UNITED STATES DEPARTMENT OF ENERGY

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P R O C E E D I N G S

MS. HOFFMAN: Thank you all for coming, and I especially appreciate the panelists for being here so early. I'm going to put you at hard work early this morning.

MR. MASSIELLO: Good. This is live, I see. By way of teaming up the panel this morning, I compiled some material from Pike Research. We had hoped to have them here, as well, but the schedule didn't work out. And I'll call your attention to the yellow box on the left, which is what they projected half a year ago. And look at the numbers, approximately five gigowatts of microgrid installed in the United States ahead of us. And after you hear the panelists this morning, you may conclude, as I have, that that's probably on the low end. So the message is, it's happening of its own volition because customers see it in their self- interest.

Last fall, we had a microgrid panel where Merrill Smith from DOE gave us the overview of the DOE demonstration projects, and some of those projects, UC San Diego, University of Wisconsin, presented what they were doing.

Today is the other side of the coin, the Defense Department, and private or I guess, Will, semi-private customers doing things because it makes business sense. And then the other comment to think about that's a driver here, in the developing world, microgrids are to electric power what cell phones are to telephones. India, for instance, is looking hard at this. And there are villages in India where microgrid is the preferred solution and you bypass the central structure. And how that plays out in big developing economies will be interesting to see.

So we have three panelists: Angie Beehler from Walmart, Will Agate from the Philadelphia Navy Yard, Philadelphia Industrial Development Corporation, and Jeffrey Marqusee from the Department of Defense. And with that, over to you, Will.

MR. AGATE: Thank you very much. Good morning, everyone. This is -- while Pat pointed out it's a little early in the morning, there's no harm in getting started early in the morning, in my book. And it's really great to be in front of all of you. I will start by admitting that I

decided to come down and participate as the public yesterday in listening to your group and your panel, your discussion, and to kind of get a feel for how everything was going, and therefore, I would do a much better job this morning.

Well, instead what it did was, it just totally made me nervous because I realized there was all of this incredible knowledge. And this is I think, among other things, a story about really how we are trying to cobble the pieces together. And we're trying very hard to figure out what are all the different resources, and we're learning as we go. And then this morning, no less than three people, on their own accords, said pretty much the same thing, we're learning as we're going, so that made me feel a little more reassured.

So what I'm going to do is, I'm going to, number one, try to stay very much within my 10 to 15 minutes, and that means I have to share an awful lot of information with you in that time because I really want everyone to have an understanding first and foremost of what the Navy Yard is and what kind of makes it a little bit

unique. I think the punch line that Mayor Nutter likes to tell people is that it's the southern city inside the city, so that gives you a little taste of where I'm going with this.

And then what I will do is spend most of my time talking about the fact that we realize we have this incredible opportunity, I think is the best way to think of it, around the fact that we, being a former military base, own our own electric grid, and that, therefore, gives us the ability to really think of it as an unregulated grid. And what do we do to really promote economic activity, that's what I go to work every day to do and, at the same time, to promote a way for all of us in this room hopefully to learn from our experiences.

So to start with the Navy Yard, it's a rather large property, as you can see from this graphic. It's at the south end of the city of Philadelphia, but it is actually a little bit larger than our downtown Philadelphia at 1,200 acres. Two hundred of those acres were retained by the U.S. Navy for three civilian divisions that remain in operation in the Navy Yard. So that's

another pretty interesting part of our story..

In terms of economic development, we're extremely well situated. We have incredible access to all of our labor pools. We're 10 minutes from the airport. We have two rail carriers that go into the property. This is not a case of a property that used to be industrial and now is going in a different direction. It's very much a case of a property that has a very strong industrial base in addition to some of the other things that we have been doing more recently.

So with this huge undertaking in front of the city of Philadelphia, back in the '90s is when, obviously, the BRAC process was ongoing, so we all had a chance to really think about this. As Ralph pointed out, I technically do not work for the City of Philadelphia directly. I work for the Philadelphia Industrial Development Corporation, which is kind of one of these entities there are actually 15 of which, around the country, that are really a combination of the city, so half of our board is appointed by the mayor and our Greater Philadelphia Chamber of Commerce, the other half of which the board is

appointed. So we are kind of an interesting mix.

And we have some capabilities to really think from a business perspective and marry that up with our public purpose. So one of the very first things we did was, we said with an undertaking like this, we've got to go forward with a master plan. And I admit to everyone, we got a little bit lucky. This was the beginning 2000, and that was when sustainability was a word that was not yet as widely used as is it today. But it was very important to Robert A.M. Stern that we really center our plan around sustainability. They felt that this was where we had a huge opportunity.

So we have certainly gone forward very aggressively with that in mind in all of these different ways that I've bullet pointed here, which I can elaborate during questions and answers in more detail.

But the basis idea was to create these six zones or six, I like to also refer to them as magnets, to try to get several things to happen down at the Navy Yard all at the same time. And so this diagram on the top kind of shows you how

we were thinking of it conceptually. And then the diagram on the bottom shows what the plan was in terms of what we would have to do with infrastructure..

Creating infrastructure is definitely what PIDC is very good at and what we've spent 11 or 12 years really executing. So, for example, this diagonal boulevard that you see here was just an idea a few years ago, and that has now been built out. All of the darker colored buildings, those are all new buildings, the idea around. This plan envisioned taking a place that had only about 2,000 employees and was using just about three to four million square feet of space, and in this master plan, growing it to as much as 20 million square feet of space, so a rather ambitious plan.

So taking a snapshot today of how we are doing, we're very excited to be able to report that while we started with 2,000 employees 12 years ago, we know that by the end of this year, we're going to have a total of 10,000 employees down at the Navy Yard.

We have over 120 what I refer to as

companies. I mean that in the broad sense. That includes institutions that are located down there, nonprofits, what have you, so really organizations. And as I already pointed out, we have the three Navy civilian divisions, also.

We've spent probably $120 million on this infrastructure that I was referring to. So you can see that that is also another exciting part of our project in that we can demonstrate in excess of 650 million in private dollars that have been spent at the Navy Yard. And that is definitely the name of the game from our perspective, is to really leverage those private dollars so that we're getting that private investment.

So these are the three things we do. We have this industrial division. We have a large office operation. And we have, more recently, a lot of attention on research and development, which is obviously what we're here this morning talking about.

Another thing that happened that I think many of you in the room are aware of, one of our stakeholders was already Penn State, the

University, and they decided to, in a rather ambitious manner, go after the opportunity for the energy efficiency in existing buildings hub. This happened in 2010.

Coincidentally, it was about two weeks after I arrived on the scene from my job that all of a sudden I found out that we were going to be working on this enormous project of which PIDC had a big hand in. So it resulted in the fact that the Navy Yard was established as the location for this hub.

Many of you in the room may know it as the Greater Philadelphia Innovation Cluster, which was great for trying to get the work in the first place, but we realized it really was missing the point in terms of what our purpose is, so it's been renamed the EEB Hub, and that just happened about a month ago.

But this is really a great opportunity for us in Philadelphia and for us at the Navy Yard. There are these 22 organizations that are now located at the Navy Yard and a number of other resources that they call on. And we have just concluded our first year of operation and things

are really very exciting, and I can talk about that, again, in more detail. But it is certainly a very important part of what we're doing at the Navy Yard.

So as I mentioned, we are an unregulated grid operator due to the fact that the Navy operated all of this system prior to our arriving on the scene. And it's a rather large system, but it's also a very typical kind of a system. So a lot of the infrastructure was built out, obviously, in various war times, but it dates back somewhere -- I would say about 40 percent of system still dates back to the 1930s and the '40s.

So we have, on the one hand, really a defensive thing that we're here talking about, and that is, we had to, as the City of Philadelphia, figure out how to get money invested into that system, and that's very much part of the challenge.

