UNITED STATES DEPARTMENT OF ENERGY

ELECTRICITY ADVISORY COMMITTEE MEETING

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P R O C E E D I N G S

(1:14 p.m.)

CHAIRMAN COWART: If you heard, please take your seats. Good afternoon. For the record, this Richard Cowart, I'm Chair of the EAC. And this is a regular, Formal Meeting of the Electricity Advisory Committee.

As many of you know, as the Formal Meeting of a FACA Advisory Committee, a transcript is taken of this of this meeting, and so whatever is said will be recorded. For that reason it's important that when are speaking you turn your mic on, and other people turn their mics off, so that the recorders can hear. If there are any members of the public who wish to address the Committee, there's time set aside at the end of the meeting tomorrow. So, please sign up, and so that we can plan for that.

Okay. A couple of announcements; during this meeting, we've got four documents that are up for approval, and again this is the formal Advisory Committee, and so our documents need to

be approved formally, so we'll have to do that with a vote and discussion and an approval vote. And one of the things we've learned in the past is that if you've got an issue to raise concerning one of the documents, it's probably a good idea not to wait till the moment of the vote in order to raise it.

And so, we always encourage you, if you have an issue with a document, if there's something you'd like to see fixed, or a problem you have with it, to seek out the Subcommittee Chair, or seek out the author of that section of the text, and just try and work it out on the side before we come to the Committee Meeting. It's okay, if you don't, but it's just an idea if you have the opportunity to do that, please do so.

We have discussed in this Committee the idea of creating a new working group on cyber security, and I just wanted to let you know that that will be touched on, I think, in one of the topics this afternoon. But it will come back before us for a conversation again, tomorrow. So

you might want to give that some thought. And then we are going to go around the room in a minute, and introduce ourselves.

I'd like to extend an invitation to the new members of the Committee, and when we come to you, just, please say a few words about where you are coming from, and we'd like to welcome you to the Committee. And let everybody hear a little bit about your interests.

And in that vein, it's important to understand that the real work of this Committee happens in the sub- committees. And the reason that the Committee has been as successful and interesting as it is; is largely due to the work of the sub-committees.

So each of the new members should speak with us or the Sub-Committee Chairs in order to find yourselves recruited to participate in the real work of the Committee, we really want to tap your brains, and get you involved in the substantive Sub-Committee work.

We have had a Leadership Meeting just

prior to this one, where we discussed all of the ideas for important topics that the Committee should be addressing in 2015, and you won't be surprised to learn that the list far exceeds the capacity of any committee like this, to do it all.

And so we are going to have some winnowing process largely in the sub-committees, but it will also be the case that as we go through the Panels, and with the approval of the work products in this meeting, and in that conversation you should have in mind, the question, what is it that this Committee should contribute next year, to this topic? Or is this topic one that we've basically considered closed for now?

And so, feel free to make the recommendation; hey, that's a topic that I think the Committee ought to address in the following way. We should have a panel on it; we should write a paper on it, we should make the recommendation to the department. Whatever it is that you are -- that you believe we should be focusing on; we will create a list of all those

recommendations. I have 11, 12 on my list so far, and I would expect in the next day we'll get a few more. And then we'll create work plans in the sub-committees that focus on the most important ones.

That's, it from me right now. And usually Pat Hoffman would be here at this point to issue words of welcome from the Department, and also to sort of talk about the work plans of the department and what they see -- what she sees ahead for this Committee. I'm told she's on her way, so she'll be here in just a few minutes.

Why don't we take this time to just go around the room and introduce ourselves, and in particular welcome the new members? We'll start here with Anjan.

MR. BOSE: I'm Anjan Bose, from the Washington State University, in Pullman, Washington, where I teach Electrical Engineering.

MR. HUDSON: I'm Paul Hudson, from Austin, Texas. I'm a Former State Regulator like some other folks in the room. And I have an

investing and advising firm based out of Austin.

MR. ROBERTI: I'm Paul Roberti, I'm a Commissioner at the Rhode Island Public Utilities Commission, and I've been there five years.

MR. BROWN: Marilyn Brown, I'm Professor in the School of Public Policy. I teach Energy and Climate Policy at Georgia Tech, and I'm also a Member of the Board of Directors of the Tennessee Valley Authority.

MR. ALMGREN: I'm Ake Almgren, I'm a new member. My background is Transmission Distribution, Distributed Generation. For 25 years I worked for ABB, everything, from electric meters to high voltage DC, so I think I know transmission distribution. I was CEO of Capstone Turbine Corporation, and at present I serve on the PJM Board of Directors, where I Chair the Liability Committee.

MR. CENTOLELLA: Paul Centolella, I'm a Former Commissioner of the Public Utilities Commission of Ohio. Since our last meeting, I've stepped back from being full time at Analysis

Group, but maintain an affiliate relationship there. And I found that doing that has not lessened my workload at all. So I'm, you know, continuing to enjoy that, and as well as do other things, including with one of our other members at the National Academy of Sciences Panel on the adoption of Advanced Energy Efficiency and Clean Energy Technologies.

MS. ZIBELMAN: Hi. I'm Audrey Zibelman. I'm also a new member. I'm Chair of the New York Public Service Commission, but I have been in the electric industry probably since the late '80s. As a Regulator I was an Executive at Xcel. For a while Wanda and I got to work together. I was Former Chair -- Former COO of PJM, and had my own company, Viridity Energy, which did demand management using predictive software.

MR. PETERS: I am Chris Peters, I'm with Entergy, and I'm Head of our NERC Liability Program.

MS. WAGNER: Good afternoon. I'm Rebecca Wagner. I'm a Commissioner with Public

Utilities Commission of Nevada.

MR. GELLINGS: I'm Clark Gellings, I'm with the Electric Power Research Institute.

MR. BROWN: I'm Merwin Brown, A Director of Electric Grid Research, at California Institute for Energy and Environment, at the University of California.

MR. TILL: I'm David Till with the Tennessee Valley Authority. I work in Transmission Strategy.

MS. REDER: Wanda Reder. I'm with S&C Electric Company in Chicago, and also a Member of the Board of Directors for IEEE.

MR. PEDERSON: I'm Jim Pederson with the FERC. I've been there for 35 years in various positions. I'm an Attorney, an Economist. The last 14 years I've been a Senior Legal and Policy Advisor to two Commissioners; the last four as Chief of Staff for Chairman Wellinghoff; and now I'm Associate Director in our Policy of -- our Office of Policy. Thank you.

MR. POPOWSKY: I'm Sonny Popowsky. I'm

formerly the Consumer Advocate of Pennsylvania, and I'm the Vice Chair of this Committee.

CHAIRMAN COWART: I'm Richard Cowart with the Regulatory Assistance Project. For the past five years I've been directing our team of people in Europe, based in Brussels.

MR. MEYER: I'm David Meyer from the Daily DOE Electricity Office.

MR. ROSENBAUM: I'm Matt Rosenbaum, also from DOE.

MS. TIGHE: Good afternoon. I'm Mary Beth Tighe. I'm on detail from FERC to DOE, to be the Acting Manager of the Electricity Delivery Division, which is the group that provides support for this Committee. I know many of you from work in other committees, other fora, and I'm very much looking forward to working you on this Committee as well.

MR. VAN WELIE: Good afternoon. My name is Gordon van Welie, I'm with ISO New England, President and CEO.

MR. SHELTON: Hello. I'm Chris Shelton.

I'm from AES, and I lead a group that includes an energy storage business that we've been working on for several years, as well as a newly-formed Distributed Energy Resource business.

MR. MORRIS: Hi. I'm Representative Jeff Morris from Washington State, a new member to the Committee. I'm finishing up my ninth term, or my 18th year, in the State House. I've chaired the Energy Committee most of that time, and I currently Chair the Committee as Telecommunications, Technology Energy and Economic Development. I also Co-Chair the National Energy Taskforce for the National Conference of State Legislators. And my day job I actually have an energy company, I work with energy startups in the commercialization process. Co-founded Northwest Energy Angels, which has got about 89 Angel investors out in the Northwest that looks at 3D outflows every other month; so I looking forward to working with this group.

MR. CURRY: I'm Bob Curry. As many of you know, I wasn't smart enough to get into this

business at the start, so I did when I became a Commissioner on the New York Commission about eight years ago. I've been off for two years; I'm going back to my old ways of corporate transactional law, but keeping more, an elbow and a hand in the energy sector. And I welcome all the new members.

MR. ZICHELLA: Carl Zichella, with the Natural Resources Defense Council. I'm Director of Western Transmission for NRDC. I also work with WECC on their Transmission Expansion Planning Policy Committee. And I worked with David on the Power Delivery Sub-Committee.

MS. SANDERS: I'm Heather Sanders, with the California ISO. It is an honor to be part of this Committee. I am a new member, and I really appreciate being here. I've been at the ISO about five years. I am responsible or Regulatory Affairs, with the State of California, related to Distributed Energy Resources, specifically.

Part of this role, I'm started our organization for Smart Grid, and built that group

to understand how smart group technologies could benefit an ISO. And before that, I worked in various consulting, software organization, design and management consulting, helping all types of participants enter the wholesale markets.

MR. MORGAN: I'm Granger Morgan. I'm at Carnegie Mellon University where I Co-Direct two centers; one on Climate and Energy Decision-Making, and one called the Carnegie Mellon Electricity Industry Center.

MR. MOUNT: I'm Tim Mount. I'm very pleased to be a new member of this Committee. I'm a recent Emeritus Professor since July, at Cornel University in the Dyson School of Applied Economics and Management. I've been working on energy issues since just before the oil embargo in '73, and recently working with the Power Systems Engineering Research Group, PSERC, on various problem-facing utilities relating to integrating renewal resources, and what I would call market barriers to the potential benefits from greater demand side participation.

CHAIRMAN COWART: All right. Thanks, everybody. And I do repeat, a warm welcome to the new members, and congratulate the Department for being able to attract such terrific people to this Committee. And also to Mary Beth, it's good to see you; and Jim, who I think will be with us representing FERC for some time.

MR. PEDERSON: Some time; I have 35 years with (inaudible).

CHAIRMAN COWART: Yeah. Right. Okay. Thanks. I think we should just turn to hearing from the Department. Joe Paladino is here from the Department, and if I could -- you know, we are a little ahead of ourselves here, but to ask Joe to come and give his report on the ARRA update.

MR. PALADINO: Thank you very much. We sure appreciate that very much. Well, there's been a lot of work done. What I want to do is I want to share where we are at, providing some results to you, just to update you on that. But I'll also share with you, and go through a document that I provided, that I think all of you

have, and we are going to go through that.

Just to show what kind of products and information we are trying to get out into the industry and to the regulator community, so that we can inform them more on what the value is basically, of the smart grid investments that we've made through the Recovery Act programs.

So if we can just skip to the next slide, please? Oh, and I guess I have this, don't I -- how it works? Okay, great. The various goals that drive us are summarized here. We had to rapidly deploy getting the Recovery Act (inaudible) result. The primary areas where we deployed and where we are in the Smart Grid Investment Grants Program, and the Smart Grid Demo Program, we basically had nine months to put that altogether and get a solicitation on the street.

And our job has been to really try to program, either it be astute program managers of those funds. I'm going to talk a little bit about where those programs are. One of our main objectives was to communicate results as well as

cost and benefits, support decisions for continued investment, and wanted to be able to advance cost benefit methodology in this area, so that folks could better value smart grid technology investments.

We've engaged stakeholders throughout the whole process, now we are finding ourselves engaging more on states, and we welcome that, as well as municipal governments. There are some municipal governments who have taken the technology to the next level, almost to the smart cities level, and we are working really close with folks like that, and we want to continue our efforts with those folks.

We've really advanced the state-of-the-art in cyber security. Every one of these projects, needed to develop a cyber security plan, and we had experts that reviewed those plans. In addition, we had annual meetings where all the recipients would come together and share lessons learned with respect to the cyber security plans. As a result they -- many of the utilities

which are low on the totem pole in this area, realize the effort, the actual effort, the organizational effort it takes to actually be on top of the cyber security aspect of this.

Many of the utilities have actually instituted new -- established new departments, and the utilities that got dedicated personnel. And we've also developed a Cyber Security Maturity Model to go along with it, so there's been a lot of effort there. In addition to that, funds were given to the National Institute of Science and Technology to help us develop in our operability standards. This is still something that we really need to address, systems integration and interoperability.

There is a whole architecture process going on, there's a standard development process going on, but I think moving into the future, we are really going to have to focus on advancing concepts and options for good architectures, as well as on control systems. To really be able to develop the advanced kind of grid that many, many

of us are looking at going to the future.

And finally, because of the information we are getting, we are in a position to evaluate the progress of the adoption rate, and what the issues are relating to that smart grid technology. And so we've been able to capture some of that in the smart grid systems report, which we just recently issued.

And we are also working with our Energy Systems and Policy Analysis Office to try to determine really what the status with respect to smart grid deployment. What the associated issues are with that, and what is the best path to actually address those issues.

So if you go to the next slide. I guess I could do that -- I'm sorry. Okay. This is a very quick snapshot of the Smart Grid Investment Grant Program; I think we've expended over 95% of all the funds. Okay. And we are talking a combined level of funding between the government provided, and what industry provided. It's close to $8 billion. Really 99 projects across the

country, some of these range from $600-million projects, down to like $5 million projects, these are multi-year projects.

Half of the money went to deployment of advance metering infrastructure, including not just the smart meters, but also the communications infrastructure supports them, and all the IT infrastructure that supports that. Okay. About a third to a quarter of the money went to advancing distribution systems in the areas of deploying things that would improve the liability, like automated feeder switches, to technologies that also improve voltage regulation, automated capacitors, the voltage regulators, et cetera.

And again, all the communications infrastructure and information management infrastructure, there's need to control those. And there are lots of varieties of the way people are actually trying to control the technology; distributed controls, or decentralized controls, or mixtures of those.

And then finally about 10 percent of the

money went to deployment of synchrophasor technologies. And I'm going to provide some examples of what we are seeing in each of these -- each of these areas. And of course the synchrophasor technologies are deployed mostly across the distribution transmission system and, I'll get to that.

The second major area is the Smart Grid Demonstration Program. And, again, this was -- this represents $1.5 billion worth of investment across the two projects. After the projects -- the energy storage projects the other half were really smart grid implementation projects. That varied widely and they were actually trying to look at and demonstrate new concepts for applying smart grid technology.

So, for instance, one of the projects, the Batelle Project, this you probably all know about, but deals with responsive equipment, and responsive appliances within people's homes; and those appliances actually responding to real signals coming off the transmission system.

That's one large project.

Another project has to do with -- is a Pecan Street Project, where that community in Austin, Texas, is actually really trying to integrate distributing energy resources, roof top, solar cars, et cetera, into a community, and really took a -- take look at the financial as well as the technical feasibility aspects of all of that.

So we've expended over 80 percent of the funds in this area, and some of these projects, like the energy storage projects are going to go out past 2015. There are a few of those. One thing that we tried to do is really focus our understanding and the way we depict smart grid technology, so it's not a black box, but rather there are specific application areas by which we can describe, not only for the technologies being applied, but also what the associated costs, or what the associated benefits are.

So if you actually look across the top row, these are basically the application areas

that we mostly are focused on. And the left-two columns deal with advanced metering infrastructure, the furthest left one deals with applying advanced metering infrastructure to be able to address peak and overall demand reductions. And so that technological arena, that application deals, not only with getting price signals to customers, but getting customers systems and technologies they can use to be able to better control their technologies.

So that's one applications area. Another application area with the restructure; and it measures what advantage does it bring to utility? And so we are looking very hard at those projects, where we are seeing actual results, and we are looking at operational and maintenance cost efficiencies with respect to deploying (inaudible) my technologies. As I move across, as I move across this list, we are looking at fault location, isolation and restoration technologies, such as automated feeder switches and the impact of that technology area. Really, what sensors do

we want to program, like transformers, and how that will actually improve the utilities' understanding of the stress levels, and lifetime of those transformers, and be able to incorporate that into their decision-making processes, so they can move, too, from a schedule-based maintenance to more of conditional-base maintenance.

Program and improve, obviously, their operational efficiencies and improved reliability. The other -- the next area is voltage management, approved voltage management on feeders, and the last has to do with synchrophasors, and we've tried to actively map these technology areas against specific benefits.

Now, if you look across -- if you look down the left-hand column, you'll see that we are looking at enhanced utilization of resources, energy use reduction, reliability improvements, operational maintenance cost savings, reduced electricity cost to customers, lower pollutant emissions. And how these technologies actually would enable to a greater extent, renewable and

distributed energy technologies, and what kind of flexibility we can bring to distribution and transmission systems to better enable the adoption and the integration of those kinds of technologies into the grid.

So that is the sort of technological framework, it's really; we are looking into the projects to be able to describe other technologies being applied. What the costs are and what the benefits are with respect to those technological arenas.

So, I'm going to go -- I probably need to hasten this just a little bit. I'm going to show you some examples, some data, you can always get in touch with me later if you want to get into this more. I'm also going to get into, and sharing with you, and look at all the products and reports we are putting out, and a lot of this information will be in those reports. Okay.

You can always get back to me if you've got questions, and I'll help you search something if you've got a question, and dig deeper into

something, so I'm certainly available to do that anytime. I wanted to share what we are seeing in Sacramento. We have 11, highly vigorous, statistically vigorous Consumer Behavior Studies. These are pricing pilots going on across the country. These studies actually, it's control groups and treatment groups, and randomizations, population sizes, of a sufficient size, so that you can actually get -- you can be sure that you are getting valid results, et cetera.

So with respect to SMUD, SMUD just finished their final report. This is going to be available on www.smartgrid.gov, as most of these reports are, I'll get into it a little bit later. And they looked at a pricing pilot which involved time-of-use rates, with a peak price of $0.27. They've looked at time-of-use rates with the peak price of 27 cents and the critical peak pricing period, where they applied critical peak pricing periods at a rate of 75 cents per kilowatt hour, and they would announce this to their population, to the people that are in the study, 24 hours in

advance.

And then we are also looking at their flat rate, with just critical peak events; and this study, they spent about $10 million on this study. It was a two-year study. It's probably, one of the most advanced pricing studies ever done in the United States. The report is very readable. I highly recommend that you take a look at it, and they are finding out obviously -- it's sort of an obvious result, that folks that opted and had volunteered to go into the study, actually had lower peak demands than the folks that were put on the default rate. Okay.

But the acceptance rates, the acceptance rates, of those that were on the default rate were much higher, so actually the population of folks that remain in -- that actually participate in the pricing program, is a much greater population as the default rate, rather than a voluntary opt-in rate. And hence the magnitude of the peak demand is much greater, and as a result of the study, SMUD is actually -- SMUD's Board has actually

decided to institute a time-of-use rate as a default rate across our service territory in 2018.

What's interesting about the SMUD Study is they also looked at cost benefit. Okay. So if you take a look across -- I'm sorry, I should have -- I apologize. If you take a look across the bottom row, they did a pretty extensive cost benefit analysis. You can take a look at this in the study, but they determined that for -- if they deploy a default time-of-use rate with no in- home display provided to the customers, they would see a benefit-to-cost ratio of approximately 4.5.

And this includes -- oops -- this includes the cost -- sorry -- this includes the total cost of 15 million of benefit of close to 67 million and that benefit of 52 million. And then that benefit is tied to capacity deferrals; that's how they are determining that benefit. And again all of this is in their study. We are seeing that AMI provides a lot of benefit to utilities, a lot of cost reductions, especially in the area of meter -- remote meter readings and remote

connectors connect capabilities for utilities are significant savings here.

One, utility is saving over approximately 700-K every year, just because if you've got a (inaudible) utility, just because they don't have to send crews out to turn on meters, and also be able to check meter readings, et cetera, and things like that. So, again, we are trying to capture what operational efficiency improvements we are seeing in utilities that are deploying AMI, and you'll also know that meters are also very useful with respect to providing other capabilities to utility.

For instance, tamper detection and notification; they are able to provide a utility to that information. They are very effective in terms of outage detection and notification, because utilities now can understand who is on and who is off, and we are seeing much greater efficiency with respect to restoration. And utilities have meters, and they can be used to measure voltage levels along lines, and that data

can be used to make voltage management much more efficient.

I wanted to share this. Chattanooga, who is really taking smart grid technology to heart, estimated that they are losing about $100 million a year in societal costs because of their -- because of outages, and damages to customers. So, they deployed automated feeder switches and smart meters across the service territory, and they got hit with the windstorm that we got hit with, back in July 5th, which we called the Jericho.

And because of that storm 80,000 people went out of power right away, but because they had automated feeder switches, within seconds 40,000 of those houses were restored right away. And because of the combination of the smart reader technology -- the automated feeder switching technology with smart meters, they were actually also able to reduce the restoration time significantly.

So, if you take a look at what the

benefits are, what the benefit streams are there; first of all, there are avoided outage hours to customers, and if you take a look at the green line, is what they actually saw. So you'll see the dotted part of that green line, actually shows that when automated feeder switches did their thing, we went from about 80,000 out to about 40,000 out in just a few seconds. Okay.

And if you follow that green line; that is the rate at which they were able to restore power to their folks. If you take a look at the blue line, the blue line shows what they expected would have happened with respect to outage with a (inaudible) -- to restoring their populations without the automated feeder switching technologies.

And so if you take a look at the calculated delta between the blue line and the green line, that area under the curb basically represents the avoided outage hours. And if we apply value of service estimates to those numbers of hours, those are damaged estimates, typically,

that customers see. We can determine what the avoided societal cost does to the community just because they deploy this kind of technology, and we are actually trying to promote and educate folks on the ability to use these customer damaged functions to be able to evaluate their reliability improvements.

The other part -- the other benefit stream, is the benefit that the utilities saw, because they were actually able to restore more efficiently, they will reduce truck rolls, they're able to restore a-day-and-a- half in advance, and they were able to save a lot of money on the utilities side with respect to efficiency of restoration outages.

We are actually working with Chattanooga right now, to develop a more detailed cost benefit, a case study on this. We are going to apply the value of service estimates to show what the value of that kind of approach is in doing -- in supporting reliability planning. And that will become available.

