communication. We'll be able to do -- operate our system more efficiently. We'll be able to do proactive maintenance, which will improve our reliability, which today is about 99.9 percent of the time we provide electricity.

So the reality is, this sweep of technology is huge. And it really gets to Ron's point. I think the Internet of everything will transform the use of electricity in the United States. I think the simple fact that Google acquired Nest tells you where it's going. Because at the end of the day, what Nest is going to do is write the software for every device within the home, and that's going to lead to an optimization of the use of electricity within every home, and I suspect every business.

Now, is the utility industry equipped to handle all of this? And the reality is that you go back to when regulation was first established to attract the capital to

provide universal access to our country, back in the '20s, it was designed for us to build out to every home, to every farm. And the co-ops were developed primarily to go into rural areas.

But we had the capability to provide universal access. And in the 20th century, the National Academy of Engineers said it was the single greatest engineering achievement. Not the Internet, not the iPhone, not a man on the moon -- you go through the list. But it was the single greatest engineering achievement.

Now, what we do in the 21st century will be different, but not significantly different. Today, we are a battery. We have tens of millions of customers making random decisions every second. Turning lights on, turning on their TV, and turning on radios. And we handle that because we have an infrastructure that acts like a battery. We're always there. We'll instantaneously respond to the random decisions of millions.

But we haven't developed yet is the capability to deal with the generation fleet with hundreds of generators, because we've had a central station approach. And with distributed generation that will change, but our ability to balance, to optimize on the supply side and the demand side, we can do it, because we've been doing it on the demand side for a very long time.

So, I envision we'll be a battery, and it'll be a greater challenge for us in terms of optimization, but we will continue to optimize. Here is the big difference. And this is where regulation is going to have to change. This might be where Ron pushes back on me.

Today, regulations allow us to optimize from the generation to the meter. I believe to get maximum efficiency out of the grid tomorrow, we need to have the capability as a utility to optimize from the generation, whether it's a central station or distributed gen, all the way to the device. It's in that optimization that there will be even

greater productivity gains, more downward pressure on demand going forward, and that's going to require for us to make these billions of dollars of investment to go from analog to digital, to replace the existing generation, although it would be a different mix. We're going to have to raise a significant amount of capital to do that.

And we need to do it at the lowest cost, because it translates into lower prices for our customers. We can do that, but we have to have a regulatory model. Not the one we had the day that was built in the '20s to provide universal access, but one built today that incents us to really accelerate our role as the battery, to accelerate our role as the optimizer. That to me is the model.

And it's, to me, I call it decoupling on steroids. And what I mean by that is, it's moving all the way to a formula rate approach, so with incentives built in for us to optimize and produce productivity gains in the use of electricity. Thank you all very much.

MR. EBINGER: Do either one -- anybody want to comment on each other?

MR. BINZ: Yeah, I want to know how Jim was looking at my notes here. On that last point, I think absolutely. I wrote myself a question, because it kind of came out of what I was hearing. How are utilities going to make money in the new world?

I think it's going to be -- by the way, we have sitting in the front row, the author of "Smart Power," Peter Fox Pinter, who three years ago made clear that one of the modes of progress for utilities was to become an energy services company; provide to the customers not necessarily kilowatt hours, although that may be part of what they do, but more generally, energy services. I agree completely with that.

And to your point, Jim, I think utilities need to start looking at getting on the other side of the meter for distributed generation. I think Mike's idea of utilities

building solar gardens is a good one, but they need to know that's going to be in competition for other people doing that. And that's okay. I mean, not only is that okay, that's a good thing.

So, utilities have been very hesitant to get on the other side of the meter. They have put all their effort into fighting net energy metering terrorists around the country. That's been their response, as everybody knows. And I think that getting on the other side of the meter with respect to generation like distributed generation, but also, in offering energy efficiency services to customers.

The largest single load is electric lighting in this country. And lighting, as we all know, is hugely inefficient, including the bulbs in this room. Those are the kinds of low hanging fruit which are, for a lot of reasons, still subject to so much economic friction that they're not happening. But I think the utilities need to embrace that.

Now, absolutely, their revenue model, their regulator revenue model has to change in order to accommodate that. You can't simultaneously sell electrons and not sell electrons and expect to come out at the end. So, Jim and I are in complete agreement with that. The only caveat I have, if any, Jim, with what you just said is that you said, we need to push this optimization to the device. I agree, but we might mean a whole lot of we's, not just electric utilities.

MR. ROGERS: Let me kind of respond quickly, because you left the impression, Ron, that somehow utilities -- and I know Mike is thinking the same thing I am -- utilities have been reluctant to go on the other side of the meter and help their customers reduce their usage. Well heck, we've been doing that for over 20, 25 years -- helping with demand side management, investing on the other side of the meter.

You know what the number one road block for us is? It's the regulator. And I can give you examples of states where they basically have an independent third

party do the energy efficiency, but only allow us to do the difficult part. So they take it away from us. I've been in other states where we've, in every state -- Duke tried to put Save a Watt in place. We're required under PERPA to buy electricity at avoided cost.

And our simple proposal was, allow us to earn, for every megawatt we can reduce, the same as the avoided cost of buying a new one. There was a symmetry to that. There was a beauty to that. But guess what? By the time it went through the regulatory process, we didn't get that incentive to invest on the other side. They went back to loss revenues. They went back to ideas from 20 years ago. So the regulators didn't kind of modernize their thinking to give us the incentive to go to the other side. They reduced our incentive, yet, they still require us to buy electricity from PERPA machines at avoided costs, but they give us much less than the equivalent for every megawatt that we save. They gave us much less for producing that result.