I talked already to you about the fact that we have a rather ambitious growth strategy as part of what we want to do, namely, to grow our community by three to four times its existing size, so that obviously has the same impact on what we

have to be doing relating to our electric infrastructure. So these are the challenges that we're really faced with.

So one of the very first things that happened, I'm glad to see Merrill in the audience here, is that when we were just getting our EEB Hub organized, and a couple of the folks that are very involved in that effort had some connections with DOE, and they suggested that we really talk about the possibility of doing a little study that would focus on the fact that the Navy is there. And Merrill had a very big hand in helping us to kind of navigate and get Sandia National Labs involved in doing so.

So this was a study that -- and this was a great way to kind of, if you will, let our appetite introduce us to some of the concepts that we really needed to get up to speed with very quickly. And I think it was a really interesting report that they were able to put together.

In essence, what it does is, it says that this is a community where there are a lot of mission critical usages and needs that we might be able to actually look at the commercial side

of what we're doing around operators like Urban Outfitters and Liberty Property Trust and figure out a way to potentially marry up those assets so that in the event of needing to do islanding of any type or any kind of supplemental demand requirements, that we would have a strategy to do that.

So it was, again, a really great report. I will have to say it was really just sort of the tip of the iceberg, but it gave us a good understanding of the types of issues that we could be thinking around to do with the Navy and our commercial users. But we realized right away that what we had to do was, we had to go forward with a real comprehensive way to think of the Navy Yard. So what we did was, and this happened last year, and this is a project that really I had to spend a lot of my personal time on, we decided to create this five point action plan around which we would go out to the market and basically solicit proposals to help us to figure all this out.

And I just want to take the time to go through these five points, because I think it's really an important way to organize our thoughts.

Obviously, we have this infrastructure that, as I admitted to, from a defensive prospective, we've got to figure out how to get the money into it. But what we realized was, we didn't want to just put infrastructure that was kind of from years ago in place, that this was a great opportunity to think about the smart grid and to think about the smart grid types of technologies.

So we identified that one of the ways that we wanted to try to do that was to encourage that a commercial firm would be involved actually in participating in this master plan, and I'll talk about that in just a moment. But the second point is what really drives us. Again, because of our economic development bent, and the fact that we realized that we really have to always justify how to do these things around commercialization and not just to go after public dollars, we felt that there would be this enormous opportunity to look at things like our tariffs and look at the way that we really just run this, I don't want to call it a profit center, but this part of our overall operations so that we can keep getting money back into the grid. So this has

really become the central part of our overall master planning effort.

And then the third point is that if we created a master plan and these economic incentives in a creative way, we believe that that would also lead to the individual stakeholders at the Navy Yard having incentive to want to go out there and do some of these distributive generation and storage projects that would become so important to the project.

And so that leads us really to this fourth point in that we want to be an experiment to a certain degree. And if there's one point that I want to leave with this whole group that is the point. We want you to know that we want to be a test bed. We want to be a place where these technologies can be implemented. And we believe very strongly in the fact that you've got to go out there and start implementing while you're also kind of in the back room sort of discovering sort of theoretically what should be done. So it's really that mix of things, so we have to put some protocols in place to do that.

And obviously all this is for the

purpose of reducing carbon. So we also, as part of this plan, will be looking at that very carefully. This is the team that won this award. We ended up receiving 16 proposals last summer that included over 52 different consultants and companies in the whole effort. So I will be the first to admit, that was part of the method in my madness, was to try to really get the word out so that enough people knew about this as it was going on.

And this is certainly a slide that all of you understand, but this is really the purpose of all of this, the green line indicating that if we do nothing and we just try to address all of the energy needs that we have as we are growing this community, we're going to need to come up with a way to take our existing demand, which is about 26 megawatts, all the way up to maybe as high as 100, and that we don't want to do that.

We want to be able to find ways to self-generate, to do storage, and that's what is really kind of being referred to in the red line. And then, of course, with the EB Hub there, we are demonstrating using the properties and using the

businesses at the Navy Yard, how through energy efficiency strategies further reduce that demand.

So this is a diagram of our Navy Yard in terms of looking at the kind of challenges that we have. We presently receive service from two different parts of the PECO system, and, of course, the two parts cannot talk to each other. So we don't have any opportunity around redundancy, for example. And both of those substations that we receive our power from really have some constraints and some congestion issues. So one of the ideas on the table is the possibility of tying in a third substation and using that as our primary way of kind of developing the smart grid around it. And I'm just sharing that very preliminarily with this group and that that's part of the plan that we're working on to figure out exactly what we're going to do going forward.

This is a diagram that I have. It took me a little while to understand it when it was first shared with us by Alstom, but I think it's a really great way for us to think about what we are trying to do in that it's not just a sequential

timeline. Obviously, at the top of the chart, you can see our timeline that we're trying to achieve.

But what it's doing is, it's pointing out that we really have three pockets of things that we need to do. We need to create this smart grid foundation. We just opened a month ago our Network Operations Center for the Navy Yard. We never had such a thing before. We worked on that with a local company called Viridity Energy. I think many of you in the room know of Viridity Energy.

And there are a variety of things that we know we have to put into place, such as a communication system. And then that will lead us to really this next phase called the Smart Distribution Phase, where we really start to turn the corner on, for example, some distributive generation and that type of thing. And then the last point of this chart is that this is the way for us to kind of think about this as a project.

One of the things that I've learned already is, this is not a project that you start and end. I know we all have a tendency of trying to do things that way. We are realizing that this

master plan that we are putting into place really doesn't have an end, it really just needs to be the foundation from which we can think about all of these technology opportunities.

So I am two slides from closing and just pointing out that these are really a list of the types of challenges and discussions that we are already really in the thick of. We hope to have this energy master plan completed by the end of the summer. I'm pretty sure that that will be the case, but, again, with the idea that that is just really the launching point for really digging into all of these different subjects as we go through this whole process over a number of years.

The last thing to point out about this plan, which is kind of interesting in that we were obviously realizing that the big challenge on our plate was to figure out what to do around our electric distribution system, but as we dug and as we introduced ourselves to new parties and new ways to think about all of this, we also realized that because of being in Pennsylvania, we should be thinking about natural gas. And so we expanded this whole effort to not just look at our electric

grid and what we could be doing to it, but to actually broaden that and to ask how can we bring natural gas opportunities to the Navy Yard in a bigger way than we are already.

And we are, in fact, in the middle of completing a major extension high pressure line with PGW so that we will be able to offer that as an opportunity at the Navy Yard.

So lastly, one of the projects that we are working on right now is called the Grid Star Project. This actually comes about from another DOE funded project that goes to Penn State. And we are their partners in helping them to figure out how to kind of put the right infrastructure in place to address this.

But it is meant, and the reason I'm using this as my last slide is to really, again, emphasize this point to all of you, and that is, we really want to be a place where we're taking theory and we're trying to put it into practice. And this project is actually underway, it will be completed by the fourth quarter of this year. We're actually building a high- efficiency modular home that will be located on the property.

We are putting in 10 EV charging stations. There's another DOE program around training the trainers with solar, that's this diagram that you see second to the bottom. And then, of course, a variety of storage opportunities.

So what we will do is, we'll take this one leg of the grid that services two of our larger office buildings and we'll be in a position where, in this NOC, we will be able to actually measure the inflows and the outflows and really start to think about what do we do about the issue of congestion and what have you.

So with all of that said, I really appreciate this time. And I did keep to my time limit and look forward to any questions that you may have later on. Thank you. (Applause)

MR. MASIELLO: Now, as before, we'll go through the presentations and then come back to questions. So, Angie, you are up.

MS. BEEHLER: Okay. I am not as technical as you guys are. So anyway, it is a pleasure to be with you here this morning. And I thank you so much for the opportunity to represent Walmart. And the good thing is, I have

a lot of pictures, and so we can go through. This is an exciting time to be talking to you because I'll talk later about a pilot that we just completed last week. And we have a lot of big renewable projects that we have just really taken off the ground recently. So I'm going to go through and just tell you a little bit about them. And I hear particularly you're interested in policy, and I have a few slides on that I'll share with you, as well.