We are also working with a number of other utilities in the value of service area, just to determine whether they are interested in applying that kind of approach to better plan their reliability improvements.

I wanted to mention this also, because this is another area where we can see significant savings, but where utilities actually are disincentivized to apply this, although utilities are beginning to apply it. We have a number of utilities that are actually applying voltage optimization technologies where they are basically automating their load tap changers and their voltage regulators, and their capacitors, and they are tying that into a control system, and they are actually actively trying to lower and flatten voltage levels along their feeders.

And what happens, what happens when you do that, is you actually save a lot of energy, and the utilities that we are working with are trying to do this reduce not only peak demand, it's a very effective method for reducing peak demand. I

know for instance that TVA is looking at this, with respect to trying to get their sister -- their member distribution companies to lower peak demand during signs of stress, but also it's a very efficient approach to reducing energy. And so it provides a great energy efficiency benefit.

So, again we have a lot of studies, a lot of projects that are deploying this technology, we are going report on that. We also have a study ongoing right now, where we are looking really; what is the state-of-the-art with deploying conservation voltage reductions, applying this kind of technology? And what are the institutional hurdles with respect to other utilities we are seeing that prevent them from full-scale deployment?

We have some utilities that are actually going in full-scale deployment, but they are disincentivized because of the cost recovery issues, because of revenue recovery issues. And we want to be able to explore that, and be able to educate regulators on what simple energy

efficiency policies they might be able to implement, so that we can actually see more efficient electricity delivery operations; and savings to a customer, because customers actually save money, more so than the utility, when we apply this kind of technology.

I wanted to lastly, with respect to my examples here, I talk about synchrophasor technologies. The program, the Smart Grid Investment Grant and Demo Programs were incredibly effective again, and synchrophasor technology deployed. And so prior to the start of these programs, they were about 166 network synchrophasors on transmission lines across the country. Now they are going to be over 1,500, and these synchrophasors, as most of you know, are gathering information of voltage in frequency, 30 times a second.

They are providing that to their operations centers. There is a backbone system for instance in the West, which is a fiber optic system, and the latency from the time that the

phasor measurement, you know, sends its signal to the operator, 16 milliseconds. And the bandwidth is there to be able to handle it. Okay.

So in deploying this kind of technology we were looking at all of the operational difficulties it took to actually get the technology deployed, number one. Number two, the other goal is to get operators to begin to use the data, and they are using the data in a number of ways. And we are seeing -- they are seeing things that they never saw on the transmission system before, like oscillations and thing like that.

And they are actually able to apply the technology in many ways, and we are going to be articulating this with the respect to improving reliability, with respect to improving model validation. So utilities don't have to take, actually have to take generators offline to validate their models; which they had to do every five years in the West.

They can keep those generators online, and do model validation, have more precise models

to be able to regulate, effectively, those generators. And we also are hoping that we are going to get more efficiency, we are going to get more capacity, more electricity over transmission lines because of applying the technology.

We have a case study, we had a rudimentary run, now we are digging in and we are going to get to a much more detailed case study, which we are going to provide -- we are going to issue relatively soon, but it's also about the California-Oregon inter tie. And the capacity of those is about 4,000 megawatts right now. Well we can increase that capacity by 100 megawatts; that may not sound like a lot, but what is that, 2 percent, or something like that?

We can increase the capacity by 100 megawatts just by applying the synchrophasor technology. We can get more electricity across those lines which results in savings of millions of dollars over many years but just by deploying the technology. We have many examples of this, with respect to how synchrophasors are actually

improving efficiency, cost savings, et cetera, in the transmission system.

Finally, I just want to say that we've been very, very active in not only communicating with stakeholders; we are trying to get the word out. So, from the very onset of this, we've been working very closely with Edison Electric Institute, EPRI, American Public Power Association, NRECA, NARUC, NAESB, the North American Synchrophasor Initiative, we have active dialogue with these folks. We've moved forward in our discussion with a number of these folks.

For example, with EPRI, we are working together on pricing studies, and they've got a set of pricing studies, we have a set of pricing studies, we are sharing data. We actually put out a set of guidelines on how to conduct with the rigorous concept of pricing studies, and that was a joint document. With NRECA, in our discussions with NRECA, we moved the ball forward with respect to cyber security practices. They went ahead and developed, you know, cyber security manuals for

their people, we've used that kind of information to educate our people.

And so these associations have been very, very, very productive, and they've told us what they want to hear from us with respect to what is the value -- what kind of information they want to hear from us, so that we can be more effective in what we provide back.

We are also working really closely with IEEE. They reached out to thousands of folks internationally, we are going to use their mechanisms to be able to get our information out, and to be able to support dialogue for people who have real interest in specific topics. To get the community focused on being able to talk about those specific things.

We are going to continue to use www.market.gov as basically our library for where we put our products, and so -- but with that we are going to improve research capability into that, so that when you go to the site and you have a question -- you have a certain need or an

interest, you'll be able to dig in and find where you might be able to pull that information.

We are going to create portals to other websites, so that we will continually be informing others through other websites what information and data we are creating, and we've got a mailing list that goes out to folks whenever we develop a product.

We go to many, many conferences, many. And so we go to many IEEE conferences, for instance, and we had a track of six separate sections at the last Innovative Smart Grid Technologies Conference, back in February. We've done the same thing with DistribuTECH, where we've got our recipients, and our recipients are involved with us, you know. Get us off the podium, and get the people that are actually deploying the technology in front of folks and sharing their experiences.

We've been able to do that, and so they are going to Town Hall meetings, they've gone to EPRI meetings, we have a big EPRI DOE Meeting

coming up in October; and we've gone to the NARUC meetings. Again, we are organizing webinars, and hopefully focus groups from that. We just had a webinar where we shared the results of the Conservation Voltage Reduction Study, I just mentioned. There were 250 folks on the -- at the webinar; that attended the webinar.

We are going to do the same thing with our value of service, reliability estimation, we are also going to have an energy storage webinar, those are all set up right now, and ready to go. And then to put all of this together, we've learned a lot, we are at a place where we are looking at pieces of the system, and now we've got a place where, the next step is really to put it all together. It's to put it all together.

And those states are working really hard to figure out; what should be the decision-making framework to determine, what kind of optimal system do I actually create? How do I deal with technology issues and change in technology? How do I deal with needing to open up markets? How do

I deal with the fact that utilities aren't just delivering electricity anymore; but, you know, consumers and third parties are generating and managing electricity.

And to be able to design the advanced distribution system, to be able to do that, is the next area that we are going to be moving -- going to have move into. And we think that we can leverage a lot of the information that we are seeing, into being able to support that kind of dialogue. Okay.

So, if you wouldn't mind, what I'd like to do, is just quickly go through this document that actually lists all of our documents, so that -- and I might -- Do I have to do this? We are going to scroll through.

MS. MALLOY: I can scroll through.

MR. PALADINO: So if you scroll to page 2? Yeah. Keep on going. The next page; yeah, yeah; okay.

MS. HOFFMAN: Use the mic.

CHAIRMAN COWART: Joe, would you use the

mic?

MR. PALADINO: Is it better if I use the mic. Okay. Sorry. I kind of got excited there. I'm going to quickly go through this documentation, which you all have, that you have electronically; all of the titles in blue are direct links to those documents on www.smartgrid.gov. Those are documents that we've already produced. We also have listed all the documents that are coming out, and we've got dates behind all of those documents. Okay.

So, basically, I'm going to first get into the Smart Grid Investment Grant documents, they are program- level documents, and they are more detailed-level documents. And then I'm going to talk about the Smart Grid Demo Program, and those documents.

So, if you scroll -- I've got to watch the screen here. If you keep on scrolling, Maureen, and keep on -- okay, so program-level SGIG should be at the top, so take the program-level SGIG document, scroll to the top,

right here. Can you scroll that up? We should have done -- practiced this for a little bit.

Okay. In terms of program-level documents, we've put out Smart Grid Investment Grant progress reports. We've put out two of those. We have an economic impact of Recovery Act investments, where we actually looked at what the economic impact of the Recovery Act was in the SGIG Program on the economy, and we tried to show -- we tried to show what kind of a multiplier effect we had, and job effect that we had, and that's available.

And then we've also put our computational tools so that Utilities can actually download these, and use these to actually do cost benefit analysis. So we actually have the spreadsheet computational tool to do that. We are going to be dividing OMB metrics, because we actually have metrics against our programs. So we are going to be reporting on those, and we are going to have a final report for the Smart Grid Investment Grant Program July 2015.

And then finally, for a lot of analysis guidance documents out, these are documents that go to our recipients that get into, how they can do their cost benefit analysis, et cetera.

Can you scroll to the next page, please? So, right here, and we can go through this list very quickly, but what I've done on the left, is on the left column going down are all of our -- the major documents that we are developing. And what I've done is; I've created a matrix, so that we can map those documents against topical areas. And those are pretty much the topical areas that I mentioned at the beginning in that matrix, the different technology application areas.

And so we've got impact reports, the first one, demand reductions from the application advanced metering infrastructure, et cetera. The one at the bottom, application of automated controls for voltage and reactor power management, that's a set of initial reports that we did December 12th, some on regulators, like in Massachusetts, they've actually used these

documents in their proceedings, to be able to understand a little bit more about what smart grid technology might provide.

If we keep on going, scrolling, just stop -- keep on going, that's fine. You'll see -- okay, that's great. Thank you. Thanks, Maureen. You'll see that we've got, up at the top here, we've got -- on the left we've got synchrophasor-related products, if you come down to where the black is, we've got documents on consumer participation and the lessons learned in the smart grid. Smart Grid Investment Improved Utility Storm Responses, a document on that; another document on valuing the electric vehicle charging stations, et cetera; so we've got a lot of documents that are going out.

Can you scroll to the next page, please, Maureen? Great. Again, we've got, on the upper left we've got more synchrophasor-related products that are coming out. Some of the key documents here have to do with advance metering infrastructure and customer systems, equipment

health monitoring, distribution automation, a final report on synchrophasor deployment. We want to take a look at the operations maintenance benefits of smart grid. We are looking at smart grid software systems, and the integration issues that are dealt with. Okay.

Keep on going, Maureen. Thanks. On just the consumer behavior studies I mentioned, we've got a whole program, and in this area we worked very closely with Lawrence Berkley; Chuck Goldman, here, is in the room, if you've got any specifically, difficult questions, you can always Chuck, because he has the answers to all of those. And we've got program-level reports; we've just talked about what consumer behavior studies we are doing. Again, we've got some reports that take a look at the impact we are seeing with respect to time-based rates and enabling technologies.

We've got an analysis of customer enrollment patterns and time-based rates, and we are going to be really looking hard at some very specific areas that policymakers are interested

in. Experience of consumers, with respect to instituting these and what kind of interfacing was required to be able to interface effectively with customers to get them on-time base rates, to effect enrollment and recruitment participation.

Inter-temporal load impacts; how does load actually change from one season to another season. We are going to be looking at impacts on vulnerable populations, like low-income populations, and the elderly populations, really looking at what the impact is there. We are getting a rich amount of data from this consumer behavior studies, and getting into the experimental design.

Just trying to describe really the design that we've put together, and if it's applied vigorously, then we think the results can really be a useful and inform us truly on what the impact you can get. In fact, peak load reduction, overall energy reductions, what kind of participation rates, enrollment rates? Of impacts on different kinds of -- on customer types, we

want to be able to get a handle on all of that.

If you go to the next; again, we've put guidance documents out on this. Let's scroll, Maureen, just to the next -- yeah, right here. Each of the utilities that are working in the consumer behavior studies space had to develop an interim report and a formal report. And these, again, are on www.smartgrid.gov. Okay. And the SMUD Report is not up there. We just got the SMUD Report, but that is, again, I highly recommend that you take a look at the SMUD Report, because it hits everything, and it's really well documented. Keep on going?

Keep on scrolling, Maureen; keep on scrolling, keep on scrolling, keep on going, keep on going. Okay, well, right there. We've got many -- we've got top of the reports that we are working on. So we've got a report on dynamic line rating systems. We've got actual results, it's a great report. It talks about applying dynamic line rating technologies on transmission systems. What the costs are, what the capabilities of those

technologies are. Okay.

Again, this conservation voltage reduction report is probably going to come out in October timeframe. We are looking at transacted energy communication systems, distribute energy resources integration -- sorry for the spelling -- micro grids, these are very, very specific -- thank you -- these are very, very specific, topical reports that are being created to provide background, and again, it's the results that we are getting from the demonstration projects.

Keep on -- Maureen, we are almost done. I'm sorry for taking up all your time. We've got very, very targeted reports that came from NRECA, these are really worth looking up. Keep on going. We've got -- each of the -- the Demo Program was a little bit different than the Smart Grid Investment Grant Program, and the Demo Program, and I'll probably do this next time, if you weren't going to do it, we actually had each of the recipients develop their own interim and final reports.

And so take a look at what their objectives were, what the performance of the technology was, and what kind of results we are seeing, not only in terms of technical feasibility, but also a cost benefit, financial, economic feasibility. So these reports are supposed to address that in detail, and we gave them guidance to do that. And so, we've got, again, the reports in -- everything in blue is available on the website, and if you actually take your document on your computer, you can click on these, and you can actually go to the information for each of these. Okay. And so you're seeing that we've got interim technology performance reports as well as final technology reports.

Keep on going, Maureen. We are almost done. And I'm just scrolling through -- and I'm just scrolling through all of the projects right now, and then to hear -- so the projects you just saw were the demo projects. The projects we are looking at now are the energy storage projects, and again, for them, we asked them to develop

interim and final technology performance reports, so they are actually trying to do the same thing.

And so, if you keep on scrolling, Maureen, to where it says, Case Studies, and that will be the last thing we get to. We've got 30 or so -- well, can you scroll just a tiny bit, so I can get the topical areas across there -- well enough. Great, great!

So largely what we try to do, is try to map, again, these case studies which are developed on the website, we are also developing more, and we try to map them against specific topics. Okay. And, Maureen if you just scroll down to the end, you'll see; you'll get a sense of all the different case studies that we are developing. We work very closely with the recipients to generate all of this information. Okay.

Everything we put out is reviewed by a recipient before we put it out. We will not put out anything until a recipient says, I'm okay with that. Because we want to be accurate, we want to be precise.

So those are all the case studies that have been developed, and are being planned. And with that, I think I should stop. I've taken a lot of time, and I apologize for that, but I guess, if you have any questions.

CHAIRMAN COWART: All right, thanks very much. Yeah, I mean, we open the floor to questions, and as our usual practice, put up you tin card. We'll try to call on people in the order I see the cards; and put it down when you are done so -- and sometimes we have to remind people. All right, thanks. I think, Carl?

MR. ZICHELLA: Yes. Just a quick question, on the time-of-use analysis says, any analysis been done on greenhouse gas emissions benefits of time of use?

MR. PALADINO: So, part of what we are trying to do, is map peak demand reduction, and over reduction to those -- to emissions reductions. So, we should be able to map against that. Okay. So, I don't know what those numbers are now, and we might -- we'll just have to take a

look, but we can extrapolate to get those numbers.

MR. ZICHELLA: When you say emissions reductions, are you talking about criteria, pollutants and greenhouse gases, or?

MR. PALADINO: Yeah. We were at -- originally, and we are going to have to go back to see if we can actually do what you are asking. Certainly carbon dioxide, but we'll hear NOXs and SOXs, and things like that too.

CHAIRMAN COWART: Paul?

MR. HUDSON: Joe, thanks. Appreciate the presentation. So, understanding that there's some natural desire to find positive nuggets out of a sunk investment, I'm wondering if there were any places where you, in looking broadly across all of the various grants, and demonstration grants, felt that the juice just wasn't really worth the squeeze. There were places it just didn't make sense to do these types of investments or programmatic activity?

MR. PALADINO: That's a really good question. I don't a good answer to that because a

lot of -- first of all utilities were coming from different levels of expertise. Number two, I think we were able to go down this road, we were probably -- because the Recovery Act came out quickly, and people wanted to take advantage of those dollars, I think a lot of the utilities probably got approvals from before -- before the real cost benefit, the hard cost benefit analysis was done in some cases. Right?

But I will say this. I will say this, I think the benefits keep on accruing over time, because I think that the utilities have to really understand how to apply the technology as well as determine how to best improve their operations to utilize all the data coming out of the projects. So I think it's going to actually take time. And I'm not trying to -- I'm not trying to sidestep your question, okay. But I think it's -- it's actually going to -- but this is important sort of background, contextual information, I --

MR. HUDSON: Actually you could say there's value in a bad result too, right?

MR. PALADINO: Excuse me?

MR. HUDSON: I said, there's value in a bad result too, I mean, that's a lesson learned as well, so.

MR. PALADINO: Yeah. I mean, I -- it's hard for me -- I'm not sure if we, though, we look at it in terms of it's all been progressive. It's all been useful; we see many, many benefits. Do the benefits actually meet the level of cost? I'm not sure. Okay. In some cases they really do, in other cases they don't, but there are lots of intangibles, right, that had to be added to that; that work.

And I think it's going to take a while, again, for utilities to really fine-tune their operations. I mean, you've got people that now -- field operators now, have iPads, and now instead of having, and just get tasks sent from headquarters to tell them where to go next, now they are able to communicate in the field, and their operations are becoming much more efficient. That's not -- that's not a benefit stream that we

are really able to capture that well.

People are actually improving their customer service operations. That's not a benefit stream that we are able to actually able to capture that well, right; in any of this. So, I think we are seeing that utilities are -- over time, are going to learn how to reengineer their business processes to really take advantage of what they are getting out of the smart grid technology. I don't know if --

MS. HOFFMAN: Paul, can I answer your -- this is Pat. Can I answer your question a little bit differently? Some of the things that were lessons learned as we rolled it out -- rolled out the Smart Grid Investment Grant Program, was lessons learned around the functionality of the meters. You know, the meters are basically a measurement device, and I would say that there was a push that it would be the center of the universe with respect to all control and functionality at the customer side.

And some of that were really hard

lessons learned on two-way communications and functionality, of how much functionality should be rolled out and at what time, from that perspective. The other lesson learned, which I think was a valuable lesson learned, but I wish we could have done more, which was pushing cyber security and the integration of cyber security as we move forward.

I think that the Investment Grant and the recipients did a great job of doing cyber security plans, but a little bit of timing, you know, in getting up to speed on the breadth and depth of cyber security issues, and how we probably could have taken advantage of that a little bit more.

CHAIRMAN COWART: Thank you. Jeff?

MR. MORRIS: I just have two questions I might kind of ask together. I notice that there wasn't a lot of outreach to some of the state legislative groups who, you know, most of the states, you know, utility regulations is a delegated legislative authority, and in some

states the legislators are still the regulators of public power who they created. One of the tools that seem to be missing is kind of a set of monetized values, of which to start looking at some of these other value chains, that aren't reflected in how much you -- power you purchase.

And I'm just wondering if -- you know, if that type of tool is in the works for some of these studies or not? And then secondly, when you start valuing things separate from the delivery of power, there's all sorts of tax law implications with that on the ground, too. And I'm wondering if that's something, if you are looking at, you know, monetizing some of these value streams differently; whether someone is going to look at the tax implications both at the federal and state level?

MR. PALADINO: You know, thanks for that. We haven't thought about the tax implications, but I'm writing it down, and we should probably look at that. And then the different structures of the utilities, you know,

whether IOU, versus municipal, et cetera, I guess gets into that. In terms of monetizing values, where we have, I think, where we are trying to really do that is in the area of weighting certain societal costs, because of reliability improvements.

We would like to do the value of service estimate approach, be able to actually put a monetary value and avoid the societal cost, because it actually will -- reliability and improvements, reduced costs from outages, et cetera. And I think what we are going to do, and what will be really useful is, and this is hopefully is -- in our final report, I think we are going to have to address what you're talking about.

That we need to take a look at what are the costs are for these different technological systems, these applications, and what kind of benefit streams are we getting? And how can we actually monetize those benefit streams; and we set a quantitative benefit streams, as well as

qualitative benefit streams.

And then again, we tried not to dig deeply into a specific utilities cost benefit situation, because we wanted to (a) respect utilities relationship with their public utility commission, and it would be very difficult, secondly, for us to actually get into all the details of the utility we get into. Cost of capital and all of those things, so we could just never -- so we are going to have to do it at a higher level.

CHAIRMAN COWART: Chris?

MR. SHELTON: Thank you for the presentation. It's a wide-ranging set of items with many different facets, so I appreciate the work to consolidate all of it. Chris Shelton, AES. In terms of the cost benefit, I think it's subtle, and perhaps you've already addressed it, but I want to make sure if you look at, particularly on the demonstration projects, but I would say, perhaps, on some of the other projects as well.

It will be six years from the time that the applications were written to when the final reports are written on most of those. I saw 2015. The cost of, I believe, Solar PV costs, not saying it's part of this.

MR. PALADINO: Oh, yeah, true.

MR. SHELTON: But just to give you technology cost difference, it's about 80 percent reduction in cost over that period, maybe more. Battery, you know, in our experience at AES, battery costs have declined 60 percent over that time, so it -- however the report is written, even directly in each report, or in a meta report, it would be helpful to do cost benefit using today's cost, and the cost in 2009.

MR. PALADINO: Mm-hmm. Okay.

MR. SHELTON: Because the whole point of the program was to accelerate and advance things, and I would say you could claim that as a benefit of the program. If you think you were a part of helping the price decline in some way, then that's a benefit of the whole program that that cost

declined. So, anyway, I just wanted to highlight that.

MR. PALADINO: Thanks for that. I appreciate that.

CHAIRMAN COWART: All right, we'll take one last question. Audrey?

MS. ZIBELMAN: Just on the benefit. So, really like at Chattanooga, looking at the cost of the service, I guess what -- it's the cost of non-service.

MR. PALADINO: Yes. Yes.

MS. ZIBELMAN: But are you -- when you looked at it, and maybe this will be in the next study, do you look at it as sort of how, if those costs are sort of linear or nonlinear? I mean we have, for example, customers who lose a ton of money, if it's a one-minute outage. Right?

MR. PALADINO: Yeah. Yeah.

MS. ZIBELMAN: Versus customers -- who is out -- whose costs may go up.

MR. PALADINO: Right.

MS. ZIBELMAN: Depending on the

duration.