So, part of the problem in us being able to compete on the energy services; our ability to put solar on the rooftop. We got regulatory approval to do that in North Carolina. But that was four or five years ago. I bet today, there would be people trying to block us from doing that.

Regulators don't necessarily want the utility to be competing with all the new entrants coming into the market, and they're trying to structure the rule to keep us from competing because they know we're effective and a low cost when we jump into the market.

And the last simple point is, we made the decision five years ago to start building solar and wind. And we have invested over $3 billion. We have built 2,000 megawatts of wind and solar in other regions of the country. We've been a seller, not necessarily a buyer, because we were waiting to buy when the prices came down, the technology improved. Because at the end of the day, being affordable really matters to

our customers.

So, we have been focused on selling renewables to other utilities in the country, utility scale. We've even look at doing solar on the rooftop, but those are primarily in states where the utilities are required to by. So, we're not sleeping at the switch in terms of building, and our ability to attract capital is great, and at low cost.

But, the impediment is really the regulators in trying to keep us from competing with the new entrants that are moving into the market.

MR. CHESSER: So, let me pick up on that. First of all, I think, you know, the key here is execution. I mean, we can all paint what the world's going to look like, but how do you actually implement as a utility and as all the participants. But we've been planning the distributed utility model; I was talking at lunch, since the mid '80s. And we still have, you know, a long way to go in terms of actually getting things that make economic sense, and also, avoiding cross subsidization.

Today, you know, in a lot of the states, distributed generators are taking full advantage of the grid, but they're not paying for the benefits that they get from the grid. You know, the backup power, the power quality and so forth. So obviously, their business model looks pretty good. Their margins look pretty good when you don't have to pay the full freight.

But you know, that single mom putting food on the table is subsidizing that, which isn't going to be a sustainable model. So, we have to figure out a way -- how do we go through and execute this on a sustainable way?

And the other thing I will say, picking up on Jim's point and working with the regulators. I'm a big believer, as I said before, if you can get -- if you can work at it, and it takes a long time, you know, a year, two years, and three years in the case of our energy efficiency program. But if you can build a community consensus around what

makes sense and get -- in the case of Missouri, one of the most conservative states in the union, we actually had legislation that was passed.

They basically said, utilities, as they raise capital for energy efficiency should be able to earn the same return on that, that they'd earn if they were building a power plant and taking into account lost revenue and everything else. But we got that because we had the NRDC, the Sierra Club, the low income advocates, the businesses all there working and supporting that legislation.

Now, once you have that and you go to the regulator, you know, the regulator is sitting there and saying, well, there's a ground swell of community support around this. They see that even though the utility is making money, they're bringing superior benefits to the community, this makes sense. So, it's a different model than we traditionally -- the way we work with regulators or work with distributed generations, but it's one that I think will work going forward.

MR. EBINGER: I'd like to throw out -- and then we'll rapidly get to the audience. But there are -- I think you've all done a great job talking about kind of the state of the industry, declining demand, very likely rising capital costs. I'm amazed when you say you could get a 40 percent rate and your consumers supported you on that.

But there are a lot of other things going on I'd just like all of you to ruminate, how do we make this transition that I think you're all supporting and talking about towards more distributed generation, when we really don't know what our carbon policy is going to be? And you ask -- I think Jim or somebody said at lunch, you know, when you replace one of the plants that you have to take down, you're talking about an investment that may be there 30 years, or if it's a nuclear plant, it may be there, longer, how in the wake extreme weather events we seem to be having more frequently -- there's a lot of talk about good resiliency and reliability.

People saying we ought to put wires underneath the ground, to the extent we still have wires in the future. But is a small distributed generation facility capable of financing that kind of investment, if they're putting it along the New Jersey coast, for example?

We haven't touched upon the whole issue of both physical security and cyber security. I'd be interested maybe -- maybe if we have all of these components tied to an Internet like device, if something happens, we're able to cut it off and limit it. But on the other hand, is there a danger as we're more interlinked that a cyber security event is more likely to be catastrophic than if we have a more diversified system?

So, I just -- and finally, I guess it's a little off track of those events, but finally, I ask the question, how does our federal regulatory need to be refined? Because if what we're really talking about is probably maybe less power being transmitted long -- maybe that's not what you're saying. But if we're talking about less power really going across state lines because we have more localized systems, is the whole structure a FERC and the whole way we regulate the system today adequate, or does it need to be completely revamped or rethought?

QUESTIONER: Well, let me thought. I'll leave the FERC to you guys, since you folks have had a lot of experience working with that. But just on a basic level, I currently live in an area that I used to run. There's a lot left to other communities.

I actually operated the power system in the area that I live in. And in those days, I refused to buy a backup generator. I said, nobody should have to buy a backup generator. The utilities ought to be able to provide the kind of power that is needed and can be relied on, and if we're not doing it, we're failing in our mission.

Fifteen years later, I moved back into this area, and the first thing I did was buy a backup generator, because the power quality needs today are so far superior.

I mean, today, I'm completely shut down in any business that I'm trying to do, in any of the lifestyle issues if I don't have continuous power.

The grid, as we built it out, as we envision it, has the potential to fill that need. You know, there's elements of self healing aspects, where it can detect a fall down on the line and reroute the power to make sure that the power comes back; to meet the company -- you know, our customer's future needs.