Right now Walmart's global presence, we have over 4,400 U.S. retail units and 56 international retail units and 2.1 associates [sic] worldwide. We have three goals that we enacted back in 2005. Our former CEO, Lee Scott, set out some very ambitious goals for us, but we are making it there.

We have a goal to be supplied -- the aspirational goal to be supplied by 100 percent renewable energy. I'm going to show you some slides shortly about where we are on that and how far we've come so far.

We also have a goal, create zero waste. And we just did our sustainability report that

you'll find out on the Walmart store's website, but we have actually been able to divert 80 percent of our waste now from landfills. Our UK partners have been able to divert 100 percent of their waste. So we have a lot of creative partners working with us, a lot of the NGOs. They've taught us a lot as we came along, and incorporating it into our business.

And we also have a goal to sell products, but sustain our resources in our environment. And we're incorporating these into our stores through energy efficiency and products and things like that. The CFL light bulbs, we came a long way. And we're finding our customers want that. Our customers are desiring those things, so our goal is to serve the customer, and that's what we intend to do. These are some of the energy efficiency items we've been implementing in our store. This is some of our daylight harvesting you may hear about.

We have the skylights on our roof and we have automatically controlled dimming ballasts beneath these, with sensors in the skylights to -- on a clear, sunny day, there

should be all sunlight coming in, which is the perimeter lighting of the store.

We also can monitor these through our energy monitoring system. We have an energy monitoring system in every store across the U.S. We have, also, on a side note, coupled to where we have advanced metering that we couple with our building management system. In about 1,500 locations, we have our own advanced metering across the U.S.

And over probably 650 of those we have sub metering at, which really pays a lot of payback to us, enable to benchmark our prototypes. It enables us to benchmark energy efficiency projects. And it also helps us in DR events, where we curtail. We can tweak where we're curtailing and making sure we're providing where we need to provide.

Okay. Here's one of those policy slides. Energy efficiency, just some tips that we have found. We found it can flourish when the business sector and competitive venues, they assist customers simply for the opportunity to earn new business, which also create additional jobs in

these markets. So a lot of times they'll approach you and they'll say we can help you with your energy efficiency. They dig in and they have helped us a lot. Where regulation and legislation, they support customers retaining current and future and environmental attributes even when rebates are realized, because we pay for those rebates as rate payers and taxpayers, and we're finding that a lot of those opportunities there allow us to retain those attributes, and it helps pay down our project costs of those renewables.

So where we see those benefits flow to customers, we're really finding those benefits enable to apply it to project costs for renewable. And it works for a win-win for the project developers, as well, and it works for us to lower our price on renewable projects.

The customer's energy efficiency ROIs or cash flows are improved when no extra cost or incentives are added during rate proceedings for energy efficiency customer investment. We do realize there are some investments and incentives that are needed. It does encourage more customer investment and energy technology. But again,

there are certain avenues where incentives are needed to make that profitable.

It's good, too, that customer have free access any time to their own data and conception information. In the past year, we've noticed a struggle with data, but we believe that we can really thrive with energy efficiency when we see transparent rates and where we can see our own data, and that's the reason we've invested in a lot of our equipment there.

These are some of the clauses we have found in our contracts over the past year where customers have to waive all their environmental attributes and credits to certain projects. I've removed the names, and the clause is here to try to not give away any specifics. But here are some of the things that customers are coming up against. And we're really concerned that sometimes we really don't understand what we're waiving, and you really need to learn the fine lines to promote more.

And the negotiated language is something that's really good, that you work with your people that you contract with to make sure

that the environmental attributes, the energy attributes are flowing to those customers to allow them to reduce their costs on their investments.

Consider the customer who implements energy efficiency. We pay for the equipment, we pay for program costs on the utility bill, we pay during the rate structure. There is incentives incented to the utility, and many times these are necessary, we just need to be considerate of them with rate payer funding. The decoupling is a good thing, we need to do that, but we can also do that through rate structure. But there is associated ROE with that as the utilities risk decreases by having decoupling. The environmental credits are important to the customer, and also to always remember, whether it be a rate program or a regulatory program with the utility or on their own through taxpayers, these incentives are rate payer funded or taxpayer funded.

Renewal energy, this is what we've done. You can see our big increase from 2012 to 2013, and the renewable areas that we're growing in. You can see a lot of solar here. We're doing a

lot of organic waste for RECS with the digester projects, a lot in the Midwest there. We're doing some fuel cells now and having a lot of success with them. And in California, we fuel our fuel cells with biogas to make them renewable.

Here are some of our bigger solar energy projects. We have a ground-mounted system in Apple Valley. In Chino, California, we have a 500 KW roof-mounted system. Here is one of our newest additions, Casa Grande, and it's a carport concept, new this year for us.

This is one of our biggest projects, Buckeye, Arizona. It's 3.5 megawatts of solar. And you can see, also, the carport parking down here, the solar carport parking. These are a few our wind turbines on top of our parking lot lights. We are trying different -- our poor Roger's store, we use them as a pilot so much and we benchmark wind turbines against each other. But this is one of our California sites. And we have a few sites now where you might see those wind turbines; Wooster, Massachusetts we have some. And in California, I think Palmdale, we have some, as well.

This is a sample of our fuel cell pilot project that we have going on and what it represents there. We have 26 in California. They supply 40 to 60 percent of our site's electricity. Walmart purchases the renewable energy and it's fueled by biogas.

Wind energy, we have a big project that we purchase power from in Notrees, Texas, 15 percent of our load at 360 of our stores in Texas. We are working -- now, this is a superimposed big turbine on the back; it is actually under construction. We are putting a GE 1.5 turbine, 1 megawatt at Red Bluff, California, our distribution center there.

Here is some information on our micro wind parking lot installations, Palmdale and Wooster, as I mentioned to you. We are also doing some pilots in Pratt, Kansas; New Jersey; and Pleasantville, New Jersey, that are planned, that are coming online soon.

For renewables to flourish, we have found that there is a constant tug-of-war with environmental attributes on projects to satisfy objectives. And we think with good negotiation

and good partners, we are having success with that. But to let you know, that is out there, and, you know, we have 100 percent renewable goal, so we need to keep those RECS to be able to claim that we're renewable, and it's very important to us.

And so just FYI, there is a tug-of-war out there sometimes, but we're very pleased to participate in these negotiations. And as you can see from our success, we've had a lot of win with great partners expanding our renewables and learning as we go.

I have really seen some recent legislation which I'm glad to see that, what is the definition of generation and electricity and the classification of a generator in regulation? And I saw a recent federal bill that expanded the definition of renewables or generators that can include some of the renewable generation, the fuel cells, things like that. So I think we are coming along there.

Renewable energy projects needed to be properly valued and favored by the ISO or utility as a distributed generation solution, an alternative. This is to need a new centralization

generation plan and investment in transmission and distribution. They can provide a lot of value to a congested grid. They can provide a lot of value to eliminate peaker plant building and so there is a lot of value to rate payers there, as well. The billing and credit settlement should be reconciled with the customer on a schedule that fits with existing systems and budget schedules. What does that mean? Well, recently I found out that we're billed on TND once a year for a renewable project, and if we can do that more frequently, that will help us to do a lot more.

Feed-in tariffs, just make sure that the customer behind the renewable system, behind the meter, is allowed to use power generated for that location. We sometimes put a lot of solar in a fuel cell on or a lot of solar, a lot of wind turbines. We want to be able to use that behind the meter. We don't want to have to feed that in. We like to see that benefit at our location if that's -- we just need the choice to do that.

Feed-in tariffs need to take in consideration different types of contracts such as system purchase, power purchase agreements,

and leases versus one form fits all. So the tariff does not change the contract terms between a private entity and a vendor.

Local permitting processes, it would help us a lot if we could get that streamlined, shorter timeline, and more cost effective language to address the installation of the technology.

