UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
OFFICE OF ELECTRICITY DELIVERY AND ENERGY RELIABILITY

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ELECTRICITY ADVISORY COMMITTEE

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MEETING

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THURSDAY
OCTOBER 20, 2011

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The Electricity Advisory Committee met, in the Conference Center of the National Rural Electric Cooperative Association Headquarters, 4301 Wilson Boulevard, Arlington, Virginia, at 8:00 a.m., Richard Cowart, Chair, presiding.

MEMBERS PRESENT
RICHARD COWART, Regulatory Assistance Project, Chair
RICK BOWEN, Alcoa
RALPH CAVANAGH, Natural Resources Defense Council
THE HONORABLE ROBERT CURRY, New York State Public Service Commission
JOSE DELGADO, American Transmission Company (Ret.)
ROGER DUNCAN, Austin Energy (Ret.)
ROBERT GRAMLICH, American Wind Energy Association
MICHAEL HEYECK, American Electric Power
JOSEPH KELLIHER, NextEra Energy, Inc.
EDWARD KRAPELS, Anbaric Holdings
RALPH MASIELLO, KEMA

RICH MEYER, National Rural Electric Cooperative Association, for Barry Lawson
DAVID NEVIUS, North American Electric Reliability Corporation
IRWIN POPOWSKY, Pennsylvania Consumer Advocate
WANDA REDER, S&C Electric Company
BRAD ROBERTS, Electricity Storage Association
THE HONORABLE TOM SLOAN, Kansas House of Representatives
GORDON van WELIE, Independent System Operator of New England
MIKE WEEDALL, Bonneville Energy Administration
BRIAN WYNNE, Electric Drive Transportation Association

PRESENT FROM THE DEPARTMENT OF ENERGY

PATRICIA HOFFMAN, Assistant Secretary for Electricity Delivery and Energy Reliability
DAVID ANDERSON, Energy Efficiency and Renewable Energy, Vehicle Technologies Program
CAITLIN CALLAGHAN, ORISE Fellow, Office of Electricity Delivery and Energy Reliability
MICHELLE DALLAFIOR, Office of Fossil Energy

HANK KENCHINGTON, Deputy Assistant Secretary for R&D, Office of Electricity Delivery and Energy Reliability
LARRY MANSUETI, Office of Electricity Delivery and Energy Reliability
DAVID MEYER, Office of Electricity Delivery and Energy Reliability

MATT ROSENBAUM, Office of Electricity Delivery and Energy Reliability
MERRILL SMITH, Program Manager, Office of Electricity Delivery and Energy Reliability

ENERGETICS STAFF PRESENT

TANYA BURNS

CAMI DODGE

NATALIE KEMPKEY

KATIE SHAY

PEGGY WELSH

ALSO PRESENT

TOM BIALEK, Chief Engineer, Smart Grid, San Diego Gas & Electric Company

JOHN HOWES, Redland Energy

WARREN LASHER, Electric Reliability Council of Texas

ROBERT LASSETER, Emeritus Professor, College of Engineering, University of Wisconsin-Madison

BRAD NICKELL, Western Electricity Coordinating Council (via telephone)

ELLIOT ROSEMAN, ICF International

JOHN SHENOT, Regulatory Assistance Project

ANDREW SHINE, Battelle

FRITZ WALKER, Air Products

DAVID WHITELEY, Eastern Interconnection Planning Collaborative

C-O-N-T-E-N-T-S

C-O-N-T-E-N-T-S (CONTINUED)

C-O-N-T-E-N-T-S (CONTINUED)

P-R-O-C-E-E-D-I-N-G-S

8:10 a.m.

CHAIR COWART: All right, good morning.

If you take a look at the agenda, you will see that we have quite a number of action items as well as some thoughtful panels on for today. And so, I think we should get going.

I want to thank everybody for being here. And for those of us, a bunch of us, who had dinner together last night, thanks for the opportunity to meet together outside of this room. That was enjoyable.

Our first agenda topic this morning is a panel discussion on microgrids. I think Ralph Masiello is going to tee this up.

MEMBER MASIELLO: The motivation for the panel this morning is so the Committee can consider whether some aspect of microgrids are a topic for the work plan in the coming

year, at least my motivation for organizing it.

So, we have three panelists:

Merrill Smith from the Department of Energy, who will tell us what the Department programs, projects, and plans are around microgrids;

Bob Lasseter from Wisconsin, who has been very active in the field for more than a decade, right, and very involved with CERTS, and I am going to use the word "autonomous" local control. And he will describe some of those projects.

And Tom Bialeck from San Diego Gas and Electric, who is involved with microgrids in San Diego's systems, where there are some of the larger and more ambitious projects underway.

So, with that, I think let's let the panel do their presentations and see where the discussion takes us.

MS. SMITH: So, can you hear me

all right?

So, as Ralph said, I am going to talk a little bit about the work that we are currently undertaking in the microgrids base and what is going on and what we hope to do as we move forward in the future in the microgrid area. We have started a planning process for that, and I will talk a little bit about that.

So, just to start off, to put it in perspective, the microgrid work is done under the Smart Grid Program. It is just a subarea of Smart Grids. These are the Smart Grid R&D Program goals, the long-term 2020 goals for self-healing distribution grid for improved reliability and integration of DER/FDR, electric vehicles for improved system efficiency.

If you look down at the lower boxes, 20 percent saving reduction in distribution outages, greater than 90 percent reduction in outage time of required loads, and 20 percent load factor improvement, are

all areas that we think microgrids can impact.

So, the Smart Grid Research and Development, the program area, as I mentioned, microgrids falls under one of the R&D areas within the Smart Grid Program. Right now, our planning number going forward for this fiscal year is $20 million. And that is not just for microgrids. That is for all of the Smart Grid work.

So, let's start with a definition of microgrids. I know you all had a paper that you got prior to this. I took a read of that, and there was a definition of microgrids in there. It is very, very close to this definition.

And by way of transparency, I will tell you where this definition came from and how it came to be. We have a group. It is called the Microgrid Exchange Group. It is not a group like this. It is a very informal group. It is made up of individuals that are actually working in microgrid deployment or

research.

And I had a crazy idea of trying to come up with a definition for microgrids by committee. So, you can imagine it didn't go quite as quickly as I would have liked. Of course, not every single person would necessarily agree with this definition. They may take exceptions to certain aspects of it. But, for the most part, we got a group of about 30 or so people to agree to this definition and give input and come up with this.

So, I am just going to read it for those who are not close to the slide. It is a microgrid is a group of interconnective loads and distributed energy resources within clearly-defined electrical boundaries that act as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island-mode.

I don't know what the format of

this panel is. I don't know if you want to ask questions now, or should we wait until the end? Okay.

And I will just give a little story, too. Unfortunately, I know we wanted some DoD folks, somebody from DoD to sort of give an overview of what DoD is doing in this area. When we get to the discussion portion of this, I can talk a little bit about the things that I know about.

But yesterday I was at a military Smart Grid and Microgrid Conference, and the Army talked and the Navy talked, the Air Force talked. This was the first time I have been to something like this where folks -- I know the Army, and I can't remember whether the morning was the Navy or the Air Force, both gave definitions of microgrids, and they were also very, very close to this, which I was very encouraged by.

It is sort of convening and coming down to one more universal definition. So,

maybe I'm turning into the microgrid geek, but that was very exciting, you know, to hear them talk about their definitions.

Just a quick slide to show how microgrids clearly fit into the role of grid modernization and support the attributes of energy efficiency, system efficiency, reliability, and security with some of the things that they allow to happen on the distribution grid.

So, sort of an overview of what we are working on: what we currently have has 2011 and prior, and those are also projects that are ongoing because some of them are long-term, maybe five-year demonstration projects, some work at the labs.

So, we have demonstration projects for the integration of renewals and other distributed energy resources. We have some small modeling effort for distributed energy resource integration. We have the CERTs testbed, which Bob will talk about. That

first thing I talked about is one of the projects that Tom will talk about today. And also, there is the CERTS technology being used in one of those projects.

We are actually working with DOE through some Energy Surety Microgrid activities and, also, through a project called SPIDERS, which, if you haven't heard about it, I will have a slide or two on that. And also, some standards development that we have been supporting all along and are working on.

So, the renewable and distributed systems integration projects, there were nine demonstration projects awarded in this area. The key goals -- and when we started this work, this was really prior to us talking about having a microgrid effort. But, in fact, one of the requirements of these projects was to demonstrate their ability to operate in island-mode and then reconnect to the grid, and, also, to have multiple generation sources.

So, they really do fit the definition of microgrid. Their primary goal was to show their ability to reduce peak load that the system saw by 15 percent.

And this is just a quick listing of those projects. So, you will be able to see that a little more when you get a copy of this presentation. The first two projects on the list are the projects that you will hear more about from Bob and from Tom.

We have the CERTS microgrid testbed, and that was set up several years ago to demonstrate the viability of the microgrid concept and the CERTS microgrid control. We are now expanding that effort to add intermittent sources, intermittent generation sources, some storage, and some load-shedding.

And I think, Bob, you are going to talk more about that as well.

So, we also have a small modeling effort. Basically, the DER-CAM model is a tool for optimizing the use of distributed

energy resources in the microgrid, you know, when you would turn things on or off and what the optimal way to operate is.

The Energy Surety Microgrid work, this is the work that we have been doing in conjunction with DoD. We are working in partnership with Sandia National Laboratory. When the project started, we thought we would look at some military facilities, with military facilities being one of those facilities that we felt would be prime candidates for microgrids.

There were some facilities that were interested in microgrids at the time. We started to talk to those individual facilities, and we cost-shared with those facilities some microgrid viability and conceptual designs for them.

And I don't know if everybody would agree with me or not, but I like to think that actually this work that we did in the Energy Surety Microgrid area was really

the launching pad for the SPIDERS project that is now an official project and funded by both DOE and DoD and DHS. And the reason I say that is two of the three SPIDERS facilities that will be demonstrated first received conceptual designs through this effort.

So, the SPIDERS project, it is an acronym that, for some reason, I just cannot memorize. It is the Smart Power Infrastructure Demonstration for Energy Reliability and Security. It rolls right off the tongue, right?

So, the SPIDERS project, ultimately, at the end of three years, at the end of completion, will be three microgrids of varying complexities. And one of the primary goals of SPIDERS, besides just deploying a microgrid, is to do a rigorous cybersecurity overlay that would be approved by DoD. The three bases are Pearl Harbor Hickam, Fort Carson, and Camp Smith.

So, the way it is often described

is a crawl, walk, run sort of configuration with Pearl Harbor Hickam being the first facility. By the end of next year, that should be complete and operating. It is just a small portion of that facility. It is focused on their waste water treatment facility and utilizing some of the renewables that they already have on base.

Fort Carson has several of the feeders that will be able to be islanded with -- I forget how many buildings -- it is at least nine buildings. And there is also a focus on that one with electric vehicles. They have already started to procure some of those vehicles. Some of them are large work vehicles, like work trucks, so larger than just cars.

And then, Camp Smith, the full base will be the microgrid, and that will be the third and final piece of that.

The standards work that I mentioned, we have been supporting the

development of IEEE P1547, and more relative to microgrids, we have also been supporting IEEE P1547.4, which we sort of call the microgrid standard because it is really focused on islanded systems and connecting and disconnecting, islanding and reconnecting to the grid.

So, moving forward, that is all of the things that we have going on currently. Most of the work that we currently have has been focusing on conceptual designs, testbeds, and some demonstrations, a little bit of analysis. And having worked for a couple of years with those activities, we realized that there are some additional key R&D activities that are needed to overcome technical and cost barriers for broader acceptance of microgrids and their deployment.

So, if funding allows moving forward, we would like to focus our next R&D effort on some of these microgrid areas. So, right now, we held a workshop at the end of

August, and we are working on refining the information that came out of that. That report should be out by likely the end of this month.

We came up with some long-term targets. If you see the targets there, the improve system efficiencies by greater than 20 percent, reducing emissions by 20 percent, and reducing outage time to require loads by greater than 98 percent, you will see that that aligns with that very first slide that I put up there.

We want to develop commercial-scale microgrids at a cost comparable to non-integrative baseline solutions. That is not an easy goal, but that is what we need to shoot for to make these systems something that people can consider and make them viable.

We had a planning group that came together. These were primarily laboratory folks that had been working in the microgrid area and said, based on your experience, what

are the major cost components of a microgrid? Where are the trouble spots? Where can we really start to look and focus an R&D program?

This is what we came up with: energy resources, 30 to 40 percent. Of course, that is one that can vary a lot, depending on what those energy resources are. It is going to be a big difference if you are putting in a bunch of diesel gensets as opposed to renewables.

Switchgear protection and transformers, Smart Grid communications and controls, and site engineering and construction, because although components of the microgrid, I think can be pre-engineered and developed. The microgrid itself is going to have to be designed for the individual site. So, that is not a cost that can go way, way, way down.

And so, we held our workshop. We had about 75 people in attendance. We were turning people away because we just didn't

have the facilities to accommodate everybody that wanted to come, and it wasn't a come-and-listen meeting. It was a come-and-work meeting. And so, it was encouraging that that many people really wanted to come and give input to this.

This is our first cut at the results of that meeting on identifying some high-priority areas. And what we will do is use this information here, if funding is available, to help us develop a solicitation to target specific research areas in microgrids.

And then, last -- this doesn't do you any good until you get the presentation -- just some resources, some online resources for microgrids that you might find useful.

And that's all I had.

MEMBER MASIELLO: Good.

Richard, we should go through all three and then do Q&A?

CHAIR COWART: I think so.

MEMBER MASIELLO: Good. Okay.

MS. SMITH: I'm sorry?

MEMBER MASIELLO: We will go through all three presentations --

MS. SMITH: Okay.

MEMBER MASIELLO: -- and then have discussion.

MS. SMITH: Okay.

MEMBER MASIELLO: Things will work better.

Dr. Lasseter?

MR. LASSETER: I found your discussion yesterday very interesting. Because some of the thinking we have been doing in microgrids for the last 10 years kind of relates to this. What started microgrids was complexity, the fact that there is so much new technology, what we call distributed energy resources, everything from small internal combustion engines, microturbines, et cetera, that it became obvious a good while ago that we had to deal with complexity.

But now if you take this complexity that is coming about with small DER units and look at the big picture of the power system, it has complexity, too.

And the one point that I think is critical that has been in our thinking is that we have started looking at reliability. And years ago, EPRI came out with what they call a reliability chart over time and the famous nine 9s of reliability they needed for contemporary digital systems, which is sort of nonsense because that is like one cycle outage per year.

And so, if you think about this, you say, hey, reliability makes sense at the customer level as a concept. Maybe I should call it power quality. But at the high-voltage transmission system, it doesn't make sense. And so, perhaps we have to rethink it.

In the transmission world, do we really mean reliability or do we mean availability? If we have enough sources at

the user, at the loads, then outages aren't as critical as long as they don't cascade out. So, I would say we may want to think about the transmission system from availability in limiting cascading faults and move our custom design levels of reliability down to the customer level for whatever their needs happen to be. Now that is a real paradigm shift to what the utilities have been doing, but I think that is defendable, if you really want to look at it.

Now a lot of this has been said. These are a variety of DER technologies. And dealing with large numbers is really what the microgrid is all about. I mean, if you think about it, and this started with California about 10 years ago saying, "We want 20 percent penetration." Well, that's hundreds of thousands of these things.

And you think about this thing of, do we control each one as an individual component right now? You get into a level of

complexity and misoperation that doesn't make any sense.

And so, what a microgrid really says is we physically group these devices with the loads and make them a single controllable unit. On Merrill's slide, she has a thing, you know, do no harm to the utility or a good neighbor type of thing. But you don't have to know all the details of the microgrid; you just have to know what it can provide to you, what services it is.

For example, you could put a lot of PV in a microgrid with some storage or some fast-responding generation and provide predictable, renewable energy to the grid, at least as far as cloud cover is concerned. Storms you can't do with that. So, you could make it ease up the utilities problem with PV when you group them with other resources and have a whole range of operation.

This is just a simple schematic. But the two things that I think really move

microgrids is, one, it deals with the high level of penetrations or dealing with a high number of these new sources. But another thing that is involved is that that can really improve efficiency and reliability.

One very important thing is waste heat. If you have small units, and it is in this building, it can provide heating and cooling much easier than in a campus model with a lot of underground piping to make that happen. It obviously can reduce the transmission losses coming in.

And so, there's a lot of pluses in efficiency, and you can build N+1 type of things into it, so you don't have to rely on the utility, if that is what you want to do. So that, when any resource fails, you can still function.

You can almost think of DER as being more a commodity, more like a refrigerator or appliance that I plug in rather than a complex engineering system. And

I think we can move in that direction.

Now these are just the drivers, and the most important one is a way of dealing with high penetration of DER. And I think, right now, what we have done with the CERTS microgrid, within the microgrid itself we can show UPS power quality. And that is because we can island within a cycle, so there is an event on the utility. We island, and then all our sources are voltage sources. And so, you have a stiff voltage source in the system. And so, the tests we have been able to do, we just see no fluctuation of voltage on an event at the AEP testsite.

The emissions and the efficiencies, CHP transmission losses, demand-side management, and support of renewables, I think we know how to do that.

And on the reliability and modularity, the key point is that we want plug and play, so that I can scale this system without having to do a lot of extensive

engineering.

The systems that are at AEP and some that are in the field are all using exactly the same concepts. And so, the engineering is worrying about how the protection is going to be, just traditional type of site engineering, and no special engineering relative to the microgrid itself.

Now there's really two models out there. I talk about the CERTS microgrid or the autonomous model, but most major manufacturers currently build one that depends on command-and-control systems. Now the difference in the philosophy is, in the case where you have a control system in here, you are saying: I take existing generation, I take whatever I am using, I use it as it comes from the manufacturer and put a layer of control and communications on top of that to let it island. Our approach has been, hey, we modify the component itself by changing its control algorithms, so that it is plug and

play in a microgrid world.

And so, just the components on the definition, you see this red box here. This has to be a switch that can open at some speed to island it. When it islands, you have to make up the load difference. If it was importing a certain amount of power, now the local generation picks it up.

And so, you have, over here on the lefthand side, you have control systems, things that are deciding how to allocate the generation, what the load is, and these different kind of criteria. And then, you have all this heat distribution system. The biggest problem is, if the control system fails, you may not be able to function as an island. And if you want to expand this, you have to redesign a lot of your design algorithms and communication systems.

Now let's take the same thing and deal with an autonomous microgrid. Now the first thing is that this little circle on the

lower left is we are saying, hey, this is a microgrid; it can work without communications, but it does have communications on the multiple second timescale. But things down in the hundreds of milliseconds or cycles has to be done autonomously. And you could have whatever mix of PV, critical loads, non-critical storage, CHP machines.

But now they are in the building. It actually increases the reliability because now I am not susceptible to faults in the higher voltage line. I don't have fast communications. I can island autonomously and resynch myself. And so, we end up with a lot more flexibility and a lot less engineering once we prove out these concepts.

Now I could spend an hour on these kinds of things. But if you think about how we technically do the microgrid, it is no different than how we do 100-megawatt-plus generation in a high-voltage system. It is autonomous. There is a droop in there. In

other words, in the power system, if a load comes on near a machine, it slows down its frequency, takes the energy out of the inertia. That gives feedback to the energy source to bring that back up. And ISO is not worrying about what is happening in that second time range. And so, microgrid is exactly the same as that.

The important thing that is different in a microgrid is allocating overloads. And what that is saying is that, if I have two sources in a microgrid and one is operating near its peak output, and the other one is operating lower, and I am importing power and I island, both of them pick up approximately one-half of the load. So, we have one overloaded.

And a key thing in making this surge thing work is that machine has logic in its control that will drive down its load and transfer it over to the other machine without having to have communications. It is

communicating through frequency variations and across the power grid itself. That is what really makes this work. So, I can add more to the system, but they all protect themselves by reallocating the load balance when there is a transient change in it. And then, the interface, which is also important, that you can seamlessly get off and get back on transient-free.

Now you saw some of this. This is the testsite at AEP Walnut facility. It has been funded, basically, some level between the California Energy Commission and the Department over the last 10 years, and we are now doing new work on that.

And notice up here I say it is inverter-based, there's no communications, and there is no storage. And we have three machines in this lower righthand corner and they are all identical to each other. They all have the same internal controls, and then we can see how they behave.

And these checkmarks are things that we have been able to show. For example, down here at the bottom, the UPS, at fairly high cost of fuel, we ran for 60 days there and collected UPS data, and found out that the load saw effectively no fluctuations in voltage. So, you could say, hey, not only do we have a system that could do waste heat and improve the efficiencies, but we have a system that can provide an alternative to commercial UPS systems.

Now out of this, there was a small company talked TecoGen. And they have come up with the first commercial CERTS-compliant type of machine. At this point, I think they have sold about 50 or 60 of them.

And it is a fairly sophisticated machine. It runs variable speed, so that it can have high efficiency at partial loads. And at least they claim that the power electronics we have to put on that and those losses are made up by the variable-speed

nature of its prime mover. And the real selling point is this overall efficiency pushing 80 percent because they can use the waste heat, and they can also use the power coming out of it.

Now one interesting story that the CEO was telling me is they don't really have, quote, "full CERTS microgrids" out there, but there is a dock in Manhattan that is a beverage company that is on it. With all this refrigeration, it turns out the utility feeder can't meet the load. So, what they have done is I think there's five or six of these machines sitting there running in the CERTS microgrid mode 24/7, and the customer is very satisfied by that.

And, see, this is what is happening: if you want to call it disruptive, is customers can look at this and say, hey, I can use the waste heat, improve the efficiency, improve my power quality, and pay this out over three years. These things are

being built in places like on this dock or in nursing homes and school systems. And this is sort of percolating up from the bottom, but being driven by this is the cost-effective way to deal with it.

Now I am involved with, outside of the AEP, with five other projects. Let me just try to give a fairly quick overview.

This is at Sacramento Mutual Utility District's headquarters. This is the first full-scale CERTS microgrid. If you look in this diagram, the blue stuff are either chillers or hot water for CHP type of work. Over to the left is a field reporting facility, which is also the backup control center for SMUD.

And so, what we are going to be able to do here is collect data. Is CHP in the real world really as efficient as we are claiming at 80 percent? And is the power quality that we are claiming really UPS-like?

This is being put together right

now. I was on a phone call a couple of days ago, and what are we going to measure to get this data that is in a believable form right now?

There is Phase 2 of that, which I believe is being funded by the Department through Premium Power, which is a flow battery company, which we are going to put, also, storage on this system. Now, hopefully, there's going to be four to six months between the two, so we can make sure that the, quote, "pure" CERTS microgrid functions well in the field and meets our expectations. And then, we will see how storage can supplement that.

The one thing SMUD is really interested in is looking at issues of export, how we deal with the protection, how do we operate, and real interesting questions. But those are still sort of being formulated as we get some actual data and performance.

This is the big project which is really, really interesting. This is out at a

jail called the Santa Rita Jail, just south of California. Already existing there is a megawatt fuel cell, which you see in the top. And then, in the bottom you see the jail itself. These are all PV units, which is somewhere around a megawatt worth of PUV. There's 2, roughly, megawatt diesel generators for backup, and we are putting a large storage, 4-megawatt hour of lithium ion battery, which was the inverters were built by S&C, that we tested them in the factor a month ago, and they are now being tested in the field.

And I think in the end of this month we will be actually doing a full islanding test, bringing the generators into it, see how effective the storage works. And this is off of a 12-kV system.

Now one of the interesting things, as Merrill had talked about, this was a peak-shaving type of thing. But one of the problems with this site is this fuel cell was

tripping off a third of the time. It is like voltage regulations and the tightness of 1547 tripped it off, and then it takes several hours to bring back up.

I think we get a lot of bang for our buck. If this system islands and the fuel cell doesn't trip off, we have suddenly done a lot of peak-shaving and a lot of efficiency improvement because it is a CHP system. But this is showing how diesels and PV and fuel cells can all work together.

Now I am involved with three military projects which are trying to look at the CERTS world. One is at Fort Sill. It is sort of what I call a hybrid. It is really pushed by the facility, the camp commander. These are sort of in their budget trying to figure this out.

And I am a little bit disappointed because it is one I call a hybrid CERTS, unlike the jail. This happens to be that there is storage. The military doesn't want

you to run your synchronous generators, which are natural gas, because they get penalized on the facility output of CO2. And so, this system is designed to island only on the battery and then bring the generation up.

So, what we are doing is we are going to make the battery function on the CERTS algorithms, but the generation is going to take the traditional paralleling P-Q type of controls that are available all over the place for backup generation. So, we are sort of showing the mixture of these two type of things. Obviously, control failure will take down the microgrid, except the battery can probably hold it up, if it has enough charge.

This middle one is through the Corps of Engineers. It is really an academic one. There's three universities, Notre Dame and Illinois and Wisconsin, and they are looking at advanced distributed control concepts, and I think some real interesting stuff, trying to anticipate failure,

anticipate what is going to happen.

And so, it is relying on the CERTS algorithms for the first few cycles. But, then, depending how should redispatch the system, based upon -- a phrase we like to say -- you know, the commander's priority.

And the last one is at Maxwell. This is with Sandia. There, there's two existing diesels, and they are reconfiguring things, so they can have the diesels operate these two buildings in a microgrid. And we will put CERTS microgrid algorithms on the generators to see whether they can do that, but there will be no fast islanding or stuff like that.

CHAIR COWART: Are you getting ready to close up?

MR. LASSETER: Yes.

CHAIR COWART: All right. We're running out of time.

MR. LASSETER: And this is the things that Merrill talked about we are

dealing with now. At AEP, we are going to show how we can make synchronous generators work, how we make storage work, how we make photovoltaics a member of the CERTS algorithm, rather than a constant power source. We have already demonstrated mechanical switches, and we are working on intelligent load-shedding.

And I will stop with this slide. This goes back to the big picture. Think about microgrids as a grid resource. Most grid resources either are a generator or a load. A microgrid to the utility can look at both. It will have internal stability. We don't have to worry about that.

So, all you really need to know from the microgrid is how much available P and Q can be provided or what kind of load you can provide, how much you can back up a load, all based on the minute-to-hour type of concept. And I think that is an important concept.

MR. BIALEK: So, I will try to be pretty quick here.

You have heard about microgrids, what they are, what they aren't. I think one of the things that you might ask yourself is, though, why would a utility be interested in this? So, I will try to give you a little bit of perspective.

We are doing several things around microgrids. We will talk about those. But I think one of the things I want to point out is -- go to the next slide -- this is really to try to wake you up. This comes out of our Smart Grip Roadmap that we had to do. But if you look at that little star down there, basically, when we look at sort of a Smart Grid vision in the longer-term, we ultimately look and say microgrids and our technologies give the customer more reliability options.

So, we are really saying here that we believe down the road -- and why do we believe down the road? Here is an example of a home with a Smart meter, with a home area network, with a pool pump, with air

conditioning, electric vehicle, some PV on the roof.

I think, Michael, you talked yesterday about sort of game-changers. We are starting to see homes that start to have these types of functionality. And so now, assuming that that home has a controller -- let's just say, for example, Bob's CERTS controller, built into this home. Could this particular home island ride through outages, if they wanted to? The answer is yes.

And so now, you look at that and say, as the prices of PV systems drop, as electrical vehicles proliferate, as GE and Whirlpool and Bosch, and all the others, come up with their Smart appliances, you now start looking at scenarios where customers, via their choice, decide to be able to do this. And it provides them an additional level of functionality.

I mean, one of things that, given the Southwest power outage, customers

generally told us that they thought we did a really good job in responding and bringing power back quickly, but the issue was on claims around things like refrigeration/spoilage of food.