MR. PALADINO: Right.

MS. ZIBELMAN: I think for us, you know, if we are looking at this, I think it would be valuable to figure out a way to group it.

MR. PALADINO: Right.

MS. ZIBELMAN: So that we could start setting metrics then around what would be the ideal situation.

MR. PALADINO: Right. No. Thanks for that question. The study that was done in 2009 took a look at utility surveys of their customers. They looked at zero to eight hour time-scales, and it's not linear, okay. It's not linear. Where we've got a couple of other surveys, then we've got them to update that information, we were also doing is we are trying to develop cost for high impact events.

The issue with value of service costs, is it really -- they need to be done in the region, and with a customer segments, and to be able to accurately get the cost for that specific

region or territory. And that's where we -- that's what we are really interested to see whether folks are really interested in pursuing that. Thanks for that comment. I appreciate that.

CHAIRMAN COWART: Joe, thank you very much.

MR. PALADINO: You're welcome.

CHAIRMAN COWART: There's obviously a lot here. I've made a million notes, and now I've got some reading ahead of me.

MR. PALADINO: So do we. Thank you very much. Appreciate it.

CHAIRAN COWART: I'm told that some of the speakers on the upcoming Panel, have some time constraints in terms of getting to the airport, so I think we are going to have to eliminate the group break right now, and just move right into the Panel. Can we do that? And people who need to leave the room for a moment, feel free to do so. But we are going to just get going with the Panel.

(Pause to set up panel)

MR. CENTOLELLA: Our fourth speaker, who I know is here, will be back with us momentarily. So let me get started by introducing the Panel. Here we go. We have a tremendous Panel to talk about this topic here this afternoon, and I couldn't be more pleased with everyone that we have. So this panel precedes the discussion that we will have on a paper -- after the panel, addressing the question of DOE's development of information and tools to support the consideration of alternative and regulatory models, and this Panel introduces that topic.

We are very fortunate with the people that we have, beginning with a new member of the EAC, Audrey Zibelman. Audrey is the Chair of the New York Public Service Commission as well as the Chair of the Siting Board there, and a member of, I think, it's five other Boards in New York State and the region.

She is, as she introduced herself this morning, the Former CEO of Viridity, the Former

CEO of PJM, and as you heard, has a long history in this industry. But more importantly for this discussion, her Commission has also initiated a proceeding that is being widely watched around the country on reforming the energy vision, which is proposing some significant changes in both utility business and regulatory models. And she will talk with us about that.

Secondly, we have Kris Mayes. Kris is a Professor at Arizona State University in the Sandra Day O'Connor College of Law. She is also a Former Regulator in Arizona, a Former Chair of the Arizona Corporation Commission. She is also the Founding Faculty Director of Program of Law and Sustainability at Arizona State.

Third, we have Anne Pramaggiore. Anne is the Chief Executive Officer and President Commonwealth Edison, one of the nation's largest electric distribution utilities. She joined Commonwealth Edison in 1998 as a Lead Lawyer for Regulatory Policy. Was appointed COO in 2009, and became CEO of Electric Utility in 2012. She is

also a Board Member of the Chicago Federal Reserve, and the Motorola Solutions, among other organizations.

And her company is very interesting because it is in the midst of both deploying grid modernization, and of implementing an Act passed by the Illinois Legislator, that created a formula rate mechanism and certain performance incentives for doing grid modernization.

And finally, we have someone, who, if you don't know you certainly should know in terms of his work at DOE, and that's Chuck Goldman. Chuck is the Principal Investigator and Senior Scientist at Lawrence Berkeley National Lab, who has been around these issues now for 30 years, and will offer some perspectives on many of the things that DOE is doing related to new utility and regulatory models.

So with that, let's have Audrey kick it off. Audrey, please feel free to either come up here, or speak from your seat, wherever you feel comfortable.

MS. ZIBELMAN: -- there, I'll sit here. So I'm not very good at using slides, I tend to do this extemporaneously. So let me -- just a couple things. One is, that this was helpful, because it's a good summary, in terms of what we are expecting the distribution utility of the future to be, and what we are looking at.

And it really is as much as all the things that you see there, but ultimately, I think the best summary that we are looking at is, it's when you think about, traditionally, the obligation to serve, because really the obligation to provide service to the meter, in a reliable, resilient cost-effective way. We are now saying fundamentally, the obligation to serve really is taking resources that sit behind the meter, and optimizing the system using those resources.

To gain all the other things that you've always wanted to do, but also now very much focused on system efficiency as well as enabling competition. So it really fundamentally makes you rethink the distribution utility; and thinking

about the distribution utility, not as just a wireless company, but really a platform provider. That is really, then, the host of all the other antecedent benefits that you want to get back to consumers, and to drive a much a much more efficient grid.

So, the question is, it's now what prompted us? And we started this proceeding really last December, and it was predicated on a number of observations. A lot of these things that I've identified, I think everybody sort of knows. In the New York style, one of the things that we are looking at, is we spent about 17 million on infrastructure over the last 10 years, over the next 10 years, we anticipate 17 billion -- another 30 billion that we would need to spend.

This is on top of a slowing or declining load growth, on top of a deteriorating load factor because of the electrification of the industry. And on top of having clean energy requirements, which themselves have a certain cost to the system, on top of being the fact that we are one

of the second or third highest priced energy regions in the country, which is not a place we want to be.

We also have increased requirements on the system from consumers for -- and that's why I prompted the question about having not just 99 percent uptime, but a 100 percent uptime, power quality, those types of things. Plus, technology that's really moving towards more driving down the cost of distributed energy technology, lots of opportunity, I think, to create great companies around smart grid type technologies, and a desire, really, to optimize how we can use them.

You know, just as a very quick example, I sort of tell folks, you know, in New York City all large buildings more than 20 storeys, of which there are a lot, are required to have backup generation for elevators and all sorts of other safety devices. Why aren't we using those? And it's a terrific opportunity for us to use these types of resources that today are being underutilized on the system. And the goal we have

is to really think about how do we maximize the value of the capital the consumers put into energy?

Whether it's energy that they need for backup resources or buying energy from the grid, and really our goal is to say, we want to make the most efficient use of those dollars to both drive a much more resilient grid, but also to really help us on the total bill perspective. So, those are kind of, I can now pass through these.

The other thing that staff identified is, you know, what is the cost of inefficiency? So for us, we looked at, you know, if you just worked -- our systems average about 55 percent capacity factor, load factor, which is not atypical. If we improve that by 1 percent, that saves consumers between 150 to 250 million a year. If we drop the top 100 hours, if we flatten that out, based on prices, and this is recent prices, we could look at savings in the order of 1.2 to 1.7 billion a year.

So those are not just the value of the

cost of, you know, not having service, this is purely the cost of running an inefficient system, and not taking advantages of technologies that could be there. The other piece that we look at, as I mentioned, is the amount of companies that are just sitting there, they are waiting for a market to go into, the amount of capital we can automate, as well as the costs that are going down.

So, we are seeing that as just a huge opportunity just sitting there on the side market ready to go in. And the way I like to think about it, is that we have these opportunities where people are buying things voluntarily, such as home security devices, smart thermostats, which are probably not going to get their maximum value unless we have the price signal down at the distribution level. For people to actually see how that could drive value.

That is not because we expect people to go out and buy energy efficiency, what we are trying to create by this new and revisioning of

the system, is actually consumers being the pull factor. A consumer say, I went to my neighbor's house, they had a really cool thermostat, I want that cool thermostat, and as soon as they plug it in, they immediately tie it into a DR Program that allows the utility to start using those, because they clicked a button and said; sure, I'll save $10 a month on my bill.

That's not why I bought the thermostat, but now we start thinking about how do we get that tipping point from consumer behavior? And so in terms of timing, so that's all there, let me just then tell you quickly just walking through what we are doing. What we've -- staff has come through with a couple white papers that we have identified how we are moving forward.

The first is the model -- it's that we need both -- we need to have integrated resource planning at the distribution level. We need to start really rethinking not just how you plan the grid to meet what you anticipate in terms of load growth, but how you can accommodate these

distributed resources, but having a very transparent process so that consumers actually know what the needs are, and you start creating that opportunity.

The other piece is, and this is a big piece that I think I'd love to talk more about, and I think I will be on future meetings, is system development. And it's a discussion that actually, we've started to have about how do you break the network system, and it's where, I think, DOE can play, as we've spent a lot of time thinking about the architecture of the future system, what kind of standards we are going to need around interoperability.

If, you know, we want to create a very deep and liquid market, we want to make sure that the market is robust and will continue to grow and it's flexible. And I think the more that one area that we really could -- we could use some help on, is really thinking about what is this architecture of the communication system, layered on top of a distribution utility, really need to look, but

really, you know, beyond AMI.

The other piece is operational efficiency, is really thinking about how the utilities, what kind of DR Tariffs would need to be put in place. For example, at the local level, we don't think about it a lot, but distribution utilities by reactive power from the grid. I think they should buy reactive power locally, it's going to be a lot more efficient. So how do we create tariffs and markets to send the signals so that we can really start now monetizing these resources in a way that is actually good for everybody?

And then the other piece is both the products and services, but data analytics. You know, I see there's going to be huge opportunity at the -- actually at breakfast today and the question came up -- hi, Steve -- as to where we see this, sort of, integration of big data analytics, technology companies and the electric grid, around the kind of analytics that you could start providing.

And if you start doing that, and there's an opportunity to monetize that, then you start thinking about the distribution utility. Like we used to think about the telephone company, that they could start unbundling services and third parties might buy them; and if the payment for these of analytics and data services can be used to offset the cost of building up the systems to enable this really two-way flow of information.

So a lot of what we are thinking about is just how do you develop that market, what products should be there in moving forward; and all of this is sort of in -- what we'll be doing is really unfolding it. So then, the other piece of this, which is really how we had started on the discussion; is why aren't utilities doing this in the first instance? I mean, and what are the challenges?

One of which is, what we've said is the regulatory model; there's nothing in it for them. I mean even though New York has gone to forward-looking test year, we've unbundled. We

have revenue decoupling mechanisms, all of that's in place, but all that means is that we've neutralized utilities, the utilities can earn a 9 percent return in New York with a fair degree of confidence that they are going to get there. That's a positive thing, but to earn 10 percent, 11 percent, to get excited; in fact, if they are helping reduce the price to consumer there's no mechanism for them to really get there.

And so the issue is, it's how do we align what we are doing about regulation with what we want the utility to think about in terms of driving a system efficiency and driving prices down? So one of the things that we are doing is we are saying well, one is we need to move to a more of a performance-based, outcomes-based regulation, thinking about system efficiency is one of the objectives. Thinking about improving energy efficiency is one of the objectives; driving innovation is one of the objectives.

So we are looking at the model in England, the REIIO Model, and if you asked me what

it stands for, I know it's Revenue Equals Innovation, Incentives and Outcome; which is good, I've said it enough now that it's in the head. As well as other earning opportunities that we might want to drive out of the system so that there's an upside that's not necessarily a regulated upside, that other competitors can come in and offer, but that utilities can offer as well.

The other piece is really thinking about information transparency, really driving in terms of where you might availability for resources, price transparency, things like that. And then, lastly, is both identification, and elimination of barriers to entry. So one of the things that, you know, I think about from my experience at PJM is that, you know, utilities forever, before we really got into markets, it was very difficult to interconnect if you are an IPP, it took forever.

There were all sorts of concerns. You had to line up. The queues were really long. FERC had to intervene. We moved into a market and there's a whole different continuum, there's a

whole different motivation. So at the distribution level, things like standby rates, if you would think about it; if we changed the utility mindset and we say, wait a minute, your goal is to drive innovation, to create this network, and knowing that the network itself is going to help you get to your goals, then things like standby rates, or smart utility would say; why would I want to hold somebody up?

I mean, I get more money the more things I have hanging off my system, and the analogy I use; Apple doesn't say I'm going to make it really hard for you to put an app on my system. And so what we need to be looking at is whether these barriers to entry, and then thinking about the -- both on an incentive basis, but also take a look at what rules we have in place that inadvertently have created these barriers.

So it's, those types of things will be the next step, so our process, as to where we are in all of this, we thought -- staff has come up with a straw man proposal, in terms of, what is

the role of the distribution system provider? You know, what do we need in terms of architecture for the system, those types of things. We received comments on those yesterday. A lot of issues around vertical integration, a challenge for us to think about because we've restructured in New York, is that utilities in New York do not own generation.

But if you are asking a utility like ConEd to put in a distributed energy resource in lieu of building a substation, what kind of relationship do they need to have with resource, because it's required for reliability. And so those were the types of things that we are getting comments on, and as you can imagine, people bear a lot of different opinions about that.

We are also coming out with a straw dog on this new regulatory model, moving to an outcome-based model. Looking at what is called the TOE text, but really looking at total revenue requirements, operating as not just capital, as a basis on earnings components so that utilities

aren't just driven by putting in more capital, but really looking at a total revenue requirement element.

And that will be out, most likely in January, with the idea we'll get comments back on that, towards the -- sometime in early 2015, with the objective, is then, after that, our utilities will be filing initial rate plans that reflect some of the things that we've discussed.

So it's ambitious. And I'll tell you, from our perspective, and a lot of this is around driving markets, driving innovation, driving prices. But having gone through Sandy, it created a fundamental understanding throughout New York, of the need to looking at resiliency, and the need to take a look at distributed resources. So it's a -- and oftentimes, you know, it takes something like that to really get people to wake up, but I had an opportunity to sit through some New York Rises events, that the Governor holds.

But then what New York did, is they put out grants for local communities to say; how do

they want to build up after Sandy. And I would say 80 percent of these communities, and this was all just sort of driven by people upward, came back in and said they wanted to do micro grids, they wanted to do smart grids. They wanted to have local distributive resources, so what's happened is, is that there's just heightened recognition, that things can be different and with that, we expect, and we are seeing a lot of receptivity throughout the state that changing from business as usual makes a lot of sense.

So you know, we are, obviously are going to take advantage of that momentum, get things going, and we are -- you know, my expectation is actually during my term, we'll skip these rate plans in place. And what we realize is that this is going to be a transition, but that it is absolutely, the time to start is now.

MR. CENTOLELLA: Thank you, Audrey. We are -- I'm going to ask people to hold questions at this point, you know, and try to take some notes and remember them, and we'll take questions

at the end of the -- of all the presentations. So, turning now to Kris Mayes, if we can get Kris' presentation up on the screen?

MS. MAYES: Oh, thank you. Well, thank you so much, Paul. And thank you for inviting me to come to speak to you, and to DOE, and it's so great to see so many good friends. And I think I'm here to be the representative of the Wild, Wild West, so I will do my best, although I see my friend Commissioner Wagner here too, and my friend Carl Zichella, so you can help me.

But I was really interested in what Commissioner Zibelman was saying about the genesis of what you did, and I find it both interesting and fascinating and a little depressing, because we are obviously, thank God, are not going to have a lot of Sandys, but we had our own war out in Arizona, that I think should serve as a political war, and I'm going to talk a little bit about this as an example of why we, too, need to follow your leadership, and follow suit. And many states need to follow suit, and beginning to think about what

the utility of the future is going to look like, and start opening dockets.

And some states have, but not enough have, and I do think that the way this is going to develop, is we are going to watch states like New York do, what they are going to do, and I think they will succeed. And then other states will come along, we are seeing some baby steps taken in other states, in Illinois, with what Anne is doing there, and some steps in Hawaii. And so it's going to progress, probably too slowly, but just real quickly again, and I wanted to talk about some of the policies.

You all know this, because you have all helped to facilitate in one way or another, some of these policies, but the policies that are driving these pressures on utilities, obviously we have the ITC there's some uncertainty around that ending, hopefully not, but potentially ending in 2016. There's net metering in most states like mine, and some states like mine, very aggressive net metering policy allowing many Arizonians to go

solar. That's obviously our RPSs like mine that have solar and DG carve outs.

And net metering is facing a number of threats by a number of utilities right now. And then of course there's energy efficiency resource standards, some of which are very aggressive, like mine, we having, probably the nation's most ambitious EE standard at 22 percent by 2020, and those other policies. Some of the things we have coming up, as you all know, that I think are going to continue to drive energy efficiency and renewables in a way that may threaten some utilities, may actually help some utilities deal with the EPA Policy, the EE carbon pollution standards.

We have value of solar dockets coming up. We have utility of the future dockets, and then of course, rate design proceedings going on across the country where some of these issues of, you know, the various perceived threats to the utilities bottom line will be addressed.

Just to give you a sense of -- so some

of you have seen this, this is an IREC slide showing the incredible expansion of solar nationally, from 2003 when I first started as a Commissioner, and when many of us in the West were adopting these policies and, man, have they been successful.

To the point where we are now doing, you know, we are topping 100,000 distributed solar systems a year in America. And just to give you a sense real quickly of some of the utilities that are facing the highest levels of DG penetration, obviously, Hawaii, HECO and a lot of the Hawaiian entities are facing the greatest pressures. But also SDG&E, and Arizona Public Service, each of which are facing 2 percent penetration; which in my mind is still not huge.

I don't think it's something really to cry wolf about yet, and I don't think that it's something that we should consider to be the onset of the death spiral, if that's what we want to call it. But in tandem with energy efficiency, what you are starting to hear is a lot of

utilities get, and I would be interested in hearing Anne's comments on this. A lot of utilities get consistent questions on their earnings calls from Wall Street on this.

So if you listen to APS's earnings calls, every single time, somebody from UBS, or one of these other, you know, firms, is asking them, what about your energy efficiency penetration; and what about solar? And what are you doing to tamp down on it?

And so that is putting pressure on them. The only thing that's putting pressure on utilities, it's people want it. This is one -- I love this slide because it shows you -- I don't know if you can read it, but it shows you the places in Arizona where we are seeing the highest penetration of roof top solar. Sun City, West Arizona; Sun City, I'm sure some of you have been to Sun City. The oldest place in terms of age, and the most conservative place in Arizona, is where most -- the most people are installing solar.

So this notion that solar is this sort of liberal tree-hugging bastion has to be put to rest. It's not. Older people, retired people, conservative people, love talking to each other about how much they are net metering and getting off of their utility systems; and so that is an interesting, social, sociological development. And this is a large part to the efforts of many of you in this room, at DOE, and through the Sun Shot Initiative, as the price of solar has come down, we've been able to lower upfront incentives, and yet solar has continued to rise.

So this is an amazing phenomenon, and again, kudos to the people in this room for helping to make that happen. And this is a slide from Pinnacle West, APS's parent company's earnings call presentation recently. You can see that they are focused, obviously, on a lot of depression of their revenues from energy efficiency, and a little bit from solar, but not as much as you would think. A lot from energy efficiency; and they are talking about it with

their investors.

So what happened in Arizona, and what should be the -- I think the warning shot across the bough, and maybe I just hope my pitch would be to you to continue focusing on this issued because it's so necessary, so we can avoid what happened in Arizona. We had an all out political brawl develop in Arizona over net metering, and there was a proposal put forward by APS, to assess a 50 to $100 charge on anybody who put solar on their roof tops, which will essentially destroy the value of that solar system, and make it come -- destroy solar in Arizona, obviously, the sunniest place in the country.

And we had people like Barry Goldwater, Jr., jump into the fray on behalf of solar, advocating against the utility. Arizona Public Service Company spent $4 million on campaign-style advertising to try to destroy solar in the State of Arizona, or essentially destroy net metering. EEI came in with a $500,000 spend on ads which I kind of suspect that they regret at this point.

I'm not sure about that.

And you'll see the middle picture there, it's actually a rally that occurred outside the Public Utility Commission, and where thousands of people showed up, including the streets were lined with solar installers, trucks, you know, coming to the -- I never can imagine, I spent 8 years at the Commission we did not get thousands of people to the Commission.

So you can see what happened there and that just gives you a sense of the conditions that led up to it. So, Audrey kind of listed some of these, and we are seeing some tipping points, you know, occurring in the West, where we are clearly beginning to need a change in regulatory systems to deal with some of the pressures that are buffeting the utilities, wind prices in Colorado are now, at least according to Public Service Company of Colorado, less than system prices.

An average existing system constant in Colorado, which is amazing, and we are more than a million Nest thermostats. In my conversations

with utilities, we have the Utility of the Future Center at Arizona State University where we are working with a number of utilities across the country. They talk more about the next thermostat than solar now.

Why; because it's a complete end run around the regulatory system. You don't need, as Audrey mentioned, you don't need a subsidy to buy these things, and people are just buying them at Home Depot, and they are putting them in their houses. I have two of them and I love it.

And then upfront incentives in places like California and Arizona have now reached zero, so we are starting to see a change, we are starting to -- we need to see a change from the traditional question that we ask, and this is from a study called America's Power Plan, which is terrific, which is, you know, did customers pay the correct amount for what they got, which is the traditional regulatory formula to, did customers get what they want?

And that is a huge, huge change in the

way we think about this, and I think that is what underlies a lot of what New York is doing. And you know what, Arizona customers, and again we are the reddest of the Red States, want their solar energy? Nine out of 10 Arizonans say that they would be willing to pay more money for renewable energy, but 60 percent of Republican voters, and I am a Republican who ran twice state-wide as a Republican.

Sixty percent of Republicans say that they would not vote for a candidate who said that they were -- that they intended to limit solar programs. And nearly 90 percent of customers support our renewable energy standard. So clearly there is public support for this, and they clash, I think, between what some utilities are starting to do in terms of pushing back against this, and what their customer wants -- customers want.

I think that it was a mistake for my state largest utility to do what they did. I think it damaged their goodwill, I think it went against what the customers wanted, and yet that's

what happened. So, again, what's happening out there, clearly New York State is out there in the lead, but Hawaii, has a couple of dockets open which I would recommend that you read if you haven't had a chance to do that yet, because they are dealing with these issues in an extreme and immediate way, and in Arizona we have a docket open on emerging technologies in which Commissioner Bob Burns is very interested in some of these issues.

I am involved in a project called The Powering Tomorrow Initiative which involves four former state Commissioners, two Democrats and two Republicans, we now have about 10 utilities and vendor companies aboard, and the idea is to create a model code of regulations that would be designed to help facilitate states dealing with those transition and go -- sort of tailor those state-by- state.