Our waste to energy, this is a description of our anaerobic digestion using Walmart organic waste and how that works. How do we accelerate our past to 100 percent renewable energy? We have a global sustainability summit at Walmart with all of our countries, and as we put it together, we are going to realize energy consumption. We're going to be able to do that through energy efficiency improvement. We're going to be able to increase our Walmart renewable energy projects and get some of our renewable electricity from the grid.

In our sustainability report, you should see that we increased our renewables now to 4 percent. That doesn't sound like a whole lot, but let me tell you, that's a lot of work. And

we're trying to do it where customers can save money and go along as we can and deliver a lot of value.

Adding it all up, we're producing a lot of renewable energy. We were so honored to have the privilege of being an EPA Green Partners leader. We're the second largest purchaser among U.S. retailers, the largest on site generator among retailers, second overall, and the third largest purchaser in the Fortune 500 of renewable energy, and we're so honored and privileged to have that title there.

Each project is to save the site money. We are crunching those numbers, partnering them with tax credits, whatever we need to do to make that project pencil. And we are contributing to our corporate sustainability goal to be sourced by 100 percent renewable energy. Demand response, we participate in 17 demand response programs at over 13 locations in 23 states. We thank FERC very much for order 719 and 745. As an entity or retailer that purchases and works in demand response to provide it to the grid, it is a welcome opportunity for rate payers and contributors to

DR to be really compensated comparably to generators, because we can deliver that curtailment at no emissions to the grid.

We can deliver that curtailment and really help and make a difference behind the scenes, especially with aggregation of customers. We appreciate the opportunity to be aggregated and aggregate our sites. There shouldn't be a minimum threshold per site for DR encourage customers to participate. We would like to see a consistent baseline across state and ISO borders for consistency, so when customers go and do demand response programs with some of the ISOs, that there is consistency and we won't have to guess from ISO to ISO what's our baseline here, that would be very, very welcome..

Critical needs, we can't curtail for six hours, you know, in an ISO. I think it would be really, really neat if we could focus on some short, immediate, say an hour out of that six hours. If you have one customer say that has a one megawatt load, if you can offer some variations for one customer to supply one huge amount, from one to two, instead of one to six,

a lot of customers can't participate for that long of a time with a strain on their system. Notification, make sure the notification is consistent. Meter ownership, meter ownership is important. We like to own our own meters if possible and invest in them. And most of all, it's important for price transparency in your rates. If your rates on a state level are not price transparent and sorted into the right buckets where transmission is in transmission, distribution is in distribution, energy is in energy, we don't want our energy rates muddled. If they are muddled, you cannot see the value that you are providing as you do energy efficiency. To base your project, it is very, very critical for customers to see the real price of energy.

This is a screen of one of our Novar systems, with everything in our store that we can curtail from different areas. This is one of our building management system slides. This is where a slide of our shadow meter on the opposite side of our store, with a logger, how it responds to our Walmart home office, our laptops. We can store our data in a database server. It connects

to our EMS system.

Here is where you go to sub meter with HVAC lights or refrigeration. It hooks to our building monitoring system. And it can give us graphs like this up on our laptop to see what we're doing.

For demand response, why do we do more? For payments, like to help us recoup on our technology as a result of 745. That was very encouraging to us. Renewable energy credits, white certificates, EE credits, these are good so that customers can proactively provide in the market as a function with aggregators or by themselves.

Service of curtailment, it's important for us to help the grid. These are our communities where we operate, and Walmart wants to be good partners. We want to be compensated comparable with generators. We want to install more, improve the ROI of our own leaders and other energy technology, which we can pay off in our stores.

Measurement and verification, we can do that. Remove unreasonable regulations by sharing our experiences with you. If we don't share those

experiences and barriers with you, how does it get improved? Also, we want full, frequent, and easy access to our meter information.

For demand response, we are finding success with ISO programs that best fit our business needs. We earn available environmental attributes in ISO programs. And we can also aggregate curtailment load throughout most region states with an ISO. So these are some benefits. I know ISO's are kind of looked upon in a harsh way sometimes, but we are finding very good benefits with them.

Here's the benefits of our sub metering. For microgrids, we would like to see the customer freedom to invest in our own meter. And when we can upgrade our own meters, we can do that at any time. We need the real transparent rates, more flexibility to allow proactive customers to participate and contribute within that microgrid concept..

Customer full control and choice behind the meter with competitive providers of EE products and DR programs. This is something exciting I can share with you now. Last week, we

just completed a PJM/IPKeys Pilot with our provider, Energy ICT. Redners grocery stores also participated in that. And we were able to perform a pilot test with an open ADR 2.0 standard that's coming.

We were also able to curtail upon price speed information from the ISO. They were actually measured through their programs. We contributed a lot with the curtailment, with the direct signals from the ISO. We have participated in this program with our Norristown, Pennsylvania, site, right next to PJM headquarters. And we had one-minute interval data metering at that store that I had paid off quickly in two events from putting those in several years ago from DR. And I have some press releases there I can share with a few of you. And so I think you can find the press release on that..

This is how we -- IPKeys is a pretty sharp company I had the pleasure to work with. They had the EIS system that gave the signal out to the players. It was not easy. Honestly, we didn't have our code correctly the first day, so we did the curtailment piece, but we missed the

code on the price speed. But we gave it a try again the next morning, and we verified our load, got our code right, and we were able to successfully price speed where the market price and an ISO got it to a certain level that we could want to respond with PDR in the future for that market. We were able to do that with our HVAC and curtail that load automatically when we received that signal from them on price.

This is what happened there. We verified it with telemetry also from our meters, from our partners with Energy ICT and their software. And we have graph meters where we curtailed, I think it was about 150 KW in 30 minutes or something like that.

And Walmart had to push Energy ICT with Walmart. The other participants had a poll, where they go out and poll the website. And I understand from the push, it's a little bit more advanced, but I'm sorry, technically I'm not sure. I'm sure you guys will know what that means.

But anyway, that's kind of what we're doing. Thank you so much for the opportunity to share with you today, and I appreciate you

considering Walmart. Thank you. (Applause)

DR. MARQUSEE: Well, good morning as I try to find this presentation. I'm Jeff Marqusee. I come from the Department of Defense. So let me give you a little background before I launch into sort of things that I think you're interested in understanding, our interest in microgrids and what we're doing right now. I work at the Office of the Secretary of Defense at DOD and I manage two R&D programs there. One is called the Strategic Environmental Research and Development Program, the other is the Environmental Security Technology Certification Program.

SERDP is an environmental S&T -- science and technology -- program. It's actually a partnership with the EPA and the Department of Energy. So my office has had a long term interaction with the Department of Energy. ESTCP is a demonstration program, and that's where we're doing work, again, in partnership with DOE on issues like microgrid and other energy type work.

So first, I assume many of you know about DOD's energy use, but let me make sure we're

all at the same page. The Department of Defense is probably the largest energy user in the world. These are the data from 2011. We had a significant increase in our annual energy costs. That's mostly due to the volatility of fuel prices.

Most of our energy bill is fuel, what we call operational energy. That's the energy needed to run our planes, our tanks, our ships, or the energy needed for tactical generators in Afghanistan or Iraq or other parts of the world.

What I want to talk to you about, though, is the smaller portion of the energy which we call facility energy. That's about $4 billion a year. Its price is much more stable than the fuel price. It's predominantly electricity, but a significant part is natural gas, as you would expect. And there are a few other odds and ends in there.

So most of the press around energy and renewable energy and alternative energy and things the Department of Defense has been focused on the operational side, but the facility side is actually critically important to DOD, as well. And let me help you understand why we think it's

important and what's sort of driving this interest.

First of all, $4+ billion a year even to the Department of Defense is a lot of money, and as our budget goes down, the scrutiny on expenditures like that just increases. The cost in the absence of doing something proactive is likely to go up. As our troops get redeployed to bases in the U.S. from Iraq and Afghanistan, the plug loads, the housing loads, all those just go up as prices go up.