So, if you think about what that really means, if I have something like this and I have got enough storage, and I have done everything, I might be able to actually ride through some of these particular events.

Part of the question becomes, when you talk about a microgrid -- and we will talk about the design features -- it is, how long do you really want to go? Do you want to go for hours? Do you need to go for hours? Do you just want to ride through the brief interruptions that would occur?

So, we do have some projects. Really, this is a layered project with DOE funding as well as CEC funding. And as Merrill mentioned, this is an RDSI solicitation award. So, really looking at

integrating and leveraging various generations of storage configurations, reducing the peak load.

And, really, one of the key distinctions here is enabling customers to become active participants by managing their energy. It is price-driven load management.

So, here at a very high level -- and for those of you that have worked in the utility world, really what we are really saying here is think about how we operate the utility today. You are really now sitting there saying, from a utility perspective, I am going to apply the same types of systems or same types of criteria to actually look at managing this local microgrid. And I hope I do it is an open question, whether it be CERTS algorithms or other types of systems, but you are really ultimately looking at what is the boundary of this microgrid.

You know, you talk about industrial customers, campuses, substation

circuits, and we will talk about what we are doing. You are really back to this load generation balance. What reliability do you really want?

And one of the key things here is really define/determine what the seamless transition needs to be. So, that is really sort of the key here because, can you withstand a 3-second outage, short momentary? Would most customers like a 3-second outage versus an hour outage? Probably. Does it nee to be seamless from a zero-interruption perspective? Maybe if you have got a data center, but then you probably have a UPS already. So, that becomes important.

And then, you look at defining what the loads are, determining how long you want to really island this particular system for. And then, ultimately, defining whatever generation you need to have.

So, for the project that we have, we are actually doing this project at Borrego

Springs. It is a desert community.

But one of the real key strengths, a progressive community, a high concentration of customer-owned solar. It is fed by a single radial transmission line. So, anytime that there is maintenance on the line or we get lots of lightning through that area, that whole substation will go out and customers will experience outages until we have patrolled the line and actually re-energized the line. So, it is a single 69 line feed into in that substation.

And one of the keys is that it is typical of our service territory. We really want to look at how we can extend this to the rest of our service territory.

One of the beauties of wonderful, little Borrego there is actually it is hot. You can see up there 120 degrees Fahrenheit at 1:50 in the afternoon; a single radial station.

The interesting thing about that

is that is 50 degrees Celsius. We looked at sodium sulfur batteries. Interestingly, sodium sulfur batteries run really hot. The power electronics are in the bottom, and they aren't rated for 50 degrees Celsius. If we buy a sodium sulfur battery and used it out here, we would actually have to build a building and put it in air conditioning. Kind of an interesting little fact.

(Laughter.)

So, here's some rooftop PV that is out here. But we also have some fairly large ground-mounted PV that is actually going in as well. So, not surprisingly, lots of renewable resources here.

Project components: so you can see here DER and VAr management. You've got two 1.8-megawatt diesel Cat generators that are actually now, Merrill, out there.

We have got the capacitors that we are converting to SCADA to actually be able to optimize what the voltages on the circuits

that are feeding this.

Advanced Energy Storage around both a commercial substation-sized facility as well as community and/or neighborhood-sized, as well as even in the home, as part of this. So, storage at various levels.

And then, when you look at it more from sort of an IT perspective, really around feeder automation, so this FLISR is really just basically sort of a self-healing capability that will be up there as well.

And then, one of the keys that sort of makes it a little bit different, and starts to go down this next path, is really this customer energy management/price-driven load management piece, where you are now using -- and I think Ralph and I were talking about using day-ahead type of information from the ISO to sit there and start looking at how we can actually leverage customers and their loads as resources to help us carry the load in and off at substation.

And then, a microgrid controller, in this particular case this controller will actually be contained actually in the substation yard and with our particular vendor.

So, here is a little different view. Bob talked a little bit about this. How do you do this? The question becomes, do you actually put all the intelligence in the individual devices or do you actually put it, in our case, we are talking about we have got an overriding distribution management system. We have got a microgrid controller. That controller will provide visibility into the distribution management system.

Price-driven load management is an element of this. It talks, ultimately, to the customers via their home area network. And we also have their status system where we will actually take more granular control of devices.

So, you can see here where we are.

We have got a whole pile of milestones that we completed. The next steps are really sort of the testing and installation of various components and demonstration of those components.

We have got a schedule here. Of course, we have got our sort of relevant piece.

I think, with that, you have heard a lot about microgrids. I think one of the points I would like to raise before I finish is, so why do we really want to do this?

Merrill talked about the military conference. We are meeting with the Department of the Navy tomorrow to talk about how they are looking at, because of the high proliferation of bases in San Diego, how can we assist the Navy in Smart Grid/microgrid kind of demonstrations?

We also see our customers being very active. I mean, I read your microgrid briefing paper. You talked about UCSD and

their facility out there. I know Byron Washom very well.

We asked them, during the Southwest power outage, "Were you able actually to island the system?" And they told us that it took them five hours to finally black-start their generators.

And then I started to ask them the next question, which was, "Okay, so now when you have to go back to parallel the grid, did you have to take an outage again?" And the answer was, "Yes, we did because we had too much load on our generators, and we weren't able to move them around to actually synchronize back to the grid."

So, the whole definition of what is a microgrid, not a microgrid, it is pretty clear beauty is sort of in the eye of the beholder sometimes. I know what UCSD's definition is and why it is what it is.

But we look at this and say microgrids are really in many respects an

alternative service delivery model under Smart Grid. DOE has got a lot of effort and focus on the dollar-per-watt, you know the SunShot Initiative. We have got 110 megawatts of PV. We have talked PV today, 14,000 installations, and that is increasing about 15 to 20 megawatts a year. We have got 120 electric vehicles today in San Diego County.

We just see, with the energy policy goals of the State, a real driver for customers being able to have a choice and being able to do what they want to do. What we see is that we need to be proactive and understand how we can leverage some of this technology to actually provide them opportunities and empower them to make intelligent choices, and still be a resource for them.

So, with that, I will stop.

CHAIR COWART: All right. Thank you all very much.

Ralph, do you want to lead us now?

MEMBER MASIELLO: Yes, we should start the roundtable discussion. Let me tee it off with a few questions for the panel as a group, in no particular organization.

A concern I have heard from the ISO in the context of distributed generation is the interconnect standards for DG today in the U.S. are pretty much around safety and it disconnects on a fault. But if you have a transmission fault, and it pulls the voltage down for a cycle, you could imagine in the future thousands of megawatts of DG tripping off.

So, one question with a microgrid is, therefore, do we need a fault ride-through capability? And then, related to that is -- and this would even be a question for Dave at NERC -- is anyone looking at system stability issues, transient stability, voltage stability, when you have got thousands of megawatts of interconnected microgrids, say, capable of self-islanding in a cycle?

Okay. The second question is, it would seem that a key element of any microgrid installation, say at a university or a hospital campus, or the like, is building the grid system and the integration of the building automation systems. But I didn't see B to G or building automation or open ADR or buzzwords from that domain on those slides, but I am sure it is included in your planning. So, maybe could you speak to that?

And then, a third and final question, are there cost/benefit analysis tools under development where you could go to, say, a university campus and put together here's the picture for you financially, the justification, and the payback, and the rest of it, as a planning tool?

MR. BIALEK: Let me address the last one first, and then I will jump to the first one.

Part of the requirements of our actual program at the end is to provide a

cost/benefit analysis. So, we will be doing that for the project because one of the things that we are looking to do is, for us to go to our Commission and ask for permission to implement this in any sort of larger fashion will require some level of cost/benefit analysis.

To your other point around sort of transient stability, how these things island, non-IEEE-P1547-type requirements, it is funny you should speak about that because, clearly, for us, as a utility with all these PV and with Governor Brown's additional 12,000 megawatts of PV that he wants to put out there, we have actually been in front of our commissions advocating for modifications of existing rules.

We believe sort of the IEEE P1547.8 draft or the German Grid Code types of systems are going to become imperative because of the issues you just raised. You don't really want 12,000 megawatts of distributed

energy resources all tripping off due to a transmission event. You want the ability, capability, flexibility.

Now that, of course, raises other issues about safety/protection with regards to islands, and that all has to be factored in. And I think when you look at that, it becomes an important element. When we think about how we will operate microgrids, you're right, you really do sort of need a new paradigm. I think we are headed down that road pretty quickly.

MR. LASSETER: I would like to say a little bit also on the stability issue and perhaps on building energy control. On stability, one of the main objectives of the CERTS microgrid was to deal with 1547 in a practical sense.

So, what happens is 1547 is net at the switch itself. Most of the time, at this point, we are consumer energy from the grid. So, there is not much problem with stability

of tripping off a lot of generation. We are tripping off some load, and the local generation is still providing the energy to that load.

Now, if you move to a point where you are starting to export a lot of energy from a microgrid, then whether you want to ride through or trip off becomes a very situational type of problem. But, at this point, we have shown that there are no stability issues based on the microgrid itself, and it might as well be an impedance load, as far as the utility is concerned. So, at this point, we have sidestepped that.

Now, at the jail project, one of the problems with 1547 tripping off that fuel cell, we are removing those types of protections on that fuel cell and letting the system at the interface switch start meeting those criterion. So, that will actually enhance the local facility. It is only going to be a load drop as far as the utility is

concerned. So, that is an example.

On building energy control systems, our intent is that is integrated into it. And about six years ago, Oak Ridge did an extensive report looking at how CERTS microgrids could be integrated into the building control system.

But, remember, we think of the control system optimizes the system relative to everything else that is going on and not dealing with any fast events. And so, everything we find, it is going to work out pretty well.

I believe at SMUD they are actually putting in a Siemens Energy Control System to be handling the building, both thermal and electrical and the machines and the storage.

MS. SMITH: And I will just add onto the cost/benefit question. As Tom said, the project that we are doing with San Diego at the end will be looking at some of those

cost/benefits as well as a number of the other projects. Of course, that is not going to be this year or next year.

I think you can do some studies and do some projections, but to take real data and analyze that. I know there's a lot of people out there claiming to have microgrids. I am not convinced there really are that many operational microgrids in existence right now.

So, as we start to deploy some of these, I think that is when we are going to start to get some of that data back. That is an aspect of most of the projects that we do.

Some of the projects I didn't talk about -- ad I know you used Pecan Street in your paper as an example. It is technically not a microgrid from the standpoint it won't be able to island, but that project and a number of others that we are funding like that that I would say are deploying technologies that would be of great interest to those who are looking at microgrids, we will have data

on those as well.

MEMBER MASIELLO: Okay. Why don't we start at this end?

MEMBER WEEDALL: So, a question for Tom. Obviously, one of the real conundrums for providers like yourself is what happens when you have got to be the provider in an emergency. Can you talk a little bit about what policies you guys are thinking about? I mean, it is one thing to do a demonstration and say, hey, you know, we'll be there, but if you are looking down the road and starting to think about these things are going to become a lot more common.

MR. BIALEK: Well, we think, ultimately, that as a utility to remain relevant, if you want to think of the longer-term, if you assume that some of these systems, a significant amount of these systems come into play, the question becomes, then, what is the role of the utility? And so, from sort of a policy perspective, we would

certainly like to be on the side where we can actually participate and enable some of these technologies as opposed to being on the sidelines watching as other people do it. So, that is certainly one of the drivers for us to do some of this work.

We also see opportunities, given some of the issues with regard to, for example, the firestorms that have occurred in the County, where we can actually be proactive from a providing community sort of level microgrids, where in the event of issues, people can actually go and aggregate, and at least have a place to stay where there is electricity.

I mean, one of the things that we saw, and I can tell you myself, is during the Southwest power outage, everybody was going, "I've got my cell phone. Oh, my battery is just about dead. Where do I go to plug that in and charge it?"

You know, there's some little,

practical kinds of things. Where can I go? What can I do? And we see that these types of activities become important. I think it looks at it from both a sort of best practices for the population as a whole as well as for perhaps individual customers.

And so, we just really, from a policy perspective, say we would like to participate. The customers do it on their own. They can. Obviously, UCSD is trying to do that. And what happens on the customer side of the meter is really the responsibility of the customer, but we would like to be able to actually participate.

MEMBER REDER: Tom, you mentioned this really changes the operational paradigm, which certainly you're right. What is the thinking in terms of planning tools and process and the implications? And then, a follow-on might be, what needs to be done in order to facilitate this down the road?

MR. BIALEK: So, you're right,

operationally, it is very different. When we look at the larger picture and say, whether it be from a transmission perspective or a system perspective, that is what we really, when we think about requiring modification of the rules around inverters, there is where we see that that needs to go. Because if you look at it from the bulk system level, you now get into the issues around what happens when there is a transmission event. So, that is important.

Now could you just repeat the second piece, Wanda? The second piece?

MEMBER REDER: Well, to the extent that planning tools, the end process doesn't necessarily, you know, incorporate this paradigm shift, what do we need to do right now in order to get it there?

MR. BIALEK: So, one of the challenges that we have actually is distribution planning, as you know, tends to be much more, what's the load? What is the

static sort of load flow? Let me look at the highest loading conditions. Let me look at the low loading conditions. And let me design the system around that.

Now what we have got is a different paradigm, where we have now all this inverter-based technology out there. We are doing a lot of work with various vendors around transient studies. So, a lot of the more traditional transmission-type studies, we are now finding that we need to actually do at the distribution level.

And the issue becomes, from a planning tool perspective, we have a GIS, and the question becomes, how do you translate the data that we have from a steady-state model into a transient model? That technology really doesn't exist in any real form or fashion. We are struggling to move there. So, clearly, that type of level of tools are important.

What is also important is the

actual ability of our planners to be able to model multiple disparate systems, and what do the models for the inverters look like, the controls, et cetera? Because I think, to sort of Ralph's point a little bit, what happens when these events occur, when hiccups occur, you certainly don't want in most cases, if there is an outage, for these systems to island on their own and re-energize the entire circuit.

Now can they island behind their point of common coupling to carry their own local load? If they are configured to do that, yes. If we are configured to allow that to happen, yes. But we want to make sure, and the planning tools really don't exist to accommodate that.

MEMBER KRAPELS: As the token entrepreneur on the panel -- (laughter) -- I had an opportunity to get into the microgrid space two or three years when I set up Viridity Energy with Audrey Zibelman. And I

was so impressed with the capabilities and the potential of microgrids. And we got it easily funded. I think Viridity went through its B round last December with Intel as one of the Viridity investors. It is really exciting.

And behind the stuff you guys talked about so capably is a tremendous body of technology providers, from Siemens to Intel to Oracle, that I think are knocking on the door of the electric industry.

And the point I want to make is more about business models. In the same way that 30 or 40 years ago we didn't think entrepreneurs could get into generation because it was too complicated, and now look at what entrepreneurs have done in generation.

Then, 10 years ago, we said entrepreneurs can't build transmission because it is too complicated. And we have built two or three merchant transmission lines, and we have worked closely and well with utilities to do that.

And now I see microgrids beginning to evolve almost on the IPP model. So, you can have an independent microgrid development company that takes the best of the various technologies, goes to a customer like a campus, and says, "I would like to install a microgrid on your campus, and I will promise to deliver the following products."

And the products are a reduction in the amount of peak energy use and, therefore, I am going to claw back some of the capacity revenues that I am having to pay you now, and real-time pricing and power purchasing, and all of the products that the good folks at the ISOs have created for those of us who can participate and demand response and efficiency.

And so, I think you will see in the next couple of years a number of independent microgrid initiatives with all of the attributes of IPPs. So, liquidated damages, financial responsibility, project

finance, 250-page power purchase agreement contracts, and all that stuff.

And that, to me, when I think about it 20 or 30 years from now, those folks will work with utilities, Tom, as we do now. Sometimes it gets a little irritating, but most of the time I think it is where innovation will come from.

And so, between the utilities and the independent sectors, I think this is really the most exciting thing we are talking about in these two days.

MS. SMITH: Actually, I would say we are already starting to see that now. I can think of a few. And I think it is sort of evolving from companies that have a microgrid system and then are starting to actually go beyond just being the technologist who supplies the system. And I think we are starting to see some of those situations on some campuses and bases.

MR. LASSETER: I think this is a

very promising direction. It is amazing, the variety of groups that call me sometimes.

But I think what we have to think about is, okay, we are finding a way to build these because there are some advantages to build them both for the customer and the contractor, the utility. But I think what is missing right now, which we may want to think about, is if we think of the microgrid as a resource both for the customer and the utility, what constraints do we want to put on it?

In other words, what does a distribution control system want to know about this? I don't think it needs to know about every inverter, but it needs to know, can you provide power or VAr support; what's the financial implications of that?

That needs to be grabbed hold of and move away from the details of the components, but saying, hey, this is a system with these following characteristics. What

does the utility need to know? What does the developer of this need to know?

And I think some good thought into that entity probably would be incredibly useful to make this not be quite as disruptive as it could be.

MEMBER KRAPELS: Have you looked at overseas applications of microgrids, the Germans and the Japanese and Singapore?

MR. LASSETER: I know of them existing, and I am reluctantly going to China for a microgrid concept, and I will find out more. But, actually, with some support of the Department, there has been an international group that meets once a year.

And I remember I went to the first ones and skipped a couple, and then one was in Greece. And I was overwhelmed. There was like a hundred people doing microgrids in Germany and another group of 20 from Japan and China and Korea. And I was just amazed at the amount of thinking that is going on all over

the world. I just can't keep up with them all. Maybe Merrill --

MS. SMITH: I can't keep up with them all, but we do have an international conference every year where we are able to share what various countries are doing in the microgrid space.

We are participating on CIGRE, which is looking at microgrids. I am not exactly sure how that is structured, but a subcommittee, or what have you on that with a number of international participants, and the sharing of data. So, we are aware of it.

I know the Chinese were just here looking at some of our microgrids. I think they visited UCSD campus.

So, we are aware of what is going on. And actually, the Japanese are doing several demonstrations here in the U.S., yes.

MEMBER HEYECK: A very interesting discussion. It brings back my memory of Pearl Street, which was, in essence, a microgrid.

So, where we are going is where we were.

(Laughter.)

But one of the things -- and Ralph is usually spot-on some of the technical issues -- voltage ride-through is going to be very important. But we really, really need a next-generation EMS system.

We need larger control areas to deal with the variability that this creates. This isn't just the flip of a light switch. It is the slip of an island.

And the paradigm is going to shift. So, as we become micro, we need to become larger with respect to controls because we need the law of large numbers to work.

The other interesting thing, as a game-changer really, has been shale gas. When you showed the unit with combined heat and power, you can have a smaller unit run some buildings from a combined heat-and-power perspective. Again, that is where we were way back when, and now we are going to go back to

that.

I can't help thinking, as folks get comfortable that gas won't be volatile, we still have the fracking issue that may bite us, but as gas becomes less volatile, we may see more of these units in a distributed way.

The last point I will make is the same point I made yesterday. The 21st century customer is really not going to accept any other SAIDI but zero.

As I went through my thought process of what I need to do to survive an outage, my most important item is my sump pump because outages occur during rainstorms. So, I have a battery backup to that.

My second most important item is my refrigerator because of what I store in there. So, you get to the point where the customer actually says, not that I have my home office, I have more people telecommuting, I am going to put a UPS in. And then, you can see the evolving, too.

But it is interesting, Merrill, your comment of 20 percent reduction in saving, I am just wondering if the customer really doesn't want a 20 percent reduction; they want something as close to zero as possible. So, that is really the challenge.

MS. SMITH: It was 20 percent or greater.

MEMBER DUNCAN: Tom, I'm from Austin. I'm President of the Pecan Street Project there.

I also was one of the reviewers with the Environmental Defense Fund that reviewed the Smart Grid deployment plans in California. And as you know, we gave your plan the highest score there.

And I just want to say how impressed I was with the extensiveness of the process you went through in your Smart Grid deployment plan. What impressed me the most, and it speaks to the issue that Wanda raised earlier about planning tools, is in the

process of doing that, you raised so many issues -- all the utilities did -- that had to be addressed in terms of integration, of the metrics that were involved, which became a contentious issue, as you know, getting into it, and so many of the consumer issues.

The reason I am bringing this up is, again, I think you all have the best Smart Grid deployment plan that I have seen in a utility. What really concerns me, however, is I know lots and lots of utilities that are doing what they call Smart Grid deployment, employing Smart meters everywhere, working with microgrids. And some of them confuse microgrids with Smart grids and such. I know lots of utilities doing that, and only a handful of utilities that have a real Smart Grid deployment plan.

I have become more convinced recently that what is most needed in this area is requiring the utilities to go through a Smart Grid deployment planning process to

address all the different issues that are being raised, both with microgrids, and microgrids are, of course, a subset of the bigger Smart Grid issue, the integrations there.

Again, I would just recommend to anyone who hasn't looked at it to look at your process you went through in the Smart Grid deployment plan. As much as we can replicate that process with other utilities around the country, it would address a lot of the different issues that we are facing in this Committee.

Thank you.

MEMBER DELGADO: As I hear you talk about this technology, the only thing I have to say is I wish I was involved in it because it looks like a lot of fun.

A concept comes to mind, and it links to some of the things that have been said. In the electric energy industry, there is a couple of concepts. One is that we have

to address the technical, and then we have to address the rules, the regulatory.

In the regulatory, usually, the question is who pays. And my understanding -- and there is a diversity around the different states -- is that there is a basic sense of service that everybody pays for, and anybody who needs premium service would have to pay for themselves.

I'm not surprised. I mean, we are oversimplifying the benefits besides the elegance of what you are doing, which amazes me. But besides that, reliability appears to be the driving force. Okay?

So, there are people who need reliability at an extremely high level, and I am not surprised that military facilities are, in fact, the drivers, for two reasons. One, they tend to have a great need for reliability and they don't seem to have a problem with money. You know, for reliability it can be paid because Uncle Sam prints the stuff and

that's their boss.

So, from that perspective, okay, the question, then, is, as we see more of this and we see people who do have a necessity, then what is your expectation? Have you looked at the policy broadwide in a system where the bulk of the people really do not need that level of reliability?

And I don't quite agree with Mike because I think there is a great satisfaction with the system. Most people are more concerned with price than with any further improvement or reliability. That is, they have quite a bit of reliability for their use. As long as you don't black them out in the middle of a Packers game, they are quite happy.

(Laughter.)

You know, the beer stays cold even if the refrigerator is turned off for a while. So, it is not a problem.

Do you see my point? My point is

there is a policy issue here regarding implementation. What is the perspective that you have on this? I don't know which one of you -- have you given a look at that?

MR. BIALEK: So, we have filed a deployment plan. Having said that, when you look at it I think in the long-term, you start getting into the whole discussion about what do rate structures look like; how do utilities recover their costs? You do have the regulatory compact. So, how does this all work out?

But do you now get into the whole level of differentiated levels of reliability? And I think that that is a very real opportunity, a real changer. It is something that typically, when we talk about that, I know our regulators look at us and say, "What do you mean you are going to provide different levels of reliability for different customers? All customers are equal."

And you look at that and say,

okay, I can accept that. But, on the other hand, if someone says, "I want six 9s," and they are willing to pay for six 9s, why shouldn't provide the six 9s and charge them for that?

And somebody that wants three 9s, just because they really don't care, well, obviously, they are going to get some base level of reliability because we are not necessarily going to go start pulling equipment out to provide three 9s.

So, I think long-term, yes, differentiated levels of reliability should be a service that the utilities should be able to offer.

MEMBER CURRY: I would like to sort of follow Jose's point. Looking at New York as an example, where basically in Manhattan we have a pretty high degree of reliability, and the cost of that is socialized throughout Con Ed service charge rate.

But, as has been the experience of many of you in many different states, there has been a separation of generation and distribution. In that process, the ratepayers who paid for the generation were paid for its disposition to the private sector. There's a lot of money changed hands when Con Ed had to shut its plants, or whoever else did upstate. Niagara Mohawk, et cetera, were only too glad to get out of there because it almost killed them.

But, at the end of the day, in jurisdictions where you are not dealing with the separation of generation and distribution, it seems to me -- again, maybe because of my limited engineering understanding -- that you are essentially cannibalizing the system. You are diminishing the value of the generating assets by substituting in a microgrid setting potential generation, let's say, on the autonomous basis. You are essentially cannibalizing the system that other people

have paid for.

So, from a reliability standpoint, to the extent that the system is backstopping microgrids in any jurisdiction, to the extent you are cannabilizing the value of the already-paid-for generation, is there any thinking abroad right now -- you know, you guys are looking at this from an engineering standpoint; I am not expecting a financial answer -- but can you point me in some direction where I can get at some of these issues?

Because, ultimately, when we had the vision displayed yesterday and someone suggested we need a big arrow going from right to left, and it would be red, and it would basically change the color of all those other arrows for a while, getting this right financially is terribly important because you are essentially attacking shareholder equity.

I guess enough said. I think there is some financial, to use a bad term,

financial engineering that has to be thought through to be able to afford the really terrific stuff you guys are doing from a straight electrical engineering standpoint. I mean, I think what you are trying to do is admirable. I would like to be able to maybe help a little bit in looking at the regulatory/financial aspects.

MEMBER MASIELLO: Tom, did you still want to ask a question or did you put your card down?

MEMBER SLOAN: Jose and Bob kind of were picking up on what I was thinking. And that, in more simplistic terms, is there was a real push for net metering; i.e., letting the small ratepayer subsidize the bigger guy who could afford to go off grid.

Moving from the reliability components of a microgrid, which a utility can help manage, to that being an independent aggregation with an independent power source, again, is going to have customers fleeing the

traditional utility and the rate of recovery of investments and affordability of electricity begins to become a concern to me.

The issue of the gas supply from fracking I think yesterday, or maybe it was in my last meeting the day before, that we were discussing, if we have a surplus of gas, it goes as CNG on the international market, which then changes the pricing of gas to an international commodity, which is much higher and impacts, then, the viability of these microgrids.

So, I guess I am looking at the Department not only to be supporting -- because I am not an engineer -- to me, really exciting technological innovations, but also helping commissions and the public policymakers and the utilities understand what the impact is going to be on the ratepayers, on the utility, on that provider of last resort.

In the telecommunications

industry, we are already seeing the wireline companies becoming less relevant technologically, and trying to figure out how you transition them into making automobiles from buggies, I mean, how do you maintain that infrastructure or how do you transition customers out of that?

MEMBER MASIELLO: I'm glad you brought that up because I was going to bring the cell phone analogy up next.

But speaking to Ed's comments, the Viridity Model doesn't require that the microgrid be able to island. So, there is an economic case for it in many places without the reliability issue.

And that leads you to this horse has left the barn. The regulatory process isn't going to impede it, and you don't need federal money to stimulate the Snyders and Johnsons from innovating and bringing products, right?

So, it is not hard to see a future

where increasing percentages of load is basically cannibalizing the system, right? And we need a roadmap for that.

So, we will give Pat the last word, I think, or Richard.

CHAIR COWART: Actually, I have a couple of questions. This conversation does make me think, Ralph, that this is a very appropriate topic for this Committee. That is seeming increasingly obvious.

I actually have two, one very large-scale question. I am just asking, I am polling your visions, frankly. And then, I am going to follow up on the regulatory question that you brought up, Tom.

The regulatory question is the more straightforward one, which is, how do you see it unfolding in the debate between the regulated utility, sort of monopoly wires company, becoming a provider of microgrid packages of services versus the alternative model which is, "Uh-uh, you don't do that;

you're a monopolist. Let's let a thousand flowers bloom."? And we are going to keep you out of that business, and there is going to be competition on that.