And we are watching very, very closely what New York is doing, and can imagine some of that being a -- becoming a part of this. So

that's kind of what I wanted to mention, there's some other sort of baby steps that are coming, great making variances, performance-based incentives, long-term planning like they are doing in Illinois, and in ComEdison, utility ownership of DG and of course, as I mentioned New York's REV.

I'm going to skip through that, there's some other interesting examples that you might want to pay attention to, Xcel, and then this is really interesting, Xcel in Colorado, exceeded their RPS goal, and then they went out and they took the RECs that they were creating, and they earned $62 million in off-system sales associated with those RECs. They actually made money from it, and there was a shared revenue mechanism that allowed them to share the proceeds between shareholders and consumers.

I'm going to skip the ComEd example, because I think Anne is going to talk a lot about that, but I think that's a good example. And I think another baby step is you are seeing a number

of utilities start to, at least attempt to own solar. And very controversial in solar industry, a lot of solar companies don't like it because they think it's an unfair and unlevel playing field to allow utilities to try to own solar, but at least it is an interesting example of utilities trying to get into the game.

It's got to be carefully structured for the -- so that all stakeholders can support it. So I'm going to end it with that. I'll just add another thing that I think is on the rise, and there's this question of whether we can extend integrated resource planning to integrate the distribution system planning, so that commissions start to, and utilities start to compensate distributed resources as part of an integrated resource planning process. So I'll end with that, Paul.

MR. CENTOLELLA: Thank you, Chris. So we are now going to turn to Anne, and Commonwealth Edison has been down this road for a few years now, so we look forward to learning from your

experience, Anne, and talking about where you may be going in the future.

MS. PRAMAGGIORE: Great. Thank you, Paul. Good afternoon. I'm delighted to be here. As a Utility Executive, I always like to get into the discussion of the future of the utility, or the utility of the future, and there is a variety of views of that, ranging from the foretelling of our demise, to initiatives that actually want to give us more to do, and allow us to have a greater impact, which I think is terrific. I've been borrowing from the Mark Twain phrase lately, "The reports of my death are greatly exaggerated."

But obviously there's a lot -- a lot happening and a lot to do. I thought what I would do today is take you through the thinking at ComEd. You've heard from the East Coast, and the Wild, Wild West from Kris, and we are smacked dab in the middle, and in some ways, our trajectory, is also smack dab in the middle. And so I wanted to start with some of the drivers for the change that we are seeing and the drivers for our logic

around this, and Chair Zibelman referred to several of them, as did Kris.

But to sort of give you a sense of why we see the change, what's driving us, and then talk a little bit about a continuum of models that we've put together of utility functionality. Talk a little bit about the Illinois experience where we are at, and what I think the next evolution is.

So, we have chart of up here that identifies really sort of three major drivers for change that we see. We built out a grid in the 20th Century that was ubiquitous, pretty uniform or monolithic in the product that it served up, but pretty cheap, and actually really drove the economy of the 20th Century, and it served its purpose, it did a pretty good job.

We also had a customer base that was pretty tolerant of undifferentiated product, and so they were satisfied with what they got. The world has changed in three ways, I would say. The financial model that supported the 20th Century; or the regulatory model was driven by volumetric

pricing, you paid by the drink. So it was a great model for creating low-cost capital to build out this system as long as there is growth. And largely throughout the United States, growth is gone or it's reduced.

Tremendous efficiency in our building stock, in our appliances; we are moving from a manufacturing-based economy to a service-based economy, all that is driving usage, really, out of the equation. And, you know, we've seen it at Exelon, if you looked at the 10 years before the recession, out average growth among our three utilities, was about a-point-and-a-half a year. If you start at the recession and move a few years out from where we are now, it's negative slightly.

So it just gives you a sense of what we are dealing with, and if your whole financial model is based on volumetric pricing, you are going to have a problem with that. If nothing else was happening, you would have to address that issue. But there are two other things that are happening that I think are really important.

One is, customers want features that they have never asked for before. They are the digital customers, the expectation economy. They are not satisfied with a one-size-fits-all product, and a monolithic approach to this business. They want solutions tailored for their particular businesses that run off of robotics or microprocessors.

If you are a residential customer, you know, you are living off your iPhone; for me it's a BlackBerry, it drives my IT people nuts, but that's what I use. But there is no tolerance for low levels of reliability. And Chair Zibelman referenced the resiliency question; weather patterns are much more erratic. They just simply are, and we've got data that shows that in the Midwest.

We just had a double Derecho on June 30th that spun eight tornadoes in our service territory. We've never seen things like that before. So it's real, and we are facing it, and so customers have more and more uses for our grid,

higher requirements for power quality, and we are facing this weather problem. So changing customer expectations, they want clean, green, and customized solutions, rather than the monolithic one-size-fits-all product.

And then the third driver is technology, technology is changing and it's obliging our customers, it's giving them the ability to tap into customized solutions, to have more control over their energy experience. And so we are dealing with that. I think the grill is going to be able to play a huge role, and serve customers in the 21st Century, but I think it's going to be really, really different.

We are moving from an asset-based focus to a service-based focus, from fossil to cleaner, from quantity to a quality approach generation, and the 20th Century, it was about getting the juice on the system, now it's about the quality of the service we are providing.

From a universal service provider to a customs solutions provider, from mass

communications to a very tailored, and more intimate relationships with customers, and from a slow, deliberate business, to a much faster and more nimble business. Those, I think, are the requirements. Based on that, we put together a continuum of models that we thought about, really just to sort spur our thinking, and they run from the utility model of today, which is essentially, the rate of return regulation, and the kind of universal service that we provide today.

And we think that's a non-starter, as I indicated, the growth question would drive you off that in any event, but there's other activities going on, dynamics that are going to move you off that. And that is the enhanced status quo, and this is, if I had a map I'd say, that you are here, for ComEd, it's the enhanced status quo model, and this is really -- You know, we are working on reliability and resiliency questions. We are adding digital technology in the form of distribution automation meters and some smart substations which start to give us some visibility

from substation to the customer, and are creating some interesting questions and data that allow us to create algorithms.

We can actually predict equipment failures on some of our equipment in a way that we never did before, so we are starting to get into that, and we've modified our regulatory model somewhat. We went in, in 2011, and basically put together a piece of legislation that has an investment plan built into the legislation, so essentially, an investment portfolio that's been preapproved, it's not our entire investment, it's about 20 percent of it, but it does capture our digital investment, which in a least-cost model, least-cost regulatory model, you've got to worry about deploying technology that may not in a sort of literal sense, address least-cost questions.

So we put in a $2.6 billion investment program over roughly 10 years. We adjusted the regulatory model and put in a performance-based rate model. And what that did for us is it addressed growth, to some extent, and allows us to

reset our billing determinants every year. And so reallocate our cost. I don't think that's a long-term solution, I think we've got to move to a different kind of pricing model.

It's still volumetric, and basically you are just reallocating cost, you know, each year onto a -- you know, sort of fewer units of sale. And that's not an ultimate solution. But it's a bridge solution. So we dealt with growth, we dealt with lag; regulatory lag is a big problem for the industry in a historic, test-year kind of model. We've put a reconciliation mechanism in there that allows us to reconcile. We use a historic test-year for O&M we use a projected capital model, and it allows us to reconcile each year. So we actually do capture our cost much more accurately than we are used to.

We dealt with stranded cost issues by this preapproval investment built in, and we address the customer experience by building in some performance metrics, and there are performance-based incentives in there as well.

And I think this is a really basic model, it's pretty fundamental, it's simple. There's not a lot of complexity to it. I think we have to go much deeper when we move forward in the future, but I think it has some of the key elements that we'd be looking for in the future.

The next model is the network service provider model, and this is, I think what they are -- what Chair Zibelman is looking at in New York, and this is, we think, the go-to direction, and I'll talk about this in the next slide.

And then the final model is a full-service model, and that's where the utility is essentially doing everything from the -- you know, providing basic service, reliability to the kind of model that they are looking at in New York, where you actually are managing transactions across the system at the distribution level. To providing all the generation and generation-related services, and that would be the full-service model.

So we -- so I told you where we are at

in sort of our evolution, but where we want to go to is really the network service provider or the DSPP provider model. And we think that that is, you know, critical. We think the grid can add tremendous value here. You know, it's pretty clear that distributed generation is here, and customers want it, and it provides value. It's also clear that for most customers a system, a distributed generation system sitting on its own is not going to be cost-effective.

So we think that the integrated grid model is important, it's the way that customers will be able to access most of the benefits of distributed energy resources, as being tied to the grid. So this model that Chair Zibelman talked about, we think has roughly six elements to it, from a functionality standpoint, and I'm going to just highlight six regulatory issues that I think have to be addressed.

One of the first things I'll say, before I jump into the six and the six, is we think it's really important to tie the functional model, the

operational needs and the regulatory model together. If you try to deal with any one of them separately, I think you are going to run into issues, you may not get the optimal result for the customers at the end of the day. It's really important to understand how all those fit together, and so that's what we are trying to do, is to understand all of those aspects.

So we view the functionality as planning, but planning will be different, and you've heard that from some of my fellow panelists. It will be much more dynamic, much more locally focused than, you know, sort of monolithic. Again, more granular, more custom; ensuring physical flow, that's number two, that's what we do today, but it will be different because we are going to have two-way flows, so it will be much more complex.

Real-time dispatch; this is understanding all the thousands of -- hundreds or thousands of inputs that you've got on the system now, which we don't have today. Situational

awareness becomes really critical here, and system thinking rather than central planning becomes, I think, the mindset that we have to adopt here. Transactional functions, we would expect the utility to provide certain services, ramping. You know, we know that certain distributed models won't -- you know, won't support the kind of initial surge that you need to -- you know, to start up certain kinds of uses.

Ramping services from the customer, they'll sell generation on the grid and potentially services to the RTO, measuring and settling all those different transactions will become a big part of the effort. Network optimization is number five, and you heard Chair Zibelman talk about this, and I think Kris did as well. So we have this communications network overlay now on the grid, and network economics would suggest that the more usage you can make of it, you can create efficiencies and drive cost down.

So what does that start to look like?

We think the smart city concept comes into play here. The more usage you can tie onto the grid, you are going to create efficiencies throughout the economy, they may not flow in the same way they have before, because I think you start getting into different areas of the economy, but you can create efficiencies.

And then finally, we think it's appropriate for the utility to be in distributed energy resources for some purposes. We are supporters of competitive markets, but we think we are distributing energy, resources can be a least-cost approach to a distribution problem, that that's an appropriate place. We also think that we can provide a distributed energy resource solutions like micro grids for public purposes, that many not be able to be supported by an individual customer, but the socialization mechanism that we have in our model, allows us to share cost.

And where it's appropriate, for certain purposes, health care, emergency response centers,

that that would be an appropriate use, and then there may be others. Those are sort of the two major areas we see now.

I will finish up with the six areas of regulatory questions that I think we have to grapple with. I've talked about growth, I talked about regulatory lag, stranded cost, recovery, there's going to be concern in utilities as we move forward as what might be stranded and we'll have to resolve that.

New services, I talked about some of those ramping, generation services, services to the RTO, how are those priced? How do we address those? Innovation, we want utilities to move faster to try different things, how are we going to support innovation? I know there are some models out there, and the question of least cost versus ultimate benefit or value or functionality. We've got to grapple with that.

If you take least-cost at its literal sense, you may not get the best outcome at the end of the day, and so we've got to figure out how we

balance that, and I think that's important. So I will finish up there. I thank you very much for your time and attention.

MR. CENTOLELLA: Anne, that was great. Thank you. Our final speaker on the Panel is Chuck Goldman and, you know, Chuck, as I mentioned works at Lawrence Berkeley Lab that supports the Office of Electricity. So, Chuck?

MR. GOLDMAN: Good afternoon. It's a pleasure to be here. In thinking about my talk and remarks, I decided pretty consciously, to differentiate what I talked about and how I did it, from what Anne and Kris and Audrey did, because I had the sense that they were going to sort of talk at the strategic higher level.

And so what I want to talk today about, was in some sense it builds off the paper that the Electricity Advisory Committee has produced about utility regulatory models, and the emerging tools, and analysis that DOE might consider in supporting. And I was hoping to share with you in the next 15 minutes, the kinds of tools and models

that we are currently doing, on behalf of DOE, and that we are doing -- that we are offering to State Public Utility Commissions and Energy Offices. And to give you feel for the kinds of analysis that we are doing, and the kinds of tools that some regulators are thinking about.

So that's sort of the game plan. Could I have the bunch, so we'll try this. So that will be now, the Electricity Markets and Policy Group, of which I'm a member, we conduct technical economic and policy analysis, on energy topics centered on the electricity industry.

Our current research seeks to inform public and private decision-making on public interest issues related to energy efficiency, demand response, smart grid, renewable energy, electricity resource and transition planning, and electric reliability. Joe Eto, Ryan Wiser and I are sort of the leaders of that group. They have about 25 staff. All of our work is funded by the Department of Energy, Office of Electricity, and some by EERE.

On this chart what I'm showing you is, sort of the five areas that are at the intersection of distributive resources and utility business models. And today in my remarks I'm going to talk about some projects that sort of go in that space where we are quantifying the financial impact of distributed resources. Talk a little bit about the efficiency business model technical assistance, and talk about what we are doing in the future regulatory model area.

And what I want to say, conceptually, is that we really are doing two or three different kind of products. There are a lot of states who are thinking about incremental changes to regulation; they are sort of in the enhanced status quo kind of world. And the kind of questions they face, are the kind of the things that came up in Arizona.

You know, like how do you deal with net metering? And how do you deal with the financial impacts on the utility and customers of that. And I'll talk about an analysis tool that we built,

that we use in our technical assistance work. And also there are some early adopters here. You know, folks who are thinking about the future of business model, who are thinking about fundamental changes to cost of service regulation. And I'll talk a little bit about the utility of the future project that we are working on with DOE/OE funding, to try to put out some white papers and some thought pieces from folks in the industry about that. So that's sort the game plan.

In terms of the first project, we are looking at the impacts of efficiency and distributed energy resources on the utility profitability and customer bills and rates. Regulators in a lot of states, and legislators are putting in policies that support clean energy of different types, efficiency resource standards, RPSs, net metering. And those kinds of policies ultimately it impacts, the utilities are concerned about avoiding earnings erosion, and lost future earnings opportunities.

Customers are interested in capturing

the benefits of these programs, and they are concerned about rate increases that may arise as a result of these kinds of programs. And generally, what we try to do is, in contrast to what happens in Arizona, we try to provide in some cases, before you get to the war, we try to kind of talk about stakeholder processes that use quantitative tools to help provide some range of options and issues for stakeholders, so they can frame the discussion the way that lends themselves to sort of thinking about options and solutions.

So, I'm going to talk about a project where we, you know, conducted a quantitative analysis, look at some of the sensitivities of some of the key drivers, and talk about the alternative mitigation approaches for penetration of PV systems. The starting place for our work, is that we've been doing this for the last seven or eight years for the efficiency area. And what I'm showing you; is we use a financial analysis model, that's essentially, we'll talk about in the next slide, but we get requests from state public

utility commissions.

We've worked in Arizona, Kansas, Nevada, New Mexico, Massachusetts, in the Midwest. We've also worked for Utilities who actually brought us in the stakeholder processes, and try to have a discussion about decoupling mechanisms, or shareholder incentives, or things like that. On the bottom there's a sleuth of technical reports that came out of this work, as well as a bunch of journal articles. And in general, we've had some success; ultimately the Commission in Arizona, used the work that we did, would be modeled APS, and Tucson Electric, and used that as part of the process to decide about a decoupling order and shared benefits.

Massachusetts, the Commission used it, in terms of thinking about the level of shareholder incentives that they'd offer the utilities. In Kansas the Commission put it in the records, and they used our work to basically talk about offering the utilities an opportunity to file incentive mechanisms, and the loss revenue

mechanisms. So the technical work has, in some cases, led to some good outcomes. In other cases, it hasn't gone anywhere; I've got to be candid. You know, sometimes it has helped the stakeholder process, but they didn't get to the finish line.

The financial models that we use, is we've developed over the last six or seven years, and it's basically a spreadsheet model that calculates utility cost and revenues prior to the addition of distributive resources. It then builds out assets. It builds up additional cases based on the policy drivers in that state. We might be modeling an aggressive efficiency, renewable standard or aggressive net metering program, or some forecast of PV penetration rates.

We do have basically base case and a bunch of sensitivity analysis. The model -- the outputs of the models are what happens to shareholder earnings and return of equity over long time periods. This is a 10- or 20-year kind of time look. And we also look at what happens to customer bills and rates. We have the capacity to

look at what happens to participants in programs, versus non-participants. We have the capacity to look at what happens to customer classes.

In general, what we find is that people -- and we have a pretty transparent process, so people explaining the inputs, and calibrating to where the utilities start from, and it provides some framework for some discussion. We also model a set of policy mechanisms that commissions have at their disposal; whether it be the decoupling mechanisms, differences in rate design, fixed charges, demand charges, lost revenue mechanisms. And we talk about the impacts of those mechanisms on shareholder earnings, and customer bills and rates. So that's sort of the analytic framework that's used.

And so the study that came out today was a study of two prototypical utilities that we modeled. One was a Southwestern utility that's a vertically integrated utility, sort of like Arizona. And we also modeled the Northeastern utility, sort of like Massachusetts. And we

looked at a range of penetrations of PV from zero to 10 percent, and recall Kris' slide where today we are in the worst-case, we are like 5-7 percent in Hawaii, 2 percent.

And so we are sort of -- we did the (inaudible) and sort of pushed the outer bounds, and test issues about, what may the death spiral look like, if you really get to very high penetration rates of PV? And what this slide is showing you is the reduction in revenue requirements, over a 10- or 20-year period, for different penetration rates of solar in these two utilities, and then the qualitative of what you see is that the revenue requirement of the utility goes down by the order of 3 to 4 percent. In other words, there's some reduction in cost, as we have lots of PV, the utilities are avoiding fuel costs. In some cases, they are deferring some capacity investments on our vertically-integrated utility. With these utility, what they are avoiding mostly is purchase power. These guys are just distribution companies, and in that purchase

power, there are some fuel and there some, you know, capacity that they are avoiding as well.

And you get a sense of the magnitudes about what happens. And what I'm pointing out here is the power of the model, in a sense that it allows us to -- we are essentially functionalizing utility cost. You can see capital assets; O&M purchase, power, fuel. So people can get a sense of what we are actually -- what are the benefits, what the reduction revenues to the utility actually looks like.

And then we also present the results of what happens on the earnings side, as well as what happens on the rate side. And what you can see from these results is that at 2.5 percent penetration, we are looking at earnings reductions of on the order of, to ROE about less than a percent for vertically innovated utility, and about 4 or 5 percent for the Northeast utility.

And what's happening in that case, is what's going on in the model, is that this utility has higher non-fuel costs, which cannot be offset

by increased PV penetration. Relative to the Southwest Utility, the way in which they report, they have lots of fixed O&M costs, they've got, you know, benefits, they've got high medical costs, but when we sort of benchmark with those guys, they say, well this is what happens when our revenue start to go down, because we've got PV coming on our system.

And you can see at the 10 percent level, that you really are locating some big hits, for 10, 15 percent return on equity downward kind of pressure; and then on rate in tax, relative modest. You know, from all customers we are looking at less than a percent, at 2.5 to about 3 percent. You know, still it's significant, but it's not -- clearly bigger impacts on the earning side than in terms of customer rates.

In the report there are many sensitivity cases, there are many examples of -- you know, all the input assumptions are sort of out there, you can see the range of results, so that you can look at lot of, it's like 40 different scenarios of

what it looks like.

I'm not going to show the quantitative results, but in the analysis what we did, is we also looked a variety of mitigation measures, so revenue per customer, decoupling, loss revenue mechanisms, shareholder incentives, sure there are rate case filings, no regulatory lag. Both of these utilities have historic test years, current and future test years as opposed to what they have. Increased demand charges and fixed- charge rate design changes, and in each of the studies we sort of give you a feel for the magnitude of the impact.

Can you solve the problem with this stuff? Can you also figure out the utility-owned PV, and can you -- does that deal with the loss earnings opportunities? So the studies sort of quantifies for the Commission, in those states, you know, how far can you get with this kind of solution, and you probably need to do a combination, if you want to sort of address this kind of stuff.

But again, my main point here is to indicate that OE has sponsored the development of this tool, we've used it in a bunch of states, I do actually find it to be quite informative and helpful to states, when, if they are in the place where they are sort of on a path, they are not doing conceptual changes to the whole industry. They are sort of in modes of sort of solving incremental problems, and that's where they are. In a lot of states, that's where a lot of folks are today.

But a lot of folks are clearly thinking about much broader issues about the future of regulation, and so we are -- LBL is commissioning a series of concept papers, exploring key policy and regulatory issues, with increasing levels of a full suite of distributed resources.

Customer-sited generation storage, efficiency and demand response. And we are calling this sort of a publication series; we are going to explore both incremental and fundamental changes to utility regulation. We are going to

examine the proposals for new business models, and we hope to advance a level of discussion on the future of cost to service regulation.

We have assembled an advisory group of about 20 folks, regulators, utilities, clean energy companies, some consumer groups, consumer advocates environment groups, to provide input and guidance to us on how to frame these topics, how to prioritize among them, and who will review the work plans, and who will review the products. And so far, you know, we are just getting started, we've had a couple meetings of our Advisory Committee and I'll share with you -- share with you where we are in the process.

We hope this will be -- we've envisioned this as multi-year kind of activity, because the number of topics that have been suggested by the Advisory Committee are far more from the funding we have for year one. So at this point, after our first two meetings for the Advisory Committee, we've sort of grouped the projects into sort of five topical areas.

We hope to publish three sets of papers over the next couple of years. The first set of papers will come out in early 2015. We are going to put -- LBL is going to put out a short introductory paper to sort of talk to the audiences about what to expect over time. You know, why didn't we pick the topic that you wanted to hear about in year one. Or that's going to come in year two. I'm going to show you the sort of frame, what the logic is and why we are doing this order. Our Advisory Committee has helped us rank the projects basically, or the papers.