But on the other hand, the people living in the inner city are not willing to pay for that. You know, they can't afford to pay for that. So, we're going to have to find a way to provide each type of customer what they need and make sure that they're paying their fair share for that. And I think cyber security ties into that, as well, because right now today, there is a real concern that you know, the power system -- computer systems can be invaded and scrambled, and transformers can be damaged.

So, the more real time intelligence you have with the grid, the more you'll be able to avoid that. But today, if you would speak to the Department of Energy or Department of Homeland Security, the grid is probably one of their biggest concerns as far as cyber security.

QUESTIONER: Let me address the issue of climate. I mean, we need a price on carbon. I mean, we came very close in 2009 in terms of passing the House but not the Senate. I think that would be very important to have a price on carbon.

But here's one of the realities for a power supplier that's building new plants. When we do our integrated resource plan, we always put a price on carbon. We put multiple prices on carbon to test the robustness of the alternatives that we're looking at as we make our decision to build a new plant.

So, we operate with the assumption that there will be a price. If you build a nuclear plant for 60 years, there is going to be a price on carbon for the next 60 years.

I think this is a problem that our country needs to address. I'm not sure I'll be around for the price, but you have to plan, assuming that if you're a prudent operator and a prudent builder, that there will be a price on carbon. So, I think that is just a given.

On cyber, I would say this. Going to a digital grid might expose us even more than the analog to cyber attack. But at the end of the day, we have to work closely with the Department of Defense and with Homeland Security to get this right. They understand the cyber issues much better than we do, and our industry is working side by side with them to try to be lock step in protecting the grid.

The tough part of this is that you know, micro grids will play a role. Today, it's not just cyber attack, but there are terrorists attacks on the grid that could take out substations. You also have more storms that could take out the systems. So, anything we can do to build the resilience of the grid is in our interest, and in the interest of our customers, because this is a world that you can't operate without electricity. I mean, you need it 24/7.

And so the bottom line is, it's going to cost more to make the system more resilient, and this is kind of the part of the conversation that nobody likes to hear, when you're retiring and replacing all of these plants, prices are going to go up. If you're going to make the grid more resilient, price is going to go up.

And that's inevitable. But as the prices go up, it changes the economics of the different alternatives. And at the end of the day, it's going to be incumbent upon us to make the right tradeoffs because for the entire time in our industry, we're focused on balancing, affordability, reliability and clean. And there's no perfect fuel. And you all need -- if you walk out of here with anything, any idea, any thought -- walk out of here knowing there's no perfect way to generate electricity, but it's critical to the modern world.

Ask the 1.2 billion people that have no access to electricity what they

think about it versus the people that have access today.

MR. EBINGER: There are a few strong men or women or something which have arisen during this discussion. I'm going to knock down a couple of them. For some reason, Mike keeps looking at me every time he uses the word “regulator.” Remember, I'm the ex-smoker on the panel here.

I think regulation has many shortcomings as applied today. I think if I had to change one thing in this equation that we're all talking about, it would be that. And I’ve written several papers on this question, and I think the United States, state by state, needs seriously to take a look at the sort of system -- I'm not talking about copying it -- the sort of system used in the United Kingdom right now which is known as RIIO, R-I-I-O.

In fact, I think you're going to do a panel on RIIO in April here at the Brookings Institution. RIIO stands for Regulation with Incentives and Innovative through Outputs. It’s a horsey name, but that’s what the Brits use for it. And it basically gives the utility a set of prices that are going to be effective for the next eight years. They know in advance what their price is going to be. And it gives them a bunch of goals and says knock yourselves out.

Make as much money as you can with those prices. Be sure and achieve the goals we’ve set for you, and the goals include environmental compliance, low income assistance. It’s special to Great Britain, but that’s what it is. And then, the utility gets a report card every year, and the earnings go up or down a little based on how they do in that report card. And there’s a decoupling mechanism in the sense the utilities are not penalized for energy efficiency activities.

If we could switch to an incentive based model in this country, you would suddenly see a lot of barriers drop. A lot of things which utilities -- and by the way, Jim, I was not faulting Duke for its failure to pursue energy efficiency, but let’s also agree that

there are very few, count them on one hand, utilities in this country where that's a true profit center; where it's something they go after. Generally, they're complying with the regulator's or the state legislator's wishes, and that's the state of the art, and there's no surprise about that.

Let me throw in a couple more random things that I've been thinking about to nail down some of the points I made earlier. There are certain inexorable processes under way. We have been talking about load being flat. Let me get into that just a little bit.

I don't know how many of you, I'd like to see a show of hands, have bought a refrigerator within the last five years. Anybody? Okay, quite a few people. I have one. It's a high end refrigerator. It's got your ice maker and all your special stuff. Do you know what the electricity demand of that refrigerator is around the clock? Less than one of these light bulbs. It's 60 watts around the clock, and that gives you that refrigerator.

That's probably a quarter of what a refrigerator was consuming 10 years ago. Everybody's got a refrigerator, and that's not changing. I replaced 25 halogen light bulbs in my house. They were each 60 watts. I replaced them with LEDs, six watts. Okay? Doing the arithmetic? I cut my electricity use 90 percent in those lights, and that's not changing.

These things are so efficient. They last 22 years. I gave my parents some, and she said she's putting them in her will. Okay? Mom says she's putting them in her will. All right.

So, those are the kinds of processes that are never going to change again back in the other direction. You add all those together, and you get electricity demand that's growing at about 1 percent a year at the most, at a national level. All by

itself, that will remake the industry.