And I will tell you my second question. You might want to answer that as well. I see competing divisions/debates about the future of the grid pretty much everywhere. There is a raging debate in Germany right now, for example, over the vision for the future of the grid.

On the one hand, you have -- well, there may be three different models -- on the one hand is millions and millions of individually Smart-metered applications. Everybody is just on a Smart meter, and there is a central controller system, basically, that is controlling everything.

Then, there is this microgrid model, which is a lot more autonomy, behind clusters of users or uses. And then, there is the point, also, that Mike brought up a minute

ago, which was, as we think about an increasing penetration of renewables, in particular, on this system, we need larger balancing areas, and we need much more transmission in order to connect a lot of remote, larger generation sources to the network that is at the other end, whether it is just gazillions of Smart meters or whether it is like a combination of that and microgrids.

So, do you see the future of the power system being much more distributed or, simultaneously, much more integrated across larger geographic regions, or what?

MR. BIALEK: So, let me address sort of the regulatory rate recovery piece. I think if you look today in our general rate case filing, GRC Phase 2, in our GRC Phase 2 we have requested implementation of a residential demand charge to try to get at the point that I think has been raised; part of it has been raised here, which is people are

leaving. How do you recovery your cost without unduly burdening those who cannot afford the PV system?

So, we have already taken that step. So, we have done -- that filing is in front of our Commission today.

And what exactly will that look like in the future? We don't know. And it may be not just a kilowatt component, but also a kilobar component. So, we think longer-term the rate structures need to change. How we recover our authorized rate of return needs to change.

As far as where we see the future, we truly believe that in the end it is going to be a much more distributed architecture than what it is today. If Governor Brown's new proposal comes to fruition, we are going to have another 12,000 megawatts' worth of distributed renewables on our system in California. And that is a large number.

And so, inevitably, you are going

to end up with a distributed architecture. And I think, Michael, you mentioned this yesterday, around more of this -- so, it is going to come to a certain point; I don't know how far it is going to go or not, but certainly it is going to take time to evolve. It is not going to be instantaneous.

And you may end up with, again, really some sort of hybrid model at some point, where you have got at the high level larger systems with more integration, but you also have it very distributed at the local level.

MS. SMITH: Can I just have a thought about the cannibalization of the system? I think you kind of also -- I am not saying that every microgrid would not fit that case, but I think there's a number of them that would not fit that case.

I mean, I think the Borrego Springs, I don't think San Diego Gas and Electric is putting that system in place

because it is a nice, cute, little community that they want them always to have their lights on. There was a monetary incentive for doing that as opposed to doing something else that could be more costly in order to do the things that needed to be done to the system.

And I think we are seeing that in a lot of the examples of the microgrids that we are putting in place, that those particular users want something that can't be supplied by the system, and they are not actually taking away from the system or not utilizing the system there. They are just adding on.

MEMBER CURRY: The analogy, though, to cellular is apt here because we in New York, we still have copper wire service to places as remote to us as that desert town is to people in California, because there is no cell service.

I have proposed, somewhat facetiously, that everyone gets an uplink for $50,000 who wants one out there, and the cell

people give it to them, and that is their price of getting out of the copper wire business.

But, really, what I was trying to address with my financial question is the regulatory paradigm: how do we look at this? Because, as Sonny knows, and as the comments in which he quoted our Chairman yesterday as saying there are a million customers in New York that are 60 days or more behind on their electric bill.

There is a glass distinction likely to occur with this great improvement. And unless we think through the regulatory paradigm as we go into it, engineering and the competence that you all have articulated so clearly today is going to get so far ahead of the regulatory structure, it is going to get really, really messy.

And I took the worst case, which is a state where you still have got generation socialized as well as distribution socialized.

In California, you don't have that problem anymore. We don't have it in New York.

But if you think that the utility industry is slow to move, you know, you have met your regulators; we are even slower. So, it needs some thought, and anything that anyone around this table has that can point me in the right direction, I am willing to undertake trying to get something moving.

And I am not necessarily thinking of NARUC. I am thinking of going to the rating agencies. I am thinking of going to people who make money from this business and make them think a little bit once in a while, instead of just collecting a fee.

SECRETARY HOFFMAN: Bob, you bring up a good point. I think it is something that we should tackle and find a way to do this.

Tom, Bob, Merrill, great presentations. I think this is an important topic.

One of the things that I look at

is you used the appropriate word, the future evolution of the utility, and what is the business model for a utility in the future, recognizing what Mike brought on pay attention to the customer and what is the customer expectation.

I will say to Jose and Mike's point on the debate of the customer, I think customers are fickle and it can be any sort of preference of the day that they will flip, depending on what their interests are.

But one of the things that I had been struggling with is the microgrid had always been termed a customer-oriented term. I actually like the ownership by the SDG&E, Tom, in saying, look, this can be a utility term in how we are doing our business model and how we are looking at utilities in the future.

And I have been trying to say we need more layer of control. I think I like the word "granular" control. But going back

and saying, strengthening the role of the distribution utility and how they are going to have a business model in the future. I think that is one of the important topics that we can look at and continue to investigate because that is going to be the fundamental principles under which we have to look at what is the regulatory structure; where do we want to go?

To Roger's point, I am going to back off. I like the term Smart Grid, but I think utilities need to do a five-year plan. Having the Smart components as a part of it, you know, we tend to get coined with a lot of terminology, whether it is microgrid or Smart Grid. But, I mean, we really need to do that business model kind of development and have utilities take a hard look within their regulatory framework, within what they are allowed or not allowed to do. How is the business model going to evolve?

I found it very interesting and

something to key on here is that we do have critical loads, critical assets. Not all loads are equal. And as we look at reliability and different levels of reliability, how can we play off of that in looking at being able to manage critical loads and critical assets on the system?

And I think that is really some of the things that are going to evolve from this discussion and doing that. I found that we will take it back for some tool development, and going back to the visioning exercise on some of the distributions, which I think still need to be worked on.

It does come down to I think we need to look at, how do we do expectations with policy, with regulatory? You know, paying for things on a 50-year term kind of assets, we are going to have to really take a hard look at that. I don't think some of those regulatory models still stand.

And so, a very good discussion,

and I thank you all for this discussion.

MEMBER VAN WELIE: Yes, Pat, it just occurred to me, and had it occurred earlier, I would have put my card up earlier. But I think there is an opportunity here for the DOE and the FERC to work together more closely.

The FERC is creating some fairly substantial incentives through a number of mechanisms. The past few years, many of the ISOs have allowed DR to play through the capacity markets. And just recently, FERC came out with Order 745, which would pay DR sources the full LMP.

Typically, in a classic economic sense, the consumer would look at the benefit coming from avoided consumption as being the only incentive for making an investment. Whereas, now what the FERC is saying, you get to keep that and, in addition, I will pay you the full LMP for the balancing service that you are providing the group.

So, there is a much bigger incentive now for people to invest in microgrids because microgrids are really just another form of DR. And so, as the FERC and ISO world looks to move towards DR, and the model there is the aggregation model, I think there is an opportunity there for sort of closer collaboration between the two agencies in terms of figuring out not only the technical issues, but also, as has been pointed out around this table, the cost allocation issues.

Because the people investing in these microgrids are doing it in some cases from the point of view of a cost avoidance strategy. Many public power agencies, I know in New England, are looking from that perspective.

And so, then, the question is, if from a federal point of view you are wanting Richard's point, to look at decarbonizing the economy, electrifying the transportation

system, you are going to need a strong grid. And somebody is going to pay for that strong grid, and half your customers are disappearing into microgrids. So, how do you sort of deal with that cost allocation problem?

CHAIR COWART: All right. Well, I want to echo what Pat said to the panelists. You guys really gave us a lot to think about, and we appreciate that very much. Thank you.

You don't need to go anywhere unless you actually want to sit in a different chair.

(Laughter.)

Ralph, which would you prefer? It seems like this will be a good time to take our break now. It is scheduled in a few minutes anyway. Okay. Take about 10 minutes and then we will come back and talk about the paper.

(Whereupon, the foregoing matter went off the record at 9:56 a.m. and went back on the record at 10:16 a.m.)

CHAIR COWART: Would Committee members please take your seats?

Our next topic is the Framework White Paper developed by the Storage Subcommittee. And for this again, Ralph, you're on.

MEMBER MASIELLO: But once we are through this, I will shut up for the rest of the day; promise.

Last February or so, Pat requested that we prepare something on the issue of valuing storage. And so, we have this paper. I apologize that it is not as here's the document ready to go. It still says "draft". But I am hoping we can clear that up today.

There was one paragraph on page 3 that the Subcommittee couldn't agree on because I was obstinate. Gordon has in the past week persuaded me I am wrong.

So, the bottom paragraph on page 3, continuing over to page 4, we will strike. And that was arguing for a congestion capacity

market for storage.

So, I think, with that, the Subcommittee is saying, as far as this is concerned, this is ready to go.

But I hope everyone has read it. I would like to call out, in particular, the recommendations that begin on page 8 as the meat of the nine points that are where our discussion should focus, I hope.

It says "Draft Estimating the Value of Electricity Storage Resources," 10/3/11.

SECRETARY HOFFMAN: Before we get started, Gordon, can you tell me where you were heading with the congestion capacity? Because I have to admit that was one thing that I looked at and I said, oh, interesting.

MEMBER VAN WELIE: Yes. So, I will try to do a summary version of the torture I subjected Ralph to.

I guess the implication of a congestion capacity product is that somehow

the market or the ISO should solve the congestion. And my argument would be congestion is really a price signal that is reflecting a transmission constraint or a dispatch efficiency. And the statement in that paragraph that the market won't get the benefit of that, I think sort of as a starting point it is incorrect.

If you look at congestion, some benefit and some don't. So, the incumbent generator is actually benefitting because they are getting dispatched and they are getting their price, and so forth.

The people who are losing in that situation are consumers. And so, that price signal is really a signal to the consumers affected by that congestion to do something about it, or the agent, acting on behalf of those consumers, to do something about it.

There are two ways of addressing congestion. The one is through a financial hedge, like a financial transmission right,

and the other is to make some kind of infrastructure investment. And really, only when the cost of the alternative rises or is less than the cost of the congestion will the consumer or their agent be incented to actually do something about it.

And I think this discussion we have just been having around microgrids is a really great case in point. Were it not for that congestion signal, the person sitting in that load pocket might not see the financial incentive to actually go and make the investment in the microgrid.

So, the thing I was objecting to was the notion that somehow the ISO should be solving the very problem it is signaling. That is the ISO stepping into the market. Whereas, what the ISO is trying to do through the market design is create a price signal for the marketplace, or in this case the consumers, to go off and do something about it.

MEMBER MASIELLO: With that, if people have had the chance to read it, do they have comments? Richard?

CHAIR COWART: I have just one comment.

MEMBER MASIELLO: Okay.

CHAIR COWART: As far as it goes, I think the paper is very strong and I like it. And I will confess that I was questioning the same point that Gordon was just speaking to.

The other point that I think just needs to be mentioned here, and it probably should be a high-level mention, is something that came up in our last meeting about storage, which is that it is important, also, for us in policy terms to be thinking about thermal storage and managed charging of vehicles as performing a lot of the services that we think of when we think of storage.

That is, if we are looking for systems that will take advantage of variable

renewable resources when load is low, we ought to be thinking about storing that value in hot water heaters, icemakers, and charging vehicles in the middle of the night, that kind of thing.

And that those functions are functions that sound a lot like storage. We are actually storing the electricity in a different form, and it is not going to come back to the grid as electricity.

That is actually the dominant, is likely to be the dominant way in which we use off-peak generation resources that would otherwise be wasted.

So, I am not sure, I didn't write the sentence that would say this, but I think that any discussion of storage needs to acknowledge that parallel use of the resources.

I mean, I get it that there is this big difference between electricity in/electricity out versus electricity

in/energy out.

MEMBER ROBERTS: But it still benefits the grid.

CHAIR COWART: It still benefits the grid. It performs many of the same functions. It is soaking up excess low-emission or off-peak generation of any kind.

And it is the sibling of what we are talking about here and needs to be acknowledged as an important part of it. That's all.

Is there a way of getting agreement that we can say that?

MEMBER MASIELLO: Yes, we can add a sentence that talks about these. As a group, we deliberately decided not to address electric vehicles, because there was another effort going on.

And thermal storage and electric vehicles aren't utility- or grid-connected applications, right? They would fall under the consumer storage, right?

But we can add the sentence that points out they are there; they are a critical element.

All of this blurs, you know. It is demand/response; it is storage. If it doesn't come back as electricity, I guess it wasn't within our intent. Let me put it that way.

CHAIR COWART: That's certainly acknowledged.

SECRETARY HOFFMAN: I guess I will say real quick, Ralph, thank you. This was actually where I was heading in some of the things that I was looking for in trying to frame the issues, as you look at the different market structures.

And I guess I go back to Gordon's constant reminders of the services, and what are the competing products for those services we are looking at? And I think it is an important attribute that it has to be cost-competitive or you have to look at the

technology and make sure that it can provide the services, basically, for the least cost or market-competitive.

As I went through the paper, I am still struggling with congestion. I know that market sets the signal. But from DOE's perspective, we have been writing this congestion study paper, you know, and doing an analysis that hit in 2006 and 2009, and we will do another one in 2012.

And it seems like we still haven't resolved congestion. So, the markets are dealing with it, and they set prices, but, yet, there is no resolution to it.

I guess I struggle with that concept, and I haven't yet to figure out --

MEMBER VAN WELIE: Yes, I will just give you the way I think about it at least. I think congestion -- I used the term last night over dinner -- it is a bit like a toothache. And so, when it is a mild toothache, maybe you can live with it. But a

bit of congestion is not necessarily a bad thing. It might actually be the most economic result, to live with that congestion.

Typically, as congestion rises, though, eventually what emerges is a reliability problem. I think once it becomes a reliability problem, then the ISO or the market operators do have an obligation to do something about it because you are sort of creating a reliability threat to a much broader area than just a local area. And we have actually stepped in and done something about it, typically, through transmission investment.

But it is also an economic signal. And ISOs really are unlimited in terms of what they should be doing to interfere in the market economics, which is why you see my reluctance to sort of have the ISO step out and create another product somehow that is addressing the price signal that has been created in the first instance.

So, ISOs are formed and created. The mission is to procure the services necessary to ensure reliability. The function is not to try to achieve some kind of least-cost outcome.

The idea being that the interactions of players in the market is going to drive the economics. And that is really why you sort of see me hesitating at saying the ISOs have to step in.

Now it is fine, I think, for states who are acting on behalf of their consumers to say, "We don't want to live with this congestion. We want to order somebody to go do something about that" or for consumers to take matters into their own hands and say, "We don't want to live with this congestion. We are going to go and use this as a justification to put in a microgrid." All of those things happen, and then, obviously, that is another action within the market that will change the economics of the market.

SECRETARY HOFFMAN: Yes, I respect that, and I think there is a better understanding that folks need to appreciate between markets and the appropriateness of congestion at some level. And then, when does it really become a problem, that things aren't working as effectively, and that somebody should step in?

And so, as we look at the congestion study or some of the documents that will come out of the Department, it is really, what is the need? Is it beyond what should be normalcy with respect to dealing with normal congestion versus something that has gone out of whack?

MEMBER VAN WELIE: I think that's fine. Governments step in and want to make changes to market economics all the time in every market. So, to think that you could somehow control or prevent that would be unrealistic. Government is, then, acting on behalf of the consumers affected by that

congestion.

SECRETARY HOFFMAN: Uh-hum.

MEMBER VAN WELIE: So, the distinction, in my mind, would be it is okay, I think, for government to do that or for consumers to take matters in their own hands or their agents to take those steps. I don't know if it is okay for the ISO to be doing that because they are supposed to be neutral on these issues, to allow the market to respond.

SECRETARY HOFFMAN: Okay.

MEMBER MASIELLO: I would like to add a comment. There is a certain urgency to this now, because OE and EE already held a workshop on storage valuation recently. Out of that will come recommendations for funded research, I believe.

And Sandia and PNNL have recently drafted the document on similar lines that we were going to start to circulate to the Subcommittee and schedule a webinar on. So,

if this White Paper is to have any value, we need to wrap it up.

Ed, you have your card up.

MEMBER KRAPELS: Yes, I have really enjoyed the dialog, especially between Gordon and Ralph, on this paper. It was instructive.

I would like to suggest, Pat, that the congestion study, in my view, is not one of the more critical and useful things that the Department does, because congestion is just an energy measure. And the electric system is energy plus capacity, and now FERC is saying plus public policy at the state level.

So, what drives investment in energy infrastructure under Order 1000 is going to become even more rich and more complex, depending on the state. In my great State of Massachusetts, you can bet that Order 1000 is going to trigger some public policy demands for stuff, transmission and

microgrids, and who knows what, in pursuit of the State of Massachusetts' unique environmental public policy objectives.

And again, the federal government is not there in guiding the states. So, the states will do what the states will do.

SECRETARY HOFFMAN: I didn't mean to derail the conversation on congestion, and I will bring it back to storage. It just happened to be just different things that are flowing around in our minds in trying to deal with congestion.

But I think, when I went through the paper, to be honest, it is a very good paper as it is written. It has a lot of questions that I think we need to address, a lot of them on focus, especially at the consumer side and the consumer level, or at the distribution level of the role of energy storage from a community energy storage perspective, from residential devices, and how one would value that.

And it goes back to one of the things that I guess I wanted to ask your opinion or your thoughts, when you were pulling the paper, of the multiple value streams. Because when you look at energy storage -- and I know this debate has been going around in the community -- of a residential-type asset, I'm sorry, the boundaries are probably going to be pretty well-drawn, that if it is put on a residential premise, it is going to be valued to the customer and you are probably not going to see, unless there is some sort of market demand/response program or something where they can participate, being able to access the value stream, except depending on how the market structure allows it.

So, I just wanted your thoughts, as you guys had that discussion on that.

MEMBER VAN WELIE: I think this is an evolving topic. And the reason it is an evolving topic is that, as the complexity of

the grid increases and you get the variability injected into the grid, so the operators are going to express a need for more responsive resource on the system. And as that need grows, so the value stream, I think, grows for resources that can supply that need.

So, in a world where things are relatively static, the need is quite small. But we are moving to a world where that is no longer going to be the case.

And so, there is a value stream today, I think, for storage resources where they can meet the services as expressed by the system operators today already, but it is limited. But I see that growing in the future. It is just inevitable.

If you look at what has happened in areas where you have high renewable penetrations, there is already a need for a much greater degree of flexibility by market resources. If you couple that with microgrids and highly-variable demand, I think that is

going to ultimately drive the value.

And the system operators are going to have evolve their market designs in order to more definitively express those needs. And from that, then, will come the revenue stream.

SECRETARY HOFFMAN: So, in stark contrast, when you get vertically-integrated, going back to the recommendation of distribution planning tools, for a vertically-integrated system they are going to have to look at a different way to say, how does storage play in the role of our system and how do we value anything?

MEMBER VAN WELIE: That's right. I think that is a very different world because there the vertically-integrated utility has a responsibility given to them by their state regulator to come back and do least-cost integrated resource planning. And they can sort of look at a completely different sort of world in terms of, how do they, then, optimally use storage devices?

So, I think, depending on which market you are trying to access, there are going to be different rules, if you want to call it, in terms of getting the revenue return.

SECRETARY HOFFMAN: I think it is just important for a paper and for the industry as itself to be able to define those different markets and the rule under which storage plays, so that we can bring more clarity to the discussion and advancement with respect to energy storage. So, I agree.

MEMBER ROBERTS: Well, there is a lot going on, obviously, thanks to the DOE and the stimulus programs, and everything else. Because there's some huge demonstrations that are starting right now on storage at the edge of the grid.

And so, I think we are going to gain a lot of insight because they are happening all over the country. I am surprised at how big this thing has become as

quickly as it has.

So, I think we will gain that information, staying on the utility side of the meter for now. Because I think you get the most benefit with the utility having control and all the dynamics that can go with it.

There is some testing going on in the residential side of storage, as a part of a system, by a couple of utilities. But I think over the next year, particularly, we will gain a lot of insight as to how valuable this is and what its real benefit can be, and the economics will, hopefully, start to fall into line, that it has some real benefit.

On the other side of the fence, though, California's new rules, which will allow storage to be on the customer side with a fairly hefty rebate, similar to solar, it will be interesting to see what the responses are there.

MEMBER VAN WELIE: Pat, I should

mention there is one area that FERC is looking at, which is storage as a transmission investment. So, the properties of storage are such that it can replace a capacity bank, for example. And so, in that context, there is an avenue already there where FERC is sort of saying, well, how do we deal with this as perhaps a transmission investment?

My previous remark is really look at storage as an energy resource within the marketplace.

MEMBER REDER: Yes, I do think the jury is out on this one, and we are learning as we go. But it is certainly true that a battery can be applied and the value streams can go all over the map. But it could be the same technology, and it could be there for microgrid. It could be there for distribution purposes, substation transmission constraint relief, and even another generation source, to the extent they aggregate them.

I lay that out as kind of a basis

because somewhere along the way I think we are going to have to figure out how to be flexible in terms of the allocation and thinking about the benefit streams because it is going to vary, you know.

That community energy storage device that is hooked up on the low side of a transformer serving a community is potentially going to be providing a lot of different value streams, and potentially it could be there just for the microgrid application purpose.

So, our systems really aren't set up right now for that kind of dynamic interpretation of an asset class. I think we are going to have to change our paradigms and our thinking and try to figure out how to be more nibble in cost allocation and benefit interpretation.

MEMBER HEYECK: I agree. It just triggered, when you said "capacitor bank," a capacitor bank could be distribution; it could be transmission; it could be inside the

generator plant; it could be on the load side. So, I would just like to be nibble because we don't need a micrometer measuring this mud puddle because, really, we don't want to limit the application of batteries.

And, Gordon, to your point, we have a battery as a transmission asset in Texas that the Public Utility Commission of Texas determined to be a transmission asset, and the way they deal with the energy is in the loss side of the equation.

CHAIR COWART: Should anybody be interested, I have written what I think would be the little intro sentence.

(Laughter.)

And I think it is non-controversial. So, I won't take the Committee's time right now, unless someone wants me to read it.

SECRETARY HOFFMAN: Read it.

CHAIR COWART: Okay, I will read it.

(Laughter.)

This would be the second paragraph after "purpose". "This paper focuses on electricity storage technologies that result in electricity being delivered back to the grid. We recognize that many of the benefits of storage, for example, peak-load reduction, taking advantage of off-peak, low-emissions resources, and congestion relief, are also provided by energy storage systems, such as thermal systems and the managed charging of electric vehicles. Those topics will be addressed by the Committee separately.

That's okay? Okay. Okay, we're done. All right.

Any further comments before this paper is deemed approved?

MEMBER NEVIUS: Just one, Ralph. In the first recommendation about what are the operational and reliability implications for grid operators, I wonder if you would be willing to insert, even parenthetically, a

link to some of the published material that NERC has provided. There is a series of technical reports on viable resource integration.

CHAIR COWART: All right. Thank you very much. That was terrific and a very substantive piece of work.

Our next topic is a panel discussion on interconnection-wide transmission planning. David Meyer is going to be leading this off.

So, David, can I turn to you?

MEMBER ROBERTS: Richard, one quick point? Did we approve the paper as noted?

CHAIR COWART: Do we need a vote? I asked whether anybody disagreed. We don't actually need a formal vote to approve a generic White Paper. But it can be reported, I think, that there was very strong support for the White Paper in the Committee, and if anyone has an objection, let me know.

So, I am not seeing any. Thank you very much.

MR. D. MEYER: All right. Well, we will turn now to our panel on long-term interconnection level transmission planning.

I am going to provide just some brief context before we turn things over to the panelists.

The Recovery Act gave DOE a significant amount of money to spend and they explicitly said that this was to go for interconnection-level transmission planning. We were very pleased to get this direction, this assignment, because, as you have already seen, there are a lot of issues that are facing the electricity sector, a lot of long-term changes that need to be understood or anticipated, to the extent possible.

And so, we wanted to establish capability, analytic capability, at the interconnection-level to address some of these questions. We did not want to replace a lot

of the existing planning mechanisms, the institutional planning activities that are going on. Rather, we wanted to build on them.

But we also wanted to bring additional people into the process. We wanted to give states a greater opportunity to participate, and we wanted to give interested NGOs a greater opportunity to participate. And we wanted to have a more fruitful, or establish the basis, I should say, for a more fruitful, long-term conversation on electricity issues, particularly as they pertain to transmission.

So that, by the time a project comes up for review, we want people to have a better understanding of, has this project been analyzed previously by others? What did they find? How well does this project fit into any planning frameworks that have been developed, and so forth?

But by involving a lot of these players early on, we think they will have

more confidence in the results when they come before them in the form of specific proposals for transmission facilities.

So, for the past year and a half, people in the East, people in the West, and people in ERCOT have been working diligently on this assignment. I should say, also, that in each of these interconnections we recognized two kinds of entities or two kinds of activities that we wanted to fund. One was planning activity by, basically, industry groups, and we call that the Topic A activity.

And then, we wanted to bring state agencies, state officials, into the process, but we realized that they would probably need institutional frameworks of their own. We wanted the states to be able to discuss some of these issues on their own, so that they can get their act together before they go to the table to talk with the Topic A people.

So, Topic A was the industry group. Topic B was the state group.

So, with that quick introduction, I am going to stop. I have asked Brad Nickell at WECC to lead this off, and we will have, first, a discussion of what the West has been doing in this area. Then, we will turn to ERCOT, and then we will turn, last, to the East.

And I should say that, for the Easterners, this was an especially challenging assignment because there were no interconnection-wide institutions in the East. And so, just establishing both an industry group representing the full interconnection and a state group, both of those were major undertakings in their own right, and these people really stepped up and were very responsive.

So, Brad, are you ready to take us on a tour of the West?

MR. NICKELL: I am. Can you hear me okay in the room.

MR. D. MEYER: Yes, we can.

MR. NICKELL: All right. Great.

Well, good morning, everyone.

My name is Brad Nickell. I am the Director of Transmission Planning at the Western Electricity Coordinating Council.

And I apologize I couldn't be there in person today, but what I would like to do this morning is provide you a brief update on the DOE-funded Regional Transmission Expansion Planning Project here in the Western Interconnection and the 10-year plan.

Special thanks to Assistant Secretary Hoffman and David for the invite.

Go with slide 2, Peggy.

In short, what have we been asked to do by the Department of Energy and by our planning stakeholders here in the Western Interconnection? In short, it is really to expand both the breadth and the depth of our existing interconnection-wide transmission planning activities, the WECC.

We have worked hard to expand

stakeholder participation through two main ways. One is bringing NGOs in, and not only opening the door, but reaching out to them directly and grabbing them by the shirt collar and pulling them in. In part, how we made that happen is part of the funding has been used to fund travel and stipends for non-governmental organizations.

And secondly is create a constituency stakeholder group, which we call our Scenario Planning Steering Group, that brings in all of the diverse interests into one room.

And our other charge is really to produce credible and publicly-available information. We have done this in a number of ways. I am going to talk a little bit about the 10-year transmission plan that we just released that you have brochure on in your packet today, as well as all of the data and models that went into this effort are all publicly available and posted in one

convenient location on the WECC website.

As far as the RTEP program itself, it is funded in part through the Stimulus Act, or ARRA. There is a $14.5 million grant administered by the Department of Energy to WECC. In addition to this, there is a corresponding $12 million grant to the Western Governors' Association that covers state participation as well as a number of WGA-led activities that are feeding into this.

In addition to that funding, we have a 30 percent cost-share, so, roughly, $6.5 million of WECC funds that come from our traditional statutory funding sources.