The first area is sort of key policy questions. We are going to start by exploring what functions of the electric system we'll need to perform in the future, and then consider which of those are natural monopoly utility functions, versus roles that the marketplace could be taking on. And Commissioner Zibelman sort of laid out that conceptually, in one of her first early slides. But that kind of discussion, we see states that are embarking on this process and

thinking through it, as sort of a starting place kind of question.

The second area is broadly incentive regulation, here we'll consider such topics as designing performance metrics, for utilities, in a way that aligns with public policy goals for distributed resources, among other public interest; how to measure performance against those metrics. When you look at the history of performance- based regulation, what regulators tell us is, the utility knew a whole lot more than us, where we don't -- we are not sure we trust the way we did these performance metrics, we are not sure we are getting gamed on this stuff.

We'd like to have some folks think about how to do these mechanisms in a way that's useful, and that we can believe, and so it's a real key to any PBR system, is whether or not you can get support from your stakeholders and your Commissioners about -- you know, you have to keep it simple, but you also have to be able to actually measure the things that you want to take

a look at, based on the policy objectives to your state.

The third area, is transitioning from traditional cost to service regulation, it covers issues that utilities can fund as they moved away from strict cost of service regulation. We are considering topics such as a toolbox of alternative regulatory mechanisms that are already widely practiced, like decoupling shareholder incentives, multi-year rate plans, as well as emerging areas, like opportunities for greater shareholder risk and rewards. A number of these topics were suggested by the Advisory Committee.

The fourth area is reviewing implementation experience, among the items that we could cover here, are survey and value-added services that our utilities are offering now, and what we can use from those experiences going forward. Also, what experience has been with performance-based regulation in the electricity industry as well as other industries?

There's a number of discrete, technical

issues that people on the Advisory Committee have raised. They recommended some technical issues like, how does the tax code that may -- how is the tax code -- that may be driving changes for utilities. This is structures that avoid double taxation, and increase after-tax returns to shareholders, including real estate investment trust and master limited partnerships.

So we definitely have some utility folks who are in interested exploring some of these more technical topics that sort of drive the finance folks in utilities and making sure that some broader audiences are aware of some of those issues.

We are also doing a paper that lays out a typology of regulatory paradigms in the utility business models. There's a lot of -- there's a lot of conversation on the topic of business models in the country today. There's not always an agreed upon sort of a way of framing these issues and describing them. So we are hoping to sort put out sort of a -- I won't say a one-on-one

kind of document, maybe a one-on-one, two-on- one kind of document that lays out for folks, the utilities based on market structure and associated scope of asset ownership, and present a typology based on four fundamental characteristics; profit motivation, profit achievement, the role of the utility in providing value- added services, and the openness of utility networks.

We are going to use this typology to highlight issues that raised estate regulators adapt cost of service regulation to include alternative rate making, and incentive regulation approaches. We hope the typology will help frame discussions that are going on out there, and this paper will come out in the fall of this year.

This is sort of a pictorial image, along the spectrum of -- Anne talked about this -- transition between assets and value, and from commodity to services, so we tried to sort of frame it in a much similar way, maybe she -- some folks have talks that we've been giving the last year on this topic. But, you know, to think about

traditional cost of service regulation, with value- added services allowed, to where you don't have that stuff, and how you think about that, we are going to try to describe what some of these models look like, and what we observe in various states where people can find themselves along this kind of spectrum.

So what I hope to do and I hope I've done this; try to give you a feel for the kind of tools that the Office of Electricity is currently sponsoring in the utility regulatory arena. There's an ambitious, a much broader list that's been proposed in your paper. I think the one thing I wanted to say, maybe, is that we found that having a financial model that can be -- that can incorporate pricing changes, incorporate resource plans, can incorporate policy choices, is a helpful, larger- picture kind of tool, before you get down to the level of distribution pricing mechanisms.

And some of the tools that are suggested in the paper, I find that for people who are

starting out and thinking about -- who want to bring people together, oftentimes it is that we -- it's a decent -- it's a good first place to start. And at least has worked in a couple of states where -- a number of states where we've been active the last four or five years.

So with that, I'll look forward to the discussion. Thanks.

MR. CENTOLELLA: Thank you very much, Chuck, and members of the Panel. I think this was absolutely fantastic, as a roadmap and an introduction as to where we are. So, Rich, do you want -- do you want to call on people, or would you like me to? Okay.

CHAIRMAN COWART: Why don't you do it?

MR. CENTOLELLA: Granger, I think you have the first card up.

MR. MORGAN: That was nice. Most of you talked about the importance of innovation, you talked about the rise of DG, and Anne correctly noted that there are economies of scale, especially for gas-fired DG that may make them for

all, but very large facilities, like hospitals, so not very cost-effective.

And most of you talked about micro grids, but none of you talked, at least explicitly, about laws on exclusive service territories, or who is going to own micro grids. I don't think there's any inherent technical or other reason, safety reasons, why modest scale micro grids that serve multiple customers couldn't be owned by private entities. Indeed if you asked me to put my money on who is going to be more innovative, I probably would put it on private entity.

So I would like to hear a little bit of discussion about modest modifications to exclusive service territory rules, and the possibility that micro grids could be owned and operated down under, and interconnected with conventional utility, but owned by private entities serving more than a single customer. I mean at the moment I can build a micro grid if I'm on a university campus or something like that, but I can't do it

if I want to serve multiple customers in an industrial park, for example.

MS. MAYES: That's a great question, and I'll take a stab at it first. I work for a university that would love to build a micro grid. We've constructed 20 megawatts of solar, and most solar on any university campus on the planet. At Arizona State University we have thought a lot about doing a micro grid on our campus. The problem is, it's still -- we have a lot of very technical research going on, that will be threatened if the micro grid went down.

MR. MORGAN: But you are a single customer, so you can presumably legally do it.

MS. MAYES: We can -- we cannot legally do it because we don't have the space on our campus to build generation, we'd have to go across the street, which would require regulatory change to allow us to serve power across a public right of way.

MR. MORGAN: Okay.

MS. MAYES: To your point about changing

specific regulations that prevent this, I mean, there was clearly a time when the utilities in Arizona passed that regulation or that law that says, you can't serve across a roadway. Why; because they wanted to prevent this kind of situation from happening. So I think you are right. We could come up with -- this is one of the things that Powering Tomorrow will be looking at.

What is the -- what are the regulations that need to change to enable that from -- to enable that to happen? There are lots of entities that would like to do that. In Arizona we have multiple military bases, that are already capable of islanding themselves, and would like to be able to do that. And so I think you are absolutely right.

MS. ZIBELMAN: We, actually New York has tariff, it's called a Campus Tariff, that allows for micro grids to be owned by private entities, and also we have a couple of commission rulings that talks about the fact that you conserve

non-owners. There is an issue in terms of adjacency, and one of the things that we are looking at, is we are focused on community -- we are calling them community micro grids, where we actually have a status dedicated, $40 million, to develop out micro grids that are community-based. So we are actually actively going to allow, now these --

MR. MORGAN: These would be not for profit?

MS. ZIBELMAN: No. These will be for profit entities.

MR. MORGAN: Okay. Yeah.

MS. ZIBELMAN: So the concept is, is that these are virtual in a sense, is that you are not really building the wires, so you really are thinking in terms of how you aggregate the load and the demand as a portfolio within the context. And our project that ConEd is doing actually right now in Brownsville, which is looking at a really community-based distributed energy, as an avoidance of building up a substation, it has the

same context. In this case it's ConEd's solicitation, but in the future cases it doesn't necessarily have to be the utility solicitation.

MR. MORGAN: So, Rich, may I ask one more follow up?

MR. CENTOLELLA: Sure.

CHAIRMAN COWART: Paul is in charge.

MR. MORGAN: So under that scheme, if I'm going to build a new industrial park, which is going to have road, which presumably will ultimately become the property of the township, and is it legal in New York State for me to put in a modest size micro grid to serve the several entities in that industrial park?

MS. ZIBELMAN: Yes. I mean you could -- you can do that in New York so long as you don't want to be served by the distribution utility that you are -- you know, that you want to make sure --

MR. MORGAN: But I want to be interconnected, I want a fair rate, so I want to support them, and with a rate that is appropriate. I mean, Michael Dworkin, one of the PhDs I

supervised, helped us design rates of this sort. Why can't I do it?

MS. ZIBELMAN: I think that the question is, it's what's the rate? I mean if you are going -- and this our debate we are having around standby rates. If you are going to be dependent on the system to be there, and then the utility has an obligation to build out its system --

MR. MORGAN: Sure.

MS. ZIBELMAN: -- to make sure that you are there, which means you need to be (inaudible) --

MR. MORGAN: On the other hand, if there are 20 of me, you don't need the full coverage for all 20 of us.

MS. ZIBELMAN: Well, I think that becomes the question I was talking about today, sort of this whole issue of networking. If you put in enough resources behind the meter, right, and so that rather than thinking of to build the distribution grid, it is the concept, it's as if -- if there's going to be an advantage, as you

have many, many more resources, it reduces the obligation of the distribution utility to provide service, because you can do a lot more load management behind the meter.

I think though that, if in fact, we did do this, I always thought you were going in a different direction, which is that if you created this -- these wires, you know, separate company, the challenge I have, and I don't know the answer to this, we have this issue in New York right now, we have 270 water companies, and quite frankly about one-half or more than two-thirds of them really should not be in the water business, because they can't afford to maintain the system.

And so, I think the challenge as a regulator, is going into it, it sounds like a great idea. What if economically, it doesn't work out? Who is going to take over that system, and who is going to run it?

MR. MORGAN: I'll stop. But you don't regulate the wiring in my house, for example, and so it's not clear to me why you should -- except

that, you know, I need to meet safety and other requirements, it's not clear to me why a PUC should have a role in regulating a small scale micro grid that serves several entities. But I'll stop.

MS. ZIBELMAN: Well, I think yeah -- well, we can continue.

MS. PRAMAGGIORE: Yeah. I would just add. So in Illinois, we actually have Illinois Institute of Technology has its own micro grid, and it is a single- service customer and that's what makes it work. I don't think we are resistant to third parties coming in and building micro grids, but I do think, you know, to Chair Zibelman's point, the pricing around that, and understanding what is the service that the grid is actually providing in those situations, is a really critical question. And we want to make -- ensure that there's value provided for that.

And then, you know, I think, to some extent, the difference between the wiring in the house and bringing the micro grid on, unless it's

a standalone system, is, what happens on that micro grid could impact, in my case, 3.8 million customers across the ComEd system. So whatever happens there needs to -- you know, has to sort of coordinate with the grid in a way that make sense; whereas if something happens to the wiring in your house, it's probably not going to reverberate across the system in quite the same way.

You might blow a meter out but -- so I think that's the challenge for us, and I just, you know, encourage us to pay attention to the operations aspects of this. I mean we are fully supportive of an integrated grid, but we do want to pay careful attention to the operations, because they make a difference, in our view.

MR. CENTOLELLA: Bob Curry?

MR. CURRY: I guess, to add to that, and just quickly, going into it, if you have 20 micro grids, it depends on the order in which they come on. If they all come on at the same time, you might be able to substitute something for something, but otherwise you need to build out to

the highest possible tolerance and work down.

I guess I wanted to follow up on the comment that Jeff had made earlier in his question of Joe, that Chuck had made. And that is grounding all of the efforts that were undertaken in the real world economies of what it costs to do something. Solar penetration is enhanced by a particularly favorable investment tax credit which is scheduled to expire in 2016.

Will this whole penetration continue because the cost of the components is going down at such a rapid rate that that is no longer relevant? It's the fact that there's sort of a standard 15 percent accelerated depreciation in the model that is not going to go away when added to the remaining 10 percent investment tax credit that will be sustained going forward enough to make --

The stuff that we look at, at DOE, tends to be more from an engineering and pragmatic way of getting things done, and what I see lacking, I think Paul Hudson referred to it a little bit

earlier; it's, how does this really price out in the real world? And yes, that's a geographical question that's a tolerance for taxes, those of you who have lived in New York and receive the Consolidated Edison Bill, probably are aware of the fact that 10 percent of gross goes to the City of New York.

Oh, that's what the -- 1.3 billion a year. Does it have an interest in what happens to that Bill? Yes, it does. So to the extent that the sensitivity to the tax regime, both in incentive and also revenue side, and how the financing actually works in the real world, how we can sustain the utilities with the appropriate incentives, I think it's a very important component and I think from what I've seen in the REV process we are keeping it fairly firmly in mind in the State of New York.

MR. GOLDMAN: I would just add that at least at LBNL our Renewables Team, Ryan Weis and Mark Bullinger, had just put out a study that looks at what might happen to different types of

renewables after the investment tax credit expires, and sort of what alternative financing folks, arrangements might -- people might be contemplating, in terms of ownership structure.

So, Robert, I definitely agree with you in terms of grounding and the practical finance of what these resources might cost. And I think the risk of empirical work out there at the labs -- that starts to look at that question.

MR. CENTOLELLA: Next question, Tim Mount?

MR. MOUNT: So I want to follow up on Granger's issue. I found the panel presentation very encouraging, looking at things that really should have been looked at a long time ago, but there still seems to be a belief that the incumbent utilities are going to sort of be in charge of everything. And I suppose my counter to that, is that I think that an organization like SMUD, that runs its own distribution system, is actually more innovative than most distribution systems; certainly any in New York, even though

ConEd is trying to catch up.

So I think that it makes sense to consider seriously distribution system operators who operate their local system for the benefit of their customers, period. So that if they, for example, as we have now, with net metering, if they pass on the problems of clouds going over the solar connectors, to the utility, they have to pay for those problems.

But on the other hand, if they have local resources, and they manage their low profile, so that it's sort of well behaved, they could save money, and that actually, would be a much better, you know, model to look at because Wall Street is always going to be looking over the shoulders of the incumbent utilities, and putting on the brakes, basically.

MS. PRAMAGGIORE: Yeah, I -- you know, I don't -- I guess the only way that I can respond to that, is how do you attract the very large amounts of capital that you need to build out -- I mean, we are not sort of building out the system

from scratch like we were 100 years ago. But we are doing some pretty significant investment if you look at what's happening -- you know -- what's happened in the last few years, and what's likely to happen over the next 10 years.

I don't know how you attract that -- a large amount of capital, and frankly governmental entities right now, you know, are struggling in terms of cash flow. I mean we serve 415 governmental entities in our state, and you know, they are looking to consolidate because they are -- you know, struggling with cash flow. So I just -- I don't know if the investor and utility model is -- you know, is completely -- is not where we want to be, I do think it's a pretty effective vehicle for attracting capital into a situation like this.

But I don't disagree; I think what's underlying your premise, is that when you are focused on a customer, desires and needs and benefits that you get better outcomes. And I do think that that's a shift that the utilities were

starting to think about. I think we've got a ways to go. I do think performance incentives and metrics -- you know, incentive are great things, I mean, you can very easily predict behavior, based on the incentives you create, and so I think that that's a road to drive the utilities more in that direction.

So I won't disagree with the fundamental premise about, tied to the customer, but I do think the -- you know, shareholders, it's still a good investment vehicle, I think when you have, you know, massive capital needs.

MS. ZIBELMAN: Yeah. I guess -- I think there's a couple things I would add to that, one is -- one thing that we do know utilities are very good at, and like any other businesses, that they will maximize profits within the regulatory model that they serve in. Now that's -- if they didn't they wouldn't be meeting the needs of their shareholders, there's nothing wrong with that.

The fact is that the regulatory model we've set up, does not really incent innovation,

does not really incent energy efficiency, does not really incent having third parties come onto your system. I mean there's just nothing there for the utility, so we move the incentive mechanisms, in terms of the risk-reward is around driving innovation, I think you will see a changed mindset.

And that's the conversation we've had with our utilities, if not then allow the regulators to find a better way there. But the other thing I would say, and the owner operator model, to me, is still a better model relative to driving investment. I do think there is something to the fact that it's an efficient -- it is an efficient way of raising capital, but also I -- you know, the idea of having an independent entity that has stakeholders rather than owners, and customers, I think, you won't get as much out of.

Because as I see in the RTL Model is that there's -- the stakeholders really, fundamentally, end up having to serve their economic interests, and the customer somehow gets

lost in that equation. And so I think a model that's really focused on meeting customer needs through innovation, will be much better.

But, you know, the other piece though, that we very quick to talk about is one -- you know, you are making a transference too; I think we have to be -- we do, and I don't want to -- we have to be pragmatic. I mean there's -- as Bob was saying, you know, utilities are the best collectors of local taxes, that we all know. Every time we shut down a -- talk about shutting down a generation plant in New York, I have a community saying, wait a minute, you are going to shut down the schools.

And so these are all things that, you know, frankly, we have a very interconnected economy that's built around this structure, and we are not going to be able to do everything at once. We do have to think about how to make really the system work better; then if, in fact, there's another business structure that comes in, so be it, but I think it's got -- that has to evolve,

predicated, and thus building out the system.

MR. CENTOLELLA: Okay. Wanda Reder, you have the next question.

MS. REDER: Yeah. Excellent Panel. I had a lot of questions come up, but I was impressed with the constituency of vision, and yet I kind of step back and wonder, you know, there seems to still be a lot of barriers along many fronts.

And I'm wondering from your perspective, what are the things that we can really do in the next foreseeable future to push the change management agenda? And then within that, what can DOE be doing, perhaps with NARUC and the states, to help facilitate this to make it just an easier thing to solve?

MS. ZIBELMAN: A couple things that I think really come to mind. I think the work that Kris was talking about is going to be really important, one of the feedbacks, you know, I get is, well people -- you know, how much staff -- how many people you have on your staff. I mean, we

are a big state, and so we have, I think, over 300 people participating, are proceeded, but we can manage that. I think a lot neighborhood Commissioners look at what we are doing and they are intimidated simply by the process of change; because you are really talking about not just not working between utilities, it's a much larger ecosystem.

So taking some learnings and actually coming up with a potentially formulaic to some of the stuff that LBNL is doing, approach to regulatory change, I think, will facilitate that. That may be a good -- you know, a very good exercise coming out of it.

The other area that I -- as I mentioned before, I really think in terms of coming up with the system architecture, this really fits into DOE sweet spot, and some of the things that Joe was talking about; is what do you want to do in terms of setting interoperability standards, if you're really talking about networking architecture?

Then what does that need to look like?

And some of these cost issues because, you know, I think it would be shame on us if we had 4,000 different utilities across the United States trying to think this through on their own, and trying to defend it in front of regulators, it would cost us a lot. So I think it would cost us a lot, so I think that would be an area where I think DOE and the Energy Advisory Committee could play very heavily in helping think through, you know: what's this process? Essentially, if you are building the Internet of Things, what's that standard need to look like?

MR. GOLDMAN: I wanted to add one comment about that, at least that we've been thinking about. I've done a fair amount of work with performance-based regulation over the last 20 years, and I think meta rules, that I hope DOE may decide to do is there's going to -- there's going to be reliability metrics that are coming into play, and there's service -- customer satisfaction, service quality metrics.

And the work that DOE has been funding,

at various labs, that tries to get consistent definitions of SAIDI and SAIFI, and tries to get ways to -- so that we actually understand reliability and outages. That kind of foundational work, and the education, and regulators, ultimately I hope will give regulators confidence that when they actually have reliability metrics in there, that they are not being gamed by this stuff, and system efficiency.

So I think there's a couple of technical areas where we get to design in PBR mechanisms that actually deal with price caps and revenue caps. When you deal with some of those other things that I think are, where the notion of, that -- I think DOE can play an important role, part-based on how do we learn the smart grid experience, about trying to provide the information foundation that will allow regulators and companies to be able to do internal and external benchmarking in a way that's consistent and fair.

MS. PRAMAGGIORE: I think there's a huge

role here, and it's, you know, very much along the lines of what Chuck and Chair Zibelman talked about, and that is standardization, standard language, standard thinking, standard approaches. I think of this as Wave II, of restructuring. I think of Wave I, being largely driven at the Federal level. You were basically separating generation from distribution, and so a lot of the policy was made, somewhat, uniformly. Or at least not as fragmented as we have in Wave II, which is really about what's happening at the distribution level.

And so you've got regulation happening in, you know, 50 different states, and so how do you create enough standardization that you've got interoperability, that you've got a common language, I mean just to start there. So I think, you know, thinking about a standard language, and standard approach to analysis. I think some of the models that Chuck had, that really looked at, you know, systems thinking. He regulatory in there, he had operational, he had functional.

You know, getting people to think that way, dynamic modeling of the system, we are going to have to look at what's going on at different parts of the system in a way that we haven't before, can use help with that, but betting everyone looking at similar kinds of models in that way, I think there's a really big role here. I think we are going to take cost out of the system if we can do that. If we don't, I think we are going to have a lot of economic waste.

MR. CENTOLELLA: Okay. The next question goes to Marilyn Brown.

MR. BROWN: Thanks, Paul. Great panel, I really enjoyed it, learned a lot. As a regulator at Tennessee Valley Authority, I'm always going to be thinking along the lines; there's Tim's question and then -- Oh, he's trying to apply the analysis of the regulatory models to different context, and it's kind of hard it really makes me -- makes my -- it hurts my brain, it hurts. I can't -- I can't do that translation, I need some help.

So the public power model that TVA activated of course, is multiple goals for Tennessee Valley Authority, including not just innovation, and environmental stewardship, but economic development and low rates which, you know, always comes back to haunt me. And I like the low cost. (Inaudible) but you can tell from those goals that there is a big push on growing the economy, and enhancing the livelihood of TVA's customers.

So when I look at the tools you are developing, Chuck, are fabulous, you are really adding a lot of clarity and rigor to the discussion about the tradeoff of the different regulatory approaches. It seems to me that often it boils down to tradeoffs. Tradeoffs between -- and do the revenues go to the earnings of the utility, or to reduced rates, and costs to the customers? How do you trade off the reductions between, or the impacts on participants -- participants versus non-participants?

And I think that the models do you know,

a pretty fine job of clarifying how the tools, the different regulatory business model features, impact each of those, but I think it may be missing a bigger context. And it's sort of the things that I deal with when I'm -- apply a macroeconomic model onto the whole system.