In the days of 8 and 10 percent year on year load growth, you can be pretty inconsistent, uncareful, whatever you want to say -- I'm not saying anybody was, Jim, but you could be that. We no longer have that luxury any longer with these companies.

A couple more small points. The amount of distributed generation has some natural ceiling, and unlike some of my environmental colleagues that I work with, I think that ceiling is a fair amount lower than they do. I think it's probably 30 percent or something in that range.

The Brookings Institution building couldn't have a roof big enough to put solar panels to supply the load here. So, there's going to be central station large generation projects, whether it's community solar or 50 megawatts at a slug, which I think is a great model, or something else. So we're not going to all become islands unto ourselves. Don't take away from today that anybody think -- I don't think anybody here thinks that.

So, you're still going to have big actors, and let's call them for sake of discussion, utilities. And so what we're trying to describe is the new way in which they will operate. But they're not under existential threat in the largest sets. They're going to be here. The question is, what are they going to look like and how are they going to pursue their business.

MR. EBINGER: All right. I think it's time to go to the floor. We have a little more than half an hour left, so please -- we'll have mike's coming around. So as I said, please identify yourself before your question. One in the back there.

MR. MANTO: Hi, my name is Chuck Manto. I have a finance model question for you based on a parallel to the computer industry. So, most of us who have

been around long enough remember mainframes and IT departments, and then the emergence of the PC that gave us all our local storage as well as our local computer generation.

Now, we're swinging back the other way a little bit to the cloud. And so there's some kind of balancing act going on between centralized information generation and storage to local. And I'm wondering, in that same light, when you're looking at your finance model, what's the opportunity to leverage orders of magnitude, more money than the utilities have by engaging individual users to do some of their own generation and storage locally in that same way that happened in the computer industry, so that part of your business becomes something akin to say, a systems integrator rather than the one that has to keep all that control to yourselves.

And so maybe there's some kind of a balance between not only distributed generation, but the financial control that shifts from you to the user in some kind of a partnership.

MR. ROGERS: I would simply say, we're going to be a system integrator. The only issue is, is what we integrate. And I think to have the greatest productivity gains in the use of electricity, it needs to go all the way to the device and it being able to balance the entire thing.

And there will be a mix of central and distributed. And I think it's hard to predict. I think Ron's point about maybe 30 percent -- that might be a good number. But it's somewhere in that zip code. But the idea of going to your customer and saying build a distributed generation in your home, it's not affordable now.

And so, it's an affordability question. I mean the gift that we have today for our country is we have some of the lowest cost power in the world. Not in all regions of the United States, I might add. Prices are a little higher in New York and California.

Come to North Carolina. You'd love it. Good low prices.

But my point is, is that people are so focused on affordability. I mean, to most people in this country, we're not out of the recession yet. So, they like the idea that electricity -- and this is an important stat, and this is why you don't see more people concerned. Electricity is only 1.7 percent of the disposable income of the average family in the United States.

And the other thing is, I would dare say, and I'm not going to embarrass you all by asking you, but I've been in rooms with 400 people, and I'll say, how many of you all know what you pay per kilowatt hour? And maybe only two or three hands go up. And then, I ask them, how much -- do you know how much you pay for a gallon of gas, and every hand goes up.

So, people -- the supply of electricity to a home is so back of mind until the power goes out. So, to get them engaged, it's actually a tough assignment to get them engaged in energy efficiency investments, much less building a generator in their home. Now, if our power's out a lot, that's probably an easier sell. But I think it really gets down to the economics.

MR. CHESSER: Actually, I think, just to add to that, I was talking to somebody the other day, the average -- you know, again, it's all about segments of the community. So I'm talking now about people in their upper middle income area who are maybe younger technology adopters and so forth.

That population, which would be a target for distributed generation, currently pays you know, twice as much for their telephone and cable bill as they do for electricity. Yet you know, I think you would argue that they don't get near the value from that that they do electricity. I think the affordability issue for that population is critical. Technology has to continue to evolve.

The battery has to play into this in some way. And I think you know, the lithium ion battery will continue to come down in cost to some extent, but it's going to be a number of years before the next generation comes. I think the biggest hope for a significant penetration would be tying distributed generation with electric vehicles and using the battery in the electric vehicle as, in effect, a backup for your -- whatever it takes in the home.

So, it's a double use of one asset, which begins to become more efficient. But without that kind of progress forward, I think you're still going to limit whatever it takes in most of parts of the country to a very small number of technology adopters.

MR. BINZ: I would say the conventional wisdom in the United States has been that for electricity to be cleaner, it has to be more expensive. Okay? And then, all of the sudden, we were surprised, and all policy makers and most people in the country were surprised with shale gas, because it broke that traditional thinking, because it is not only cleaner than coal, it's cheaper.

And it's that kind of technological breakthrough in storage and other areas that is really going to be the driver of change in this industry. We've just got to use technology to drive the costs down, so that the pricing to consumers is lower.

QUESTIONER: Ron, I know this will be heretical and out of the model for what I'm supposed to say. I'm not concerned about the price to the degree that these two gentlemen profess to be, for the following reason: Over the last 20 years across the country, across all utilities, electricity has gone up at slightly less than the rate of inflation.

In real terms, that means electricity prices have been flat. I think we can afford a clean electricity future. When I was a chairman in Colorado, we moved significantly to lower carbon and to clean up other emissions of electricity. And we did

that at a rate increase of less than two percent compared to what it would have been if we'd stayed on the course we were on.