The next slide, please.

This slide shows a little bit of an organization, they call it an organizational funding diagram, which encompasses all of the entities and organizations in the Western Interconnection as well as the National Labs that are involved in this process.

You will see over on the left, as David explained, the Topic B to the states and their activities, and then Topic A that is managed by WECC and under the leadership of the WECC Board, TEPPC, or Transmission Expansion Planning Policy Committee. And this organizational chart really created the framework for addressing all of the interconnection-wide planning issues here in the West.

I think a couple of things to note. One is very close coordination between WECC and WECC-led activities and the Western Governors' Association and the regulators, through WIRAB and CREPC, or the Council on Regional Electric Power Cooperation.

In short, everybody is involved, and we are trying to look at all the issues in a consistent manner, and really specifically bringing everything in, all of our assumptions in, in such a manner that, whether we are looking at transmission or we are looking at

variable generation integration or reliability or cost, at the end of each of those individual analyses we can bring the results back together and form a package that is holistic in view.

The next slide, please.

There are a number of deliverables under our grant agreement with the Department of Energy. The 2011 deliverables include creating this multi-constituency steering group which is made up of one-third state and provincial leadership, both from the regulatory side as well as from the energy offices and Governors' representatives. The other part of that constituency group is about one-third non-governmental organizations and about one-third traditional utility planning types, if you will.

That group has a very close interaction and connection with TEPPC. Basically, one-third of TEPPC and one-third of the SPSG are the same people. So, we get an

inherent coordination there just by people.

The 10-year Regional Transmission Plan, which I will speak to next, in addition, we are creating a number of long-term capital planning tools that enable us to bring in environmental, water, and cultural data into the transmission planning process. And those are underway right now.

In addition, we have partnered with a number of universities here in the West to create educational materials on different planning topics.

In 2013, as we look forward to that and the end of the grant period, we have an update and expansion of the 10-year Regional Transmission Plan, as well as -- and I apologize; I just realized there is a typo on there -- a 20-year Regional Transmission Plan.

Next slide, please.

There are a number of value propositions, both nationally and for the

Department of Energy, as well as for the stakeholders here in the Western Interconnection, which is, from a population perspective, around 77 million people.

One, it is interconnection-wide. We are looking at it with a consistent lens, if you will. We have diverse process leadership.

And on that front, I think here in the West in our processes we have tried really hard to set the bar for stakeholder interaction. And I think that is one thing. If nothing else, we have checked that box.

The federal funds that have been provided by the Department of Energy are very highly-leveraged, both with financial contributions from the WECC and our funding sources as well as millions of dollars of in-kind contributions from WECC members and other organizations and stakeholder groups here in the West.

In addition, we are leveraging

heavily past DOE-funded activities, including the Western Governors' Renewable Energy Zone effort, and I don't know, tens of millions of dollars of work that has been conducted in the past and currently at National Labs across the country, NREL, Sandia, Pacific Northwest National Lab, and Lawrence Berkeley National Lab, in particular.

In addition, we are leveraging even data from the Eastern Interconnection. And special thanks to David Whiteley, who through their efforts out there got us out of a pinch related to some capital cost assumptions. We actually used data from their effort on understanding the range of capital costs for transmission, and we used that to help true-up and validate some of our numbers.

In addition, we are leveraging a number of activities that are university-led that are, in part, DOE-funded, activities that the Department is funding under the Power System Engineering Research Center, or PSERC,

as well as CERTS. Those activities and those people are being leveraged in this effort as well.

Here out West, we have a known path for perpetual funding of this process, subject to budget review by the WECC Board and, of course, approval of our budget by NERC and FERC. We continue to plan for the perpetuity of RTEP and this process.

With the recent FERC Order 1000 going on the books, it is going to really shape what RTEP looks like really starting in 2013.

The last thing is we are already seeing that the 10-year Regional Transmission Plan and the information that was created as part of that process is used and useful. We are seeing it in a number of state processes, both on the regulatory side as well as on the policy side, and really bringing in this credible data into a more local jurisdiction, understanding different opportunities for cost

efficiencies here in the Western Interconnection.

In addition, the recent announcement by President Obama related to the Grid Modernization Pilot leveraged a number of activities that were managed under RTEP. Specifically, this process and WECC facilitated the creation of what is known as the Foundational Projects List, which is a list of transmission projects in the West that have a high probability of both being needed as well as being built between now and 2020.

This brought many of the lines in the Western Interconnection to the attention of the Secretary of Energy, and really led to the discussion amongst transmission developers, federal and state agency leadership, and WECC about the impediments to transmission development, and specifically, getting permitting on federal lands.

This did result in the creation of an MOU between DOE and the Federal Land

Management Agency that led to the pilot program that the President announced back a couple of weeks ago.

In addition, WECC and the RTEP process identified the lines that were referenced in the pilot project or selected in the pilot project and the ability, at least in part, to deliver renewable energy. And I think that was a key metric to gaining the Administration's support.

Thirdly, we created and administered a survey on behalf of the Department of Energy really to ascertain the permitting status of major lines in the Western Interconnection. And it is the answers to this survey that also drove, in part, the selection of the lines that were announced by President Obama.

And lastly, and I think long-term, this is the single biggest value proposition of RTEP in general. We have had the opportunity to educate many non-traditional

planning stakeholders on the importance of getting transmission built and how this does connect into lowering the environmental footprint overall of producing electricity.

Next slide, please.

The last main thing I am going to cover is a little bit about the 10-year Regional Transmission Plan. You do have a brochure in your packet, I believe, that provides an Executive Summary.

And in that brochure are a few things and a couple of key messages. One is this plan is a regional interconnection-wide perspective and covers really three things. We are looking at grid utilization, we are looking at cost, and we are looking at environmental impact, all through the lens of assuring reliability in the future.

By doing this, we have organized stuff, we have organized a plan in three ways. One is we have taken a look at an expected future network, and this is really based on a

number of bottoms-up planning assumptions from state, provincial, local, as well as some regional planning groups' planning activities. We also looked at a number of alternatives to this expected future from really the lens of cost and grid utilization, and then, a number of other insights specifically related to environmental and water aspects as well as variable generation integration.

The plan is very stakeholder-driven stem to stern, from the assumptions to the studies that were conducted, to the review of the results in the creation of the plan documentation.

Importantly, this is a first-time product for WECC, and we look forward to building on it in the next two years and as we put out another set of plans.

From a documentation perspective, and this is all available at that address on the WECC website, we have Executive Summary brochure. In addition, we have roughly a

hundred-page plan summary that electronically is available now that is being printed as we speak. If you are interested in a copy of that, you can go to our plan website and there is a place where you can request that, and we will send you out how many copies you would like.

In addition, there's over 600 pages of very detailed analytic details, as well as spreadsheets and all kinds of data and modeling information that can be used everywhere from the Federal Energy Regulatory Commission and DOE all the way down to local planning jurisdictions.

The next slide, please. This is slide 7.

We had a number of observations and recommendations. The big one that is getting a lot of attention right now is we looked at a number of alternative packages, resource packages related to meeting enacted state renewable portfolio standards. And we

found some alternatives that look an awful lot less expensive than some of our assumptions that were provided by our stakeholders. That has set off some interesting discussions between a number of different states. In part, California is two-thirds of the incremental renewable energy demand between now and 2020, and so they are the biggest market, if you will. And there are places other than California that would like to sell into that market. It looks like there may be some cost advantages in doing that, in building the transmission necessary to deliver that remote renewable resources.

In addition, we have some more reliability and congestion-based observations, as well as some issues related to available generation, cooperation on planning.

And six and seven are both something new. One is we did a pilot on environmental and cultural considerations. And what we really had an eye is, how can we

incorporate those very important aspects into future interconnection-wide transmission planning processes? And we are looking forward to doing that.

In addition, in partnership with the Western Governors' Association and Sandia National Lab, we have looked at the water resource impacts on future generation mixes. We did that as a pilot this time and Sandia built the models in order for us to look at that. We are going to be bringing that into the decisional process going forward. In addition, a number of enhancements going forward for our transmission planning activities.

Next slide, please.

What to expect next? We have a number of enhancements that I have listed there to our planning process and really looking out further and being more scenario-driven in our planning, and looking at all of the what if's, and trying to understand how we

get to where we might want to go.

In addition, our educational materials and modules that are being produced by Arizona State, Washington State, and Colorado State, we have three of fifteen modules done. Those will be posted or will start being posted to our website and be publicly available to all here shortly. And then, we have our next set of plans in 2013.

Next slide.

Peggy Walsh and David on our preparation call last week asked me to provide some comments and things for your consideration at EAC. And so, I have things I would like to put in front of you.

One is leverage the activities that you have paid for through RTEP and the grant to WECC. We think the information in there is very useful for you to meet your obligations under EPAct `05 and the triennial congestion studies. So, we encourage you to leverage your work for that.

Continue to support WECC-led analyses an our processes. In part, leverage our robust stakeholder process to support your guys' mission and objectives at the national level.

Continue to support the Department's participation in WECC activities. David's and Larry's direct participation, as well as others from the land management organizations or agencies and FERC have provided significant contributions to the process and the plan that you have in front of you.

Help WECC continue to leverage other DOE-funded activities, and specifically, promote to the Department other related DOE-funded activities that can be applied to planning activities nationwide and at different levels. And really create packages of information that are used and useful.

There are lots of things that have been done over the last two or three years at

the National Labs and other activities that we have been able to leverage. And we really encourage the EAC to advise DOE to keep looking at things holistically, and how can one activity help or be leveraged by other activities.

And lastly on that level is the continued support of PSERC, or the Power System Engineering Research Center. We have been able to leverage a lot of good work from there as well as CERTS.

With that, that concludes my remarks, David.

CHAIR COWART: Well, thank you, Brad. That was excellent.

I want to move on fairly quickly to the presentations from the other interconnections, but, first, I want to see if people have any clarifying questions they want to raise while we have Brad immediately available here.

We have one from David Nevius.

MEMBER NEVIUS: Hi, Brad. Dave Nevius.

I know there are a lot of federal lands in the West. Are you doing anything as part of this study to look at what it would take to get siting approvals for some of these facilities?

MR. NICKELL: Dave, as you know, WECC isn't in the siting and permitting business.

MEMBER NEVIUS: Brad, you're breaking up. Can you start over?

MR. NICKELL: Oh, yes. Can you hear me better now?

CHAIR COWART: Yes, when we put you on mute, we can hear you. When we put us on mute, we can hear you.

(Laughter.)

MR. NICKELL: Excellent.

WECC is not in the business of siting or permitting at all. We do help facilitate conversations, though. I think the

DOE pilot and the MOU that I described earlier is one way, just calling attention to the need and usefulness of transmission projects. That, in my mind, is the WECC angle on that.

And the other thing I will add to that is, as part of the Topic B funding to the Western Governors' Association, they are looking into state and federal cooperation on moving needed transmission projects expeditiously through their respective permitting processes at the state and federal level.

CHAIR COWART: Brad, we have a clarifying question from Mike Weedall also.

MEMBER WEEDALL: Brad, Mike Weedall, Bonneville Power.

I was wondering, could you tell me what you guys are doing or how you are incorporating the planning process? Certainly, what we are trying to do at Bonneville in our planning on non-construction alternatives or non-wire solutions.

MR. NICKELL: That is a point I probably didn't emphasize enough. As part of both our expected future as well as our alternatives, we look at a number of energy-efficiency and demand-type management programs, both what we think is representative of existing statutory levels, if you will, as well as with a lot of help from Lawrence Berkeley National Lab, again DOE-funded, looking at what is the full economic potential of energy efficiency and demand-type management, and how does that impact the need for energy and for transmission? So, we took a hard look at that, and there are some observations in the plan that are centered on that particular topic.

CHAIR COWART: We have time for one more. Brad Roberts?

MEMBER ROBERTS: This is Brad Roberts from the Electricity Storage Association.

Are you looking at energy storage

as well in that?

MR. NICKELL: In this round, we did look at some energy storage. In particular, we have some pump hydro projects that we did some modeling on, as well as we took a first shot at modeling some compressed air energy storage.

From our perspective, what we are really looking at is large-grid storage where we can get sufficient amounts of energy and capacity. So, that's our focus versus the distributed side of more, if you will, battery-scale focus.

That is an area that was identified in our plan as a need area to focus some more analytical activity. And one of the challenges that we have had is creating models that really represent actual storage operations well and get the pricing right in our models.

But we are working with some developers as well as the National Renewable

Energy Lab has built some models recently that will allow us to represent that better. So, we are looking forward to that in our current planning cycle. That information will be available in our next set of plans in 2013.

MR. D. MEYER: Great, Brad. Thank you again for that excellent presentation.

We are going to turn next to ERCOT. Warren Lasher, who has been leading the planning work there, is going to tell us about what they have been doing.

MR. LASHER: Great. Thank you, David, and thank you for the opportunity to be here today and speak before you.

I have got a presentation here. I wanted to give a little bit of background information to kind of lead into where we started our process associated with the ARRA funding.

But, first, I have to find out how to work this device here. Ah, good.

So, a little background

information on ERCOT. Most of this will be familiar to many of you.

As you can see, ERCOT is the smallest of the three interconnections. We have about a peak load of 68,000 we recorded this year. We have very limited tie capacity with the outside regions. We have got about 1100 megawatts tie capacity; 800 of that is with the Eastern Interconnect. The remainder is with Mexico. We have about 2800 megawatts of generation that can switch between ERCOT and the Eastern Interconnect.

Just a little background on what our generation resources are, we are a predominantly natural gas-fired resource. Natural gas sets the marginal cost of power in most hours.

We have a significant amount of wind energy already on the system. We recently moved to an LMP day-ahead and real-time market. Generation is redispatched on a five-minute basis. And importantly, we have

an energy-only market for wholesale generation.

This is our transmission system. In ERCOT, 345 kV is our highest voltage level at this time. The red lines there are 345 kV. The blue lines are 138 kV. That is just to give you an idea of kind of the scope. We have San Antonio, Houston, Dallas are large load centers.

So, one of the important points is that we already have a fairly vibrant interconnection-wide planning process in ERCOT. We have a five-year planning process. We have participation by specific transmission owners. We have a fairly vibrant market for participation in building new transmission.

We also have an established process for a long-term transmission plan, a 10-year plan that has been developed three times. It is required by State law to be done every even-numbered year.

We have a legislature that comes

into session every odd-numbered year. It only meets in odd-numbered years for approximately 140 days, I think is the legal limit. So, that is a little Texas joke for you there. But the purpose of the long-range plan is to provide them with a 10-year view of the system when they come into session.

We also have recently established a significant investment in new transmission for renewable energy projects. So, what you are seeing there is the CREZ plan. It started as a legislative discussion back in 2005. The entire plan, approximately 2300 miles of new right-of-way, is scheduled to be completed by the end of 2013.

We currently have approximately 10,000 megawatts of wind on the system. That plan is established to provide sufficient transmission capacity for up to 18,000 megawatts of wind capacity.

As a highlight there also, we have 33,000 megawatts of wind and also almost 1500

megawatts of solar projects that are currently in the interconnection queue being evaluated.

So, in that context, back in April 2010, we received ARRA funding from the Department of Energy to support our long-range planning process. And the goal of the funding has been to enhance the existing long-range planning process in two ways.

First of all, to allow ERCOT and stakeholders to develop and vet new tools which will provide additional and analytical capability for the long-range planning process and, also, to establish new stakeholder forums for evaluating the long-term needs of the system and evaluating the long-term planning process in general.

And one of the other components of this process has been to expand the future view of the ERCOT system from a 10-year plan to a 20-year plan.

Where we stand today, we have worked with stakeholders to develop and vet a

set of base tools to allow for analysis of resource expansion, likely resource expansion in our energy-only market through a 20-year planning horizon. We have established a business-as-usual scenario in order to vet those tools, and we have had detailed, lengthy discussions regarding the set of scenarios that will comprise this initial long-term planning analysis.

We have an interim report which has been finalized and is available on the ercot.com website.

This is a timeline of where we have been and where we are going. The next six months for us is going to be a period of incorporating some new technologies, and I think I have got some more information on that on the next slide, and, also, finalizing our set of future scenarios, so that we can develop a fairly robust view of potential futures for the ERCOT system.

So, these are some of the new

technologies that we are working to incorporate into our long-range planning analysis: demand-side resources, solar resources, storage, geothermal, electric vehicles, et cetera.

We are working with stakeholders who have specific technical knowledge in these areas; plus, we are reaching out to National Labs, et cetera, to develop a set of potential assumptions associated with these resources, so that they can then be incorporated into kind of our base tools that we have developed.

So, in summary, the ARRA funding has been utilized to enhance what was an established long-range planning process, both to enhance the actual tools and the processes in order to conduct those studies, but also to enhance the stakeholder involvement in those studies.

In the future, the plan is to utilize those tools to conduct the planning that is already required by State law.

And I believe that is my last slide.

MR. D. MEYER: Any clarifying questions for Warren? Yes?

MEMBER KRAPELS: How did ERCOT or the Texas Commission decide who would build the various transmission lines that were aimed at wind integration?

MR. LASHER: Good question. There was a regulatory rulemaking process, and the plan itself was first established and the lines were certified as lines for the Competitive Renewable Energy Zones. And then, we went into a rulemaking process where various transmission companies actually bid on the right to build those transmission lines.

There was a very robust interaction between the transmission companies. We actually had, I believe, four companies come in who had never built transmission in Texas before who were awarded a portion of the CREZ plan.

The CREZ plan is being built by, I believe, eight or nine different transmission companies. And it has been a really interesting process.

One of the other aspects of this has been there has been some extremely detailed technical studies that have been conducted associated with reactive power needs associated with that plan, and those studies have been coordinated by all of those transmission companies. So, it has been very interesting, the dynamics of some of those very detailed technical studies with some of the new entrants and the established parties working together to ensure the reliability of the system.

CHAIR COWART: You mentioned in passing 2300 miles of new transmission as a result of this planning process.

MR. LASHER: That was a result of the planning process for the Competitive Renewable Energy Zones.

CHAIR COWART: And we commonly hear that it is impossible to build new transmission and site new transmission, get it done.

MR. LASHER: Uh-hum.

CHAIR COWART: Is there something you want to tell us about Texas that we ought to know?

(Laughter.)

MR. LASHER: Well, you know, it is interesting because it is becoming increasingly difficult in Texas to build new transmission, and it is extremely difficult to build new transmission once you get into some of the urban centers.

This process grew out of a legislative mandate. So, this was originally vetted at the Texas Legislature. And from then on, it was given very high priority.

The projects themselves were required to be fast-tracked through the regulatory routing process. So, they each

went through the routing analysis process at the Commission on a six-month deadline. After six months, by Texas law, once a project is fast-tracked, is determined to be fast-tracked, either for a reliability need or in this case the Texas Legislature determined that, it is given 180 days to go through the routing process.

If on the 181st day it is not approved by the Commission, a route is not approved, then it is approved by law. So, there is a good bit of push behind it.

But, you know, a lot of these lines went through regions of Texas where there is not a lot of population. Some of the lines went for 20-30 miles over one person's land, which we have 500-, 600-, 700-thousand-acre ranches out in west Texas. However, I think it grew out of a belief in the overall need for and desire for increased renewable energy for Texas.

MR. D. MEYER: I recognize we have

four cards up, and Bob Curry just signaled his desire to offer some comments. I am going to ask people to withhold their comments for now because I think we do need to move on to our third presentation and then go into a full discussion.

MEMBER CURRY: David, could I just add that I have spoken with each of the three Texas Commissioners about the process of people coming in who have these large ranches and pleading their case to move it 15 feet that way, 400 feet the other way. And apparently, each of the Commissioners split up the number of disgruntled potential customers and met with them one-on-one.

Is that a fair statement, Warren?

MR. LASHER: There was a lot of work conducted. However, I should say that some of those transmission lines had over a thousand interveners. So, there were some that had a significant number of small landowners and then some that had just a few

very large landowners. Yes, there was a lot of work that went to that.

MR. D. MEYER: Our third presentation will be from David Whiteley. And I go back to the earlier remark that in the East it was necessary to create new institutions to carry out this assignment. So, this led to the formation of a group called the Eastern Interconnection Planning Collaborative, and David Whiteley is leading the project on behalf of that group.

So, David?

MR. WHITELEY: Great. Thank you, David.

Just a little bit of background on the EIPC first, and sort of a process update and structure where we are at, so you are a little more familiar with the EIPC. Then, I want to talk about our study results so far and some of the value that has been unlocked in the work that we have done, and then, of course, sort of what's next.

So, taking a little step backward, the EIPC was formed as a self-funded organization by planning authorities in the East. I guess now the term is Planning Coordinators, but back when it was formed, it was planning authorities, really on the basis with the intention of integrating and analyzing the approved regional plans in the East, and to develop potential expansion scenarios and do transmission expansion analyses on those expansion scenarios, all of this in a manner consistent with Orders 890 and now Order 1000.

As the DOE was funding the interconnection studies, EIPC applied and was awarded a $16 million grant for studies in the East. And this grant is being conducted in two phases that I will describe.

So, who are the 26 planning authorities? I have listed them here as well as highlighted the principal investigators on the DOE project, the DOE-funded

interconnection studies project.

In fact, in the room here, three of my 26 bosses are represented. So, if I say something wrong, please correct me.

I mentioned that the DOE project is being conducted in two phases. This is really a transmission analysis or a transmission study. But to do transmission planning analyses or transmission studies, you have got to start with the resources.

And so, our study is really in two parts. As David mentioned, since we didn't have sort of a structure, one of the first things was to create that open and inclusive stakeholder structure and process to participate in the study.

Then, leveraging on what the EIPC was really formed to do, complete an integration of the existing regional plans, and we chose the year 2020, which is a 10-year out case, essentially, because it is as far out in the future as the Regional Planning

Authorities had information at the time.

And then, the first real substantive work for the future is to look at resources and resource options based on an economic basis beyond 2020. So, while the case that we could originally create was a 2020 case, we wanted to extend that by looking at potential resources and resource futures based on what the economics might show, maybe 2030, 2040, 2050 even, into the future.

Then, the real transmission analysis is in Phase 2, and that work hasn't even started yet. So, I will give you a little bit of a view on that.

In terms of where we are at, the stakeholder process has been established and is functioning, I would say, in a very robust manner. We have got 29 Steering Committee members. We have a stakeholder Steering Committee, representatives from all sectors and the states. In fact, one of our Steering Committee members is here today as well.

Sonny is on our Steering Committee.

It operates on a consensus-based manner. We don't take votes, although we have threatened to try to take votes.

The dialog has been very active and intense. It is, I think, from time to time based on individual positions and individual opinions, but collectively I think we are coming to some very interesting answers and results.

We have got a great interface with the states and the state group that has been formed in the East and is funded to participate in these studies as well as do some other White Papers and other studies. That is the EISPC group, the E-I-S-P-C, Eastern Interconnection States Planning Council. We have got a good working relationship with them.

And where we are at with Phase 1, which will draw to a close at the end of this year, we have completed that integrated load-

flow case for the year 2020. We have developed resource futures for the year 2030 and completed at this point 77 of 80 economic analyses of how the future resources might develop.

And the stakeholders are now in the final stages of choosing three scenarios that will be analyzed from a transmission standpoint next year. Again, this is really a transmission study, but it starts with resources.

So, let's look at some of those study results. And I don't want to bore you with 77 out of 80 results, but I do want to highlight, beyond the integrated regional planning case for 2020, we have got these eight future resource expansions. And they are really policy-driven with various sensitivities on the input assumptions.

And again, it is economic-driven. So, the policies are around things like carbon, RPS, energy efficiency, nuclear, those

kinds of different policy options that you could sort of put your finger on and impact how the resources may develop from, again, an overall macroeconomic kind of view.

And then, there will be the three scenarios that are eventually chosen for the transmission analysis. And that is what our Phase 1 is about.

The eight futures that were ultimately chosen by stakeholders include a business-as-usual, which is really a no-further-policy-option future. Everything that is in place right now stays in place. So, states with RPS requirements, existing EPA regs, anything that is there today stays in place, but nothing new.

And then, various policy options, a couple based on a carbon-constrained future. And that is implemented by putting a price on carbon. So, if you emit carbon, it costs. It costs to create carbon, both from a national implementation standpoint or a regional

implementation standpoint, where you are looking at regional constructs of how the carbon constraint is met.

Then, too, on an RPS, where there is a 30 percent renewable portfolio standard, and again, implemented nationally or regionally, where the regions are constrained to meet that requirement within the region.

A case that is a very aggressive energy-efficiency demand-response, distributed generation and Smart Grid, we haven't come up with a good acronym for that one because it would be really long. But let's just call it the Energy Efficiency Demand-Response Case with that other stuff, too. And that was a very interesting future with tremendously-reduced demands.

Then, there was a nuclear resurgence future that was proposed and has been studied, and their nuclear generation and development was given some advantages costwise that would say, gee, if nuclear cheaper, what

would it look like in the future? Would we end up with more nuclear? So, we sort of pushed that button to see what would happen.

Well, the quick question here from my right was, where would you put the nuclear? And there were only a couple of places where it was prohibited in the model, and one was in Manhattan. We decided we wouldn't build a nuclear plant in Manhattan, in the New York zone; JK I guess it is.

(Laughter.)

And then, I think Wisconsin was the only other place where it was prohibited.

And then, we had the final future was what I call the kitchen sink, which is the Combined Federal Climate and Energy Policy, which is a carbon constraint, an RPS requirement, and energy efficiency and demand response, all thrown in together, to see if you put all the policies together, how different is it from any of them individually? So, a very interesting way of structuring how

the future resources might development.

Let me just give you a quick view. Future 2, which was the national implementation of a carbon constraint, and here the objective was to get 80 percent of the carbon out of the economy by 2050. We did that by basically charging for carbon emissions in the entire economy.

And what we found, by 2030, is that, if you can see the yellow numbers at the bottom, basically, by 2030 the electric sector of the economy almost totally decarbonizes. You have 250 gigawatts of coal retirements, 300 gigawatts of wind development, and about 120 gigawatts of combined cycle, but the combined cycle only runs a small amount of time. Of course, you have got nuclear and hydro as still represented.

But by 2030, the electric sector is a very low carbon-emitter because it is the easiest in terms of carbon price for the economy, transportation being the one that is

more difficult to achieve.

So, those are the kinds of results, and we have 77 of these tables that are 77 different snapshots of what the future resources might look like.

We also did at this point some high-level transmission analysis. And this is the work that Brad was talking about earlier that we shared with the West. In terms of looking, the resources is just one, of course, part of the equation. How those resources drive transmission will really be uncovered in Phase 2, but at least to give some feel for the impact in the first phase of the project, we did some high-level estimates of the amount of transmission that would need to be added.

And we did that through a building-block approach, basically, taking transmission lines and looking at them as if they are single blocks. If you need a thousand megawatts of transfer, you use a 765, or excuse me, a 500 kV line. If you need

2,000 megawatts worth of transfer, you use the 765 kV line, and just put them in in blocks to try to come up with a real coarse estimate of what would be required.

And for the five futures where there was a significant amount of transmission added, future 2 being this carbon-constrained, future 5 being an RPS, and 8 being the kitchen sink, where you have got everything, a significant amount of transmission miles being added and cost anywhere from $30 to about $60 billion.

But, again, this is a real broad-brush, high-level kind of estimate, simply to give an indicator, not to be a definitive data point that is used in any kind of a decision manner.

So, that is kind of where we are at on Phase I, but I think we have already unlocked some value. And let me just touch on a few of those things.

First, the stakeholder process

itself, creating it in the East, where there hasn't been an interconnection-wide kind of analysis, I think is an important place where we have achieved some value with a very balanced representation, I think, from the stakeholder community.