In addition, though it's about, depending on the year, 20 to 25 percent of our annualized cost, it's really about 40 percent right now of our carbon footprint. And if you look out into the future and assume deployments come down as the President has projected, it could easily rise to significantly more than that in terms of our carbon footprint. And just to give you a sense of how important or how big the Department of Defense carbon footprint is, you know, the last time I looked, which was a few years ago in the data, but I doubt it's changed, if the Department of Defense was a nation, it would be

about the 40th largest in the world in terms of greenhouse gas footprint, so we use a lot of energy.

But one of the things that drives our interest in the facility energy beyond price is what we call mission assurance or security issues. This has gotten increasing attention since there was a Defense Science Board report a few years ago. Obviously, every time there's a grid outage in San Diego or other parts of the country where we have a big footprint, the attention just grows and grows for that.

Underlying all these interests is statutory goals, executive orders. We have a boatload of them, to put it mildly. They are generally consistent, but there's a few inconsistencies in them. And though those are important, I would argue that we would do everything we're doing in terms of energy efficiency, renewable energy, the microgrid work I'm going to talk about, even if we had no statutory goals.

The statutory goals drive sometimes the rate at which we do things, but they are not really

driving our interest or our level of investment.

Now, all this sort of numbers and reasons is just a byproduct of the size of our infrastructure. On the right side of that chart, you know, we have a breakdown of our number of real property data. We have over 300,000 buildings. I always refer to Walmart when I talk about this, because the only organization in the United States which is comparable, you know, within an order of magnitude in terms of that footprint is Walmart. I mean this is two plus billion square feet of buildings in predominantly the United States, which just leads to this $4 billion a year.

In addition to that footprint of buildings, we have a large fleet of what we call non-tactical vehicles. These are commercial vehicles, and as I'll come back to, that's a big part of managing our electricity in the future we think.

So the sort of core strategy that my boss, who's responsible for installations and environment talks about is really not very surprising, it's what you would expect. Number

one, we've got to reduce our demand like any organization. That is the near term things that we know we can do.

We are aggressively increasing our supply of energy on our basis, predominantly through renewable energy projects. And if there's questions on that, I can talk about some of the unique authorities DOD has.

We are using those two bases to increase our security through investments in microgrid. And then across all those things, there's the strategy that DOD is fundamentally a high-tech organization. That has always been our advantage in war-fighting times, and we need to use that culture and those technology resources to also change how we manage energy on our facility.

So let me give you a quick view of what our energy on our facilities is, particularly electricity. Not surprisingly, we're an enormous consumer of electricity, about 30 billion kilowatt hours annually worldwide. Military bases, and we have about 500 of them depending on how you define them, you know, the small ones may have a peak load of 10 megawatts, the larger ones

often peak out above 100 megawatts, so these are pretty big customers..

We are in pretty much every electricity market, and we have to follow the market rules. So we're in regulated, deregulated, quasi-regulated, to be regulated, was regulated, whichever way you want to lay it out, right. And for that reason, even though we're very much a top down command and control culture, in the installation world, we live very much like commercial entities in a very fragmented market, and we have to take that into consideration.

The other thing is that our installations don't often look like a typical campus in terms of their power profile. We don't operate 5 days a week, you know, 8:00 to 5:00 or 9:00 to 5:00. We operate 25-hour, 7-day a week operations. If you look at our power profiles of places in San Diego, for example, you tie a ship up, you hook it up to shore power, you take it off, you get changes in demand which are larger than most facilities peak consumption in the year in a matter of minutes. So we don't always look like a typical commercial facility.

What's happened in the last year or so is a coalition of two separate interests. One is we have extreme concerns about security of the grid and being able to continue operations. We also recognize in the changing marketplace, given how big a customer we are, we need to begin to exploit some new market opportunities. And this coalition of these two separate interests has driven us to look at smart microgrids as the potential answer for a lot of DOD's facility energy concerns.

So one thing just to warn you about, DOD does not have a formal definition of a microgrid. So I guarantee you, when you talk to different people in the Department of Defense or read news articles, you will hear numbers all over the map of how many microgrids we have, and part of that is because we don't have a uniform definition.

But all of them involve what you would expect. We have to have, you know, both loads and generation capacity and in some way an ability to island. Our interest is fundamentally we need to have energy security at these installations, but we want to do it cost effectively.

The solution for an individual installation is going to depend on what the generation assets that you can put there economically are and what the economic opportunity to deal with the marketplace depending on what utility or ISO you're in. So there isn't a single answer going forward. The other thing to make you aware of, and I thought about it when we talked to you about the Navy Yard is that, even how we manage our infrastructured installations is not uniform. So it is very common, if you go to a Navy installation like the former Philadelphia Navy Yard, the distribution system is owned by the Navy, by the Department of Defense.

If you go to most Army installations, the distribution has been privatized. It could be owned by the local utility, it could be owned by a cooperative which has been created there. So we have a very mixed set of ownership both for our distribution systems and our generation assets. Again, that just leads to the -- our view that this is not a one-size-fits-all even for an organization like the Department of Defense.

So just stepping back to my comment that, you know, you'll hear numbers about a large number of different microgrids across the Department of Defense, part of that is, we've had microgrids for decades, you know, they can be the very traditional backup generators tied to a few different buildings which have very little smarts in them, have no ability to operate in parallel to the grid, and they've been basically the old fashioned way to provide energy security. They have no economic benefit other than the economic benefit of being able to continue to operate when your grid goes down.

We also have a large number of sort of moderately smart or moderately dumb, depending on your opinion, microgrids which do operate in parallel to the grid. These are situations like down in Dahlgren, which isn't far from here, where you have generators, diesel generators hooked up to the substation. They do participate quite aggressively in emergency demand response programs, but they have very limited automation.

We have situations like in Tinker Air Force Base where, back in the mid '80s, we, in

partnership with the utility, built peaking power plants. They're operated by the utility, obviously they're running parallel to the grid, and in case of emergency, when the grid goes down, we have the ability to operate them to power parts of the installation.

That's sort of what's existed for decades. What we are very interested in doing is sort of a, you know, very much what the Department of Energy has been investing in for the last several years, is moving to a much smarter microgrid, one which allows us to integrate renewable energy, which we could have on site and, therefore, provide us energy security, perhaps integrate plug-in vehicles or other electric assets, allow us to integrate at a much shorter time scale with the grid, and allow us to have long-term energy security in case the grid goes down. I don't think this is a research project. Most of these technologies exist. But there are challenges about really extensive networking assets. We have considerable challenges to meet our cyber security concerns, I think those are all doable, but you have to prove them. The

Department of Defense isn't going to launch on a massive effort until we have proof that we can do it at the scale we're interested in.

So one of the ways we're trying to tackle the future issues is in a program that I manage under ESTCP called the Installation Energy Test Bed Program. This is a new effort that we started about 2, 3 years ago and really has gotten more aggressively pushed forward over the last year to use our existing infrastructure, those 500 facilities, those 300,000 buildings as a test bed for energy technology.

It's a concept we started to use in the environmental arena in the '90s very successfully, and we're translating it over to the energy arena. The idea is very straight forward. We're such a large consumer in terms of buildings, energy, generation, efficiency, technology that it is our own self-interest to take a little risk to test dozens of different technologies, and if one or two work out, we can replicate them at hundreds of locations.

There are very few other organizations in this country which have the type of footprint

the Department of Defense has who will benefit by being a leader in this way. We're doing this by reaching out to the private sector directly for innovation. We've got a lot of partnerships with the Department of Energy. Merrill has actually helped us quite a bit in reviewing some of these projects. And so both by leveraging past DOE investments, leveraging large corporate investments, VC investments, we think we can actually take advantage of what's been a pretty significant investment in new technology the last five years.