Now, customers don't like to pay rate increases, but they don't mind it as much if they feel like they're getting something back for it. And I think there's a reservoir of demand for clean energy in this company, not only among some residential customers, but look at every hotel you go into, and they brag about how much wind is in their portfolio. Or every winery now in California is becoming de rigueur, right, to have a clean energy winery, and so forth and so on.

Safeway, Walmart, all of these companies. So, I think there's a reservoir of demand for that, and I don't want prices 1 percent higher than inflation to be a barrier to us moving forward on that. So, let's assess very carefully that argument about increases in prices.

Now, you can go overboard, and I'm surprised Germany hasn't come up. I was expecting Jim to raise it.

MR. ROGERS: I'm holding it back.

MR. EBINGER: Yeah, you're holding it back. So there are ways of doing that that are wrong or would be unacceptable in this culture, but there are plenty of ways of doing it that would be right. And so, that point I've made. Jim?

MR. ROGERS: I'm just going to say, if you buy an iPhone 5 and you compare it to the iPhone you had before, you can see the difference as a customer. If I spend $6 billion and raise rates 6 percent to reduce emissions of sox, nox and mercury from my plants, when you throw the switch, the lights look the same.

When you turn on your TV, it turns on just the way it always turned on. So, for the average customer, not the sophisticated customer, but for the average customer, they don't understand how you can raise the rates and see no change in the

electricity, even though the electricity they're getting is much cleaner.

QUESTIONER: Jim, I don't agree. I think with leadership --

MR. ROGERS: Boy, you ought to talk to my customers.

QUESTIONER: I think with leadership you can make that case.

QUESTIONER: There's a lady back there that's --

MR. EBINGER: Yeah, we have a lady in the middle here.

MS. DODGE: Yeah, I just wondered -- Nina Dodge, and I work for several local associations dealing with these issues for the District of Columbia. And I just want to bring health into the equation here, and asthma, for instance.

And I want to understand, what kind of leadership do you think is needed to fill out the equation so we're not only looking at 30 to 80 years into the future in terms of hardware and software, but we're actually tying other societal costs to this equation? Thank you.

MR. BINZ: When I was chairman of the Colorado Public Utilities Commission, we implemented a legislative measure called Clean Air, Clean Jobs. And basically, we looked at the entire coal fleet of Xcel Energy and decided what to do with two gigowatts of coal generation. We made a lot of changes, lowered carbon and a lot of other criteria pollutants by about 40 to 80 percent in that fleet.

Now, where I'm going is, the three senior doctors at National Jewish Hospital testified before my commission and presented a huge amount of data about the impact of particulate pollution in the Denver metropolitan area from coal plants in the metropolitan area, and translated into savings, healthcare savings over the period.

It was very influential in our decision to consider these other non-utility specific issues, a larger societal question. And you're helping me make a point I've been wanting to make all day long. We need to incorporate, not in any way that prejudices any

fuel or anything else, but we need to bring that decision making into the heretofore much narrower question of what does a utility need.

And the question should be, what does the society need out of all of this, and then we translate it into implications for utility range.

MR. CHESSER: So that takes me exactly to the process that I was talking about with our comprehensive energy plan. We had that exact testimony. We had doctors talking about the health impacts. And you actually had people in the room -- small businesses, low income customers. When they heard that testimony, they said, yeah, you know, we do have to retrofit some of these plants. We did them ahead of when we were legally required to do it, and we had a community consensus around it, because the education and knowledge was there.

And to Ron's point, I think it's the utility's responsibility to get the knowledge out there; not only focus on the smart grid aspects, but the whole societal impact.

MR. ROGERS: I should simply say, look back over the last decade, the last two decades, and you've seen almost a 90 percent drop in SO2 in this country, a 50 to 70 percent drop in NOX, a reduction in mercury, a reduction in fine particulate.

And the utility industry has spent billions, multiples of billions of dollars to reduce emissions. We're carrying out EPA mandates to do that, but at the end of the day, we've really cleaned up our fleet. And as I may have mentioned earlier, Duke just built five combined cycle gas plants and shut down 90 old coal and oil plants that reduced our emissions footprint even more.

And actually, I mean, just as a footnote for the country, today -- and Co2 doesn't really get to the asthma question -- I have asthma. I kind of know this. But the Co2 emissions in this country, because of shale gas and technological improvements, is

now at the same level as it was in 1992, even though the number of people in our country is greater and the size of our economy is much larger.

So, I don't think the customers or the people in the country know the amount of money that's been spent to reduce emissions that can have an adverse impact.

MR. EBINGER: We have a lady about halfway down that's been very patient. Can we get her a mike?

QUESTIONER: Thank you. Julia Colonis. I'm a market economist and environmentalist. I appreciate greatly your discussion. Very informative, but focusing, not surprisingly to the supply side.

The demand side was not mentioned, except I think Mr. Chesser mentioned expectations are a matter of degrees. Where I come from, we talk a lot about changes in consumer behavior in order to decrease the demand of electricity, irrespective of technological changes from the industry side.

So, my question is, in your prediction of decrease in the demand of electricity, do you account for what we're doing on the other side, changing consumer behavior? Or are all of your predictions based only on the supply side? Thank you.

MR. ROGERS: I think the short answer is, it's both behavioral changes. We see that. I mean, we have a project in Charlotte called Envision Charlotte, where virtually all the downtown capacity of the buildings have all come together and made a commitment to reduce emissions 20 percent in 5 years. And a lot of that is on behavior and competitiveness between the different buildings.