So you have low rates, earnings suffer, but jobs grow, the economy grows, the demand grows, the earnings improve, and you have a whole swarm of maybe importing different kinds of commodities into, say, the Valley, you are not perhaps importing as much coal, but you are importing -- but you are using lot of more indigenous resources; and that's growing the economy in the Valley. I don't think there's that level of complexity in the tools, yet. Do you have a sort of aspirations to add that to a more macroeconomic feature to the tools that you are developing now?

MR. GOLDMAN: The Finder Model originally included both investor and utilities and public power, so that has the capacity to

analyze public power and municipal utilities basically. We've never had a request to actually do it, which is interesting, in the seven or eight years that we've been doing this, we only get request from investor and utility, regulatory commissions on that process, which I think is interesting in itself.

MR. BROWN: We can't fix that.

SPEAKER: We'll see if we can.

MR. GOLDMAN: But I do think, Marilyn, you are raising a broader issue, which is, I would acknowledge completely that we've defined the problem within the framework of regulation and historically; who our clients historically have been. DOE's guidance has been pretty clear to us, that our primary audiences and clients are state regulatory commissions and energy offices who are oftentimes understaffed and under-resourced. And that the type of expertise that we have at the national labs, given limited DOE budgets in many cases, can best be utilized by trying to ascertain their needs and trying to serve them well in the

context of broader stakeholder processes.

And when we do that, we work with utilities, we work with RTOs, we work with all the parties, but we start out, at least at LBL, from the perspective that we have to be pretty grounded in the tactical assistance of what this -- at least the program that I work in, is sort of supposed to be doing. And so I think the models you have -- you are conceptualizing are great for decision- makers, and for people who have TVA and BPA.

And I think you should -- I think those -- I hope those folks have the -- they should have the resources and the tools to develop that stuff. These are billion-dollar corporations or entities, and so I expect they fully have those kind of resources, but it is a more expansive vision that at least, we've been starting out with.

MR. CENTOLELLA: Rebecca?

MS. WAGNER: Just to follow on Wanda's comments or request for, just what else could DOE be doing? What I've observed in this process and

working on this paper is that there is a disconnect between utilities, regulators and policymakers, so I mean, there's a disconnect. I'll acknowledge that, even within our own Commission, about our perceptions on how things can go.

In New York it sounds like the REV -- because I can't think of what the acronym stands for -- so I'm just going to call it the REV Model, or concept, was brought forward by the Commission. It sounds like in Illinois that was driven by the utility through legislation. Before we can all start evolving in our regulatory models and our utility business models, you need buy-in from those of us -- well, regulators, policymakers and utilities.

Any suggestions on how we get there? I mean I wrote a portion of the paper regarding DOE's convening authority, but there's got to be something. I can have a conversation with one utility executive at a certain level, at NV Energy, and they have no idea what I'm talking

about. I can guarantee if I went to the mid-American level, they would know exactly what I was talking about.

And it's -- and then legislators have a completely different perspective. So any way we can kind of shape this? That would be, I think, helpful for the whole effort.

MS. ZIBELMAN: You know, I think that, from my observation on what's happening, and I've been with the Commission a year. In New York this actually started as a result of the Governor really looking at and saying things have got to change, and putting together a team with the assignment of, you know, get this right. And so that -- so it really did start, you know, from a standpoint of that level, so it wasn't that heavy a lift for me because it was the reason why I was brought in.

But I think, from my perspective, EEI is, you know, itself beginning to look at this and moving, I think, trying to move away from, this is a death spiral, as to how do we embrace this, and

how do we move this forward? I think there's active dialogue there. I think at NARUC this is becoming more and more of a common conversation. I had an opportunity to sit in the National Governor Association had their energy meeting here yesterday, and we are seeing more and more conversations.

So I think the conversation is occurring, people are starting to formulate it, and I think, you know, the work that we are all doing, is to try to make it more of a concrete discussion so that people actually know what they are talking about, is happening. I mean, I really am -- I think within a year, you are going to probably expect to see many more states opening up proceedings, and looking at these issues in a much different way.

I mean, within NARUC itself, as you know, there's probably about eight or nine states who are actively looking -- have proceedings going, and you know, are looking at these issues. So I think it will -- it will get there, but like

everything else in electricity, I mean, it's an education process, because when things are going well, nobody really pays attention, and it's really, that's in New York -- for want of a better word -- we had, you know, we had Super Storm Sandy, so people started paying a lot of attention.

MR. GOLDMAN: It's clear that crisis brings opportunity, and New York clearly faced a very serious crisis, but also this is a very unique situation, right, three of the four utilities are -- have U.K. Subsidiaries, they've gone through the PBR process there, they have a very strong leadership in their Governor. They have, you know, it's a -- every state is different, as you know, and I think the only thing I would say is, find the state that looks a little bit like Nevada, and follow this process.

For example, I think that Minnesota is actually quite interesting, because it's a vertically integrated utility, in a state with a modest Commission staff, and the history of sort

of working together, and they are trying -- they are looking at these issues in a very thoughtful way, pretty early in the process. But, you know, probably from California, no one is going to do it the way California does it. You know, it's just not the way most people are going to do it.

We have the resources, the amount of money and the amount of staff that's (inaudible) in California, nobody else wants to do that in the U.S., and New York probably comes second. People look at New York and say, you know, we don't have a 300 Commission staff. So I look at the -- look for states and places where you can find -- where you can -- where your utilities can relate to the conversation. Where they say, this is not some crazy guy from California talking about this stuff. He looks like us, and that --

SPEAKER: They speak with (inaudible).

MR. GOLDMAN: I think that's actually helpful. In the work that I do around states, I really try to find models that people feel comfortable with.

MS. PRAMAGGIORE: Yes. I'll just echo what you heard. I actually -- so I've been in the Utility since 1998 and, you know, dealing with restructuring since that time, and I actually think there's more consistent dialogue going on right now, through all the different stakeholder groups that I've seen, so I actually, am pretty optimistic. It's going to take a while, there are some really thorny issues here, and they -- and with big stakes.

You know, if we get it right, you know, to Marilyn's point, you've got a vibrant economy, and you've got people working, and you've got electricity that's you know, reasonably priced for the value you are bringing, and if you get it wrong you have economic waste.

So it makes sense to work through it, and make sure that we get it as right as we can. It will never -- you know, it's not a perfect -- there's no perfect solution set, but I do think people are having the conversation now, in a much more consistent way than I've seen in a long time.

MR. CENTOLELLA: Rich, you have the next question, but I'm also aware that we are pushing up on 4:10, we have four cards up. We've gone through the Panel time, and most of the discussion time for the group, so I'm going to ask you to -- what you want to -- how do you want to proceed from here?

CHAIRMAN COWART: Sorry. I'm looking at the agenda.

MR. CENTOLELLA: Clearly, very, very popular topic and I don't want to cut people off.

CHAIRMAN COWART: Yes, it is. Right, it's a great topic.

MS. REDER: Let's finish the last three.

CHAIRMAN COWART: Yeah. Okay. I was just looking through, Wanda. All right, we can continue for another 10 minutes.

MR. CENTOLELLA: Okay. You have the next question.

CHAIRMAN COWART: Like everybody else, I want to say thanks to the Panel. I mean, I was very happy to see who was coming, and I was very

happy to hear what you had to say. I just want to make one observation.

As we consider sort of the architecture of the utility business model of the future. It struck me, listening to all the presentations today, that something that I am sure is in the back of everybody's mind but wasn't said, which is that, whatever we come up with, has to aggressively, and fairly dramatically, drive emissions in this sector, down; over the time period that we are talking about, having this architecture in place.

So, we know from the beginning that, you know, the preconditions here or the foundational goals, are economic viability, reliability, it has to physically work in the real world, and I would add that anybody that's creating the design criteria for this architecture, has to have on the list, and it has to drive the emissions in the sector, or across the economy, significantly lower.

If we go through this whole process, and

come up with something that doesn't accomplish that, then I think we have failed, and the reason why it comes to my mind is, I've been doing this work in Europe, and in any meeting like this in Europe today, it would have been listed by every speaker as one of the three essential design criteria for a model. And I know everybody has got it their mind, and I'm just urging us to be very clear that we design this -- these new architectures with this goal in mind.

MS. ZIBELMAN: Actually I think it's in my slides as one of the objectives. This is so, but I agree.

CHAIRMAN COWART: And I guess I would add, if we do design it that way, then we see opportunities for load growth, for example, the electrification of light duty transport, and suddenly we have a different business model with a lot more resources that we can call on. So it's just important that we -- all these conversations include ideas like that.

MS. ZIBELMAN: Yes. Thank you.

MR. CENTOLELLA: Thank you, Rich. Sonny?

MS. ZIBELMAN: I have to leave.

MR. CENTOLELLA: Okay. Thank you very much, Audrey.

MR. POPOWSKY: Well, sorry. Sorry you are leaving Audrey. But anyway, primarily -- I want to follow up on something that Anne said. I think about that customers are seeking customized solutions, and my question is from a -- and first of all, I want to say, a terrific Panel. I thought this really was just excellent.

But my question is, for most residential customers, I'm not sure that they are seeking customized solutions, but what they are seeking is to be able to have reliable service, at a reasonable price. And to me, what I always come back to is; well, what's the default product? What's the product for the guy that moves from Philadelphia to Chicago? They are still an excellent by the way; but what's the default product?

And how do we devise a system that, at the same time we are opening up the opportunities for all these customers that do want customized solutions and all the great things we are talking about today; and at the same time, taking care of, or protecting maybe the 70, 80, 90 percent of residential customers who want to be able to get just basic reliable service and reasonable prices.

MS. PRAMAGGIORE: Yeah. I don't know that I have an answer for you, but we think about it a lot, and I completely agree, and I think that's, you know, one of the concerns that we have when we think of, you know, different options for coming at this, you know, this question of what does the grid look like in the future? To the extent that, you know, there are certain things that you can do, that basically leave you with sort of a bare-bone system for a group of customers, and that's not where I think we want to be.

I mean, you know, the beauty of the original system is that it served everybody pretty

equitably. You may not have had the greatest reliability that you could have, but everybody had pretty decent reliability at a pretty reasonable price if you look across the country. And I think that's coming into question because you do have, you know, customers, and to your point, not everybody wants a custom solution, some people just want to be able to turn the lights on, and not have to worry about, you know, paying the bill.

But there are others, you know, we have customers that work off of my microprocessors, manufacturers. And, you know, I spent last year, I went around to some of our, you know, major manufacturing customers, and virtually every single one of them runs off of microprocessors. So it's not just -- it's not an outage. I mean, outages, they are long gone with that, it's voltage depressions, and you have ruined their business.

You know, they are out of production for a day trying to reset those systems. So the types

of things that they need on the system to serve them are very different, than even five years ago. A lot of this is just -- it's happened, it's interesting over the recession period, but I agree with you that that's a question, and I don't know that we have any answer for it, but we do think about it, and I think that's part of, you know, the notion that the integrated grid can provide the greatest economic value is that it creates, you know, we think it maintains a level of reliability and service to, you know, many of the customers who don't have the option, you know, to move off the grid, or to take on different solutions. I don't think that's a great answer but we do think about it.

MR. CENTOLELLA: Jeff, next question?

MR. MORRIS: Thanks. I'm going to direct this at Chuck, and first I just want to say, as a policymaker, it looks like your shops has put in a lot of great reads this summer, greatly appreciate it. And I've been waiting for the study that came out today, and it would come

out, so I kept looking at your website, and reading the other reports, I mean --

MR. GOLDMAN: It only just came out a couple hours ago, yeah.

MR. MORRIS: So I hope this is not too repetitive of Marilyn's question but, you know, there's a lot of focus on, kind of, states with your high density or high commodity rates for electricity and, you know, in my state I've got 64 utilities in Washington State, three are regulated, the other 61 are different forms of public or co-opts.

Different dynamic than Hawaii, very cheap commodity price, they are afraid of opting to actually publish their poles and wires costs, because their fear is, is that customers will leave when they look at how much they are paying for poles and wires versus the actual of the commodity itself. So it's kind of the opposite of Hawaii.

Is there -- with the algorithm you built for this report, is it possible to look at either,

you know, rural, you know, high infrastructure cost, or cheap power versus infrastructure cost as a different variant from what's been built in the current report?

MR. GOLDMAN: The financial model allows you to functionalize cost for generation transmission distribution, customer charges by customer class, and allows you to forecast it out into the future, and allows you to compute average rates by customer class. And so you can look at some of those questions. I'm not sure what problem you are trying to solve, it sounds like you don't have any -- you know, I'm not sure what the issues you are concerned about in Washington, per se, so I think that's --

I mean, the only thing that I would say is that from -- at least from the experience that I had in smart grid working with smart utilities, the bigger challenge unfortunately is that the variability in the municipal model is quite broad. I mean when you have companies like SMUD that are really leading edge, and you have companies in

other parts of the country who could not install AMI, and couldn't get the thing to work, because they just didn't have the resources and the people.

So I think the challenge in public power and rural co-ops is oftentimes it's skill sets; it's what's the economy of scale they need to sort of manage a modern grid? And a lot of function I think they could do really, really well, in terms of customer service. But sometimes I think they have some problems and challenges on the technical side.

So I think one of the challenges is to think about, how can those folks work together in ways that work for the business model they have? And take -- and getting access to technical skills, and the technical resources they want to make the changes they want. Still in a very small utility context, you know, and that's, I think, one of the challenges that those folks face.

MR. CENTOLELLA: Okay. Last question. Merwin?

MR. BROWN: Thank you. And thank the Panelists, to both those who are there now, and those who left. I've done some thinking on this, and done some writing on it, and the institutional structures for this industry, that were created in the first of the 20th Century, began to be attacked in the 1960s. And then you can trace the evolution to where -- it seems to me we've reached a critical point to where something has to be done relatively fast compared to history, anyway.

And knowing that it's a big something, and so we have to get it right; I think, because as someone said, the stakes are quite high. And it's going to very difficult to do by sub-optimization approach where you optimize one step at a time. The odds of you coming out on the other side are very slim. You can't jump a big gap in multiple steps in other words, multiple leaps.

So we need someone with a long vision, long- ranged vision to lead, and someone who can stick to it to make it happen and build this

cathedral, to use another metaphor. When you look at the stakeholder with driven entities, they are driven pretty heavily, pretty harshly, by the quarterly return kind of approach to things.

In other words, you can't really I think trust them to have the long-range vision and stick to it for very long. And when you look at the policymakers, those who must answer to voters, I think they suffer from some of the same short-term thinking; that they can't get the votes if they tend to think in terms of the long-term. And then on top of that, there is the rate payers who, I think, are going to start seeing rates to go up, and don't ask the question why. What am I getting out of this investment that's going on now? The regulators, I think, are being pressured by all of those three major players in this arena.

So my question is, and despite New York, apparently, you know, have taken on this task of taking the long range and the big picture; what do you think is -- from a regulated perspective -- are your chances of holding out long enough before

all the backlash from these other short-ranged people who are going to stop you before you get across the gap, before you make your leap and you get caught halfway? Can you give me some hope, what's going to happen?

MR. GOLDMAN: I think the only -- well, just sort of a -- I'm not an optimist, Merwin, but you're even -- you've caught me for a sober assessment. I think the one that I would say is that we -- we are very fortunate in the U.S. to have relative low gas commodity prices, and I think that buys us a lot of time. And we also have a rebounding economy in a lot of parts of the state, and despite California's reputation as a terrible place to do business, we have a vibrant economy right now, and we are doing great, in the Bay Area at least.

And so I'm actually optimistic that we have sometime in terms of -- and because of the recession, we actually have some excess capacity in parts of the country. So we actually have some time to work through these, and absorb the cost of

infrastructure, which, to be honest, would be we are undecided. We have invested in electricity industry. You know, we under-invested for lots of years as we went through restructuring.

And we haven't been candid about it, we need to tell the truth about what really happened during the period, but we do have some time, and we should take action.

MS. PRAMAGGIORE: Yes. Chuck, everything you said, I think was, you know, very -- very powerful, and I just -- the only thing I would add is just to pick up off the last point of having the candid conversation. You know, this is just an industry where it's really hard to have the candid conversation, it's complicated. For the most part people don't really want to discuss it except us. You know, we think it's great but, you know, most of my customers don't really want to have a discussion about it.

But I think we have to sort of -- we have to tie this industry's success to the economy. I mean it really is about, you know,

whether we are going to have a successful economy in the 21st Century, and that means jobs and benefits for everybody, and I think we have to have that conversation. I think we also, you know, alongside with that, is the notion that, you know, there is more choice in this industry, there is more options and that's -- you know, has individual benefit.

And not to lose Richard's comment about the green aspect; when I think of sort of the two drivers or the two pillars, it's about, you know, economic -- yeah, economic strength in the 21st Century for this country, and that's reliability, resiliency. And, you know, we've always managed our cost pretty well in this country when you look, you know, internationally. We've had some pockets, me being one, where it wasn't so great at certain times, but in general we've managed the cost pretty well, so that's one pillar.

And now the other pillar is -- you know, and that -- and our economic success is tied to being successful here. The other pillar is, if we

don't deal with the emissions problem, and this is the industry to do it, we are going to have physical problems, environmental problems that we can't manage after a certain point.

So those are the two drivers, and I think -- and so we have to have the conversation about what it's going to take to get there, and there is some cost associated with it. And one of the things that we tried to do when we went in with our legislation, was we said, we are going -- we know we are going to raise prices on you, our customers.

We are going to tell you how much we are going to raise prices on here, but this is what we will give you for that. We'll meet these standards; we'll meet these performance metrics. If you don't like that sort of tradeoff, then this is not going to happen, but if you agree that this is really important, improving reliability, you know, reducing estimated bills and, you know, the numerous performance standards that we have built into this legislation, this is what, you know,

your bills are going to go up $3 a month.

And we were very, very explicit about it. I think we -- I think that's the conversation -- I think we have to have an honest conversation, and it's tough in this industry. I agree with you.

MR. CENTOLELLA: Thank you, Anne. I'm going to add just one comment to -- in response to Merwin. I mean, if you think about America, I mean our strength has been innovation; our strength has been looking at how we get to the frontier. And that is clearly a big driver of economic growth and productivity in our economy, it is also essential to meet Richard's concern about climate change, because we don't have all the technologies that will be necessary to reduce emissions on a global basis, and this is a global problem.

And so, you know, this is an opportunity for us, but it's also an opportunity that we really have to rise to meet, and that's an issue both for the department and for the industry and

stakeholders generally. So with that, let's give our remaining Panelists a round of applause. This is a great push start (inaudible).

(Applause)

CHAIRMAN COWART: Paul, Thank you very much. And I concur. It's a great Panel.

SPEAKER: Thank you.

CHAIRMAN COWART: Can we take a 10-minute break?

(Recess)

CHAIRMAN COWART: I have the strong suspicion that there are brilliant conversations going on in the room that will have to be deferred until dinnertime.

MS. REDER: So we'll get started here. I'm just going to give a little bit of update on this smart grid area. We've got the regulatory tools paper to approve and Paul has to leave at 5:15, so that's why I'm moving this thing along.

To give a little recap of what we've done. We have put a lot of encouragement to DOE to summarize the ARRA stance, put it in the matrix

and benefit forums to make it easier to get at, and to work with the stakeholders to push the information out. So what Joe presented today was evidence that the message has been heard. There's been a lot of work in that front, and I encourage all of you to take this material back and kind of push it into our respective communities because there's so much there, in order to kind of leverage and learn going forward.

As we take a look at 2014, with all that we've done and where that takes us into 2015 -- do I have clicker? I don't know -- next slide. We have had several speakers here, and others -- in the monthly calls it seems like there's so much that happens, so these are the kind of speakers that are coming forward, as we can lead them into the agendas, and oftentimes we come up with themes through these speakers that either help us in the existing papers, or create ideas to move forward in papers.

Laney Brown, for example, certainly gave us some insights on the ICE Model. The ICE Model

was behind the scenes on the cost of -- the avoided cost from Chattanooga and others, for interruptions saved. And that work is going to be dusted off and improved upon, so that model can continue to get better as we connect reliability improvements to the cost to society, and the benefits that society sees.

But anyway, we'll continue to do this two more that on the forefront, energy, storage and smart grid, Dan Ton is going to do. I really think the EPD Chattanooga experience by Dave Wade, is going to give us some insights to how he is going to be able to leverage and manage the data. And I think that will actually spur some thinking on taking the information and kind of how do we leverage it going forward, because the work that he's done has been absolutely amazing; and continues to be on this journey of bringing the data together and using it in a way -- innovative ways to improve operations.

Next slide; on the panels, we did have the Distributed Energy Storage Panel, and of

course we just heard we will have the information and tool development to support future regulatory models, we have that. Now, I think what we are leaning towards doing -- we can go to the next slide -- is ramping up a couple of papers that have been in the slide, one is distributed energy storage paper, I'll talk about that after Paul gets done, in the interstitial of time.

These are just three slides, there's an outline, and actually you've seen a lot of that before. Clark Gellings says they are working on an R&D paper, and that has been kind of customized to marry well in with the 21st Century work. So we will hear about the 21st Century paper tomorrow and, of course, the R&D paper will be released on the heels of it that really talks more specifically about the technology.

So those are both 2015 releases. We are here to help Joe and others in reviewing reports that are in flight, and of course some work that needs to be done is to kind of step back from the ARRA stand and just provide some overall comments

on that's gone. I think some themes that I've been hearing is, you know, what technology -- how do we integrate the technology, looking for overall grid architecture and the overall controls? Where are the interfaces with the regulatory piece, and how we continue to dance that pass the tool side?

So that seems to be the space that our community is continuing to evolve in, and I think beyond the reflections the ARRA, that's largely where we are going to spend our time. I think in the interest of how fast the clock is clipping along, at this point I'd like to just roll it over to Paul, and he can talk through the regulatory tools, paper of which you have distributed. Our goal here today, is actually to get full EAC approval on this so we can go forward.

MR. CENTOLELLA: Thank you, Wanda. So if we can get the slides up summarizing the paper; and find the clicker. So let me first of all, thank all of the people who work on this paper, and there were many of the people who were here

who had a hand in it. Bob Curry, who I guess has -- you know, has left the room; Rebecca Wagner. Wanda had a piece of it; certainly Paul Hudson, Paul Roberti, and Sonny Popowsky. Marilyn had some very good comments, and Former Member of the Committee, Phyllis Rea, worked on this as well. If I've missed anyone, please excuse me, but it was -- it was certainly a team effort.