The current investment we think about in three large areas, and I'm not going to go through these in detail. One is, though, about how we manage the energy on the campus level across our installation, and that's where the work on microgrids, advanced demand response, storage technology comes in..

Probably the largest investment we're making is on efficiencies for our built infrastructure. We're predominantly interested in the retrofit market. We have a lot of existing buildings. And even as large as our new

construction budget is, we're not going to build our way to efficiency. It doesn't work if you do the numbers.

The third area we are investing in is on distributed generation, predominantly renewable, but not only renewable energy. And again, in each of these, we're partnering quite closely with the Department of Energy. Let me just touch briefly, though, on the first topic which related to the microgrid area, and it's an area which we really just started the last year or so. Previous to this year, we had started four demonstrations. There's some significant work going on at Twentynine Palms, a Marine Corps station in California that's led by General Electric. We have some other work by the United Technology and Lockheed Martin which is going on to Fort Bliss, one of our larger bases in Texas.

We've started six demonstrations this fiscal year, listed the companies there. There are many of the major players in this space and the bases we're going to be doing this at. So these are both smart microgrid demonstrations. These are ancillary service demonstrations.

These are how we handle plug-in vehicles.

So in this space, for us, you know, everything from sort of the virtual power plant concept to an island in microgrid is all about how do we test and assess both the technical performance and the economic performance of different architectures and technologies when you deploy them at a military base, which will have some wrinkles and some extra cost having to do with cyber security and other sort of bureaucracies of the Department of Defense so that we can make smart decisions in the next couple of years on what we're going to do across the complex.

I want to just briefly conclude to tell you about a couple of studies that are coming out which might be of interest to you. One of the issues that we were concerned with a year ago, and I know Pat Hoffman also had some concerns on this, is there was a lot of talk about all the different activities going on military installations between work that was funded by us, jointly funded with DOE, funded by individual military services. So we commissioned MIT's Lincoln Lab to do an

assessment of what's going on, to try to describe these in a rational way, a topology, and to do sort of a forced auto cost-benefit analysis. This is going to be a public report. It's about two weeks away from being released. So you're welcome to read it, hopefully by the end of this month.

There's another study that was requested from what's called the Business Executives for National Security, or BENS. This is an organization of large defense contractors who, under their own resources, do studies that they believe will help the Department of Defense. And they're completing a study which will be released this summer which looks at the sort of business case of how you might deploy microgrids, okay.

It's not obvious to us, this is something we're going to uniformly buy, this might be a privatization function, it might be a mix. There are many different models you can think about for how you would push aggressively forward to deploying microgrids across 500 installations. I mean, you know, the business case is going to vary by both what utility or ISO

you're in, it's going to vary by what the function of the installation is.

Finally, there's a third study which is underway right now. One of the issues that we felt we were really under informed on was what is the revenue side of this equation. I mentioned, you know, our installation is 100 megawatt type peak load, and we all think, okay, how could we be smarter about using that asset to generate revenues.

So we're doing three case studies analytically in three different -- very different parts of the market, PJM here, CA-ISO, and one in Southern at specific military installations to try to understand what is the revenue sources, what are the barriers for us doing that both technically, programmatically in a regulatory sense so that if we go forward for different microgrid type approaches, we know both the cost and the technical performance where we can also hopefully more accurately project the economic return, which is essentially a reduction in our cost for electricity.

I'm not going to read this. I think if

you're involved in microgrids, we see a lot of benefits in there. There are security benefits, energy benefits, and they come in a lot of different flavors. I know my boss, who's in charge of installation environment, really views this as an attempt to change how we manage the energy radically at our installations both for economic and security reasons. And, you know, it'll have some painful steps because we're a big organization, but I really do think within a few years, you'll see large scale microgrids appearing in many military installations.

If you are interested in anything I talked about very quickly, we are an unclassified, very open program, and so all the information is available. And I'm happy to answer questions later. Thanks a lot. (Applause)

MR. COWART: All right. Ralph, any concluding comments or TF by you?

MR. MASIELLO: No, Richard. Why don't we get right to the question and answer and discussion?

MR. COWART: Okay. Questions for any of the panelists? We'll start with Sonny.

MR. POPOWSKY: Thanks. I have some questions for you, Will. I'm a neighbor of yours in Philadelphia. I don't live too far from the Navy Yard, and it's just tremendous what you're doing there, I have to say, for Pennsylvania. But could you talk a little bit about your relationship with PECO? I know it seemed to me that you're still getting all your power through I guess a 34 KV interconnection there. And so you're not attempting I guess to be an islanded institution? You're still reliant -- you have tariffs I guess with PECO, or, in the long term, are you also looking at operating more independently?

MR. AGATE: Thank you. No. First of all, our intention is to remain a PECO customer indefinitely, and that when we talk about our growing energy needs, our partnership with PECO has to be a good one because most of that energy is going to be supplied by PECO.

So what we're really at the beginning stages of, when I shared that diagram of some of our thoughts about what might be a better way to go about thinking about our own internal grid, and

that, therefore, is affected by the way in which the services are coming into the property.

Those are the types of issues that we need to really work very close with PECO on to make sure that what we think is best for the Navy Yard also works well for the PECO grid outside of the Navy Yard. So very much they will continue to provide our power, and most of our power I really would have to be realistic in saying that, when we think about, you know, really aggressive strategies around achieving energy efficiency and we think about aggressive strategies around encouraging companies to put in distributive generation and what have you, you know, I think that no more than 20 percent of all of our power is going to be produced through those two means, and so we really need -- we need to make sure that we have a good way to get the rest of that power or most of our power through the PECO system. We pay PECO as a large user. We used to have a tariff that had a discount in it. I don't know too much about that tariff because it was before my time, but that went away on 1-1-2011, when the latest deregulation came into effect.

I think I answered all your questions, hopefully.

MR. POPOWSKY: That was the day the rate cuts came off, 1-1-11.

MR. AGATE: Right.

MR. COWART: Mike.

MR. HEYECK: I'm going to -- Bob Curry yesterday had a question and it relates directly to one direction I'll just make a comment on and then there's another direction which is the technical, and let me deal with the technical first. One, I think Ralph knows this very well, that as we go to more distributed generation, microgrids, and whatnot, it'll create a lot more control and monitoring issues in the grid.

And that is one of the precursors of the discussion we'll have next regarding the next generation energy management system, and so I'll reserve time in that segment. The other is, and I invite Bob to join in on this, is the grid, PECO, or whatever provider you have, is going to be your backup. So if the grid is not being used at certain periods of time, but it is used as backup, what is the financial paradigm? Are they full

service? Is there a discount? If there is a discount, then somebody else is paying for it. I mean the annual revenue requirement is what it is.

So the grid is going to be transformed. It's going to take years, but as we replace the grid in the next two or three decades, and we are going to be replacing the grid in the next two or three decades, we really have to think about the new paradigm of the grid including distributed generation and microgrids, and more importantly, how would you pay for that. And I invite Bob to add to that.

COMMISSIONER CURRY: Okay. Well, I guess I can't avoid repeating myself. The concern I see is not so much whether we do it, because I think from a pragmatic reliability standpoint, as all of you know who have heard the mantra of what state utility commissioners are responsible for, and, indeed, it extends obviously to government generally, the safe and reliable service of just and reasonable prices. What comes first is safe and reliable.

So in looking at any microgrid situation, any distributed generation situation,

my question always is, are we conferring a benefit on -- and to take it to an absurd example, in New York State, a decision was made by some of my predecessor colleagues on the commission not to count Verizon's wireless revenues in determining how the copper wire network would be paid for. Now, we all in this room carry around one, two, perhaps three BlackBerrys, wireless connections, whatever. Someone in the District of Columbia here is paying for those folks who can't afford that, aren't interested in it, et cetera. And ultimately it may be that those folks who aren't that sophisticated end up being on public assistance, and ultimately the taxpayers pay for some of that sustenance of the existing -- not assailing Verizon down here, the existing telephone utility.