But it's a combination of behavioral changes -- you know, telling your child, turn those lights off, and technology. It's the two working together that's going to drive the demand down over time. It's not either or. It's both.

MR. CHESSER: I personally feel that the days of Jimmy Carter sitting by the fireplace with a cardigan sweater asking you to turn your thermostat down is not going to get the kind of energy savings that we need. Probably 80 percent of it is in the technology. The more efficient refrigerator, the more efficient air conditioners. Air conditioners today are twice as efficient as the ones most people have in their homes. So, I think mostly, it's the equipment efficiency that's going to drive it.

MR. BINZ: I want to also mention, put in a plug for certain policy changes at the regulatory can induce the kind of behavioral changes we're talking about. And one of them which hasn't been mentioned today, and I know it's still a third rail in some places, is time sensitive pricing for electricity. Time of use pricing, and other kind of signals to the customer about the cost to them and to the system at certain times of the day.

I think regulators who have historically been very shy about putting in time differentiator rates, are beginning to see the significance of that. The flat rate pricing around the clock, around the year is the single greatest impediment to the smart grid moving. If you had arbitrage opportunities with respect to time, and if you knew how to value generation resources with respect to time of use and the cost of the day, you'd get a big change in consumer behavior -- and whether you want to call it behavioral change or price response -- whatever you want to call it. But that's a tool that we have, to this point, neglected to use.

MR. EBINGER: Anita?

ANITA: Remarkable and important discussion and thank you. A couple of quick questions, really. One is, it almost feels like there's an analogy here to peak oil. Like we were going to run out of oil, and suddenly, we got too much of it or a lot of it.

And with respect to what you're describing in terms of the technological

changes and all, and particularly talking about too, the device itself and talking about the environmental health, et cetera, implications, I wonder if there's room here for a greater national discourse than what we have had to date and how you would encourage that, if you would.

And part two, real quick is, when we're talking about technology and inputs -- resource inputs, it goes beyond, I think the boundaries of the U.S. So I'm kind of wondering how -- or if this is not relevant for purposes of this discussion, how that would look in terms of an international discourse on the same subject. Thank you.

QUESTIONER: Well, my nomination to FERC was an attempt at a conversation at the federal level about some of these issues. I got shouted down in talking about something which you heard Jim Rogers say today, and that is that eventually, natural gas has to be cleaned up.

Twenty years from now, natural gas is going to inhabit about the same role that coal does today. And that is, it's going to be a great fuel. It's going to be cheap in relative terms in those years, but it's going to produce too much carbon for our carbon budgets. That's all I said, and of course, that brought the right wing down on me in my nomination for the FERC.

So yes, we do have to have a national conversation about these things. They're not actually very scary. I mean, you've heard us sort of show all of the warts and the -- both the promise and the warts of the system that we've got right now and where it's going. So, I agree with the sentiment of your question, yes.

I'll make one quick observation. I know Jim's got something to add to this on international issues. I am a bidder essentially in the United States program to work in Africa, the Power Africa initiative, the administration. And it's an effort by this administration to reach out to under developed countries -- under developed with respect

to the electric grid and their capacity -- their legal and regulatory capacity.

So, I think there is much to be done, and again, I'm not going to pre-empt Jim on this, because he's very active in that area.

MR. ROGERS: I would actually not go there, but I would pick up on the point -- it's important to have a national conversation about this, because you have to really separate the fact from the theology. And in the power sector and in the environmental area, there is a lot of theology. And a lot of people's positions are a function of the mix of the assets that they hold.

But the change that we need in this country is at the state level. It's the state legislature that needs to change. It's the state regulators that need to change. And so, a national conversation would get it -- we could have a rich conversation, but I'm not sure, unless we engaged the people on the state level that have the capability to change the rules, to change the regulatory model, if it will get any real result.

And with respect to the -- I'm in the process of focusing on the 1.2 billion people that have no access to electricity. And I think it's sort of an interesting coincidence that in China, there's 1.3 billion people, and they've lifted -- I mean, 99 percent of the people in China have access to electricity.

They've probably lifted more people from poverty in a shorter period of time than any country in the history of the world. But they did it by giving them access to electricity. But unfortunately, they build a coal plant every week, and 80 percent of the electricity comes from coal. And so, when I look at this 1.2 billion, they deserve -- because the greatest inequality in the world that exists today is between those that have access to electricity and those that don't.

We can't bring them electricity in the same way that the Chinese brought electricity to their people. And so, they deserve access to electricity, and we need to find

a way to use renewables, to use battery technologies. And maybe in the process of bringing electricity to the 1.2 billion, that there will be some reverse innovation that will come back to the developed world to help us model our grids in a more efficient way as we experiment in those countries.

MR. CHESSER: The only thing I would add, I think there's one area for national -- a national view of our excess resources, as you were talking about. You know, a lot of folks today that own coal fire generation are shutting those plants down and replacing them with gas fire generation. And that's sort of the traditional approach.

But you know, the back of the envelope numbers that I've read, if we actually got serious about building efficiency and were able to take those buildings that were using two to three times as much as another one, you could replace the coal fire plants that you're shutting down with energy efficiency. You know? We wouldn't have to build those coal --

Then, what do we do with the excess gas generation? Well, I think it would be a higher and better use. You know, transportation, maybe some of the distributed district heating and cooling operations. And then, maybe we could export some of this gas out of the market where it's now, you know, three times the cost in Europe than it is here; help our balance of payments and help their balance of payments.