The states process that was created through the EISPC has been actually very helpful in this study process, and we have got a good relationship, as I said, with the states.

The inter-regional coordination and discussion that is taking place within the planning authority community I think is very helpful because it is bringing all of the planning authorities together to look at this study sort of one at a time or together as one big study.

And that was probably most highlighted by the development of this inter-regional case for 2020. And there was very good dialog of what the stakeholders believed

would happen in 2020 versus what the planning authorities believed would happen in 2020. And it is not about being right or wrong here, but just the dialog was, I think, very valuable.

Clearly, there has been an educational process, both in terms of the folks that are at the table in the study, but also in understanding the tools and the language and the study results themselves. And discussion on how to create a 20-year-out case has been very valuable. Again, planning authorities right now look about 10 years into the future while we are looking 20 years into the future, and how we go about creating that case has been very helpful.

Certainly, not without challenge. Clearly, we are trying to integrate resource analysis and transmission analysis. Taken to the extreme, this would be an integrated resource plan for the Eastern Interconnection, which is not achievable. We have known that,

but I think it has been underappreciated.

And also, realizing that you cannot model everything at the same time. We can't model the gas system and the electric system and all the environmental regulations, "and, and, and", and put it all together and have one great big model analyze everything. You have got to break it down into pieces.

Understanding how the changes to the inputs change the results, at least from a resource standpoint, it has been kind of interesting because you push on the system in one spot by an assumption, maybe it is natural gas price or something else, and there are consequences that have been uncovered that we wouldn't have anticipated.

And then, of course, accommodating the diverse input from the diverse stakeholder community has always been a challenge. I have been accused of being the chief squirrel herder, not cat herder but squirrel herder, because of the diverse interests here.

And then, finally, translating the technical answers into something that people can understand and statements that people can see as valuable. Where are we getting value out of these studies? And that is a challenge for us as well.

So, what's next? We have Phase II, which will be conducted in 2012. That will be the for-real transmission work. That is exciting for me as a transmission planner.

And the three scenarios that the stakeholders are choosing will be analyzed in the year 2030. We are going to focus probably at the 230 kV level and above, again, because of the size of the interconnection.

We will be doing production cost work and cost estimation work for generation and transmission expansions. These will be more detailed answers than the ones that we created for Phase I. That is the work in front of us in 2012.

And the three scenarios, just if

you are interested, I think where we are going to end up, we are going to have a business-as-usual and then we are going to have a regionally-implemented, nationally-set RPS. So, this 30 percent renewable portfolio standard, but regionally-implemented, will be a scenario.

And then, finally, it is the kitchen sink scenario. The national carbon with increased energy efficiency, demand response. And very interestingly, you could put the RPS in there and you would get that as a bonus, because if you push on carbon, you also take care of a renewable portfolio standard to get that as a benefit. Sort of it just comes along for the ride, because if you are going to reduce carbon, the only way to do it is through renewables.

One final thing, just our cheap plug for our website. If you don't know where it is, we are eipconline.com

And I look forward to your

questions.

MR. D. MEYER: Thank you, David. That was very informative, I thought.

Well, let's go back to the questions. Mike, I think you had your card up first.

MEMBER HEYECK: I couldn't resist Rich's question. The answer on why things work so well in Texas: AEP does have a big footprint in Texas. We are the second CREZ provider. It is very simple: one planner, one siting authority, and one regulator. That's why it works.

MR. D. MEYER: Rick Bowen.

MEMBER BOWEN: Yes, I guess it is kind of a question. I think David answered part of my question for his section. But for ERCOT, I know recently the air regulations have been kind of getting a lot of highlight, and it is impacting a lot of the generation side of the equation, which I would assume -- I know in David's because we have been part of

that group, his group anyway -- have had some modeling around it. But I think, even in David's, we have tended to focus a little more on the carbon aspects as opposed to overall MAC changes and things that go beyond just the carbon simulations of what happens if carbon plays a role in the U.S. economy.

And so, I guess I wasn't sure, though, in ERCOT what we're doing down there -- and I say "we're" because I live in Houston -- but what we are doing down there relative to modeling that in, the study work that you guys did.

Did you take into account MAC impacts on the solid fuel plants and what may or may not happen, if, indeed, they are drug into that, which I assume they would be? And of course, CSAPR kind of hit us all by surprise, but I wasn't sure if that was in there, either.

MR. LASHER: Yes, the specific regulations that you mention haven't been

incorporated into the actual scenarios that are being developed for our studies. However, the analysis that ERCOT is doing as a part of the request from the Public Utility Commission are being done with the same models and by the same team as is working on the future scenarios. So, incorporating that into our future planning is not going to be an issue. It is up to our stakeholders to fully vet out exactly what they want the various scenarios to look like.

MR. D. MEYER: Let's start with Ed and just go around the table.

MEMBER KRAPELS: It is a question for David. I have had the privilege of developing a couple of inter-area transmission projects between PJM and New York. I think I have learned that when PJM or New York or New England look at their reliability requirements for transmission or generation, they typically don't look to the next region to solve their reliability needs that they might have because

they can't predict how that region will behave.

In your modeling of inter-area reliability projects, what do you do about that specific problem that we have in the market today?

MR. WHITELEY: Well, again, we haven't actually started to do transmission studies yet, but that is one of the beauties of the EIPC because we will have both New York and PJM there to look at one case with one future set of resources and come up with a joint solution.

That means they will be looking at the situation together, and there should be one set of answers as opposed to two, which I think is where you might be headed with the question in the past.

I think that is one of the values of what EIPC is doing, because it helps inform the regional processes, as to what the potential future might look like, and I think

does support, you know, from some standpoint, the Order 1000 inter-regional coordination requirements, not that it solves them, not that interconnection planning is required in any sense, but, again, being informative of that process I think is a benefit that we will see. Again, we haven't done it yet, but that is the way I envision it unfolding.

MEMBER KELLIHER: Just a quick question for Warren. And I agree with Mike's observation that it is just different in Texas. The institutional barriers are lower, and it is the one place in the Lower 48 where you actually have unified regulatory authority. Everywhere else it is split.

But with respect to the CREZ lines, if permitting was fast-tracked, how has development proceeded post-permitting? Is everything on schedule, everything on track?

MR. LASHER: Yes, construction is generally on schedule. This is kind of an interesting aside to bidding out the process.

When they took in actual bids, the various transmission companies came in and said, this is how much we think it would cost us to build these lines and this is the schedule under which we think we can have them done.

And it was almost like a "Name That Tune". I can name that tune in four notes. I can name that tune in three notes, you know.

And so, the transmission companies, fairly early on in the process, committed to getting these things done extremely quickly. And once they were locked into that kind of a schedule, there was real incentive to make good on that.

I, myself, was really surprised at some of the schedules that they were proposing. We are on target for end of 2013 having all or nearly all of those circuits in place and operational.

MEMBER KELLIHER: That's great. What about cost? If cost ends up being higher

than estimates, the developer has to prove that the additional costs were prudent?

MR. LASHER: Well, yes, they come back in for prudency, the costs do, when the line is used and useful. The costs are being tracked on a quarterly basis. There's actually a consultant who publishes a quarterly update, and that is available online. If you go to the Public Utility Commission website, there is a link to the website where they have these quarterly updates.

Costs have increased, mainly due to routing considerations and having to route around this or around that. For the most part, costs are tracking what the original cost estimates were.

MEMBER DUNCAN: Warren, as everyone has noted, the CREZ has been very successful in Texas during the time this has been being built out. However, the land rush has really started on the coastal zone for

wind power in Texas. I think like 1200 megawatts is under development now. And we haven't even started the offshore development yet.

One of the reasons it started there is because you had transmission capacity coming out of the coastal zones going into the south and the Houston zones.

Given that, and that transmission is starting to fill up now, and there is a huge potential now on the coast and offshore, is there discussion or thoughts about a second round of CREZ being developed now, as you finish the western buildout?

MR. LASHER: It is a good thing Commissioner Smitherman isn't here. Yes, I'm not sure he would appreciate this joke, but, God, I hope not.

(Laughter.)

CREZ was a very rigorous and difficult process. To my mind, one of the reasons that we want a more robust, long-range

planning process is so that we can answer regulatory questions in a more timely manner, provide more timely information. So that we don't have to have this legislative mandate for some sort of different extra planning approach.

So, I would like to think that we will be in time to implement a longer view of the valley needs and the needs of the renewable energy in south Texas in order to inform the planning process and make good decisions along that route.

But you're definitely correct that new transmissions will be required in order to connect renewable resources in south Texas much beyond what is currently planned. So, there is a need for a significant study of those resources.

MEMBER NEVIUS: Two questions, one for all three of the interconnection-wide plan activities. Are you talking with each other and sharing experiences about how you are

going about these processes?

And the second question, and I guess this is mainly for the Eastern Interconnection, is, what kind of objective function is going to be used to determine what transmission would be built or what wouldn't be built, when you get into that phase of the analysis?

MR. WHITELEY: Well, I'll start since you had the second question for the East.

The view of what will be built is going to be based on reliability only. We are not going to try to do a market simulation and build transmission that is based on some kind of congestion metric, or whatever. It will be solely: here's the resource mix. How do we support it with a transmission system that meets our reliability criteria, essentially? We are not going through an exhaustive review of every standard, but certainly the typical N-1, N-2 planning standard kind of

requirements will be what we will be using.

In terms of sharing, what we are doing, yes, Brad and Warren and I have talked in the past. We have kind of exchanged information.

Brad mentioned the cost information that we put together. We worked on that together.

They have routes that are different. So, immediately there is not a lot that is shared across all three, but certainly the combined experience is being shared, I think, between the three interconnections.

MR. LASHER: I don't have anything to add to that.

MR. D. MEYER: Brad?

MEMBER ROBERTS: A real quick question for David. In your process, you showed demand response, and I didn't see storage mentioned anywhere in there.

MR. WHITELEY: I figured I was

going to get the storage question.

(Laughter.)

And I think the answer is similar to what Brad was explaining. Storage is not shown in our models as a resource option, and that is because of the unique characteristics of storage and the difficulty in modeling the energy-in/energy-out and prices.

So, we forced storage in in some levels, you know, in some amount, but it is not an economic option that is chosen. This is an expansion capacity model, basically, that we are running at this point. It is a pipe-and-bubble capacity expansion. And you have got resource options that it can choose from, you know, wind, solar, coal, combined cycle.

The problem is storage, because of those unique aspects, is not represented. I mean, that is one thing, one of the shortcomings of the model that we live with and try to work around.

MR. D. MEYER: Brad Nickell, Peggy tells me you are still on the line. Do you want to add any comments, particularly on the dialog across interconnection lines/boundaries or what the groundrules are that you are using for addition of new transmission in the plans, and those questions?

MR. NICKELL: Can you hear me okay?

CHAIR COWART: Yes.

MR. NICKELL: Okay. Great. Thank you.

I don't have anything to add beyond what David Whiteley has explained on kind of ad hoc coordination amongst the three of us and lessons learned, if you will, on different point subjects.

As far as transmission, when we look at different expansion options, there are a lot of proposed transmission projects in the West. So, we use that suite of known projects, around 90 of them, to serve as

proxies. And we did in our plan play them off of each other in a limited fashion from a capital cost perspective.

As we moved resource packages around, generation around the interconnection, based on stakeholder input, we matched that up with transmission projects to deliver that energy back to the major load centers. And really, from a reliability perspective, we used both our existing path ratings, path ratings that we have here in the West, and the good thing about using projects is most of them are sufficiently through some reliability-based planning that we know what their impact is, to what allowable commercial flows will be in the West. And so, we use those numbers as proxies for reliability in our production model and kind of play those off, and then look at the capital cost implications of different generation and transmission packages.

MR. D. MEYER: Sonny, do you have

comments?

MEMBER POPOWSKY: Yes, more of a comment than a question. As Dave said, I am one of the 29 stakeholder representatives on the EIPC. So, I did want to take the opportunity to commend Dave. It really has been quite an incredible task because, as he said, you have 26 planning authorities and 29 stakeholders.

I think just getting the folks together, in the Eastern Interconnection, my sense is it has always been a little bit of a Tower-of-Babel-type situation.

We are just getting the 26 planning authorities to use the same terminology and the same definitions of, you know, what is a planned resource; what is a scheduled resource? Compiling those just into what we called the rollout was quite a task. I thought that was going to be the simple part, was just to get the starting point. But just getting the 26 planning authorities

together to put out what we called the rollout for the start of the analysis was a great task. I think that was of tremendous value.

And then, getting the stakeholders to operate on a consensus basis has been valuable, I think very valuable, certainly for folks like me, who wouldn't ordinarily be at those tables.

The only thing I would add is that I think, unlike the West and in ERCOT, where they are really, it sounds to me like they are really using this to plan their system -- like the West is putting out a 10-year plan, a 20-year plan. I think, Dave, you would agree that what we are really talking about is three hypothetical scenarios. We are not going to take these three scenarios, take these plans, and walk into state commissions or walk into FERC and say, "Here's what we should do."

These are really just exemplary, hypothetical scenarios as this is what it would look like if we tried to do

interconnection-wide planning. And hopefully, in the future, if this process continues, we can come up with actual not necessarily hard-and-fast plans, but at least ideas of what the regions could look at.

MR. WHITELEY: Yes, I would definitely agree with that. This is not the plan with a singular set of transmission facilities for the singular future that we think is going to happen. This is information that will be useful.

And thank you for the compliment. There's a lot of great people working in the East to try to make this happen. So, it is not just me.

MR. D. MEYER: Any other comments? Yes, we are scheduled to break for lunch soon, but Peggy says we have -- assuming people are willing to continue the discussion and delay lunch a little bit, we can accommodate a few more questions, if people have them.

CHAIR COWART: I just have one

comment, and it might lead to a question.

The comment, as I listened to these stories, is to commend the Department for giving the support that it gives to these planning processes. Because I don't know, at least for the eastern process, without the Department's support, I don't see how it would be happening.

And I noted the comment earlier about WECC creating a permanent mechanism for the planning process to be supported and participation by the relevant stakeholders to be supported over time. And I hadn't heard that such a thing is happening in just continued support for EISPC or the involvement of stakeholders in the East. And I wonder whether I just hadn't heard about it yet.

MR. WHITELEY: No, I think that is one where the jury is still out. But what I would say is that EIPC was formed really before the DOE issued its FOA and with the intention of enhancing the coordination

between the regional planning authorities in the East. And I don't think anything -- and I will look to my three bosses that are here to say if it is anything different than what I think it was originally formed as.

But, in terms of the jury still being out, we still don't know exactly what value we are getting out of this process in the East and how deep it needs to be and how intense the work needs to be. It could be that we have just scratched the surface of something very valuable, and we need to do a lot more. It could be that this is probably as much as you could reasonably do. It is hard to tell until we get a little further on into the real transmission planning work.

MR. D. MEYER: Let me respond briefly to the point that Rich raised. Pat and I both feel very strongly that it is so apparent that, especially with respect to transmission, like it or not, we are all in this together. The only way we are going to

get the transmission built that we know we need is through a lot of fruitful conversation, and it has to be informed by things like common vocabulary, common set of data, common understanding of what the real options are.

I think some of the people who came early on into this eastern process particularly, they thought they knew what some of the workable options were. I think they have learned that, hey, the range of workable options is not quite as broad maybe as they thought, that some things are going to work and be economic and other things are not, at least for a reasonable period of time.

But this kind of collaboration is essential. So, we can come up with different ways to do it, different institutional structures, different mechanisms, but the underlying need is still going to be there to get the relevant parties involved, to get them talking to each other, so that they can come

to some agreed-upon way of going forward.

MEMBER VAN WELIE: So, my view on this is that it has been enormously valuable. I also would like to commend David for the excellent work that you have done. You're right, there are a lot of good people working on this, but without you herding the squirrels, we wouldn't have a good product, and you have really helped achieve that.

I can't imagine this process ending. I think the planning authorities or coordinators can build into their budgets the ability to support this from a technical and analytical point of view. That just can include, I think, creating the venue.

The tricky part is going to be how to fund the states' involvement and all the other participants in the industry that wish to become involved. That is going to be the tricky part.

And then, two other thoughts. To the question to David on the fact that these

are not "the plan", I guess what it does do is set up the counterfactual, though, for policymakers. So, the business-as-usual-based case and the transmission buildout that goes with that gives people a view on what is going to happen without policy intervention in some way. And then, it is going to ultimately come back to policymakers to decide whether they like that outcome or not and whether they want to put their thumb on the scale and influence the outcome in some way. So, it is going to come back to, I guess, Congress and perhaps state legislatures to figure out whether they want to influence that outcome in some way.

MR. D. MEYER: Brad Nickell, if you are still on and you want to offer some perspective from the West on this, we would be happy to hear it.

MR. NICKELL: I will offer, I guess, a perspective. I think Doug Larson from the Western Interstate Energy Board might say something along this line, too, but,

obviously, I am not speaking for him.

From a state participation perspective, it is very, very important to have the regulators in the room. It is very important to have the Governors' representatives in the room.

And I look as this whole thing as it is a very big ball, it has got a lot of inertia, and we are a bunch of Lilliputians trying to move this big ball around and move it slowly in different directions. We can't stand in front of it, and we can't move it really quick, but if we all get behind it in certain directions, we can cause it to move. We need the state folks in the room and the provincial folks in the room to do that.

In the West here, we have an organization called the Western Interconnection Regional Advisory Body, or WIRAB, It is kind of under the same umbrella, under the WGA umbrella. And they do receive Section 215 funding, so that statutory

funding, the same funding vehicle that WECC uses for its budget.

And that is a possible funding vehicle and a business model, if you will, to use ratepayer-based funding to ensure that state folks have an opportunity to participate in planning activities.

MR. D. MEYER: Any final -- sorry, Bob Curry?

MEMBER CURRY: Yes, just a quick question, and this is, obviously, not addressed to Warren.

To what extent has FERC been involved, should it be involved at a different stage, if that is a practicality? Obviously, the ISOs, in my view, are sort of FERC's representatives on the ground. Don't take that personally, Gordon.

(Laughter.)

In the New York ISO, we expect a lot of coordination. But, ultimately, FERC is going to have in all likelihood an interstate

transmission, a say in how much money you can make from this. And that is going to be -- pardon me for returning to money again -- that is going to be one of the essential elements that takes the concept to fruition in terms of developers.

And I just don't know. Is this the right time, wrong time? Is there ever a good time?

MR. D. MEYER: There's a two-part answer to that. First, FERC has attended -- all of the meetings for these interconnection-level planning efforts are totally open. Everything is fully noticed, and anyone who wants to participate or to come to these meetings is able to do so.

And so, FERC has sent staff, senior-level staff in many times, to these meetings, East and West, and I'm not sure whether they have shown up at ERCOT or not, probably not. So, that's one point.

And they have, by their own

choice, these people have been very low-key. Sure, they talk to folks at the breaks, and so on. But in terms of the actual dialog, they have not participated. I think that is probably understandable.

The other point, though, is that after we launched this process, and after it seemed to get a very positive response from a lot of states and NGOs, FERC did bring out Order 1000. It launched the NOPR, and then the rule came out last July.

And some of the features of Order 1000 were pretty significant in terms of how they matched up with some of the things here. That is, the directive in Order 1000 that regionally planning entities are going to talk to each other about lines that cross their shared boundaries, and that these regional planning entities will take, as Ed Krapels was mentioning, they will take state policies into account or local policies, for that matter, to the extent that they are reflected in law or

regulation.

And so, those things are being factors into these Order 1000 processes, which I think is a major step forward.

Other final comments?

(No response.)

No?

Well, thank you all. It has been interesting and valuable.

CHAIR COWART: Thanks, folks.

We will take our lunch break now. We return at one o'clock.

(Whereupon, the foregoing matter went off the record for lunch at 12:12 p.m. and went back on the record at 1:07 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:07 p.m.

CHAIR COWART: As you all will recall, this year we had three meetings, face-to-face meetings of the full Committee, roughly, March, July, and October.

That leads us to a conversation that has two parts. The first, quickly, is, do you think three meetings a year for the full Committee is about the right amount? And secondly, is something like that array of dates roughly the right spread? So, just any reactions at all to that?

MEMBER REDER: From my perspective, I think three meetings a year seems about right.

CHAIR COWART: And there is certainly the expectation that the Subcommittees would be active in between those three meetings. And so far, the practice has been for those Subcommittee meetings to be done by conference call. That is not set in

stone anywhere. If a Subcommittee decided that it was important to do something different, then that is a conversation I think we should have.

MEMBER ROBERTS: In the previous Committee session before, we did hold testimony one time as a Subcommittee, but that was the only time we had an alternate meeting from the regular Committee meeting.

CHAIR COWART: And you said we held testimony? That was on the record and --

MEMBER ROBERTS: Yes.

CHAIR COWART: Okay.

MR. D. MEYER: On this question of how many meetings to have, I will be very blunt, very candid. It seems to me we have these face-to-face meetings, and they are excellent. The dialog is excellent. The material is a very substantive meeting. The feedback we get is good.

And people kind of get juiced-up and enthusiastic about things to do and

questions to address, and so on. Then we all go back to our day jobs and things sort of really tend to revert to a lower level of activity.

So, the question is, would going to, say, four meetings help ameliorate that or should we look to other kinds of solutions, mainly being much more aggressive about maintaining sustained activity at the Subcommittee level and putting more emphasis on that level of activity? So, I just want to get some discussion of that.

Obviously, these meetings are not free. There is a dollar cost for us associated with putting one on. Even the room rent for this facility is pretty darned good now, thanks to Rich's organization. And we don't know whether that is going to continue to be available the way it has been. I mean, this room is heavily utilized. So, it raises a scheduling problem in its own right.

So, bear that in mind when you

think about how frequently we should meet.

CHAIR COWART: Tom?

MEMBER SLOAN: Yes. Many of you interact with the DOE on a fairly regular basis. For my constituency, and I am not speaking about my State constituency, I am talking about the fact that I carry information and issues back from here to two of the larger national legislative groups, NCSL and CSG, on a regular basis. For me, more frequent interactions with you, where I can get a larger scope of information allows me to transmit or communicate that to my broader audience.

So, I mean, cost and time and all being manageable, four meetings is preferable to three. Certainly, three is preferable to two or something of that nature.

CHAIR COWART: Mike?

MEMBER HEYECK: You have heard this, David, from me, that we have a chicken-and-egg problem here. We kind of decide what

we do, and we do it. I would like to avoid the subjects that are not unlike world hunger. Like federal siting is probably near that world hunger type of perspective, but some other things are not. And we have good dialog about those.

I really think that there needs to be more of an interface with the Department, I'll say, key leadership, like Bill Parks, like Merrill, like those individuals that are below you that happen to know where the gaps are or what keeps them up at night, for us to address.

Now we are free to address anything we want sort of within the rules, but I would really like to work on things the Department would like us to opine on. I can give you a lot of examples of those, the one being we talked about next-generation EMS systems. This is really going to be a key player, for example.

I don't know what the Department

is doing. I do know what EPRI is doing. So, we could have some dialog as to who is doing what.

And the grid security paper that was written, the first time I brought it to this Committee, they said, "Hey, find out what everyone else is doing." And with a lot of players, Dave, I found out what NERC was doing. And instead of this big, it turned out to be this big.

And you presented here what I call the gaps. So, somehow a dialog to figure out what the gaps are in the key areas.

MEMBER REDER: And picking up off of Mike's comment, I agree wholeheartedly. I think in many respects there is already analysis that is going on within DOE. To the extent that we have a mechanism to bring that into the Subcommittee conversations and leverage that, build upon it so it becomes a very collaborative, iterative process, it would probably be more fruitful in the end.

So, you know, if we could figure out points of contact in order to reach out, what others departments, where do the expertise and the analysis reside, would be very useful. So, that was one comment.

And the other comment is, going to the space, a different topic, perhaps there is an opportunity to use the Virginia Tech space across the street from the Westin. So, we are working on that as an option.

MEMBER KELLIHER: From my observation, looking at other advisory committees, I think advisory committees are most effective when an agency has some decision or decisions that are in the queue and they realize that advice outside the government, some expert advice outside the government from a balanced group, would help the government make a decision.

But, unless there is that kind of connection between some impending decision and the outside expertise, then advisory

committees sometimes aren't all that productive. They become general educational fora where sometimes it is the advisory committee members educating each other more than the government or the government educating the advisory committee members. And they end up having some momentum of their own, but not really doing what -- the purpose of the Federal Advisory Committee Act is to improve the quality of government decisions. It is not to educate advisory committee members.

And I am not just clear what are the decisions in the Department that are pending or impending, somehow in the queue, that you would like the advice from the Advisory Committee. And I think that is the purpose of an advisory committee.

SECRETARY HOFFMAN: Let me just add some thoughts to that. I mean, I will tell you, for example, with the microgrid program, what we will be looking at is, where

do we want to go next with that program? So, the discussion and what are the issues surrounding the value of microgrids I think was extremely helpful.

For energy storage, it has been a however-long debate on how to value energy storage and how to address that.

And as Ralph brought up, the Department is looking at an exercise. We had a meeting looking at the value of energy storage.

So, actively giving value to topics that are under great discussion and great debate within the Department, even if there is not a, quote/unquote, "decision" at this moment in time, it is helping us work towards some decisions and directions on where we are heading.

So, from that perspective, I think it is very valuable to us from a strategy perspective of where we are heading with our program and the activities we are working on,

and the analysis that we want to take in the future, whether it is for the Department or Congress or anybody else. So, I would just add that.

But I will go back and say that we will continue to strive to try and pull together where some of the directions or some of the issues that we are trying to deal with, and how the Committee can add value.

I will go back and pull up -- Mike is talking about the high-impact, low-frequency discussion for good security. One of the things that we are developing is actually a plan on how to determine some of the GMD issues and develop a framework for the industry as well as the Department on looking at that, in cooperation with what NERC is doing.

So, one of the things that I had talked to Rich during the break about was actually having a series of presentations on the topic, as well as presenting our strategy

for what we want to do in that, to get everybody's feedback.

So, I think we are going to slowly work into some more things, and I will do my best to kind of pull it back to home on where is the value that we are getting out of that.

CHAIR COWART: Wanda?

MEMBER REDER: One other comment. I think it would be useful if there was a mechanism for a feedback loop. So, once we get the paper submitted, just some understanding of if they are useful or if there is incremental work to be done, it would be a useful Subcommittee activity.

And I will say on the other point of view, what we talked about doing in future meetings was actually getting more of DOE staff and relevant staff directly participating with the Committee in communication, so that you actually can see some of that direct feedback into the discussions and what is going on versus kind

of relaying it.

So, one of the things we are going to try to do is pull more of the Department and more of the other relevant federal government folks to the meeting, depending on the topics that are covered.

CHAIR COWART: So, I will just summarize what I think I heard, just for our mutual benefit, of really three different things.

The first is that we would like -- and I have asked Pat to help us do this, Pat and David both -- for each of the Subcommittees to be connected to senior Department officials who have active work ongoing directly related to the general topic of the Subcommittee. So that, even between meetings, there would be a liaison in the Department who is actively working on those topics.

So, that is the first thing. And the Subcommittee Chairs know to look out for

that and to kind of follow up on that request.

The second point is something that I think many of us have said and Pat has acknowledged. We are going to be most useful as an Advisory Committee if we are plugged into either pending decisions, as Joe just pointed out, or at least work streams that could use guidance from the Committee as to what direction the work stream should go.

And that, whenever possible, we ought to be focusing on asking for and getting an indication of what is the decision or what is the work stream that the Department is soliciting feedback on.