I don't want to replicate that unknowingly. I want us to be thinking about now how we subsidize. In New York City, Con Ed gives a 15 percent discount to master meters. That's a pretty significant discount. Is that justified? I don't know, maybe it is, maybe it isn't.

We have the Bank of America tower on

42nd Street and 6th Avenue which houses Merrill Lynch's trading floor, which runs 24/7. They have their own CHP operation there. What's the standby cost? Has it been rationalized correctly? I'm just raising these questions.

I've been criticized by my colleagues for being a strategic thinker in a tactical job, so I'm just raising them again now because they have to be addressed as we go through the significant spend and to have the confidence of the rate payers who will ultimately bear the cost of this, that we've thought it through, that we're doing the right thing, and we're not needlessly replicating, we're intelligently replicating various aspects of the delivery system.

MR. COWART: Pat, your questions next.

MS. HOFFMAN: I'm just probably going to add to the discussion. First, I want to thank the speakers, a great set of presentations and a lot of thoughts that will come out of that. Just to reemphasize the point that Jeff was making, there is no one consistent definition of microgrids as we talk about it from the DOD perspective. If anything, there's been a range

of things that have been investigated from a seamless integration within the utility all the way to the other end of the spectrum where certain buildings and things are isolated from the grid.

And they recognize, and I thought it's fantastic, as people take a look at the MIT Lincoln Lab study, the presentation of that range of different types of activity, so I thought that was important to just emphasize again.

I think it leads into some of the discussions of the utility business models in the future. And I guess I would look, if the committee, the Advisory Committee is interested, to go back and maybe investigate some of this regulatory intubation that may have to occur and look at some of the different states and what they're doing. And if we can pull together a panel on that, I think that would be very interesting from a regulatory point of view.

The other thing that I wanted to emphasize or get thoughts on is I think it goes back to where we're heading is really taking a harder look at the optimization at the distribution level, which was something that was

talked a hair bit about yesterday, but it's really getting more sophisticated in the use of the distribution system, advancing the distribution system, but actually optimization.

Some of the thought processes of which Sandia is running, facilities and other folks, even utilities, through is really optimization of right size, you know, solar systems. Let's not just put a maximum, you know, set of solar panels out there, but figure out what is the optimal size solar system and what would you pair it with with respect to, say energy storage, demand response, natural gas, and how do you go through the optimization or evaluation.

And I found that there's some very interesting work that Sandia is doing that we might actually have the committee take a look at. I think a future effort will be how vehicle integration comes about, which could be an opportunity for the panel to -- or at least to help the committee to help advise us in that direction and look at the vehicle integration.

And then ultimately those come back to how we're looking at energy management systems

and investments in the distribution system and how we can optimize the assets there.

MR. COWART: Thank you. Merwin.

MR. BROWN: Thank you. Since I think one of our jobs here is to get a handle on where we think additional research of various activities are needed, I guess I'd like to get some clarification from your perspective. For example, Jeff, you made the comment that the, I'll call them the components, really didn't need research, but from what you said, I would hypothesize or guess or assume that there is research needed in the area of integration of these components, and so that is one area.

The other question I would ask related to that, though, are the components considered the economic costs, or is more research needed to bring the cost of components themselves down also? So I guess the question is, where do you think the gaps are in where we need to focus on, I'll call it broad technology development?

DR. MARQUSEE: So I think there are many components out there that allow us to hopefully test and implement smart microgrids. In the

component side, I would back off the statement I made a little bit, is that when you talk about storage technology, there's an area in which there's a lot of interesting work going on. There's a lot of claims for our future costs of storage, which if they turn out to be, it will be great. I'm a little skeptical of many of them when I pitch them all the time. So I think with the exception of storage technologies, we're fairly mature, except for the integration and being able to manage it most effectively in an optimized fashion. But storage is a huge lever that can change the architecture you'd want to use, and that's where the technology probably continues to deserve the level of investments it's getting.

MS. BEEHLER: I have an answer to that also. As we're installing our renewables, the incentives right now, the tax production credit, that is what has helped us on a lot of these big projects. And so I hear people saying, can incentives last forever, I don't think incentives can last forever, but I think they are doing their purpose, because as we've utilized these incentives that we paid for as taxpayers or rate

payers, we're noticing that the cost of solar is coming down.

And so the more and more that you produce or the more and more projects you install, it should be lowering that cost of the renewables for your facilities, which we have seen a decrease, and we think it's a large result of more and more being made. And I think that's the purpose of incentives, to get you over the hurdle at first, and then that's the purpose as technology increases and it becomes more affordable, then you don't need the incentives to carry on after that.

MR. AGATE: So all that I will add is just a couple of thoughts. One is that from, you know, as I admitted at the very beginning of my presentation, one of the things that we need the most of is knowledge base and really assistance with, you know, the fact. I think that we're not unlike many entities that have this opportunity around microgrid development, and yet that's not necessarily the business that we are really in.

So the question is, how do you kind of bridge that gap? What's the best way to do that?

Is that through some technical assistance through DOE, some kind of programs, or -- and is it also -- it's interesting in listening to this discussion both yesterday and so far this morning. And I don't know the answer, and I don't mean to open a can of worms, but the question of how do the utilities think about the potential of microgrid development?

From my perspective as kind of a user, it feels, to me, like it should make all the sense in the world in that I think that what we're trying to do is come up with a real organized way to kind of manage a micro community in a way that, instead of there being a million data points, there are 1,000 data points, and I would guess that that is a really beneficial thing to the outside utility, for example, PECO.

So if that's the case, maybe there is some way to kind of try to promote some way in which the utilities are working with entities like ourselves to be able to go forward with projects like that. So those are kind of my thoughts.

MR. BROWN: May I follow up on that?

MR. COWART: Please.

MR. BROWN: Thank you. First of all, panel, thank you for the answers, but I'd like to build on something you said, if I may. Being new to the committee, I don't know whether putting opinions out is an appropriate thing, but --

MR. CAVANAGH: It's an Advisory Committee.

MR. COWART: I think it's okay..

MR. BROWN: Having been in California and being heavily involved in research in the area of things like high penetrations renewable, both central and distributed, I kind of thought about this role of the microgrid, and while we see the microgrid coming about from more or less a customer-driven point of view and perhaps growing like mold on the shower curtain, I really think, when I look forward into the future and look at the struggle of being able to integrate large amounts of very small distributed generation, particularly a variable kind like photovoltaics and electric vehicles, I really think, my prediction is, we're going to find the microgrid, as you suggested, may become a necessary

component in order to keep the grid stable and running.

And the real question I think is going to be is, where is the sweet spot to which the microgrid quits growing and interfaces with the wide area grid? And that might even be a dynamic sweet spot that will vary according to the current situation on the grid and things like that, which raises a number of technical challenges and also, obviously, regulatory and institutional challenges.

But in the for what it's worth category, regardless of who owns it, et cetera, I think it will only be shown to be, if not necessary or highly desirable configuration of the grid, to look at it as a microgrid to reduce the million points of communication across the wide area, I mean points you've got to watch to the thousand as you suggested. Thank you.

MR. COWART: Right. So we're short on time, but I've got all the cards that are out in order. I think next is Clark, then Brad, Paul, and I'll let Rob have the last word.

MR. BRUNO: Thank you. I will try to

make this question short. Price, for the Navy Yard, if I am a tenant in the Navy Yard, will my retail cost of electricity be cheaper in the Navy Yard or cheaper in downtown Philadelphia? And then for Angie, to cost, do you have a target sort of time period, two years, five years with which you aim to recapture an investment in renewal, both microgrids or any other of the technologies you were talking about? Thank you.

MR. AGATE: Okay. Let me just also comment that when we think of cost, we don't only think of the operating cost. But to address the operating cost, we have to be competitive with what the prices that are being paid elsewhere, in particular, in our own Greater Philadelphia market. So in terms of actually creating our value proposition at the onset of our energy master planning, that was one of the key criteria, that we had to go forward with a sustainable business model that would allow that.