So, I think there is room for a national discussion about the most effective allocation of resources.

MR. EBINGER: Yes, sir.

MR. HILL: Terry Hill with the Passive House Institute. Along the lines of energy efficiency and buildings, would it be possible to even think of the utilities instead of borrowing money for new generation, they borrow money to retrofit the 130 million houses in this country?

MR. CHESSER: Well actually, Jim and I, I guess, were sort of the pioneers in the industry on that very concept. We both have worked out our own unique deal where we'll go to the capital markets and raise capital. So if you're a building owner, if you were to retrofit your building to high efficiency standards, it would take you about seven years to get a payback.

Well, the capital we raise, we will invest in you as a -- you know, as a contribution, and that will take your payback down to two to three years. Now, the deal is, we have to get a return on that capital just as if we were building a power plant. It's called negawatt that we're building instead of a megawatt. But that model is there, and if it were adopted more aggressively across the country, we would cut back on a lot of the natural gas for our generation we're having to build.

MR. ROGERS: One of the things that we've said is the most -- the way to think about this is, the most environmentally benign plant you can build is the one you don't build. And so, that's why the investment in energy efficiency and in technologies and changing behavior is really critical to having a robust system going forward and a low cost system.

MR. EBINGER: Sir? Up here, please?

QUESTIONER: I am (Inaudible) and my area is in networking, but a different kind of networking. Communication networking. So, I have a question, but before that, I want to thank the panel for shedding several kilowatts of light onto a very complicated problem.

And my question has to do with regulation and the regulatory structures that we heard a lot of problems with. If I could get the panel to make sense of what fraction of the problem would be sort of allocated, if you will, to the end goal that different people envision, versus to problems in the transition of getting from where we are to

where we all agree or don't agree to be?

And if there are any mechanisms of like understanding what that dynamic is between transitions versus end goal, I would appreciate the panel's insight. Thank you.

MR. ROGERS: I would start by simply saying first, utilities have got to embrace the future. They have to embrace the new technologies that will lead to productivity gains. They need to embrace distributed generation and kind of work through it with providers of distributed generation, and maybe, they should invest it, because utilities generally have a lower cost in capital than all their customers.

And that kind of gets to Mike's point, earlier. So, I think to get to what we need to get, utilities have to have a mindset of embracing the future, and the regulators have got to embrace the future, too, and help facilitate it by changing the rules. And if it means going to the legislature to change the rules, you need to go together. And that's to Mike's earlier discussion of a collaborative effort to make a change occur within a state that gets us to that other side.

But it's going to take collaboration. It's going to take a lot of work to be able to move. But at the end of the day, it's like shale gas. Technology moves swiftly and it breaks down regulatory barriers faster than anything. So, I'm a great believer that technology and innovation will force utilities as well as the regulators to change the rules and behave differently.

QUESTIONER: I would add a couple of things. I think regulation presents a rather significant barrier now. It's not always the regulators, although many times it is. It's also state legislatures in some cases.

In North Dakota, it is illegal for the public utilities commission to consider future cost to carbon and electricity rate making. Okay? Illegal. In other states, it's

mandated. In Colorado, it was optional.

And this notion of moving off an asset based return model, which is what we're really talking about, instead of paying for iron in the ground, paying for results. That's the essence of what I was talking about before. That's probably going to require legislative change in some states, although in others, it will not.

Utilities, and there are good ones, there are great ones and there are some pretty poor ones. They're all relatively conservative organizations. That's why their bonds are for widows and orphans. Right? I mean, these were safe investments. But utilities are not known for their ability to move quickly.

Jim's -- I'll pick on Jim, is one who was more facile and is more facile than most. But Steven Chew told me this joke. You know, there's these three utility executives, and they were wringing their hands over their future, and oh my gosh, how difficult is this? They decided they'd better end it all.

So, they decided to jump in front of a fast moving object. And they jumped in front of a glacier. Okay? That was their estimate of what a fast moving -- object was.

QUESTIONER: God, I was loving everything you said until the end.

QUESTIONER: And then, somebody added to my joke the last time I told it, and the glacier killed them. But Paul, I think you have a very good question. And I think we need to look -- and again, I think there's room for federal leadership on this. I do.

I think Congress could do things, could sweep away certain barriers. They certainly have tried that in the past, in the Energy Policy Act of 2005. Of course, you talk about glaciers, there's another one.

MR. CHESSER: So let me just give you an example to counter this a

little bit. You know, there were some economic incentives during the recession that -- grants made available by the government to fund energy initiatives. You know, I don't know if you remember that.

MR. BINZ: Sure. There's lots of money.

MR. CHESSER: So in Kansas City, our guys, our glacial engineers, came forward and said, look, why don't we build a smart grid? Sort of a microcosm of what we're talking about here with all the different composts. The self healing aspects, the distributed controls, the demand management, electric vehicles being backed up. And let's do that in one of the lowest income areas of the city.

It was called the Green Impact Zone. We partnered with Representative Cleaver to do that. And in three years, it's been built out. You know, because the regulatory model was set -- I think utilities do have a chance to excite their people and create a sense of vision and a sense of momentum. But you know, the environment under which they work and the reward systems under which they work have got to be aligned.

MR. BINZ: Mike, you're right, of course. As the power commission, we significantly increased Xcel's energy's return on energy efficiency investments, and they went from a few million to round numbers, 90 million a year now inside of Colorado. You're absolutely right.