And then, the third point is that communication in between meetings, both on the Subcommittees and between the Subcommittees and the relevant DOE staff, should be fluid and bidirectional.

The reference was made in our leadership team conversation yesterday about creating documents and throwing them over the

wall, and wondering what happens on the other side. It is not necessary to be in that mode. We ought to be in a much more bidirectional mode.

I judge that all of those requests have been heard.

MEMBER CAVANAGH: I guess I would second Joe's comments. I was trying to get your attention a second earlier.

You know, you may want to reconstitute a little bit, too, if this is the time to look at the next year. I mean, I, for one, will acknowledge that I am an engineer, and, Pat, I am not going to provide you a lot of great information on how to figure out the next steps in R&D. But there are a lot of other people around the table who are and other people who could take my place, and fine with that, if that is sort of the focus, is kind of the next steps in R&D.

In the past, this group has talked about, I would say, much more sort of broad

national policy on how transmission is of critical importance to a variety of national goals, and that raises a lot of policy issues. I know I, for one, would like to be involved in that. If we are not going to do that, then maybe we could look at some different groups and smaller committees or differently-constituted committees.

SECRETARY HOFFMAN: I don't think we are eliminating any of the policy discussions from this group. So, I think we would just continue to rotate what some of the topics are that are relevant to the discussions.

CHAIR COWART: All right. Are we good?

Yes, in terms of the schedule, I gather by looking at faces and hearing no objections, that the notion of three meetings, roughly as we had in 2011, would suit the Committee.

And what we will do is just sit

down with David and Peggy and just try to set some dates, and we will send you an email with those dates, and in order to avoid the major potential conflicts that we know about.

MEMBER ROBERTS: Just one additional comment on that, on the three meetings.

CHAIR COWART: Uh-hum.

MEMBER ROBERTS: I think having a day and a half, if we are going to just do three. I don't think you would do more than four, but one day is just a little too tight.

CHAIR COWART: Okay. Good advice. Thank you.

All right. Yes, the next topic, actually, is the Transmission Subcommittee.

Mike?

MEMBER HEYECK: We actually have two memorandums that we are going to be looking at, none of which involves world hunger.

(Laughter.)

So, I just wanted to make another comment about the resources around the table. I think Merrill mentioned CIGRE this morning. You have a pipeline into me through to CIGRE, if you need. I am the U.S. President of the National Committee of CIGRE, and Wanda is very active in IEEE. So, there is more conduit around this table than just our companies.

There are two memorandum. One is the grid security memorandum. Last meeting, the Committee has provided advice to find out what everyone else is doing, and I mentioned that I visited with Dave; also, Gerry Cauley and John Procario, and actually participated in the meeting of the Security Task Force -- I don't know exactly the name -- to try to find the gaps.

And the gaps included, and that Committee agreed -- whether this Committee agrees, we will find out in a few minutes:

One, determine specific grid vulnerabilities to HILF events and cyber

attacks. We figure that the labs are very useful in determining how to harden these assets, which is the second one.

It is to develop grid component-hardening standards.

And the third is to develop specific gaps in sparing the critical components. The industry already spares transformers to some degree. And this exercise would be to identify gaps in those.

And I know that Barry was kind enough to offer some comments through Rich. I just wanted to give Rich the first opportunity to provide those comments and to see if the Committee agrees.

And then, if there is anyone else who wants to provide comments, please put your name tent up.

MEMBER R. MEYER: I can't be funny more than once.

(Laughter.)

The regular teach is out today,

and I am just the substitute teacher. No one really has to listen to me, you know. I get to take attendance at best, and that's it.

If you look at the document that has been previously distributed to you, not by us, but through the formal mechanism, I direct your attention to the third page first. We have a number of small changes. I believe they are small changes.

Item that is marked No. 3 on the third page, the first sentence says, "The electricity industry via EEI and NERC". We suggest a change there, that it say, "The electric industry and NERC or the electric industry via EEI and other sectors".

To be sure, we work very closely with EEI on these matters. So, this is not an NRECA/EEI issue. So, I just want to raise that issue first. I leave it up to the leaders at this meeting to decide when to consider that issue or not.

Very good. And then, on page 2,

if you look at, this appears at the bottom of page 2. In both Items 1 and 2, there are references to standards. Whenever there are references to standards, we recommend changing the word "standards" to "guidance/best practices".

MEMBER HEYECK: Any objections to that?

(No response.)

I think standards are, let's just say, misinterpreted these days. Would guidance and best practices be suitable?

Okay. Anytime the word "standards" appears.

MEMBER R. MEYER: Similarly, on the second paragraph of page 1, the word "standards" appears there. And unfortunately, Barry and I did not have a chance to chat about this prior to this meeting or even at this meeting. There he has a change from "standards" to "R&D and guidance".

I have no particular feelings

there. I certainly defer to others around this table. I don't know if "R&D and guidance" would be best there or if that should also say "guidance/best practices".

CHAIR COWART: Why don't we say "R&D, guidance, and best practices"?

MEMBER R. MEYER: That would certainly be fine with NRECA.

MEMBER HEYECK: Is that all, Rich?

MEMBER R. MEYER: And the final change, and I want to emphasize that we are making this point solely within the context of grid security, in the middle of the second paragraph on the first page, it says, it appeared to say -- again, I'm not sure of the language that was in this draft originally. There was a reference to, let's see -- does anyone's draft say, "However, the grid is ill-prepared"?

MEMBER HEYECK: Yes.

MEMBER R. MEYER: Okay. So, the suggested language is to remove the phrase

"the grid is ill-prepared" and substitute instead, "However, further work is needed to better understand potential steps for addressing widespread high impact."

MEMBER HEYECK: Any objections?

(No response.)

"Further work is needed to" --

MEMBER R. MEYER: "However, further work is needed to better understand potential steps for addressing...." And then it continues, "widespread high impact".

MEMBER HEYECK: Okay.

MEMBER R. MEYER: And I will give a hard copy of this to Peggy because she asked me to.

(Laughter.)

So, thank you all for your consideration. Much appreciated.

MEMBER KRAPELS: For the record, I object to the split infinitive "to better understand".

(Laughter.)

MEMBER ROBERTS: I have a question real quick.

MEMBER HEYECK: Go ahead.

MEMBER ROBERTS: I wrote a note on No. 3 on critical spares. Just out curiosity, are there certain size transformers that are not even built in the United States anymore?

MEMBER HEYECK: Actually, if you go beyond transformers, it would be electronic equipment. Because in HILF events, you could pretty much fry some relaying or digital relaying and things like that. So, the issue here is to identify gaps in what needs to be spared. And certainly relaying is something that is not a long-term, long-lead-time item. However, it is really just to identify gaps.

MEMBER ROBERTS: I was just curious about transformers. I mean, are there certain sizes that are not even built in this country anymore?

MEMBER HEYECK: Yes. Yes, 765 kV transformers, for example, are not built here;

345 kV, there's a few plants, but not many. St. Louis. Actually, Hyundai has announced something for Alabama or Tennessee, I think. So, they are some that are developed out there.

Any other comments?

(No response.)

Any objections to moving this forward?

(No response.)

CHAIR COWART: I hear no objections. So, we can record that this recommendation has been unanimously approved by the Committee.

MEMBER HEYECK: Thank you.

The second item is titled, "Interdependence of Electric System Infrastructure and Natural Gas Infrastructure".

First, I want to acknowledge Barry Smitherman has actually led these efforts, and he could not be here for this meeting.

You have that document before you, and I will refer you to page 4, where our recommendations are outlined.

But the essence of this is that firming-up electric capacity is not linked to the firming-up of the capacity in the gas pipes, and there needs to be a linkage between the two; otherwise, we are going to have a reliability issue with the grid.

At this time, I will open this up to comments as well.

But it became very evident in the Texas cold snap with respect to the electric side, but I think we extended it because there is a gap between firming-up electric capacity to the market and the gas supplier firming-up capacity to the plant.

And many of you know, if there is an emergency out there, I think in many states the Governor can declare an emergency, and the firm capacity, even if you declare it firm, could be negated by a Governor's action. So,

there seems to be a disconnect between electricity supply and fuel supply.

Comments? Ed?

MEMBER KRAPELS: Yes, Mike, on page 5, Recommendation No. 3 seems a little out of place. Why should DOE fund research on the use of natural gas? What is the purpose of the research? Can it be defined more precisely than that? Surely, natural gas will be the fuel of choice to replace retiring coal plants.

I don't know; it just seemed just thrown out there without more elaboration and definition of what DOE is supposed to do with that big question.

MEMBER HEYECK: And from my perspective, I think "research" is probably too strong a word to use. I think this is more planning, looking at capacity, rather than researching. So, "should fund planning"?

CHAIR COWART: Actually, I think what you mean is planning on the likely use of

natural gas or on the potential for natural gas to replace all the coal-fired generation.

Whoops, my microphone was not on. Sorry.

I think that is what is intended. It is not research on how gas can do it, but it is research on the degree to which gas is likely to be called upon and relied upon to do it.

MEMBER KRAPELS: And the policy is that you are straining the natural gas infrastructure system --

CHAIR COWART: Correct.

MEMBER KRAPELS: -- by asking it to play this role. Maybe if we could use some of those kinds of words there?

MEMBER DELGADO: But, beyond that, it is also being aware that this issue exists that puts in jeopardy what is the bulk of the new generation; that at critical times when there is alternative need, the generation may not have fuel. So, this is an issue that has

to be addressed because, as gas become a humongous portion of the intermediate and base, then this can be a significant problem.

CHAIR COWART: We have got such a strong interest here. Let's start back here. Gordon?

MEMBER VAN WELIE: I was just going to suggest that we delete 3 and insert it as a bullet under 1. Because, essentially, when you are looking into the dependency issue, one of the things one ought to be evaluating is an increased dependency on natural gas as a result of retirements of all the coal units.

CHAIR COWART: Do you have language to suggest? Why don't I ask you to see if you can write that bullet? And then, in a minute, we will come back to it.

Wanda?

MEMBER REDER: Yes, I notice that it could perhaps be strengthened by commenting on the transparency or visibility across

domains. A lot of this is policy-oriented, and I think from an operations perspective we probably need better visibility. And perhaps we could incorporate that in the recommendation, No. 1, the coordination.

Mike, what are your thoughts?

MEMBER HEYECK: I like inserting the word "transparency". So, if you would like to insert the word "transparency", take your document out and put an up caret and figure out where it is going to be.

MEMBER REDER: All right. You've got it.

CHAIR COWART: Roger?

MEMBER DUNCAN: Just a quick anecdote to illustrate the severity of the point. During our outage, statewide rolling blackouts in February in cold weather, where we lost several power plants and gas was curtailed, one of the things that happened under the existing rules is that several gas pumping stations running on electricity were

cut off.

CHAIR COWART: And Joe?

MEMBER KELLIHER: Yes, I think on that last point, I think the southwestern issue is more electric causing the gas problem, not the reverse. Normally, we think of it as the opposite.

But I don't really understand what No. 2 is saying. And this is actually not a new issue of should the gas and power day line up. It first arose in New England in 2005 or 2006, and FERC has asked this question at least twice and has been reassured by ISO New England and others that the two days don't have to match up, unless things have changed since I have been paying attention.

But it is not as if gas is not available on a firm basis. It is. But if you don't know for sure you are going to be selling, you don't typically buy gas on a firm basis.

So, I am not sure what No. 2 is

saying because gas is available on a firm basis, but is No. 2 suggesting generators should be required to buy gas on a firm basis, and those costs should somehow be borne by them if they don't get dispatched? Or those costs should be socialized somehow?

I'm not clear. No. 2 doesn't seem to be saying that all gas sales to generators must be firm. It doesn't seem to be saying that. But I am not sure what it is saying, short of that.

MEMBER VAN WELIE: I guess I will just give my view. I don't believe that one needs to have all gas generation be firm. The New-England-specific issue is some quantity about gas-fired generation we think needs to have either an alternate fuel supply or local storage, or something to be able to ride through a temporary interruption of gas supply into the New England region.

So, how we solve that problem, we haven't yet arrived at a solution just yet.

But it seems clear to us that the work that we have done in the past 10 years to sort of try to increase the coordination between the gas system and the electric system has helped matters, but it has not solved the problem.

And in fact, as we look forward and see that a large percentage of our oil-fired capacity will retire in the next five years, that is likely to be replaced by more gas-fired generation. So, this problem is sort of expanding, at least in the New England context.

My perception is, looking at what is happening elsewhere in the country with low natural gas prices, it is even displacing coal generation in the Mid-Atlantic area, particularly all the smaller, less-efficient coal units.

So, I think that the dependency between the two systems will grow over the time. The question is, what is the mechanism to ensure electric reliability? And at the

moment, in my view, the market designs are not expressing that need in any way. Once you express that need, you create the revenue stream for somebody to do something about that.

So, that is directionally how we are going to be addressing this from the New England point of view. I am not sure, whoever wrote this paragraph, what they had in mind, whether they had in mind something that was consistent with what I just said or whether they had some different objective in mind.

CHAIR COWART: I think it is consistent with what you just said. From a prior conversation, I recall the phrase being consciously added here to the first bullet in No. 2, "when required to maintain power system reliability". In other words, meaning not to suggest that all gas gen has to be firm, but, rather, when it has been determined that there is an explicit reliability need. That was the intent, anyway, of the author.

MEMBER KRAPELS: Can I just ask a clarifying question?

Gordon, does FERC or does anyone in the regulatory arena now give you any form of warning if there are concerns on the gas supply side that it might impact electricity generation in New England?

MEMBER VAN WELIE: No. So, there is no centralized structure for giving us any kind of warning. We have had to develop over the years the ability to try as best as we can find out what is happening on the gas system. I mean, cooperation between us and the gas industry has increased substantially over the years.

I still personally think we are sort of doing this in a 1970s' style manner. We have on our control desk people who are scanning the gas pipeline bulletin boards, filling out spreadsheets, and trying to sort of come up with a fairly rough-and-ready estimate of whether there is enough in the

system.

And so, we use that information combined with coal's, with the pipeline operators, to sort of get a sense of where we are. And then, we will make our commitment decisions.

The reason I use this sort of 1970s'-style analogy is that here we are on the electric system with transducers all over the place. We are putting PMUs out there. We want to understand electric system reliability down to the millisecond. And yet, we are sitting here scratching around trying to find out what is happening with our most important fuel supply. It just doesn't seem to me to be a balanced situation from an operational point of view.

MEMBER HEYECK: I think if I have to put this simply, it is to define the gaps between ensuring electric reliability and ensuring the gas is there for electric reliability.

And then, there is the alternative, which Roger mentioned, to make sure that, to the extent that gas is dependent upon electricity, that we consider it a critical load.

I think those are really the two things we are struggling with.

CHAIR COWART: So, I think we have two pending amendments. Gordon has his pen out for one of them, I think, and Wanda was working on another one. Is that right?

MEMBER REDER: Yes, I can read it off.

It will be a bullet that goes at the bottom of No. 1. "Appropriate transparency and visibility to support reliable operations across the domain".

MEMBER DELGADO: That's beautiful.

MEMBER REDER: What, Jose?

MEMBER DELGADO: Gosh, that's beautiful.

(Laughter.)

CHAIR COWART: Beautiful.

David?

MEMBER NEVIUS: This is another place where you might want to make reference to an update to our gas/electric interdependency study, which is getting off the ground now. There is going to be an informational presentation on it to our Member Representatives Committee next Tuesday.

Again, we had done something a couple of years ago, and this is an update, taking into account the new situation and increased use of gas, and so on. So, the agenda for that conference call meeting is on our website under the Member Representatives Committee, and I think it is two o'clock on the 25th of October.

But if somebody wanted to just sit in on that, or at least just look at the background material, it will give you an update of what we are doing. And if you want to put some reference or link in here, it

probably would be useful.

MEMBER KRAPELS: David, can I ask you a question? Is there such a thing as a North American Gas Reliability? Maybe there should be.

MEMBER NEVIUS: We have worked with the Natural Gas Supply Association, and we have worked with the Interstate Natural Gas Association in the past.

One of the points that Gordon was making is -- or excuse me, I think it was Roger was making -- is the dependence of gas systems, pipelines, compressor stations, on a reliable supply of electricity is something we addressed back in the early nineties along with NGA. We had a coordination study.

And what we found is in many cases the utilities didn't know who was behind some of the meters, and they may have been compressor stations. And even though they were gas-powered compressor stations, they had electric controls.

So, when you got into a load-shedding event, the utility may inadvertently cut off load for that meter or cut off that meter, not knowing that they are actually sort of cutting off or reducing their throughput gas supply. There was a specific instance.

So, we actually developed a recommendation. The NGA Operating Committee and NERC Operating Committee adopted a resolution -- it was either 1993 or 1994 -- to address that. Unfortunately, it didn't address the intrastate gas pipeline system. I think in the cold snap there may have been some issues related to cutting off firm load that affected some intrastate gas facilities, both processing and compressor stations. So, that something, a gap that needs to be closed.

But, in any event, we are looking at that again.

CHAIR COWART: If you can provide us with a single sentence reference that we can insert here, just basically as a footnote,

that would be fine. And if that is all right with the Committee, we will make a point of adding that as a footnote.

And I am taking it one step at a time. Wanda's language is acceptable to people?

Without objection, it will be put in.

And now Gordon.

MEMBER VAN WELIE: So, I am happy for someone to come up with better words than this. I have included an additional sentence in the last bullet under 1.

So, the last bullet reads, "Periodic reassessment of the status of interdependent infrastructures to determine whether shifts in technology or policy have changed their relationship with one another."

New sentence: "Such assessment should include an evaluation of whether the retirement of existing electric generation will result in the development of additional

gas generation and thereby place greater demands on the natural gas system", or something in that vein.

Because that is, I think, the issue: as older units retire, and it could be oil, it could be gas. It could be oil or coal or even nuclear, actually, in some cases. My perception of this is we will see the gas replace that.

MEMBER HEYECK: That means we strike Point 3?

MEMBER VAN WELIE: Point 3 and just include as essentially an additional sentence under 1.

CHAIR COWART: Is that amendment, Mike? Yes? Any objection?

(No response.)

Done.

Would you please deliver your handwriting to Peggy? Thank you.

Are we ready to move adoption of this recommendation?

All right. I am seeing unanimous support. So, I don't need a motion and a second, and all that, right?

Unanimously adopted. Thank you very much.

I think Pat has a couple of words to say on this topic.

SECRETARY HOFFMAN: I guess I just want to thank you for both of these memos to the Department. And since I actually had a chance to read the draft, which gave me some time to think about some of the things that we should do in response to the memos.

And David and I have talked whether at the next Advisory Committee meeting or we set up some phone calls to, No. 1, discuss some of the tools and some of the framework document of what the Department is looking at with respect to the high-impact, low-frequency-type events, specifically GMD. Specifically, how are we developing some toolsets so we could have a wider area of

visualization of the some of the interdependencies? We are developing some tools in that area.

I would love for the Committee to see some of the things we are working on and then provide us some advice back on our strategy and our thoughts and our directions in this area, in addition to maybe getting some highlights on what NERC is doing, for the Committee to understand that.

The gas and interdependency issue, one of the things, as I was reading the draft, which I apologize I actually had an earlier version of it, was looking at getting TSA from the safety point of view, and also inviting FERC, and actually have a discussion on some of the reliability and some of the firming and impacts. And we could have that. We could have an offline discussion first and see, so we can keep things moving. So, we actually can flesh out some of the discussion before we actually do it for a full Committee meeting.

But we are going to talk about some further ideas in this area. But I did want to tell you that at least there were some thoughts starting to gel, based on the memos coming to DOE.

MEMBER HEYECK: And if I may add -- Pat, thank you for your comments -- as I said yesterday, we have about a third of our assets on the electric side that are at or near life, and we are going to have to replace them. We need to replace them in a smart way that doesn't break the bank from a consumer perspective, but replace them in a smart way for security, efficiency, and technology reasons.

CHAIR COWART: All right. Let me say thank you to the Subcommittee for this work, and to Barry, who led on this natural gas paper. And congratulations to you all.

Now we are going to be roughly on schedule because it turns out that there is no one registered for public comments today.

We now turn to the Smart Grid Subcommittee's White Paper on Electric Vehicles.

Wanda?

MEMBER REDER: Okay. I would like to thank the Subcommittee and all of those who put pen to paper and contributed comments along the way.

This actually was an effort to look at the electric vehicle implications on the grid. Through the course of this, there was an effort to work on scope. The scope was focused on near- and mid-term, which is five to fifteen years. What was excluded is vehicle back to grid.

A lot of discussion, of course, on cost allocations, implications on overloads, exceeding ratings, roaming, rates, cost allocation, security, that type of thing. So, the nature of this White Paper is to try to surface those as well as provide DOE three succinct recommendations.

At this point, good, David's at the table. David Anderson is actually with DOE in the vehicle technologies area and was invited to contribute at relatively the last minute.

So, what we would like to do, through this discussion, is make sure that we capture his comments, which are tracked on the document that is projected. I would like to turn it over to David, and you can just talk through your perspective, and from there, we will open it up.

MR. ANDERSON: Okay. Thanks, Wanda. And thanks for the opportunity to provide some comments onto the paper.

You know, the comments that I inserted into the document were, as I have told a few of you, were kind of meant as notes to myself for talking points to lead into a followup phone conversation with David. But, as those of us who work at DOE know, most of our days we don't get to work on what we plan

to work on. You are usually addressing higher-priority interrupts from various levels of the leadership. So, we didn't get to have that phone conversation. And so, I just decided to email him the document with the comments that I had put in there.

So, that is just kind of the context for the comments that I think have been distributed to you guys.

A couple of general comments, I guess, first. I have a horrible memory. So, I have to take a lot of notes whenever I do anything, and I took a lot of notes yesterday and it has been really interesting.

As a car guy, I tend to focus on the vehicle and up to the plug, and anything that happens on the grid side of the plug is often seen as a black box to folks in our office. And so, it is good to be able to think about what goes on outside the vehicle.

So, I learned a lot. I made a few notes. One thing that stuck out in my head

yesterday was I think Mike mentioned that approximately 350 billion kilowatt hours are wasted on the grid each year just in the transmission and distribution system. It takes a lot of power to move a lot of energy around. And so, I was thinking, well, 350 billion kilowatt hours, what is that?

To put in a car context, if you assume a car can travel about three miles on a kilowatt hour of energy, and that is a conservative estimate -- it is probably closer to four, but let's just say three miles per kilowatt hour -- that is about a trillion EV miles that are represented from that 350 billion kilowatt hours.

And a trillion is still kind of a number that is hard to get your head around. If you assume 15,000 miles per year that an average vehicle travels, that is about 70 million vehicles, as opposed to the 1 million plug-in vehicles that the Administration has as a goal for 2015.

Now that is about 25 percent of our vehicle fleet in the U.S., about 250 million light-duty vehicles. So, that just kind of puts it into perspective.

The impact, when you are thinking about the impact on the grid of electric vehicles, at least from an energy supply standpoint, it is much less significant than the small percentage of inefficiencies in moving power around the grid.

A couple of other notes from yesterday. There was a lot of discussion about codes and standards, standards specifically. That actually comes into the paper as well. So, I will comment on that as we go through the paper.

And I guess I will stop there as far as comments from the discussion yesterday. I can talk for a long time about vehicles, and I don't want to keep you guys here too long.

So, looking at the paper, I enjoyed reading the paper. Again, we focused

on the technology in my office more than the policy, but certainly the technology informs the policy. And so, I think the paper, it was a very interesting read and very consistent with the thoughts that we have in the Vehicle Technologies Program.

Our program is about $300-million-a-year program, about half of which is devoted to vehicle electrification. We also manage about $2.8 billion in Recovery Act projects, nearly all of which is related somehow to vehicle electrification.

And so, it is a high priority of the Administration, and it supports the goal of a million plug-in vehicles by 2015. I think I said that, but I am obligated to say that anytime I speak.

The first comment here is just on the range of 1 to 6 kilowatts that a vehicle might have, represent as a load on the grid. And that is certainly correct. You can plug a vehicle into a wall socket, basically, Level

1 charging. That is about 1.5 kilowatts. AC Level 2 charging goes up to almost 20 kilowatts, but the truth is all of the hardware that is being deployed is only capable of up to about 7.2 kilowatts.

But that doesn't even matter because the vehicles that are being deployed are really on capable right now of about 3.3 kilowatts, with a few upcoming vehicles capable of 6.6.

But there is DC fast-charging infrastructure being deployed, and that is 50 kilowatts. That is where your big, instantaneous loads can come into play, and standards are being developed to kind of define fast-charging at up to 100 kilowatts. So, these fast-charging components will certainly not be at the residential level. They will be at industrial, commercial-type facilities, but that is just to add some commentary about the range of 1 to 6 kilowatts that vehicles could represent.

And I should note that a lot of the DC fast-charging, the higher level, 50 kilowatts to 100 kilowatts, those are being implemented along in some cases with renewable generation, solar panels, or with in-ground energy storage, large batteries, to kind of mitigate some of the effects of having such a large load, mitigate those effects on the grid by using the in-ground storage rather than grid energy.

MEMBER REDER: David, are you suggesting that we add a comment on the DC fast-charging and that we will see it in this near- to mid-term?

MR. ANDERSON: Yes, I think that is a good idea. There is currently DC fast-charging infrastructure on the ground that is in use. So, we can see it today, certainly not in nearly the numbers that we will see, you know, the standard approximately 6 kilowatts charging, but it is there and will grow in the near-term, if you define near-term

as five years.

As I am not a Committee member, I don't want to provide language for the document, but I will certainly provide input.

This is another comment that probably doesn't require any additions to the document. The sentence that spans from the first page to the second, you know, talks about vehicle-to-grid technology. As you mentioned, Wanda, that is not really covered in this paper because it is not really seen as near-term. And that is consistent with our thinking in the Vehicle Technologies Program.

There are some demonstration projects going on, but in the immediate-term, vehicle to grid is kind of a farther-reaching technology, basically due to concerns of the auto OEMs, the battery being such a critical component to the powertrain, they are reluctant to warranty batteries that might be exposed to any cycles not used for moving the vehicle around.

I think I have another comment here on the bottom of page 2. Actually, it was a question. The statement was made that EVs are likely to remain significantly more expensive in terms of purchase price, but much less expensive on a cost-per-mile basis as compared to conventional motor vehicles.

So, my question was, does the cost per mile only consider operating cost or is it also the amortized capital cost of the vehicle? Right now, most of our analyses in the office basically state that it is still not cost-competitive if you wrap in the capital costs. Certainly, the operating costs are much lower for a plug-in vehicle than for a conventional vehicle. But if you wrap in the capital cost, just due to the price premium that you have to pay, mostly due to the energy storage system, the battery --

MEMBER DELGADO: What we meant here was the actual charging cost because we are trying to compare behavior.

MR. ANDERSON: Okay.

MEMBER DELGADO: Really, you pay for the car in --

MR. ANDERSON: Right. Yes, so there is a price premium for the car, but certainly, yes, the operating cost --

MEMBER DELGADO: The per-mile expense of the car, without using the capital, which you are really saying, is the question we are talking about. Being so cheap drive performance. You can double up the cost of electricity and it won't make a difference --

MR. ANDERSON: Right, right.

MEMBER DELGADO: -- to the buyer. Or you can quadruple it, and it is still trivial compared with --

MR. ANDERSON: Right.

MEMBER DELGADO: -- what would happen if you got a diesel truck.

MR. ANDERSON: Right. Exactly. And, obviously, your assumptions with regard to electricity cost and fuel cost change the

equation, electricity cost not so much. You know, fuel costs are really highly uncertain.

Going forward, we tend to believe, as battery costs come down, as fuel price becomes more volatile, the equation will shift even more favorably to plug-in vehicles.