So let me just run through a few things quickly and then we'll see where the discussion takes us. So our initial was that electric distribution, we are being asked to do a lot of new things. This was going to require significant investment in a field that's slowly growing or declining in sales. It was going to require integration between real-time distribution from operations that integrated, you know, from distributed resources all the way up through the grid to generation.

And then that was a significant change from the historical patters which was kind of to build distribution to fit the demand requirements.

And utilities and regulators are really being challenged to develop new -- both utility business models and regulatory models. What we did was to develop a paper on the information and tools that DOE could develop, and to discuss the convening of discussions, about how best to, you know, utilities and regulators could meet emerging requirements.

So the paper reviews some of the current regulatory and policy discussions, and supports continued exploration of some of these issues. It discusses the emerging requirements for the industry. It summarizes both adaptations of traditional cost of service regulation, as well as alternative and emerging regulatory models. I want to point that it recognizes differences among jurisdictions, and does not endorse or recommend any specific model.

This is something that we don't see as a DOE rule, but see DOE as supporting the consideration of alternative models in the different jurisdictions. It recommends that apart

from developing information and tools in nine areas to assist with the development of these models, and it recommends that the department use its convening authority to support discussions of emerging models.

A bit of background, you can see it highlighted here, and I probably should have highlighted it because of the emerging technologies proceeding that Kris mentioned in Arizona; Arizona as well. The hash states are the western states, Interstate Energy Board states that did their own analysis of all kinds of regulatory models. These are just a few of the things that are out there in some of the leading states, and I'm sure there are things elsewhere that I've missed.

Here are some of the changing requirements that are driving some of this change, and many of them you've already heard in the panel discussion today. So I won't try to go over all of them. We also did a kind of topology of different regulatory models, ranging from the

existing cost of service model, to one set of alternative models that are ex-post models that lean towards supporting investment.

These are things like capital expenditure, trackers, and formula rates. And another set of ex-ante models that tend to lean towards driving efficiency, but in the absence of being based on utility business plans on having -- we will output incentives may not support investment and may not support reliability.

So those include multi-year revenue and price gaps. Then you have a couple that try to bridge that gap, the sliding scale formula that's used in parts of the South, and the result-based regulatory model that's used in the U.K., Ontario, and that is being considered in New York.

And so we talk a little bit about what those different models are. And then we -- you know, we reach our recommendation, and of course the first recommendation is for DOE to really help regulators look at alternative regulatory models, develop a white paper, and you'll see later on in

our recommendations, will also play a role in convening the discussion on these models.

Now we have a bunch of more specific recommendations, and I'll pause at this point and see if people want to move to individual sections of the paper to discuss, rather than have me just run through everything. If there are individual sections we can turn to them, otherwise I'll continue to summarize some of the more detailed recommendations.

CHAIRMAN COWART: I think it would make sense, Paul, just to ask if there's any comments, or problems with each recommendation as we go through. And then to see if there's any discussion or whatever, and then, when we get to the end, we will entertain a motion for approval of the paper.

MR. CENTOLELLA: Very good. Thank you. So recommendation number one; is DOE develop a white paper on alternative regulatory models, and how those models play a role in meeting emerging requirements. Any questions, comments, on this

recommendation?

Recommendation number two; this is based on looking at data that is now becoming available about distribution reliability. In part, because of work that was done at LBNL, EAA is now starting to collect data on reliability metrics from distribution utilities, at least those distribution utilities that follow the IEEE standards.

And so our recommendation here is that the department should evaluate the data that's being reported, and prepare a white paper describing both the available data and how it might be useful to both utilities and regulators, recognizing that it may have uses in tracking utility performance, or benchmarking that performance. Questions or comments? Okay.

Recommendation number three, grows out of a larger set of issues, and we heard this discussed somewhat today, the fact that regulators and utilities are evaluating a range of investments in both modernizing the grid, and

improving the reliability of the distribution systems, deploying and integrating distributed energy resources, and developing information and control systems that are going to be needed in a world with many more distributed technologies.

You know, these evaluations involve some new and complex issues. Issues about, you know, how energy and to what degree and how energy and capacity cost, may or may not be avoided by distributed resources. Issues about how the cost and impacts of distributed resources may vary from distribution system to system, based on the number of resources on that system, based on the characteristics of that system, and may not be captured at a sort of high level, that treats all distributed resources and all deployments of those resources the same.

And how to -- you know, how ultimately regulators and utilities can direct and help manage the development of the new information and control architectures that will be necessary to be developed over time in order to manage this

system.

So our recommendation in this area is that, if the department you have a -- if the department should work with industry to develop and make available additional data on the cost of -- oh, let's see -- I'm skipped up. All right, here.

Recommendations that is -- I skipped ahead of myself in my notes -- is that, you know, we recognize that the DOE Grid Tech Team is already beginning to look at this area, that should be supported, but there are some specific things that we think DOE should be supporting. One is the development of distribution planning models and tools, and related data, and information and methodologies that allow you to look sort of from the bottom-up, and integrate your more detailed information into regulation and planning. We make a specific reference here to what are called reference network models which are models that are used in parts of Europe and Latin America in the context of regulation.

Additionally, picking up on Chuck Goldman's comment earlier, we also suggest that the support for the development of economic valuation and financial model. Third and this is really an area that goes beyond just regulation, and I think ultimately should be the subject of further review by the EAC.

There will be a need for systems, information and control architectures and market structures, for this more distributed environment, and the Department, in terms of supporting regulators in utilities, can begin by supporting, looking at how those architectures and systems can be developed. Ultimately we think, you know -- at least my personal view, is this is probably a multi-year, maybe hundred-million dollar effort that needs to be funded, and I know the Department has tried a couple of times to get that level of funding for this issue. This is an issue that probably the EAC should come back to in the future, in terms of looking at in more detail.

And finally; providing technical

assistance both to regulators, policymakers, staffs and utilities, and other stakeholders about how to use all of this information; so, fairly detailed recommendation. Detailed planning models, financial models, support for regulators, and other stakeholders in understanding that, as well as ongoing support for helping them participate in the development of the kinds of systems that will be necessary in a distributed world. Questions about this recommendation?

CHAIRMAN COWART: I just think you need smaller type. (Laughter)

MR. CENTOLELLA: Well, you've read the report, right? Let's --

CHAIRMAN COWART: I think it's a great recommendation, actually.

MR. CENTOLELLA: Okay.

CHAIRMAN COWART: Yes. Carl?

MR. ZICHELLA: Yeah. This is a minor thing, but it's somewhat important to a lot of folks that I work with, and the economic valuation bullet is right on, but I do think, you know, it

could be couched a little differently. It sounds like all we have are impacts that we need to evaluate how much that cost us. And the actual benefits, potentially, from integrating these resources are overlooked.

We talked a little bit about that earlier today, the subject of a lot of research right now, so a very live area, is what the benefits are, as well as the cost, and getting that right, especially if we are going to be instigating changes. Some of the people that may be needed to make those changes will be resisting if they feel like the benefits or the technologies they support aren't being incorporated in that calculus.

MR. CENTOLELLA: Well, our intention was not to insert the word cost before impacts but, you know, we can accept -- certainly accept and edit that says, you know, both costs and benefit impacts.

MR. ZICHELLA: I think for the audience we want to reach, it might be a useful change.

Okay. Wanda can you perhaps keep track of these changes.

MS. REDER: Yes.

MR. CENTOLELLA: Any other comments on this? Yes, Jeff?

MR. MORRIS: Thank you. It's not -- I guess just one nuance that I want to at least throw out for consideration. I know that I'm negotiating this space for policy, that one of the things that's constantly brought up by the public sector utilities, is the lack of some tools that they have. Wherein the mitigation has always talked about is utility ownership with some of the DG equipment. Well, obviously public entities like, you know, PUDs and municipalities don't have access to some of the depreciation tax tools.

And I think that, you know, that that should be noted there's -- that there's not one-size-fits-all silver bullets. And, you know, the public has some special considerations that need to be accounted for.

MR. CENTOLELLA: Do you have a specific

thought about how we should -- I mean, we've tried to not just talk about regulators and regulations, but also about utilities. You know, throughout the paper to try to recognize that not all utilities were regulated in the same way; but if there is other specific things that you are thinking about --

MR. MORRIS: Yes. It's just that some of the mediation tools that are being talked about, and developed are really, I think, seemingly focused on regulated utilities. And there's going to be some consideration because public utilities are having the same loss of revenue that the regulated utilities are. And they don't have all the same tools to necessarily mitigate that loss.

So, I don't necessarily have a solution, I guess it's a nuance that might -- reading through this my first (inaudible) was, well this seems to be all focused mainly at regulated utilities for the most part, and maybe -- I usually don't carry a lot of water for the public

utilities, but I just want it noted.

MR. CENTOLELLA: It was something that we thought about, you know, we started out with this being a regulatory tools paper. So, I mean, that is, I guess, something to note, but we did, you know, in several places try to use both regulators, and utilities with the idea that utilities would included public power utilities.

MR. MORRIS: Yeah. I think it's specific for me, is that, you know, in most states -- in some states because of case law, a public utility cannot offer something as product unless the legislature specifically passes a Bill saying you can sell street lights. I'm just throwing that out as an example. And so, you know, those are the other types of tools that I'm seeing that you have to have state legislatures authorize the sell. It's not the same in every state that way, but in some it is.

And then maybe you have to be -- other tools put out there to make up for the lack of them being able to depreciate some of these assets

that are being offered as mitigation tools to make up for the loss of revenue, from loss of power sales.

MR. CENTOLELLA: Well, if you have a specific place where you think that there's something that we should add, I mean, we can certainly look at that. I'm not sure whether -- I guess I'm not picking up exactly what that would be, but you are certainly open to --

MR. MORGAN: Well, he might solve it by just, in that final sentence before the bullet saying something like; for a variety of ownership models, or for something like -- something like that.

MR. CENTOLELLA: That will be fine. Yeah, right before the colon there.

MR. MORRIS: Great.

MR. CENTOLELLA: Okay. Can you record that? Yes?

MR. KENCHINGTON: Yeah. Hank Kenchington, DOE. I was just wondering, these are tools for the distribution system, why do you all

feel that this is a proper role for the Federal Government to develop these tools?

MR. CENTOLELLA: Well, I would say that, you know, what we are seeing is that the power system is becoming more integrated from, you know, transmission all the way down to distribution. You know, I guess, I don't read anything in the DOE Act, as opposed to in the Federal Power Act, which says that the Department of Energy should only be concerned with the power system at about the power level.

You know, and it certainly -- you know, many of the issues that we talk about, for example, in terms of reliability, or integration of renewables, are issues that happen at the distribution level. You know, this is not say there are not roles for states, and we do call that out at specific places in the paper. Yes, Chris?

MR. SHELTON: I would add, last year, at least, on a storage sub-committee we did a paper on storage strategy, and we questioned this very

question about. What should the scope of the DOE activity be? We actually went back to the DOE mission, which very clearly states that all of these activities would relate to the mission.

MR. CENTOLELLA: Okay. Any other questions or comments on this recommendation? Okay. Moving to where I started to look at, before in my notes. So this is something that Joe talked about earlier, the outage cost, or interruption cost estimated that DOE has put together one of the things that the Committee noted is that while this is some of the best available data sets the DOE use, it is largely based on older data.

Only two of the data sets that are in it today, are post 2000, it doesn't include data from the Northeast or Mountain West. It doesn't cover outages longer than eight hours and, you know, we recommended there was a need to improve the granularity and quality of data that was available, and to look at this for different customer segments than simply just the broad

customer classes that are indicated now.

And recommended that DOE work with the industry to develop and make available additional data on the cost of outages, improve the granularity and quality of data. You know, look at some different customer segmentations, and that this additional data should be considered for inclusion in the ICE calculator as it becomes available. Questions or comments about this? Clarke?

MR. GELLINGS: I hate to do this at this eleventh hour, we've criticized each other for doing that to papers that we've written, and I should have caught that before. But just as serious, and we heard from this from the panel earlier, are power quality events. So I suggest, simply adding some words that go beyond outage -- you know, outage and power quality.

MR. CENTOLELLA: That we can do. Any other questions or comments? Okay. Move on to the next recommendation, which is about automating demand participation. So we've heard a little bit

about this but, you know, this is an area where, if you think about electric demand, most of the things that use electricity are either associated with thermal inertia. You know, they are building heating and cooling, water heating, refrigeration, or there's some flexibility in the timing with which they use electricity.

You know, they are pumping loads, batch processes, charging of electric vehicles, you know, and other things. And this represents a significant potential resource on the system. At the same time, when you saw it in some of the presentations earlier today, you know, we have, you know, a private industry that is coming into this space and, you know, in significant ways.

You are of course aware Google's investment in NES, of Apple's home kit platform. You know, and of all the things that are going on in big box stores, in telecoms and cable companies, and you know -- and this has a potential to really remarkably change the power system in some very positive ways.

However, you know, there are also some barriers. Many of those barriers are regulatory. The lack of common standards, full self-settlement practices. The theory of RSOs and RTOs which today are oftentimes calculate a -- within the operating day and then they could just look at the forecast. But don't make any information available based on that, and that information could be used to help position demand to better manage the system.

So what we've recommended here, is the department should prepare an analysis, of how best to remove barriers, and enable responses from smart devices. It should support the development of a benefit cost framework, a common-standard-based approach for communicating with smart devices, and where cost effective from a systems perspective, inclusion of response and capability and DOE efficiency standards.

And notice that such that could provide for (inaudible) State Commissions an opportunity to ensure that smart energy using devices can

contribute to the reliable and efficient operation of the power system. Questions or comments about this recommendation? Heather?

MS. SANDERS: So we really agree with making what devices and customers do link to the wholesale markets, and I wanted to offer something in the recommendation about looking at the reasons why the ISOs and RTOs don't offer those look-ahead prices. There are implications to doing that.

They are rarely -- they rarely materialize in a way we did, about five years ago, we wrote a price device paper with this very concept, and then we started looking at the market data and found that, you know, we do calculations a day ahead of course, and then we do it on a rolling 15-minute unit commitment basis about four-and- a-half hours ahead.

And what we found, I had one of the market announcer guys do something to say, okay, how many intervals do we find that we are actually -- you know, we broke it up into 10 intervals just to try to get some semblance. How many times are

we really in those ranges with our predictive prices, versus the actual prices? And it was not a very good indicator. So that's why we don't do it, because those implications are, that if I put an advisory price out with some expectation, and it actually doesn't turn out that way, you know, what does that mean?

And then, on the other hand, if I put out an advisory price, and then something happens and the prices are lower. So I'd like to include in this recommendation some attention paid to that research, that says if you do offer these, what are the implications, and if you do offer these advisory prices, what are the implications of doing that.

SPEAKER: Are you saying you want uncertainty and variability?

MR. CENTOLELLA: So I think that's a fair modification, Heather. We do try and -- writing this, I think we've got it in here. It talked about information based upon the Look Ahead forecast, rather than the Look Ahead forecast

itself, recognizing that there may be reasons to modify that in terms of how you go about offering information the position demand. Tim?

MR. MOUNT: I'd like to sort of make a counter to what Heather said. In Australia they do this all the time. They project prices ahead, and the purpose of those prices is not to be accurate, but to say; this is what we think is going to happen to the system given the resources that we have on hand; the offers and everything that we have in the market. If they are projecting very high prices, they hope new resources are going to come in and make those prices low. You know, you are not giving binding prices; you are giving information about the system.

MR. CENTOLELLA: Right. And I think the other thing we had in mind is that this is -- this is simply additional information and that market participants, including, you know, companies that are, you know, investing in data analytics of, you know, homes and businesses, we'll take into

account as an additional piece of information. And may not regard it as, you know, the price in the future. Other comments or question? Marilyn?

MR. BROWN: Just a little picky question about using the term, presuming at the point is to remove barriers. I've had to hark back to a report that I wrote with a Bob Marley, back at the DOE days, when the 2005 Energy Policy Act, required preparation of a multi-agency report, identifying the market failures and barriers to energy efficiency and clean energy technologies.

The point -- and in writing that report we had material reviewed by the Council of Economic Advisors, and OMB, that were very picky about the use of the terms market failures and barriers. They are quite different. They felt it was important to place the need for intervention in the context of where the market has failed, and if in order to address those failures, you need to identify and tackle barriers that may not be market failures, that that was justifiable.

But first you have to identify what is

the market flaw, or what are the flaws, they may be regulator in nature, and this harmonious regulations. It may be asymmetric information, it may be externalities, but I guess I would try to tighten up that language. Identify the market failures. I mean, I don't know how to say it succinctly. You might just maybe at least address it by saying, market failures and barriers, that in the context of the report we might even flesh out what that means, the market barriers.

You know, these guys over there, the two economists sitting there -- or maybe -- Granger, I don't if you are an economist. Tim is. You know, you study this all the time, it's the -- what is the market failure, to justify this intervention, and then to intervene you may need to know a little bit more about the barriers to ensuring that the optimal, societal investment is made. So are you following?

MR. CENTOLELLA: Yes. I am.

MR. BROWN: Can you hear me?

MR. CENTOLELLA: And as an economist I

understand what you are talking about. You know, I had used the term barriers think of market values as a subset of barriers. Recognizing that not everything that maybe identified may be something that requires a public policy intervention, it may simply be a discussion among vendors about how to reach a common standard.

MR. BROWN: Yeah. And I was getting to harking back to Hank Henchington's question, is there a public role? Is there a need for a public role here? I think you should state that, and then go from there?

MR. CENTOLELLA: Okay. I have no problem saying market failures and barriers; that's --

MR. BROWN: Okay. And that's the logic?

MR. CENTOLELLA: And then it may be that once DOE has identified what's going on, you know, within the sector, we may decide that some things are market failures in our public policy intervention. Other things are simply barriers because the market is not yet sufficiently

developed, and those things may be remedied, within the private sector once more people understand them.

MR. BROWN: Perfect. Exactly.

MR. CENTOLELLA: Okay.

MR. BROWN: Yeah. Yeah.

MR. CENTOLELLA: Any other comments on this recommendation? And you've got --

MS. REDER: Got it.

MR. CENTOLELLA: Got to change. Okay, moving on then. The next one is on volt VAR optimization, and you know, we heard a good discussion from Joe, of the fact that this is a real area of some low-hanging fruit in terms of economic value. There are a couple of -- I don't know that they are -- they are market failures, but they are certainly barriers. And one is the lack of planning and measurement and verification tools, at this point, that allows utilities and regulators to estimate these things.

The next one may be a market or a regulatory failure, and that is that, you know,

that as you do volt- VAR optimization, you are also reducing the throughput through the meters of apparent power. And that means lower revenue potentially, through utilities that have volume-metric base rate recovery. And so it may be that you need the former in order to remedy the second element, but these are areas where we thought we needed some remedy, and so there's a very detailed recommendation in the report to try to build on what DOE has done already.

That it should, you know, pursue several developments that facilitate the improved evaluation of volt-VAR optimization, and unleash the benefits that it has identified, including, number one, develop a business case calculator that would help utilities evaluate the cost and benefits of Volt-VAR optimization on their systems.

Number two, develop a measurement and verification tool, that consist of a standard recommended measurement techniques and metrics that can be consistently applied to measure and

verify the benefits that you get from Volt-VAR optimization which, you know, you may not always be as straightforward as -- you know, as some other things.

Third, if there's a need for planning tools, recognizing that -- you know, that Volt-VAR optimization gives you different things on different types of feeders, and we saw that earlier in Joe's presentation. And finally, a database that really showcases the results that have been achieved, where different technologies, both the existing Volt-VAR conservation voltage reduction kinds of technologies, as well as some of the emerging technologies in terms of solid state power electronics, that the department has helped develop, that also contribute in this area. Show what they can accomplish.

That's the recommendation, are there questions or comments about recommendation six? Great, let's move on.

Distributional pricing; this is an area where, again, this is a regulatory question that's

coming to the fore, as regulators are struggling with how to recover the cost of enhanced reliability, treatise (inaudible) with energy resources. Discuss different elements of distribution cost causation, deal with recovery of fixed distribution costs, and value metric rates.

The recommendation here is that the Department should assist interested regulators and utilities in addressing these issues, by preparing a white paper, or a series of white papers on the following topics. First of all, issues and options for providing and pricing enhanced levels of reliability.

Secondly, alternative approaches for the recovery of fixed distribution costs. Third, the development of distribution models that could facilitate efficient pricing of distribution for distributed energy resources, including approaches that are designed to incent efficient siting and operation and distributed generation. And fourth, methodologies for depreciation that can be applied to new smart grid technologies that may have

shorter lives than traditional technologies. Clarke?

MR. GELLINGS: Paul, a nit here, but I think the Department might be in a tough spot when it starts doing pricing work, and so the title, Distribution Rate-Making, might be more appropriate.

MR. CENTOLELLA: Okay, I think that -- Okay, the label, Distributing Pricing, is mine for purposes of the slide. We can go back and see whether or not that's actually used in the body of the report. You know, I don't know whether we used it or not, but we can certainly go back and check. Jeff?

MR. MORRIS: Thank you. Yeah, I just -- my one thought when I looked at this recommendation was just that, while appropriately looking at rates, there are other group states that have very strong lifecycle risks, IRP states, where monetization of technologies that can take capacity off the system, those types of values would be a very important, in the eventual

rate-making process as well, that have a robust frontend integrated resource planning process.

So, you know, one bullet might be, you know, methodologies to monetize, you know, new energy technologies and the integrated resource planning process.

MR. CENTOLELLA: Okay. Thoughts about adding just a bullet?

MS. REDER: An extra bullet (inaudible)?

MR. CENTOLELLA: Yes. Jeff had an extra bullet to propose. Do you want to repeat your last raise, we want to know, to get it down.

MR. MORRIS: Check me for consistency now, huh?

MS. REDER: Yeah.

MR. MORRIS: Developed methodologies for monetizing the value of new energy technologies that can integrate renewables, or take capacity off the grid for integrated resource planning processes.