And I remember talking to general counsel about it one time after the cases were all closed. I said, is this going to do anything? He said, you throw money at us; we're going to respond to it. I mean, that was a crude way of saying regulation can provide the incentives, both positive and negative for utilities to move quickly on these things.

MR. ROGERS: But see, you are an enlightened state regulator, and I

would dare say as you look across this country, there's been a reluctance to incent utilities to make those investments, to even make the same return off those investments as they do when they invest in a power plant. That's really the impediment.

MR. BINZ: Jim, I think an important change is about to occur. I want to see if you agree with me on this. The EPA is looking at new rules for carbon emissions from existing plants. And they're very seriously looking at energy efficiency as a mode of compliance for utilities.

I think -- you can fill in the blank with whichever utility you want to -- even blank will think about doing energy efficiency. I want to hear what you said. Even blank --

MR. CHESSER: I filled in the blank.

MR. BINZ: Well, start thinking about energy efficiency when it becomes a compliance mechanism for EPA regulations.

MR. EBINGER: I'm sorry. We've run out of time. And I'm going to exercise the power of the chair to ask one final question, which I think we'd be remiss to not to at least touch on.

And that is, as we look towards the future electricity situation in the country, can we continue to have a situation where we have a number of states with deregulated markets and a number of states with regulated markets, and wonder, how are the two likely to fare in the changing environment that you gentlemen have been talking about this afternoon?

MR. ROGERS: I'd start this by simply saying there are 19 states that have moved into the competitive market. And within one of the states that we operate in, we were one of the low cost suppliers to this state. And what it really did is equalize the rates within the state.

Our rates went above the national average, but the even higher cost utilities in the northern part of the state, their rates were equalized with us. And so, what you really have is a hybrid system in the United States. We're kind of muddling along with two different kinds of models. And I believe that in the competitive market, they've failed to put capacity markets, and there will be no building of new generation.

You won't see the building of new nuclear plants as you see by Southern in Georgia, which is a regional effort, or in South Carolina by SCANA. You won't see, even like Duke, that built all these gas plants to shut down the coal plants. You don't see the modernization happening in the competitive market. The modernization of the generation in this country is occurring in the regulated markets just because of the regulatory compact.

And so, there are some good things about the competitive market. Their development of DSM and PJM is one. But at the end of the day, I actually think we learn a lot from observing and looking back on how the rates have changed, how much emissions have changed in these regions under two different models, and then make a judgment. And I think the jury is still out.

But if I was betting today, I would bet on the vertically integrated model. It's going to produce more value and cleaner energy in a more modern system than the competitive model.

MR. CHESSER: So, I would observe, first of all, when this happened, the competitive states were the higher priced states. They're the ones where they were losing industry and there was a lot of pressure from industry heading down to Jim's service territory from New England and so forth. And they were saying, we've got to do something to create some price pressures and to help us be more competitive.

My projection today would be, none of the lower priced states have any

kind of competitive ending. You know? I don't know of a single state that said hey, what we need to do is get more competition. We're happy with our regulators that we've been able to keep costs under control and get the kind of innovation and get the kind of environmental responsibility.

On the other hand, I think there's such an infrastructure buildup around the competitive model, that PJM system and all of these non regulated companies that have political clout -- I don't think they're -- they're going to slide back. So, I think the hybrid model is something we're going to see going for as far as I can see into the future.

MR. BINZ: Charlie, I don't think the -- first of all, your question is, is it sustainable. I think it is, basically. So much of this is local markets.

And I think there will be a movement towards slowly more competition in the generation market. I don't see as much progress or change in the retail markets. I think the west is going to undertake an interesting, I think experiment of an energy and balance market. That's not a fully competitive market, but it's kind of the first step on the way.

I tend to agree with you about the southeast. That's pretty locked in. I don't know that much is going to change there. However, depending on how hard the EPA pushes, that could scramble things quite a bit. If a lot of new cleaner generation is going to be coming in, you might be looking to more independent power producers in those states, and that sort of puts pressure on markets.

Having come from a state with vertically integrated, I know you can make significant progress when you've got an alignment of the regulators and the utility and the political leadership in the state. That was the lesson from Colorado. So, whatever efficiencies you waive by not having a competitive market, and you do waive some efficiencies by not having a competitive wholesale market -- the others, if regulated well, I

think can perform well.

MR. CHESSER: Right.

MR. ROGERS: I think -- let me make one last point that I think you all should take out of this conversation. You look across the United States, and there are significant differences in terms of access to fuel.

In the south, there's no gas. There's no coal as a consequence of that. They have been leaders in the building out of a nuclear. I mean, Duke, about 50 percent of their electricity comes from nuclear, which is carbon free, clean electricity. But in the Midwest, and we have operations in the Midwest, it's probably 80 to 90 percent coal, because all those coal plants sit in the middle of the country.

And so, as you look across the country, every state's different. Access to fuel is different. Regulatory regime is different. Mix of customers is different in terms of industrial Midwest and the auto industry and steel industry. And so, the emphasis there is more on affordability than even clean.

And so, this is a far more complex story, and it's really geography driven. And there's a lot of history that reflects the geography and the differences. So, there's not one size fits all, and we need to be sophisticated and nuanced in how we talk about it and the conclusions we reach for the way forward.

MR. EBINGER: I'd like you all to join me in thanking the speakers for a very lively discussion. (Applause). Nice job.

MR. CHESSER: Thank you. You, too.

MR. EBINGER: Great job.

MR. BINZ: Thank you, gentlemen.

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