So, I guess my comment there was to make it clear that we are talking about, you know, the real thrust is that operating expenses are much less or operating costs are much less for the plug-in vehicles.

MEMBER WEEDALL: Mike, can I jump in here? I just have to respond.

I would just say I just can't agree with that statement. Look, we have bought the Leaf, and after the tax credit, it is $25,000. So, the idea that all vehicles are more expensive -- even if you take your statement and I amortize the full capital cost, it is still much cheaper than the `97 Camry that we just gave to our son to drive on a per-mile basis.

So, I just think the whole statement of all vehicles are going to be much more expensive is a little strong for at least the personal experience I have had.

MR. ANDERSON: Right, I would agree with that statement. Which part of my statement would you disagreeing with because I think we are consistent?

MEMBER WEEDALL: I guess I am responding to the statement that is in the paper, you know, that all vehicles are more expensive.

MR. ANDERSON: Oh, okay.

MEMBER WEEDALL: Or it is going to be more expensive for a long time. Because, once again, it didn't work out that way for me.

MR. ANDERSON: That wasn't your experience with the Leaf. I appreciate that comment.

So, your Leaf there that was $32,000 before the tax credit, I mean, there

is the tax credit. So, I am not sure if the paper is considering federal and even state and local-level incentives.

But the $32,000 I would say is expensive for a vehicle of the class that the Leaf is. The $25,000, even after the tax credit, if that were a conventional vehicle, it would be a $15,000 to $17,000 vehicle. So, there is still and $8,000 to $10,000 premium there.

MEMBER REDER: We are probably getting in the weeds a little bit.

Roger?

MEMBER DUNCAN: This is too complicated. I think if you leave the statement as you originally had it, that the operating costs are certainly cheaper.

MEMBER REDER: Yes.

MEMBER DUNCAN: No one disagrees with that statement. The Leaf maybe. The Tesla, on the other hand, you know --

(Laughter.)

MEMBER REDER: So, what I am hearing is purchase price, but much less operating cost on a per-mile basis?

MR. ANDERSON: Yes, and I don't even think we need to get -- yes, we will leave it there.

MEMBER REDER: That's it? Okay. Moving on.

MR. ANDERSON: All right. Apologies.

Okay. So, on page 3, the second paragraph from the top I didn't comment on in the paper, but it gives several examples of studies that talk about the number of EVs that could be accommodated by the grid. And they all have the assumption that the vehicles are not charged during peak periods.

My comment there is that, yes, smart charging is critical in order to accommodate a large number of plug-in vehicles on the grid. Probably no need for changes in the document there.

The comment that I did add, let's see, what is this comment? The biggest impact on the electric power system in the medium-term of widespread EV deployments is likely to be at the electric distribution level. Yes, again, that is consistent with our thinking.

If purchases of hybrid electric vehicles are any indication, we are going to see plug-in electric vehicles clustered. People that have bought hybrid electric vehicles often live in the same neighborhoods. You know, your neighbor buys a Leaf, and you have to go buy a Leaf to show how green you are.

And so, even before we get a huge penetration level of plug-in vehicles, there may be some impacts at the local distribution node level, simply due to the fact that we have that clustering.

And even if we are not overloading transformers, my understanding is that transformers are designed to kind of heat up

during the day and cool off overnight. And if people are charging in off-peak times, i.e., overnight, and the transformer does not get a chance to cool off, it could shorten the life, as I understood it. Not being a grid guy, I am just reiterating anecdotes.

MEMBER REDER: There are folks who want to add comments in here. I think what we are going to do, David, is go through your comments.

MR. ANDERSON: Okay.

MEMBER REDER: And then we will take official edits for the document from the Committee.

MR. ANDERSON: Okay.

MEMBER REDER: So, go ahead.

MR. ANDERSON: Okay. I thought I saw a hand up.

The comment that I wrote on the top of page 4 that wasn't shared, and it was just kind of a thought, as I have listened to the discussion here, is, in my mind, it is OE,

the Office of Electricity. It is kind of their charge to understand what the impact on the grid is of electric vehicles, but they can't do that without our office, the Vehicle Technologies Program.

It is our job to work with the Office of Electricity to let them know what the likely load will be. Of course, modeling consumer behavior is often an exercise in frustration.

But the point being that, as in any large organization, we often work in silos, and there has to be some collaboration between Vehicle Technologies and the Office of Electricity to kind of solve the problem of what the overall impacts are going to be.

The comment there in pink on the sentence, "the notification process to inform utilities where EVs will be charged," et cetera, you know, we are doing a lot of deployment projects, EVSE.

And I apologize if I haven't

defined EVSE. EVSE is Electric Vehicle Supply Equipment, also generally know as electric vehicle charger.

Anytime an EVSE is installed, it typically involves the pulling of a permit from the local jurisdiction. In a lot of cases, in our deployment projects we are trying to install the mechanism whereby the permitting authority can notify the utility when a permit is pulled, so that the utility is aware that an EVSE is going in. That might be easier said than done, just given the number of utilities around the country and the fact that there are 44,000-some-odd municipalities issuing permits. But simply a suggestion for how that notification process could be implemented.

The second comment on page 4, I highlighted the word "residences". I think the overall assumption is that most vehicles will be charged at home or wherever the vehicle is kept overnight. And so, just

again, highlighting residences there.

There is often a pyramid shown in a lot of presentations I have seen where the bottom of the pyramid is residents, the middle of the pyramid is the workplace, and the top of the pyramid, being the smallest piece, is public charging, to sort of represent where the charging events will occur.

On page 5, yes, the information there, I just wanted to note this goes to understand how consumers are using the vehicles, how they are utilizing the charging infrastructure.

Again, through some of our Recovery Act projects, we are deploying about 20,000 EVSEs around the country, supporting about 13,000 electric vehicles or plug-in vehicles, kind of concentrated in major municipal areas.

And we are collecting data from all of this infrastructure to kind of understand how it is being used, collecting

data like max power pulled from each EVSE, what the average 15-minute rolling power is, the total power delivered. And this information is being collected and analyzed and published.

So, over the next three years, it will be the largest collection of information I think available on how consumers use their vehicles and their plug-in infrastructure. And I think that will go a long way to inform the decisions of what the impacts on the grid are going to be.

The second comment on that page, anticipating how consumer EV charge behavior might change in response to pricing signals, San Diego is one of the cities in which we are deploying vehicles and chargers. That is through a project with ECOtality North America. They are working with San Diego Gas and Electric to actually implement time-of-use pricing, and through the course of the project, analyze and understand how that time-

of-use pricing scheme affects consumer behavior when they charge their vehicles.

A comment that I didn't put on here, in the middle of the last paragraph on page 5, the sentence, "Consumer demand is only marginally impacted by motor fuel prices" is how the sentence begins. That is true in the short-term, but I think in the long-term there is a lot more price elasticity in there.

You see over time with elevated fuel prices consumers tend to purchase a lot more fuel-efficient vehicles. They can't really react in the short-term. You don't buy a new vehicle every time the price of gas changes, but in the long-term purchasing habits can be shaped.

On page 6, I think the comment that I had inserted there is related to standards, my comment being "DOE is actively engaged in the codes and standards arena through participation in standards-development organizations, in coordination with the auto

manufacturers, EVSE manufacturers, and other stakeholders."

I also mentioned the U.S. Drive Partnership, which is our partnership with the automotive manufacturers and energy companies. It has a number of technical teams in it. One particular technical team is the Grid Interaction Technical Team, which their sole focus is the support of standards development covering the interface between electric vehicles and the grid.

I guess one comment, additional comment, there is that we talked a lot about standards yesterday. In the U.S., at least as far as vehicles are concerned, standards is kind of a voluntary process. I have heard the comment that standards are great; there are so many to choose from. And it is really up to the industry to adopt the standards that they feel are appropriate.

We are certainly involved in the development of standards by offering technical

support to the standards development organization, most specifically, SAE, the Society of Automotive Engineers. Again, we are not trying to promote a specific standard, but promote the development of suitable standards by providing technical input and expertise.

MEMBER REDER: We are kind of running through some time here.

MR. ANDERSON: Okay.

MEMBER REDER: So, if we could make this --

MR. ANDERSON: Speed it up?

MEMBER REDER: Yes.

MR. ANDERSON: All right. Page 8, again, I entered the comment there regarding our deployment projects. I won't talk about that again.

A comment that I didn't have there, there is a footnote at the bottom, footnote No. 8, that says "fast-charge, also known as Level 3 charging." Traditionally,

that is known as Level 3 charging, but it is incorrectly known as Level 3 charging. SAE is further defining their nomenclature, and fast-charging is more accurately referred to as DC Level 2 charging. So, I would recommend a change there.

Level 2 charging is more specifically known as AC Level 2. Most all of the infrastructure that is going in is of the AC Level 2 variety.

DC fast-charging, formerly commonly-known as Level 3, is more specifically DC Level 2, yes.

Page 9, I guess the wrap-up comments would be the three EAC recommendations, the first recommendation states that "DOE should provide state utility regulators and stakeholders information." Again, we are collecting this information through our Recovery Act deployment projects. It is made available to the public, and over the next three years there is going to be a

lot more information coming out.

The second recommendation, "DOE should analyze the impacts that EV deployment may have on the electric power system and make recommendations." Again, I think it is the responsibility, at least within DOE, of the Vehicle Technologies Program to support the Office of Electricity in doing this. And so, we again need to kind of break down those silos.

And finally, the third point there on standards, the word "promoting", "DOE should, to the extent that it is needed, consider promoting...." I am glad the word "promoting" is there rather than "issuing" standards, because that is what we are doing. We are certainly promoting standards and promoting the development of standards, not picking winners and losers.

I have a few other minor comments, but I will leave it at that, in the interest of time.

MEMBER REDER: Okay. Very good.

With that, we will open it up for discussion. If you have specific language, now is the time.

Roger?

MEMBER DUNCAN: Well, I want to apologize first. I scheduled two calls with the Committee on this, and I had household emergencies at both times that prevented me. So, I am sorry my comments are coming in late. But I do have a few.

First of all, on the general charging discussion, almost all the charging that we are seeing now is occurring at the residences. I mean, that pyramid probably is misshapen. There is hardly any use of the public charging stations, I think, that we are seeing at all.

And furthermore, the fast-charging is really not necessary in the residential. My Chevy Volt that I have had for 10 months now, I have an old 120 in the garage that

works just fine.

I think the real bottleneck is occurring, though, because of the lack of charging for people in condos and apartments. There is a residential charging bottleneck for people who don't have garages, and they are not using the public charging stations and they don't have a garage. And some of them are trying to charge at the office. But that is the bottleneck, and it leads to other issues.

You also have in here later the idea of community energy storage being combined with public infrastructure that you mention to offset that load. I think the need may be more complicated than that.

There is probably going to emerge a need for community energy storage at the residential level, which is going to be much more difficult to site as a smoothing activity. It is easier for fleets that have their own facilities in a lot facilities.

But I think you may see this break down into residential charging, fleet charging, and public stations. And everyone is putting so much emphasis on the public charging infrastructure. And I think groups like ECOtality and such are having tremendous problems locating those stations now.

So, that is one comment. I think that is where the real bottleneck may occur.

MEMBER REDER: Do you have some specific language to propose?

MEMBER DUNCAN: I don't, but I can send you something, if we can't do it right away.

MEMBER REDER: What we would like to do today is get this over the finish line.

MEMBER DUNCAN: Is finish, get done.

MEMBER REDER: Yes. So, if you wouldn't mind, draft up something. That would be helpful.

MEMBER DUNCAN: I will try to do

that.

The second thing is just a comment. You mention in there that there may be a policy issue with people paying, being reluctant to pay for other people's electric infrastructure. I will just comment that I doubt this is going to happen because I don't think that the circuit-level distribution system upgrades are going to be enormous enough to trigger rate increases on the local level. They are going to be somewhat distributed, even though they will be mainly focused in Prius neighborhoods, as we call them.

But you don't have new substations now going into expanded neighborhoods, being resisted by the neighborhoods that are not having the new substations. I just sort of doubt personally that that would emerge as an issue.

And then, the final somewhat of an anecdotal comment is I think you we will

probably see the major test case of this next summer in the Pecan Street Project. You list the projects here.

This has come about since you started this paper, but by next summer we have one neighborhood in Austin on Pecan Street where we will have 150 to 200 homes that will have solar on them. They already have 176. GM has arranged to put 100 to 150 Volts into the same neighborhood. And the average August temperature this summer was 103 degrees in that neighborhood. So, we are going to see if the transformers smoke when all that combines next summer.

So, I don't have any other changes to the recommendations. I will see if I can work on a one-sentence change on the charging.

MEMBER REDER: Excellent. Thank you.

Sonny, go ahead.

MEMBER POPOWSKY: Yes, and let me apologize because I may have to leave early to

get back to Harrisburg for another engagement.

The two points raised by Dave that I think that we really ought to address with just a paragraph perhaps are his comments D3 and D5. I think what Dave is saying here, and I agree with him, and I don't think we captured it in the draft, is that most residential charging will be done at night overnight.

We focused in our paragraphs on page 3 on the problem of fast-charging, the half-hour charge. And I think we should include Dave's points 3 and 5, which is that most of it will occur overnight in residences. But even that could cause problems because of the cooling-down factor. So, we shouldn't think we are home-free just because most of it is occurring at night.

The other point I would add is that, if people just come home, I think they are likely to come home at five o'clock and plug in and just leave it. And five o'clock

is right at your winter peak. So, I think that is what most people are going to do.

So, even if it is not fast-charging, the overnight charging, especially if you just come home right at the winter peak, five o'clock, and plug in until the next morning, that is a problem.

The other, which I apologize, I raised in an email last week, if I could. We added a paragraph, the Subcommittee, at the very end, on page 6, and it is paragraph capital "B".

And I am sorry that Guido is not here because this was an issue we discussed.

The way this is phrased is the concern is what he called EV roaming and how to get regulators to figure out how to allocate costs among service territories. I think that would only be a problem if the customer is the car or the driver. But the customer, I think, is the charging station.

If you are at home, the bill will

go to you at your home because you have the charging station. If you are at the Westin Hotel here, the bill will go to the Westin Hotel from PEPCO or Dominion, or whoever. They will send a bill to the hotel. They don't have to worry about the fact that I drove my car from Pennsylvania to Virginia.

So, I would actually -- I hate to say it -- delete that paragraph. At least that is my view, that that is not a problem. If the customer is the entity that is providing the charging, the electric company charges the hotel. The hotel then charges me the same way they charge me for watching a movie on the cable.

So, I think that is the way it is going to work. I don't think that the way we put it in this paragraph is the way it is going to work. So, I would delete that.

MEMBER VAN WELIE: I would agree with Sonny. I think it is going to be like internet service.

MR. ANDERSON: Yes, I will echo that agreement. A lot of the business models that we are seeing form around charging, there are various service models. Without going into details, yes, that is the way --

MEMBER ROBERTS: I am involved in a project to roll out a million charging stations in hotels. They are convinced it is going to follow the same internet charge. It is going to be free, and it is going to be an attraction to stay in the hotel. The hotel owner will pick up the cost.

MEMBER HEYECK: That is my single comment, to drop this section, because I don't really believe that this section is really going to be that big a problem.

MEMBER REDER: All right. Is there any objection to dropping this paragraph?

(No response.)

Hearing none, it's gone.

MEMBER ROBERTS: Which?

MEMBER REDER: The EV roaming first paragraph, the whole section, I guess.

MEMBER ROBERTS: This whole section?

MEMBER REDER: Yes.

Rich?

CHAIR COWART: Yes, I have one comment to add a positive note to this paper. It is mostly I like the paper, and it is mostly focused on challenges.

I want to add to it something that we have talked about in the Committee, but it is just not here. That is, on the positive side, electric vehicles offer the opportunity of significant new managed load that can to help balance variable renewables on the grid.

And I have a sentence for that in the text and also in the recommendation. I would just add a sentence on top of page 3 in the background section. This could go pretty much anywhere, but I was looking for the place where it flows.

"These challenges will be inconsequential in 2011, but could become quite significant as deployment of EVs increases." Right after that, "On the positive side, EVs offer an important new opportunity to link variable renewable generation to managed charging systems and rate designs, helping to balance generation and load." Very simple.

MEMBER REDER: All right. Any objections to that addition?

MEMBER CAVANAGH: Yes, I think so. Why are we linking a generation source and a load source? We balance aggregate, generation and --

CHAIR COWART: Yes, that's what I mean.

MEMBER CAVANAGH: Okay. Can we take out the word "link"? You said "link" variable resources to this load source.

CHAIR COWART: An opportunity to -- I am thinking of a generic --

MEMBER CAVANAGH: "Assist with power system balancing"?

CHAIR COWART: Well, I want to be more specific. I want to specifically mention variable renewable generation as a challenge to the system that --

MEMBER CAVANAGH: I guess one person's positive is another person's negative.

CHAIR COWART: I understand, but there is a win/win situation here. This is actually a point which is worth consideration for the Committee's thinking about integration of renewables generally.

That is, in order to accept a high degree of penetration of variable renewable generation, we are going to need more managed load. And this is one of the major, new sources of managed load.

So, I agree that we don't need to link a particular solar farm to my car. But, as a grid management and grid planning policy,

thinking about doing these things in tandem to me makes a lot of sense.

MEMBER VAN WELIE: Could I offer a suggestion which might close the gap here? If you, in the first instance, make the point that we will need additional balancing resources, and then you can say "and electric vehicle charges" or charging could be one of the resources to provide that service.

Does that solve your issue?

MEMBER CAVANAGH: Yes, that's good.

CHAIR COWART: I thought I had satisfied you by moving away from the word "intermittent" to "variable".

(Laughter.)

But, apparently, we just have to go the next step.

Please understand that the policy objective is one that you would support.

MEMBER REDER: So, Rich, you have a sentence drafted, something along the lines,

"In recognition of needing additional balancing resources...," something or another?

CHAIR COWART: Something like that.

MEMBER REDER: All right.

CHAIR COWART: I will work on those words.

And then, the positive note, again, at the end in the recommendations, Point 3, "DOE should study the most effective methods" -- I am working off of Sonny's edits here -- "of minimizing any negative impacts." And I would say, "and maximizing the positive contributions of EV deployment".

And, Rob, that is neutral-enough for you, I think.

MR. ANDERSON: Not to belabor a point, I sort of agree with at least the sentiment of linking, if not the word. I mean, we have looked at studies to link nighttime wind generation with nighttime charging. And just the fact that a lot of the

wind generation occurs during nighttime, there are synergies with EV charging.

MEMBER REDER: Okay. Other comments? Gordon?

MEMBER VAN WELIE: I was just going to say, on that point, though, I think you could tee it up a different way, which is the likelihood is, if we have a lot of renewable generation on the system -- and I think this is playing out in Europe already -- that you have wasted all that energy. You are basically having to spill the energy. And so, the opportunity is not to do that and have it actually be stored in vehicles to be used the next day.

MEMBER DELGADO: Yes, these comments can become complicated. You know, you are going to need about three more pages in the paper.

(Laughter.)

I would suggest that there are positives to the car that have positive

impacts on load at night.

MEMBER REDER: Rich, a suggestion here. I know we are pushing on break.

I can summarize the things that I heard as comments, and during break maybe we propose language and flash it up, and then make sure that everybody is in agreement after break.

Would you be --

CHAIR COWART: If we can accomplish that, that's terrific. If not --

MEMBER REDER: And if not, we will carry it on later.

CHAIR COWART: Right.

MEMBER REDER: All right. So, what I heard, that there is language being drafted around the table along the lines of Roger said that, you know, there are implications around condos in residential. Sonny said, relative to Dave's comments, he was in agreement with proposal D3 and D5. Also, we needed some language around the

overnight charging and the implications to the lack of diversity of load on equipment. And, of course, we just went through Rich's comments in recognition of balancing resources. And then, there was a comment towards the end on recognition of the positive contributions of EV.

One other comment up here. Sorry. Brian?

MEMBER WYNNE: Yes, quite possibly, the only topic the entire year that I know something about. And I have had to really kind of narrow it down. I think there have been some really great comments.

The piece that is missing to me -- and, Dave, you kind of pointed at the silos -- is there is no discussion here of the role that automobile companies are playing in this, on the demand side of this.

And this comment kind of reminded me -- how many people are plugging in their cars right now besides Mike and I and Roger?

Okay. You know, my Volt, like Roger's Volt, when we shut it off, it gives us an option. You can charge immediately or you can defer it. Also, there is a third option. You can set the time. I need a full charge by such-and-such a time.

So, that is the default for me, is I have mine set to give me a full charge by six o'clock in the morning. I have no idea when it charges. I would literally have to sit out there all night to watch, you know, wait for it to go solid green and start charging.

Your point, Gordon, about energy being spilled. Wind energy price is going negative in Texas. So, the automobile companies have a role to play in that, is my point, in designing the technology. Because most consumers are not going to look up the third option, by the way, is deferred charging, you know, best price, something like that. It is an algorithm, basically.

And if I put it on that, I haven't loaded when the best prices are because it is Dominion, and I don't think there is a difference.

But I would have to actually do some research to figure out when is the right time for me to do that. But, at the end of the day, what I do, I have it set, default to basically just charge by a certain time in the morning.

My point simply is on the positive side of this is designing the cars in such a way, and the automobile manufacturers are really focused on this, to encourage, give the consumer an option. Make that option available to charge at night.

It also has charge immediately, and I do that when I get to the office. You know, when I pop the little door, it says, "Do you want to charge immediately?" because you are set to defer. And I hit "Yes", and I charge with a 110 at the office.

So, the role of the automobile companies in designing the cars so that there is an interface in the car that reminds the consumer, that gives the consumer the option to charge at a time that is more convenient for the grid, when there is more energy available.

I am not sure exactly how that fits in. I am sort of struggling through the document to figure out exactly where the most positive place to put that in.

But I think that is important, that we marry up all the good work that is being done by Dave and Pat Davis' group, so that we don't cause problems as we build more and more volume on the grid.

MEMBER REDER: Are you suggesting a fourth recommendation to encourage coordination with the automobile industry?

MEMBER WYNNE: Well, I think that coordination is going on right now.

MEMBER REDER: Yes.

MEMBER WYNNE: But, yes, I think that is essentially why I am almost hesitant to say it because telling DOE that they need to cooperate with the automobile industry is redundant. I mean, you know, it is essentially going on.

I just wanted to make sure that that positive element of it was carried through --

MEMBER REDER: Right.

MEMBER WYNNE: -- and that it is recognized as an opportunity.

MR. ANDERSON: I would suggest that a suitable place to add that might be in the last paragraph on page 6. There is a statement about, "It will be important for the charge meter to have standardized communication," et cetera, "display the economic impact of the charge/discharge to the consumer". And that is kind of where that price signal comes in, Section C, bottom of page 6, right in the middle of that paragraph.

Now I had written off to the side a note. Instead of displaying the economic impact of the charge decision to the consumer or just make a decision automatically. Like Brian was saying, he sets his to charge, be sure to be charged when he needs it, and there is even an option to do it based on price. So, maybe that could be expanded to kind of accommodate that note.

MEMBER REDER: Brian, do you find that an acceptable insert?

MEMBER WYNNE: Yes, absolutely. I think that is exactly the right place.

MEMBER REDER: Anything else?

(No response.)

All right, Rich, it is back to you.

I would just recommend that we get the language back to the back of the table over break, and then we will see where it lands.

CHAIR COWART: Okay. So, just

looking at the agenda here, we are scheduled for a break. And then, we could deliberate to see whether or not we can come up with language in the next 15 minutes, if we can summarize all this.

If we can't, this might be something that we could actually wordsmith and send around to the Committee and ask for an electronic vote, if we wanted to move this forward without waiting until the next meeting. So, I want to leave open that possibility because I think that may be what we end up with.

MEMBER REDER: Okay.

CHAIR COWART: And then, when we resume, we will just have kind of a quick discussion, wrap-up discussion, and a conversation about items that the Committee members would like us to have on the agenda for the 2012 work plan.

And I think that can be at this meeting a relatively short discussion. The

Subcommittee Chairs have already weighed-in on some of this.

And, David, do you have anything further?

MR. D. MEYER: Well, I would say to everyone that now is the time to put your suggestions forward about topics that come to mind to you as things that would be worthwhile to pursue. We have some ideas already that have occurred to various people, but I want to be sure that we make it very plain that the window is open and now is the time. I mean, the window is always open in a sense, but, still, it is especially timely now.

CHAIR COWART: Okay. We will try to reconvene at 3:00 and then have that discussion, that short discussion. We will probably adjourn a little bit early.

Thank you.

(Whereupon, the foregoing matter went off the record at 2:41 p.m. and went back on the record at 3:02 p.m.)

CHAIR COWART: All right, we are reconvened.

Mike?

MEMBER HEYECK: Just a process comment. The Subcommittees do a lot of work on these documents, a lot of redline changes. The problem is between the Subcommittee delivering to the full Committee there is very little time for the full Committee to consume. I just wanted to see in the future if we could lengthen that time to actually have some redline changes exchanged with the Committee, so that we could, frankly, avoid writing reports on the fly.

CHAIR COWART: So noted. It is an excellent recommendation, and it is not a good use of 20 or 25 people's time to sit here doing a lot of redlining. I absolutely agree with that.

Some of it will be deliberative and, therefore, essential to do in full Committee, but not the small change edits that

mostly we have been making.

So, a request to the Subcommittees on a forward-going basis will be to make sure that there is an opportunity for that kind of work in advance of full Committee meeting. It might be a hard discipline to impose on ourselves, but we probably should do that. It is a good recommendation.

So, in the next very few minutes, we should begin a conversation about next year's work plan. And I guess I should begin the conversation by -- everybody is not in the room at the moment -- by just pausing for a moment because Pat Hoffman needed to go to a meeting with the Secretary. She is not here to say this.

But to thank each and every member of the Committee for their work this year and their contributions to the deliberations of the Committee, to the mutual education of your colleagues and the Department. And I realize that every member of this Committee is busy,

experienced, knowledgeable. It is a terrific collection of talent, and the Department, I know, really appreciates your service. And I just wanted to make a note of that as we officially -- this is the last meeting for 2011. I just needed to say that.

As I understand it, the terms of members of the Committee vary and they come up for reappointment or renewal. That means that we are going to be and the Department is going to be in the process of considering Committee members for next year.

And I guess here I will ask each of you to make recommendations. I think Peggy is probably at this point the person to talk to. Or is it you, David?

MR. D. MEYER: Either. Peggy and I talk pretty frequently, as you can imagine.

CHAIR COWART: Okay. So, if you have suggestions to sort of balance out the interests and expertise of members of the Committee going forward, please make those

recommendations known to Peggy and David.

And I think that is it on this. I actually don't know the process by which the Department makes those decisions, but I know that they are going to be discussing the Committee makeup for the next year.

Now, in terms of the work going forward, we have had a request from the Department for the Committee and the Subcommittees to be more proactively engaged on directly-relevant policy matters. We have also replied with a request back to the Department, and I am hearing this quite clearly from people in two ways.

The first is for more direct connection to senior staffers at the Department working on particular projects. And secondly, a request that the Department anticipate decisions that are actually in front of the Department on which they want precise input from the Committee.

And so, as opposed to just talking

about interesting policy issues, we really want to apply your talents and expertise to the decisions that the Department is facing, and on which our input is most directly relevant.

And this is, I think, a request and a discipline that has to be bilateral in terms of the Committee and the Department. So, I am stating that in part because I know it should be part of our conversations going forward with Pat and her staff, and, also, to let you know that I heard that from Committee members and recognize it as an important request from the Committee itself, that we focus on issues that the Department is really grappling with and where they want our input.