MR. CENTOLELLA: Okay. For integrated resource planning processes -- did you get that,

Wanda?

MS. REDER: Yes.

MR. CENTOLELLA: Okay. I have no objection to this, are the Committee members fine with that addition?

MS. REDER: Yes.

MR. CENTOLELLA: Okay. Any other thoughts about recommendation seven?

MS. SANDERS: I have a question?

MR. CENTOLELLA: Yes, Heather?

MS. SANDERS: Okay. This is more of a question than a recommendation. On this one, I'm wondering about defining services that distributed resources can offer to the Utility, and how the Utility would pay for those services. I don't know if it fits here or not.

It seems like the intent of this one is about cost recovery of integrated distributed energy resources, and the distribution system built to do that. But with those distributed -- you know, those distributed resources come capabilities that they can be sold to the

utilities, and I'm wondering if that belongs here, in that consideration, or if it belongs somewhere else?

MR. CENTOLELLA: It's a good point. You know, I mean, we talk a little bit about it when we were talking about what are the impacts of distributed technologies. We didn't really go into defining markets or how -- you know, what those capabilities would be in terms of how they would be costed, I guess.

MS. SANDERS: Right. Because what I'm thinking is that if you are relying on distributed energy resources to offset some of the capacity procurement that the utility must do. The utility may be buying that capacity as well from the distributed resources.

MR. CENTOLELLA: Right.

MS. SANDERS: Rather than just having the individual end user procuring that, and then it just being there. I mean it really depends on how the structure is, so I just thought I'd bring that up because it does enter into the

conversation once you start building or adding these distributed resources as -- to serve the utility in a reliability perspective.

MR. CENTOLELLA: So I think there may be some language that would, at least in part cover that, back when we talk about distribution planning and operational models, and -- you know, and therefore what the impacts of these kinds of resources would be. You know, if we -- if you want to come up with -- if you think there's a sentence that captures that, that's missing, we can certainly look at that.

MS. SANDERS: Yes. Okay.

CHAIRMAN COWART: Hi. Hi, Paul. I have the recommendation.

MR. CENTOLELLA: Okay.

CHAIRMAN COWART: That I think does capture it; if you look at your third bullet.

MR. CENTOLELLA: Yes.

CHAIRMAN COWART: Alternative methodologies, development of distribution models that could facilitate efficient pricing, just

strike -- of distribution. Efficient pricing for distributed energy resources, including approaches designed to incent, and you -- it directly addressed Heather's problem.

MR. CENTOLELLA: Okay. Let's make that strike. Okay. Granger, I had you next.

MR. MORGAN: Yeah. On the first bullet, I don't want to propose a change, I just want to make sure that it's presumed that this includes customers' premise -- response. I mean, Anne, for example, was talking about customers who have great problems, lose a day's business if they get a slight hiccup. Those guys ought to have, you know, power conditioners at their places, and so it may be much more cost-effective to do that on the customer side rather than, you know, on the distribution system side. And so I presume that's implicit --

MR. CENTOLELLA: Yes. We are not making a presumption that it has to be done by the utility.

MR. MORGAN: Yeah. Okay. Very good.

MR. CENTOLELLA: Jeff, did you have something further?

MR. MORRIS: So, sir.

MR. CENTOLELLA: Okay. Merwin?

MR. BROWN: Merwin Brown, CIEE. Now of all these discussion, I'm not sure what this is for. Is this to -- is the ultimate customer, a stakeholder really a policymaker, regulatory person who is trying to decide how to put in place a regulation, or a policy to allow this use of distributed resources, through, say, a market or a regulated kind of thing. Is that what these tools are for? Is that who would use them?

MR. CENTOLELLA: So it would be used by regulators and policymakers, it could also be used by utilities and these tools may be available as well, to other stakeholders who are participating in regulatory proceedings to help them better understand --

MR. BROWN: Okay.

MR. CENTOLELLA: -- you know, some of the (inaudible).

MR. BROWN: But it's really to help decide what might be the consequences of taking a certain position or action with regard to how to treat distributed resources. It's not really meant to be used as a marketing type?

MR. CENTOLELLA: No. It's not a marketing-type tool at all. It's a -- you know, these are analytical tools, you know, to evaluate impacts.

MR. BROWN: Yeah. By marketing I meant, using a market situation to determine price, that's not what these are for. Okay. I'm back on track again.

MR. CENTOLELLA: Yeah.

MR. BROWN: Thanks.

MR. CENTOLELLA: Anjan?

MR. BOSE: My question is along the same lines. As I see the many recommendations, most of them are talking about methods and models and tools, and it kind of -- there's of course -- lots of methods and models and tools out there, right now, in almost every one of these areas.

Somewhere in the R&D stages, some are just proposed, some are -- the question is, I'm trying to figure what is -- what are we asking DOE to do here? Most of your recommendations start out with assist regulators, so are we trying -- are we saying DOE should endorse one of these models, or what? I mean -- I'm getting a bit confused.

MR. CENTOLELLA: So the -- you know, the point is that regulators and in some cases utilities as well, you know, don't have tools that are sufficient to address some of these issues, and so DOE, I think, has a rule, in the development of informational tools which regulators and utilities and others can then choose to use or not use, you know, based upon their applicability in their particular situation.

MR. BOSE: That's precisely my point, it's that since there are many, many models and methods out there should -- are you suggesting that DOE should increase R&D in that area, and actually they do R&D in these areas already, so they do some kind of consolidation of what R&D has

already been doing.

MR. CENTOLELLA: So we attempted to look where we were able to identify what DOE was already doing, acknowledge what they were doing, identify areas where there were gaps over weaknesses in what they were doing, and make suggestions about ways to enhance those areas. So we did talk with people in the Department about what was already, you know, underway in a number of those areas, and we referenced some of that work.

MR. MORGAN: But to follow up on Anjan's remark.

MR. CENTOLELLA: Yeah.

MR. BOSE: I mean, is there any discussion in the frontend of this piece about collaborating with NARUC, that those -- research in these areas, or it does work in these areas to support NARUC members.

MR. CENTOLELLA: Well, there's certainly a theme of collaborating with regulators throughout the paper. I don't know that there is

a specific upfront mention of NARUC. Most of what -- much of the research work that NARUC takes on is it actually comes from funds that come from DOE, you know, so I think that whether the Department does this directly, or does it through NARUC I think is -- you know, I mean that's the question to be determined down the road.

I realize I'm past my time when I should be going to the airport. You know, we have three more recommendations to go through. Rebecca, do you want to, you know, take over here? I apologize. Okay. Thanks.

MS. WAGNER: Okay. So we can do this quickly while Paul is still gathering his stuff. Any more changes to recommendation number seven? Okay. Recommendation number eight; and it's been a while since I've looked at this, because I've looked at too often. Recommendation number eight goes along the lines of social cost. Do we have any questions on social cost on this recommendation? Okay, seeing none.

Recommendation nine goes along with

support for innovation. Okay, thank you for clicking this along for me. And this recommendation is that the Department prepare a white paper for options for advancing energy innovation including through statement and regionally- based institutions. The white paper should address the option that running through utility rates --

SPEAKER: Thanks, Paul.

MS. WAGNER: -- could be one of several potential sources of support for innovation initiatives. Any questions or comments on this one? Good. Thank you. DOE convening authority, this is the section that I'm actually familiar with so it will be easier if you do have questions.

The intent here was so that DOE has broad convening authority, whether it be through NARUC type events; DOE has funded some of the functions that we've doing in the West for the State-Provincial Steering Committee. There's a lot of opportunities where regulators, utilities

and policymakers are gathering and use DOE's convening authority to continue this discussion and evolve it to the next level. And so any questions on this recommendation? There you go, Wanda.

MR. MORGAN: Well, I would like to know on recommendation eight, what social cost mean. Does that include the cost of disruption, or power unavailability; because if it does, then the tools to assess that at the moment are in really pretty pathetic shape?

MS. WAGNER: I think when we are looking at social cost, I mean, we geared this mostly around -- well, 111(d) is what I was thinking, and that's the first issue, but to your point -- I think you make a valid point.

MR. MORGAN: Yes. I mean at the moment the tools we've got to assess the cost of power, reliability and disruption, are just, from my perspective, inadequate. I mean, they are a decade old, and when you go back and look at them, how they've been done. I mean, if that's not

what's implied there, then I'll just shut up.

CHAIRMAN COWART: But, Granger, there's an earlier recommendation exactly on that point.

MS. WAGNER: Right. I was just going to say that, there's a recommendation earlier.

CHAIRMAN COWART: The recommendation on valuing the cost of outages and power disruptions?

MS. WAGNER: I think it's recommendation four.

MR. MORGAN: Okay.

MS. WAGNER: And that's where you raised the point about power quality events, and the recommendation there is to update the ICE -- or interruption cost, the estimation tool.

MR. MORGAN: Right. And no one on the -- I'm sorry, so I should have caught this earlier, but that one only talks about data, and what's clearly also needed are available data and improved methods for -- I mean--

CHAIRMAN COWART: That's something for the record.

MR. MORGAN: Okay. Thank you.

MS. WAGNER: Clark?

MR. GELLINGS: Yeah. I don't want to complicate this anymore than it needs to be, but as I've been touring the nation talking about some of the issues regarding the integrated grid, among the things that are in this category are, like, the local economy, and employment, water issues, which are often regional in nature. I mean, the list goes on. So, I'm not suggesting that you necessarily lengthen the list for this purpose, but looking at the title, and the description, it's not clear to me that you intend to narrow it down only to environmental, and a few other things that you've mentioned. So maybe the language just needs to be tightened up. Or maybe in the text it is tighter.

MS. WAGNER: I tend to agree with that because special cost means different things to different people, and I can look back through this, and see if there is -- I think it's just kind of a broad catch-all phrase, rather than to be narrowed down, so maybe we can think of a

better term for social cost.

CHAIRMAN COWART: The way I read this text, it was intended to be broad, and it was intended, you know, it's constrained by where practicable. And it's intended to offer a menu to state decision-makers and utilities about costs that they may wish to consider. So I guess my take on it is, it would be a reminder to people to consider if water is really important in your jurisdiction. You might want to consider impacts on water resources.

In other places that consideration might be more on employment or power quality, or emissions. But as a Former State Regulator who would be the recipient of this kind of information, I think it was fine. And it wasn't going to be -- it wasn't going to be possible in this paper to specify exactly which ones we think are relevant in the case of creating a utility business model that includes, you know, the forward-looking distributed DER view of the world, so.

MS. WAGNER: And I think there is also, in the text of it, we know that these are potential examples, so I don't know that we could have an all-inclusive list, and I don't know how we change the title to "social cost" including the, not limited to... but I think the point is well taken but it's -- from what -- for me, as a regulator, water would be a critical component of this.

CHAIRMAN COWART: So I hope DOE knows what we are asking them to do.

MS. WAGNER: I can take a look at clarifying some of the language potentially. Okay.

CHAIRMAN COWART: All right, Wanda, I think you are up.

MS. REDER: Yeah.

CHAIRMAN COWART: Right. Yes, Wanda. Are you requesting a motion to approve the paper?

MS. REDER: Well, it just -- it depends on how you want to do it. I think it might be best for -- just to take his recommendations with

regard -- do a track change, send it around tonight, and then call for a vote tomorrow. We can do it now. I mean, I've got them, so however you want to handle it.

CHAIRMAN COWART: Any requests from the Committee one way or the other? Merwin?

MR. BROWN: I didn't hear enough major change that would mean we need to ponder this.

MS. REDER: Okay.

MR. BROWN: So I would suggest a vote based upon what's been said here.

MS. REDER: It sounds good to me. Move to approve?

MR. BROWN: So moved.

CHAIRMAN COWART: Is there a second?

MR. HUDSON: Second.

CHAIRMAN COWART: All in favor, say aye?

MS. REDER: Aye.

CHAIRMAN COWART: Are there any opposed? All right the recommendation of -- for this document, with its recommendation has been approved by the EAC, and we understand that the

changes that have been made orally here today will be included. Thanks very much. And thanks to all the authors for putting this together (applause).

(Motion approved. No nays voiced)

MS. REDER: Yeah. A great piece of work; and they did a lot on it. Okay. I think we'll just jump straight to this. Before we do this, Clark, did you want to add anything on the R&D piece?

MR. GELLINGS: There is nothing, yet, much to add. Let me just quickly, for those who aren't familiar with the background on the R&D paper, it's about two-and- a-half years old at this point. It was originally drafted because of the concern that several of us had that the focus of everything to do with smart grid seem to be gravitating to the meter. As if people were saying, well, the smart grid is the smart meter, and vice versa.

And we were a bit concerned that really the smart grid ultimately is a whole a lot more elements of functionality that would be added to

the power delivery system, now even, obviously distributed energy resources as well, which is much in the dialogue at the time. And perhaps we could help highlight that but putting in a R&D paper together. The purpose of which, more was a catalogue of all of the things that should be done, not necessarily by the DOE, but by the world, in order to truly realize all the elements of functionality that we could. And so, now we held off on actually finishing the draft, until the architecture paper which you'll hear about tomorrow, was completed.

Just to be sure that we now have included the technologies that were identified as part of that effort, that's been done. And actually the R&D paper has been redrafted, it's not yet been circulated except for -- to just a few of us -- but the plan is to do that, and we are going to be most anxious for comments. I have a concern that the last time we circulated it we got no comments.

That either means we did a hell of a

job, or nobody paid much attention to it. I'll let you figure out which one that might be. I can tell you where my concern lies, and when you are looking at it, one of the things that's still an open item; it's what is it that we tell -- out of all of this, what do we tell DOE, that we think they ought to do, or ought to look at?

Because they can't possibly do everything that's identified in that paper; one thing we can do, which I'll leave it for you to think about, is to use it as a way to argue that really Pat Hoffman should get a lot more money. Okay. Now, if -- even if that doesn't happen, it may at least help support and reinforce the fact that at least, nobody should take the money that she already has, which is always the risk, I suppose.

So, I don't know. Anything else Wanda, that I could say about it? I look forward to everybody's comments. I think it probably will -- it has elements of everything from each of the sub-committee, so I think we'll circulate it, even

though it's a sub-committee effort, I think we'll probably circulate it rather broadly, and look forward to comments. Thank you.

MS. REDER: Okay. And the other person we -- piece of work that we have is, Carlos Coe is leading it. It's in conjunction with the Storage Committee. This will come on the heels of the storage paper that Merwin will talk tomorrow. But essentially, it goes into the distributed energy storage aspect which has been only touched slightly on in prior work. So we have provided a bit of an update here in terms of the definition, the scope.

And of course we'll get into the gaps and the current work plan and status is to roll this out in early 2015. So well, we have refined, I think, the outline that was presented before, and it's weaving in nicely, I think, on the heels of the work that we'll talk about tomorrow.

The only other thing that I wanted to switch gears on then, is the workforce piece. That's a separate Ad Hoc Committee to give you a

little background, since several of you are new to this. We actually started in 2012, with a pretty thorough piece of work. These are the folks that are currently involved, of course, with changes on the Committee. Some have gone off, and some have been added, but fundamentally we realize that there was kind of a perfect storm brewing with a lot of people retiring and exiting, and the changing of skills and so forth.

And came up with a whole laundry list of recommendations, in fact there's so many that we prioritized them, in a kind of have first tier and a second tier. But the top one, above all, was to take the findings that were coming out of the $100 million of the ARRA Smart Grid Education funds, and the programs and curriculum that came out of that, and kind of make them public, put them on a portal, get them out there so others could use them. And of course the rest of the list goes on, so that was the 2012 paper.

In 2013, we again came back and said that the ARRA projects were a very important piece

of work. We did some further survey work through CEWD to try and figure out the prioritization, and what people are really thinking, and came forth with some more recommendations along those lines.

And it's kind of now, essentially, where we are in 2014, as we see that there is a lot of pieces of education as it relates to Power and Energy, Department of Labor, Department of Education, Natural Science Foundation. And at the end of the course, the DOE as well, but yet there's no real overall owner.

So, well, there's been programs, and initiatives and pieces that have kind of evolved over time. Essentially what we are seeing is that we, I think, in terms of all agencies, need a leader to kind of pull this stuff together. Meanwhile we also recognize that within DOE there've been resource constraints. So we circulated these recommendations the last meeting, and essentially we are trying to position the question here today, as though this memo says, we are encouraging DOE/OE to take the lead and pull

these agencies together and coordinate the effort.

Recognizing that there's good work that's been done, materials need to be made available and this Department ownership, really, still lingers. So, DOE has more of a targeted focus on the energy-related issues, and so that's kind of where we left the observations. And then these were the following recommendations that were coming out. So, essentially what we wanted out of this effort here today, again, is a full EAC vote on these recommendations.

And Anjan, I don't know if you wanted to add anything, you've been active in this effort all along. These four, and those four, were the eight separate recommendations that were in the memo. Nothing?

MR. BOSE: Right.

SPEAKER: Do you want to comment?

MR. BOSE: I'll just repeat what the main observation here, was that nobody has a particular mandate to look at the workforce issues in the energy industry from the Federal Government

side. And so we are stuck between the fact that NSF has a STEM mandate, an overall mandate in education, but it doesn't -- and almost everything that NSF does today, has an educational part to it. But DOE, I think, has done things at various different times, but not as a part of an overall mandate. So that's where these recommendations came about.

MS. REDER: Yeah, Pat. What are you thinking?

MS. HOFFMAN: My only comment is that I have my own workforce issue.

MS. REDER: I know you've been -- this has been a hard thing to kind of get, given all of the other things that have been on the plate, so that's really been the challenge. Yeah. But I -- did you have a follow-on, Pat, or move to Carl?

MS. HOFFMAN: No. I was just going to say, that I think some things should be relatively straightforward from, you know, going back to your original point that we need to capitalize on the investments that have already been made, and

that's a relatively straightforward, high priority, that we just need to assign somebody to and get it done.

MS. REDER: Carl?

MR. ZICHELLA: Yeah. I strongly support the idea of having a driver to the process. As Anjan just pointed out, you know, we have this situation where little bit of things are vulcanized across a number of variety of locations. We need to sort of martial that, and point it in the right direction. The only question I have is, you know, does OE, as an office within the Department have that kind of clout to move other entities that are not part of its own portfolio of -- or a little satellite of its own operation, if you know what I mean.

So that's a question. Should it be something that somebody -- some other entity within DOE, or is OE going to be able to move, you know, labor or National Science Foundation, or others to coordinate? Somebody needs to do it, but they have to have enough gravitas that the

others will listen.

MS. REDER: That's a fair question. We've had people from Labor and NSF on the discussion, so I certainly recognize that could be a big problem, if people haven't been involved, but I think there is willingness to kind of share. Pat, did you have any follow-on to that?

MS. HOFFMAN: No. I think we can engage the other agencies, and I mean, in the past we've tried to take the recommendations from the EAC, and as it affects other agencies, really try to get them on board. We do, do a lot of work with NSF, and you know, try to make sure that we are engaged with the CEWD and some of the major players. It's an important thing to do. It kind of comes down at the end of the day, what are the specific things that we want to do together, to move that ball forward.

And the different mission, priorities of the different federal agencies, as Anjan brought up, it makes it difficult to pull that package together because of that.

MR. ZICHELLA: Yeah. I understand. I think we made other efforts in related fields, the Rapid Response Team for transmission. You know, the role that CEQ plays in that; out of White House to try to get the agencies together on NEPA issues, for example. There is not a great analogue to this, but it seems to me that that's the right idea, to try to get those -- make it meaningful for them to be there, you know. It's going to be enough of a priority, I guess, is the answer.

MR. BOSE: I think, Carl, the thought here was that even though this is sort of a divided responsibility among many agencies, and so on that -- and even within DOE, it should be actually higher up than OE because OE is mainly on the power grid side, and energy is much bigger than that. But our tactics here was to say that, maybe OE can be the champion of this, given the large amount of investment they have already made in the ARRA Grant, and keep these other people kind of involved.

MR. ZICHELLA: They have more skin in the game, that's for sure.

MS. REDER: There's more -- Yeah, go ahead, Rich.

CHAIRMAN COWART: Well I'm just -- I'm wondering whether the discussion has now proceeded to a point where we could --

MS. REDER: Let's vote.

CHAIRMAN COWART: -- entertain a motion to have a vote, or not?

MS. REDER: Yeah. It sounds good to me. So moved; if I can.

MS. WAGNER: I second.

CHAIRMAN COWART: All right. It's moved and seconded. All in favor of approving this workforce memorandum say, aye.

SPEAKERS: Aye.

CHAIRMAN COWART: Are there any opposed.

(Motion passed by voice vote)

CHAIRMAN COWART: All right, it's approved and we have put the ball in the hands of OE, and recognizing that -- obviously that would

have to lead to other steps, but I think --

MS. REDER: Right. Okay.

CHAIRMAN COWART: And Pat knows that.

MS. REDER: Thank you.

CHAIRMAN COWART: All right. Thanks, Wanda.

MS. REDER: Yeah.

CHAIRMAN COWART: And we can't -- we can't today solve her workforce problems, but we can adjourn and go to dinner together, which is what's next -- next on our agenda, we just need some directions, concerning location.

MR. MORGAN: It's just across the street.

CHAIRMAN COWART: I'm sorry, is there something? Oh, yeah, it's -- I just want everybody to hear that, that's all. That's right. Everybody clear about -- So Matt, or Samir, do you want to tell us what time we are supposed to be at the restaurant?

SPEAKER: When does it start?

CHAIRMAN COWART: 5:50, it says.

MR. SUCCAR: This is Samir. Yes. The restaurant, 5:50.

CHAIRMAN COWART: All right. And everybody knows where it is. All right, in that case we are adjourned for today. We will reconvene at 8:00 o'clock tomorrow morning.

(Whereupon, the PROCEEDINGS were adjourned.)

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CERTIFICATE OF NOTARY PUBLIC

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I, Carleton J. Anderson, III, notary public in and for the Commonwealth of Virginia, do hereby certify that the forgoing PROCEEDING was duly recorded and thereafter reduced to print under my direction; that the witnesses were sworn to tell the truth under penalty of perjury; that said transcript is a true record of the testimony given by witnesses; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this proceeding was called; and, furthermore, that I am not a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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