MR. D. MEYER: Let me be very explicit on one particular point here. That is, as we identify promising work topics, or as you identify promising work topics, before the Subcommittee invests substantial effort in research or writing a paper, or something like

that, the next step, once you have kind of begun to get a sense of, hey, this topic is pretty important and we should give it some attention, that is the time when there needs to be active dialog with the appropriate people in the Department.

So that, before you start investing a lot of your time, you have a sense of what is the landscape here within the Department? How is the Department thinking about this? What have they done? What have they not done?

That will mean that the subsequent work that you do will be of greatest relevance and value. And making that happen, as Rich has already made clear, I mean, there is a substantial responsibility on our side to facilitate that dialog, but we want to be sure you understand we are going to expect you to be very active in that dialog. So, yes.

CHAIR COWART: All right. Now in terms of brainstorming about topics that you

believe we should be paying attention to in the coming months, maybe we can just begin by putting ideas on the table. I think the Committee leadership and David and Pat will then try to turn that into an agenda. But, at the moment, it is just we are just brainstorming.

MEMBER HEYECK: I think we talked about this. It is really the next-generation EMS system to deal with the variability, to deal with microgrids coming in and out, to deal with storage, to deal with the many things that are going to be new to the system.

I know what EPRI is doing. I don't know what the Department is doing. But we should identify gaps in overall grid control.

MEMBER REDER: And I would add to that the location of the intelligence. So, to the extent that it is layered or distribution, I would think that would be part of the scope as well.

Oh, go ahead, Gordon.

MEMBER VAN WELIE: I was just going to point out the linkage between this and some of the recommendations embedded around modeling, and so forth. So, we already have on the table the need to improve the modeling. The modeling is a very intrinsic part of the next-generation of EMS. So, I just wanted to remind you of that linkage.

MEMBER ROBERTS: We hard during the transmission planning discussions, when I asked the question about the storage, there are no models. And so, that is why they just happened by default, kind of wing it a little bit.

And so, I know some effort is going on in that arena. I know the Storage Subcommittee is going to entertain a paper and discussion in our next meeting on that subject. But I think that falls into that whole category.

CHAIR COWART: This is on

modeling?

MEMBER ROBERTS: Detailed models of storage and how you model it.

But then, also, Ralph and I just talked about I think we need to continue on the topic of microgrids. There is a lot there.

CHAIR COWART: Wanda?

MEMBER REDER: Yes, I think it is time to assess the benefits of the projects that went in through the stimulus effort and really showcase the successes. You know, there is definitely a wonder, and I think it will be an ideal opportunity in 2012 to really bring some visibility to the good work that has been done. And to the extent that there have been challenges or barriers, that might be suggestions of where we focus some policy discussion.

MR. D. MEYER: More specifically, going back to the microgrid discussion this morning, what in your view are the central

issues, questions, problems that cry out for attention? I don't know that, reviewing the benefits of the Recovery Act projects, some of those are related to microgrids; others are not. I mean, I don't know; were you talking about just the microgrid projects or the storage projects, or what?

MEMBER REDER: Actually, I was talking about all of them. There was some discussion in Bill's vision statement early on that said, you know, in 60 months those kinds of things will be highlighted. I think, actually, we have to highlight those in parallel with the projects actually going on.

Right now, the industry is craving understanding the benefits, understanding best practices, lessons learned. This goes across the projects. So, it is storage. It is the microgrids. And we have an opportunity, I think, as we find those successes, to bring visibility to them.

MS. WELSH: Just a point of

information, the ARRA projects are just now beginning to report benefits. October was the first reporting period. So, next year will be full of rich data, but we probably need about six months to give the projects time.

There is a very rigorous metrics and benefits analysis effort going on by Joe Paladino and his team, which is made up of several National Labs. So, we should look to ask for that information at our July meeting, so that they have the benefit of six to eight months' worth of metrics reported in and analyzed.

MEMBER ROBERTS: David, back to your point on microgrids, one of the areas I think has to be the economic impact on operating utilities.

MEMBER HEYECK: I am not sure if this is a topic. But given the fact that R&D dollars are scarce, we have a body of R&D dollars in EPRI. I think in T&D space they spend about $90 million a year. And there is

a body in the Department. I am wondering if we are making the best use of those dollars where there is overlap, where collaboration can occur.

CHAIR COWART: It is an interesting question. And I wonder whether this Committee could opine usefully on it. It sort of sounds like the QTR kind of question. I wonder what the Department, you know, Mr. Koonin, thinks about that, yes, about whether the coordination between DOE and EPRI and the Labs' research agendas has been thought through. I assume it has as part of QTR.

MR. D. MEYER: On that, I like the approach that Mike has laid out before. That is, let's see where the gaps are, if there are gaps.

There is an Office of Science at DOE that does some very fundamental research. I mean, they took a very strong interest in storage -- this was a couple of years ago -- because they saw that storage was potentially

just a breakthrough area. And they have a continuing interest in storage, I'm sure.

But there is also the ARPA-E office, which is separate from the Office of Science. And they have undertaken a bunch of high-risk, high-payoff R&D projects, only some of which pertain to the electricity sector, but quite a number of them pertain to the electricity sector.

And exactly how they have selected their projects, I don't have good information on the process they have gone through. But I think that the sort of gaps review that you have outlined fits very well.

And I have to caution that we -- we and you -- are probably not going to be able to pursue all of these things. We are coming up with a pretty big menu here. But that is exactly what we ought to be doing, is coming up with a good menu and then saying, now, out of this range of possibilities, what do we really want to focus on?

CHAIR COWART: Let me put two more on the table that came up in conversations with the Subcommittee Chairs yesterday.

One I think Wanda may have put on the table. That is asking us to look generally at the question of aging infrastructure and wondering, what is the pace of reinvestment or replacement that is going to be needed, just to get an idea about that. And then, to draw attention to the policies that would be called on to make sure that replacement of that infrastructure isn't locking in the technology of the past rather than the technology we will need in the future.

And if I have stated your suggestion accurately, that is a high-level policy issue that might be appropriate for this Committee to take a look at.

MEMBER REDER: Yes, you have it, right, in that, overall, the assets are aging, and Mike had some statistics earlier. I think

from an infrastructure perspective, we need to take a look at that. And then, rather than get into a rut of replacing like for like, look at where Smart Grid infrastructure can be used appropriately, weaving in benefits and understanding the different scenarios.

CHAIR COWART: Now, David, you may articulate this somewhat differently. But whenever I talk to David about transmission planning, he expresses a strong interest in having the policymakers focus on ways to improve participation in or the process of transmission planning, not the technical modeling, not the technical side of it, but the process of transmission planning in such a way that there will be greater public acceptance of the need for new assets, when that need determination has been made via a process that has a lot of public input and support.

And there may be policy recommendations to the Department or that the

Department could make to sister agencies that would assist in the location, in the siting of transmission, once a need determination has been made, something like that.

Now you can improve my statement

MR. D. MEYER: Right. Okay. Think of it this way: that is, how would things be different if there were an Executive Order from the President telling federal agencies that they will adopt a rebuttable presumption that, if a transmission expansion plan has bubbled out of a particular subregional or regional area under Order 1000, and that plan has gone through whatever reviews are appropriate, that, at any rate, the federal agencies will adopt a rebuttable presumption that the need determination has been affirmatively met on the basis of that Order 1000 process.

So, what that means is, if you are a regional forester out somewhere in the West, and a company comes to you with an application

to run a transmission line across a part of a national forest that you are responsible for, this regional forester, before he or she can make a decision about granting that permit, they have to do an Environmental Impact Statement under NEPA. But the scope of that Environmental Impact Statement is always something to be determined through scoping meetings, they are called.

And today it frequently happens that the regional forester gets drawn into the question of need. Is this facility needed? And you have to satisfy that need question before you can go on to the siting question. That is, the one question is, is it in the public interest to develop this facility? The second question is, assuming you have an affirmative answer on the question, where do you put it?

And so, the assumption here is that the existing process for determining need needs to be made more rigorous, needs to be

tightened up, made more rigorous, and more dispositive of the need question. You are still always going to have a need for a handoff kind of from the technical analysts who do the planning, and so on, to a government official, whether it is a state official or a federal official. And so, public officials are always going to determine need, but it is on the question of what.

And so, we are saying, if you had an arrangement where the federal official would give the rebuttable presumption to this technical analysis -- now that doesn't mean that the federal official is locked into accepting that at face value. But if they are going to not accept it, the burden of proof is on them to show why should this analysis not be deemed sufficient.

But to ask the benefit of this is that right now we are seeing that all-too-frequently you get litigation and relitigation and relitigation of the need issue, and in

this loop that you can't seem to get out of. And so, we are trying to find a way to take care of that.

But, once you get the need question nailed, then, hey, it is in the public interest to find a place to put this thing. If you can enable state officials or federal officials to say to themselves the need question has been settled, it is my job to find a place to put this thing, to me, there is a lot of benefit from that.

But this is an idea that is sort of percolating around with us, and we are just sort of throwing it out there to see whether it resonates.

Now let me add that what this does is to put a huge amount of weight on the Order 1000 planning process. And it may add requirements to that process that go beyond the existing wording of Order 1000; I don't know.

But it certainly means that, if we

were to go to the Forest Service now and just sort of ask them, "What do you think about this rebuttable presumption idea? How does that sound to you?", I could imagine them saying, "Well, not a bad idea, but we have to be sure that Order 1000 is going to deliver, that it is going to take into account that the plan is operating under Order 1000, or going to take into account our concerns. If we can be assured that our stuff is going to be factored in, we will be happy to take its results."

But it isn't just the federal agencies that would feel that way. I can see a lot of other constituencies saying, "Man, if Order 1000 is going to have this kind of clout, I have to take it more seriously; I have to make sure that various things are factored in."

But, to me, what's not to like about that? You know, I mean, if we are going to have Order 1000, let's make it work.

So, sorry.

Rich?

MEMBER R. MEYER: We really support the need for transmission to be built. We supported Order 890. We like the fact that Order 1000 builds on 890. Anything that moves this process, the transmission siting along, we like. And I like the idea of that kind of presumption because it helps things move along.

NRECA, along with a number of other folks, were parties to the 4th Circuit litigation that FERC lost. We were there supporting the government. We were also -- I don't remember if we were interveners or amicus in the 9th Circuit decision.

And we fully appreciate the negative momentum that occurs when such losses are suffered. Within that context, I simply raise the issue of this: the question of need is answered by looking at the facts, the evidence rather, under whatever the applicable

statute is. And therefore, material research is needed to determine whether the Secretary of Energy or any single official can deem a particular presumption to be made, such that the burden of proof is then on someone else, whether that kind of Executive Order or otherwise is sufficient to affect how the law and evidence fit together.

Please do not take my caution as a suggestion that you can't do it. I offer the suggestion because I fully appreciate, as you do, how important it is to get this moving forward and not suffer an additional loss in the courts.

CHAIR COWART: David?

MEMBER NEVIUS: I also agree, David, with what you said about -- and what Rich said, too, about -- getting the need identified. I am reminded, however, of a similar process that was followed in Alberta, and they went through the whole need determination first.

It was a two-step process. First, they did the need. Then they established that. Then they went and did the siting.

Not everybody showed up to comment during the determination of need, but they all showed up when it got to be the siting or the routing hearing. And they had to go back around again.

So, it is important to get people involved upfront in that need determination process and make sure that they are all heard there. And then, the only thing that remains, then, is to decide on the route, and that is all that is left.

They thought they had a perfect process, and it failed because they didn't encourage or cause everybody to get involved during the need determination step.

CHAIR COWART: Mike?

MEMBER HEYECK: Let me describe the PATH project. The PATH project had to go through West Virginia, Virginia, and Maryland.

It was in the NEPA process, headed by the National Park Service.

It was first designated to be needed by 2012. Then it was 2013. Then it was 2014. Then it was indeterminate. Then it was 2014 again. Then it was indeterminate.

The problem is the cycle time of any review process, regulatory or otherwise, encompasses about two or three planning cycles, to the point where you are always adjudicating the need.

And frankly, being a planner from the old days, that line is a no-brainer. Yet, it sits there with a $125 million worth of investment without anything in the ground.

I bring this example up because I made the comment about solving world hunger. And I am absolutely with you, David, on this, but how do we get to a point where we actually have a measurable impact on this process of siting?

If the NEPA process could look

back to what comes out of the planning authority, then what I would say is make sure the planning authority doesn't have a cycle time that is shorter than the process for NEPA. And that would be very helpful.

We have got to get a point where we recognize that the planning processes are deterministic. They are predicting a future. You can't get a micrometer out there to try to figure out the exact date of need.

But I like your thought. I just want to be careful that we don't get to a point of wasting a lot of energy producing a recommendation that yields very little impact. And I am saying that from, when I was here in 2008 trying to move toward taking NIETC beyond its current scope, and then NIETC went the other direction. So, siting is hard.

MR. D. MEYER: Well, there are other ways maybe to frame this concept or this idea. But, to me, doing a better job on the needs side is pretty darn important.

And so, we hit on this one way that it might be improved. There are probably others. But I am looking for ways in which we can tighten up this process, make it more rigorous, make it more dispositive of the questions, the need question.

CHAIR COWART: Mike?

MEMBER WEEDALL: So, two thoughts. One is just to follow on this line of conversation. I would just offer that one of the ways that we have had some great success in the Northwest is, again, along the non-wires. We put together a roundtable of regional leaders and some folks from outside the region.

And particularly if you have got a line that is a lightning rod for the public, we found that this is just a great way to get the public involved with those experts and to diffuse some of the criticism, for them to really see what the options are.

So, I just throw that out as far

as one tool that we put together a few years ago. Again, it has been a big hit for us.

The other thing is just to go back to the brainstorming part of this exercise and just to join the chorus and to say, you know, looking at the issues around integration with the grid, with all of the technologies that are coming, renewables, et cetera, obviously, people know what a nightmare we had in the Northwest this past spring with the wind and too much water and the fish, and balancing all of that.

We knew this was coming. We just didn't expect all the circumstances to hit at once. So, we thought it was going to come somewhere down the road.

But I think the experience there cries for -- you know, it could happen to us again this year. It certainly is going to be becoming more of a problem for other entities, too.

MR. WHITELEY: Order 1000, as I

understand it from FERC, does require people as they develop long-term transmission plans, to consider non-wires alternatives. I mean, that is built in. I am not saying there isn't a fair amount of homework to do to make that real, to make that consideration of alternatives real and thorough and solid, yes. But it is in there.

CHAIR COWART: Wanda.

MEMBER REDER: I am going to change the topic a little bit. When Bill presented the vision, when we first kicked off, there was a fair amount of discussion on socializing the idea from a region perspective and maybe getting some alignment with EPRI and CIGRE and EEI, NRECA, and others, to kind of get some consensus, if you will, from a vision perspective and then go out and have good dialog and interaction.

I wonder if we should add that to our list for 2012.

CHAIR COWART: That seemed to be

the discussion at the moment when Bill was here, that we did want to follow up on that and have some feedback from the Department to the Committee, and make it more of a dialog. So, yes, that should be on the list.

MEMBER REDER: Yes, I just want to make sure it is on the list.

CHAIR COWART: Yes, that's right.

Gordon?

MEMBER VAN WELIE: So, I was just hoping you could expand on the process whereby the Committee will decide on what it is going to work on in 2012. A little while ago, we were having this discussion about we would like to work on the things that the DOE wants us to work on.

So, we could sort of generate a long list of ideas forever here. And I just wondered when in the process we get to hear what is on the DOE's mind, so that we could look at the relative importance of these things.

MR. D. MEYER: Yes. We will. Peggy has been taking a lot of notes here. We will have a good menu of possibilities, and Pat has some ideas of her own. Bill Parks has some ideas, I expect, Hank Kenchington, and maybe some others. So, we will have some things to add to the list that is going to be collected here.

Then, this remains to be vetted with Pat and others. But my sense is it would be nice to have some kind of discussion to enable you folks to have a discussion with appropriate people around the Department. I mean, if it is an R&D strategy question, then we should get somebody from ARPA-E and the Office of Science in, and so on.

I am trying to find an efficient way to handle this other than just having you march through topic-by-topic talking with subsets of Department officials, trying to consolidate these things.

Maybe a better way would be to

bundle these topics in some way and do three or four with one subgroup of Department officials and three or four with another, or something like that. But I think that kind of exchange ought to happen, so that, in the end, we have a list that we can come back to you and say, "Please address these topics."

But that would also give us the sense that you feel that, yes, these are important topics; yes, these are things that you want to put time on; yes, these are things where you feel you have got expertise to offer, and just a good fit.

SECRETARY HOFFMAN: Gordon, one of the things that the leadership talked about yesterday was getting the senior DOE staff together with the leadership, which includes the Chair and all the Subcommittee Chairs, and having a couple of hour-long discussions. I think what these guys are wanting to do is get your input and then have that discussion, and then bring it back to the Committee.

CHAIR COWART: It is, obviously, a little bit of a Venn diagram here among three different things. What do we think are the most important things for the public good? What do we think this Committee is best suited to work on? And what are the topics where the Department has a present need and where our input would actually be relevant to a decision or a process that is underway.

And so, I think it is a little bit of a circular process at this point, until we sit down with the Department. But it is a very good question.

Mike?

MEMBER HEYECK: On the on subject, I don't want to be too negative on the siting. We just need to discuss what part of that crumb that we could actually take forward with some success. So, don't take my lashes from the PATH exercise as too negative on that.

Another topic, actually, I like the process that Peggy and Rich talked about,

that the Subcommittee Chairs meet with staff. There is a back-and-forth process, and then there is something that goes to the full Committee, I would say prior to the full Committee's meeting, and then decide on what we are going to do.

The item I would like to just add to the table is the environmental rules that are coming down the pike certainly will cause, advance some retirements of some plants in the middle of this decade.

But, starting January 1st, 2012, there is going to be an impact that warrants monitoring. And that is, when does the industry run out of credits? On July the 18th next year, do we have to shut the plant down because we are done with credits in the area?

I think it is hard to plan for that. Certainly, the RTOs are looking at that, as well as NERC. But it might not be bad to take a look at the experience, particularly next summer, and how that

projects to the point.

Because I think we are focused on the retirements, but in between there's going to be dispatch issues because of emission limits. And we are just going to have to watch that.

CHAIR COWART: Wanda?

MEMBER REDER: Yes, I have been thinking, and I don't know if this would be an appropriate topic or not, but I will put it on the table. I wonder if it would be appropriate for us to look at kind of the reliability risk factors.

So, you know, if you look at the mix of generation, there is a lot of uncertainty. What happens if there is a problem with fracking and, you know, there is a massive switch from nuclear, gas, and we certainly have the environmental impacts and the switch from coal. So, that is going on. Transmission siting is going on. Aging assets are going on and distribution.

I wonder if it is the role of this Committee to kind of step back and look at it from a very holistically perspective and say, what are the reliability risks and the various scenarios?

It's an idea and it might be too macro in order to get our hands around. But I also ask the question, if we don't do it, who will?

MEMBER VAN WELIE: I think the planning authorities have to it. I mean, if you think about the EIPC discussion, that is part of what you put into the scenario analysis. So, I am not sure this is the right group to do something like that.

MR. D. MEYER: There are two parts to that. One is just the information itself in order to be able to appropriately appreciate risks. Then, there is the consideration of that information by the appropriate bodies.

So, there might be some things the

Committee could do on the front end, leave the actual formal consideration of those things to other people.

MEMBER VAN WELIE: I guess I have struggled to see what the Committee could do. I could see the DOE having a role in this. So, if what you are thinking of here is a risk assessment which says, "We're the DOE. We've got to worry about the integrity of the electricity system for the nation," and you want to make sure that there is an adequate risk assessment being done by the people who are planning, you are going to get that information in some ways through these various plans, the interconnection-wide plans.

So, what would you want the Committee to do, is the question, that is not duplicative of something that is already happening, would be my question.

CHAIR COWART: I think that we can leave your question as maybe the last point on this point.

MS. WELSH: I wanted to just ask one thing. I did talk to Bill after the presentation and said that we got some initial feedback on the vision, but he didn't lead with an ask of this Committee.

And so much of what DOE is going to be doing that has an interest for this Committee is going to be based on that new framework and that new vision, I said, "When can you come back?" And he said he needs six months to go out and vet this.

But I would suggest that this Committee, since we are the first people to see it and hear it and have an opportunity to comment on it, that maybe one of the first things we do is provide some written comments on that initial vision, even though he wants it to evolve and he wants to come back, having had six months' worth of input. He heard you all yesterday, but it is an opportunity for dialog with him; you know, maybe get a meeting with Lauren Azar and him and help with that

evolution of that vision. Just a suggestion.

MR. D. MEYER: On that point, yes, and the mention of Lauren Azar, Lauren has a lot on her plate right now. She has been perceived, rightly, as a very capable person who can troubleshoot things. And so, a lot of people who have troubles of one kind or another come knocking on her door.

But one possible thing for her to pay attention to is a lot of Bill's presentation yesterday was sort of divided into, well, he divided it into three components. That is, technology, R&D technology change, market design, and policy.

Then, some of the remaining stuff kind of tended to clump the market design and policy stuff into something called institutional problems. We have got technology/R&D kinds of activities. We have got another subset that is focused on institutions.

So, Lauren is kind of the chief

institutional wizard for us, and she is clearly the one to talk to on those kinds of questions.

MEMBER VAN WELIE: Peggy, just on this last point, the thing that sort of really worries me a little bit is I sense the DOE sort of struggling with, on the one hand, it feels a responsibility to ensure good outcomes, whatever that is. And on the other hand, it seems to me they have very little control over those outcomes because there are so many other players out there in the industry, you know, regulators at the state and the federal level, and policymakers that actually do have their hands directly on those outcomes.

And so, I come back to what I said yesterday. I wonder if the DOE is even better served sort of abandoning the notion that the DOE can affect these outcomes directly and saying there are certain things we want to see happen, though. Whatever the outcome is,

whatever the evolutionary process brings us, to Mike Heyeck's point that we have adequate spares of critical infrastructure in place, that we solve the gas/electric interdependency, that the cybersecurity issues are dealt with, and use the DOE's weight to ensure that those elements are taking care of irrespective of what the resource mix ends up being or what technology is used in order to achieve reliability in the long run.

So, while I hear your question, I wonder how open the DOE is to even going down that path.

MR. D. MEYER: Let me put out a theme that I have heard several times from the Secretary. He is very mindful of a peculiar federal role that he sees, and it is to keep the big picture in mind, keep reminding others of the need to keep that big-picture perspective.

We recognize there are plenty of other actors out there who have their own

responsibilities, and we are not trying to interfere with their exercise of those responsibilities.

But, nonetheless, our job is to focus on the big picture and from time to time speak up about if we think the big picture or aspects thereof are not being given adequate consideration or attention. And so, I think that is a good part of what we are trying to do here.

I mean, you heard Bill say some folks have -- we are up against this situation where the old paradigm for the grid looks like it is not so helpful anymore because we are adding all of these new variables, new requirements, new design requirements. So, what is the new grid paradigm going to look like? What is the new industry paradigm going to look like? What new business models need to be embedded, and so on?

It is very hard to see through a lot of those problems. But I think it is

important to continue to think in that mode, to try to come to grips with these things, to get a sense of what do we know, what don't we know; what things are we never -- I mean, obviously, the uncertainties are so great here that we have learned there is no way we can accurately forecast, say, 20 years out.

Right now, one way that I think about that seems to me like it is useful, we have got the industry saying, well, we think we can plan out 10 years, yes, sort of, if we keep looking at it on an iterative basis.

But it is also useful to be looking out 20 years. Some of these 20-year looks could inform the planning done under Order 1000. Say, you know, when you are making those 10-year plans, give some thought to the fact that you are going to have to be prepared at the end of that 10 years to face some other problems that you might not -- I am saying that, if you are only looking in short time blocks, you can get to a situation where,

all of a sudden, you are not well-prepared for the next decade. You know, you might have done a great job for this decade, but then you are just not ready.

So, you need to be thinking about in these multiple timeframes and recognizing the need to always update your thinking periodically.

And so, I think there is a role here for the Department, and I think that we do have some R&D money to spend, and there ain't nobody else who is going to be able to do that. So, it is very important that we get that part of it right. But we need to be thinking about the institutional things as well.

MS. WELSH: And to piggyback onto that, I get phone calls weekly on what this Committee is doing by people outside this Committee. I got a call two weeks ago from a lawyer who was in litigation and wanted a copy of one of our transcripts.

So, having this Committee opine on things, by the weight that this Committee carries in and of itself is helpful. Whether it is specific or on broader national policy, people are watching you and assuming that you have the ear of the Department, and that what you opine on is listened to. So, the activity to just undertake an exercise to have this Committee make a statement on something has value and weight.

MEMBER VAN WELIE: But perhaps I can state my concern another way, which is it strikes me that one's view -- you know, capturing a vision is very much a function of the political process. And I am looking for a way to have the DOE create some stability for the industry from a policy point of view. And if the vision is sort of tied into sort of one current Administration's view on things, my fear is that, should that change, all of that gets dumped and two years later we might be talking about another set of agendas.

And so, how do we sort of pick themes that could persist from Administration to Administration and have those carry forward and have it be a stable policy signal to the industry? That is in some ways what I am searching for.

And I guess what was worrying me a little bit about the vision that I saw yesterday is you are going to have sort of half the country agree with the Chair, and you are going to have the other half of the country saying, "No way." And that strikes me as being an unstable signal for the industry. That is my concern.

CHAIR COWART: David, I think you are going to have the last word because we need to --

MEMBER NEVIUS: Oh, no pressure. No pressure.

(Laughter.)

I have been thinking about how to say this. And Gordon gave me a little bit of

a clue, I think. Rather than DOE saying, "Well, here's the vision: gas prices are going to do this or the share of gas for electric generation is going to be this, and coal is that," and so on, and then talk about R&D needs, and so on, because we don't know what it is going to be. We just don't know.

Now let me go back to a presentation I heard many, many years ago by Vikram Budhraja, when he was a System Planning Manager at Southern Cal Edison. What they did is they came up with a plan, and then they tested that plan against certain futures to see how robust it was to be able to respond and adapt to all these different futures that no one could predict.

And I wonder if there is something along those lines that would be a better way to approach this. So, rather than DOE saying, "Well, here's the vision," there is no "the vision". There's a lot of visions, and we don't know what it is going to turn out to be.

But maybe there is a way to use that approach.

MR. D. MEYER: Well, I think Bill got that message loud and clear yesterday, that putting those numbers up, especially at the front end of the presentation, is a red herring. It just throws people off on the wrong track, that we need to emphasize the uncertainty of a lot of these things much more, yes, yes.

CHAIR COWART: That is a very appropriate final statement for this meeting. Thank you very much for all the ideas and the conversation.

I suspect we are just going to have to digest it and, as David suggested, the Subcommittee Chairs are going to be needing to meet with folks in the Department to come up with a candidate list of suggested topics, which we will then share with the full Committee. I think that is how we are going to have to proceed.

Any final comments from you all,

other than my saying thank you very much to the stalwart members of the Committee still with us?

MEMBER REDER: We will, obviously, be circulating this EV for a final vote after comments are incorporated.

CHAIR COWART: That is correct. The EV paper will be circulated.

And we are adjourned.

Thank you very much.

(Whereupon, at 4:01 p.m., the foregoing matter was concluded.)

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C E R T I F I C A T E

This is to certify that the foregoing transcript

In the matter of: Electricity Advisory Committee

Before: US DOE

Date: 10-20-11

Place: Washington, DC

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate record of the proceedings.

Neal R. Gross

Court Reporter