And it does allow it, we think, and I don't have this report finished yet, but that is really the critical question, is that if we're buying our power at a reduced rate because of

being such a large customer of PECO's, but we unfortunately also have to pay a big price.

In our instance, we presently have a contract with Duke Energy Generation Services, or DEGS, and they run around our Navy Yard and basically maintain all the equipment and everything, so we have to pay for that, also. But even with that add-on cost, we still have enough of a gap that we are able to get the money into our grid and still maintain a rate structure that is comparable for each of those individual smaller customers that -- what they would be paying elsewhere.

But the second thing is, and this is a really important driver in terms of why we're doing this, is that we believe that one of the big costs that we would otherwise have as the Navy Yard is just the development cost of getting all of that infrastructure into place so that we can build these new buildings and what have you for these new customers that we hope are going to show up. And so what we're trying to do is, as opposed to, in a traditional model, where all of that cost would just be automatically turned over to

whoever that developer is, we're trying to come up with a business model where we would be able to, in doing all of this, kind of bring some of those costs under the umbrella of how we're developing the microgrid itself.

MS. BEEHLER: And, of course, at Walmart, our objective is every day low cost for our customers. So we have to be very mindful of the costs we put into renewables. But, yes, we are saving money. We look at the projects because we believe that the renewables should be at or beneath the cost of brown power, and so we are looking at that.

A lot of our renewable projects, though, are purchase power agreements, and so we put it in. However, we are considering ownership on some of ours. We make large purchases from a bulk wind farm or the solar, but we always do the pencil to the paper to make sure it's coming in at or beneath the cost of brown power.

MR. COWART: Brad.

MR. ROBERTS: There's a couple of issues at work here. To Bob's point about reliable service, on average in the United States, power

quality or power availability is 99.99 percent. But that still means power can be out nine hours a year and meet that number and that's not acceptable to a growing number of organizations and business structures. Technology has allowed us over the last decade to demonstrate microgrids to the extent, with uninterruptible power systems and all, in six nines plus so how you manage those, that sector of the load is growing annually. Data centers today are about 2 percent of the power consumption. And so those numbers -- there's no end to the amount of data people want to crunch on their iPhones and everything else. So that whole market is growing, but that's going from just being uninterruptible power to total energy management as a microgrid, and so there's a lot going on..

Walmart can't live with the power being out nine hours a year. Most of your stores wouldn't find that acceptable. So there's a lot going on here. The load factor has always been an issue in this country. It's below 50 percent. So how do we get that base load actual demand and the base loads become closer and closer? I think

electric vehicles are going to help drive that. So there's a lot that's going to happen here and a lot of changes are going to take place.

MR. COWART: Paul and then Ralph. Is that all right?

MR. CENTOLELLA: Dr. Marqusee, given your interest in your smart and secure grids, I want to take advantage of your being here to ask a question that's been on my mind for a while about sort of the future control architecture of the grid, and ask in particular whether or not you see any advantages or relationships between microgrid development and cyber security, and whether or not there are research questions about how we look at cyber security that are different in a world where we have more distributed intelligence and more microgrid architecture than our current architecture based largely on centralized dispatching control?

DR. MARQUSEE: You know, I don't think I have an easy answer for that. That's a hard question. We're definitely very concerned about this as you move. I mean we had security in our electric distribution systems, our bases and

stuff, when they were stupid. They're behind a locked key, they're an analog switch, I mean that's pretty easy security.

You know, I think there are technical challenges, and there's a lot of red teaming going on between DOD and DOE on this issue to try to understand the vulnerabilities. I think we've got a big challenge, because it's not that we can start with a fresh piece of paper, we have an enormous investment in legacy infrastructure.

You know, I think everyone wants to move forward where you have much more visibility towards all your loads and generations remotely, but how do you do that securely? We are obviously concerned about being a target. But I would add to that, you know, we have a huge history of doing a lot, from business practices to military information processing, which we're all an extreme target for cyber attacks.

So there are some unique things here, but I think we don't want to over extend the unique aspect of it. There are certain things about security in the cyber world which cut across independent of what you're doing with it, and some

of them are just good business practices, you know, and sort of hasn't existed in this part of the world and has existed for decades in business software, for example, right. It's harder to implement it because of the legacy and, you know, proprietary control systems and things like that. But it is a big challenge, it's one that DOD is concerned with and is investing some resources, mostly jointly with DOE and then in combination with folks at NIST.

MS. BEEHLER: Commissioner Centolella, also on our ADR 2.0 pilot with PJM, there was also cyber security concerns enacted within that pilot to ensure that. So I'm sure IPKeys or PJM could help you with that.

MR. MASIELLO: Okay. I get the fun to wrap up. I'm going to put this out in a deliberately provocative way. If you were a market research consultant and you looked around this room and you said, this is the electric energy establishment, regulatory, utility, and so on, there's three or four very compelling data points here. Dr. Marqusee put up a slide that said fragile electric grid, okay. Here's your biggest

customer and he says you're fragile, you don't meet my reliability needs.

Angie had a slide that showed where Walmart's energy needs to come from. Renewable energy from the grid was the least component on your diagram, right. Will is talking about, as we grow the jobs, we could grow from 25 megawatts to 100, but we're not going to do that. And if Philadelphia Electric tried to charge the Navy Yard, the cost of solving the congestion problem could get another 25 or 50 megawatts of delivery, it would change the economics of do you need to be independent, right.

And the fourth data point I meant to bring up at the beginning, the State Senate in Connecticut passed legislation mandating five cities in Connecticut consider microgrids because of lack of reliability in the hurricane last year.

So, you know, I'm just saying, if we don't think of ourselves as regulators, suppliers, utilities, but we say we're the establishment, this trend is a giant wake up call, so.

MR. COWART: Nice summary. Thank you.

And thanks very much to the panel, really good information. (Applause)

MR. COWART: I'm looking for Mike. Oh. So, Mike, on the agenda, you're up.

MR. HEYECK: Not much going on at Transmission, so let's just pass that one. What I'd like to do is, there are three pages in your packet, the Transmission Subcommittee Report, if it's two pages or back to front, and there's also the Power Marketing Administration draft recommendation which Ralph Cavanagh will be covering.

My remarks are built on what the subcommittee is proposing today. And I would invite any comments or additions by the subcommittee. Mr. Chairman, we'll probably make up some time in this.

The three parts of our work plan are grid infrastructure resiliency, can that incorporate the infrastructure security presentation that Bill Bryan had, and it also incorporates the presentation that Bill Parks made at both of our meetings, this one at last. And then there's the Power Marketing

Administration. So those are the three parts.

I'm going to discuss grid infrastructure resiliency first. If you recall, we did as a committee send a letter to the assistant secretary and the secretary regarding the need to fill in the gaps, so to speak, on grid resiliency, and the major tenants of that were, as we replace the grid over the next 20 or 30 years, let's do it in a way that actually addresses security a little bit more with some standards and guidelines. Actually, guidelines is the operative word here. And EMP, electromagnetic pulse, particularly high altitude electromagnetic pulse and geomagnetic disturbances were high on the list for those.

This work plan actually takes a deeper dive into a couple of areas that I wanted to highlight. There's a lot of anecdotal evidence that the grid is old and aging, some elements being older than me, older than you, Jose, and how much of it is at or nearing life, and the element to get to this is to try to come up with what is it going to cost to replace.

Now, everyone around this table would

say that we're not going to replace things one for one, when we replace things, it's going to be in a smart way, but it's an attempt to take a look at the aging grid and determine how much it would cost to replace over the next 30 years.

Another tenet of this resiliency work plan is to follow on that letter we offered last year to determine gaps in current resiliency efforts. NERC is very active in the resiliency area, DOE is partner to that, the industry is partner to that. But NERC's efforts are largely in the geomagnetic disturbance area, and is there a way that we could cover both GMD and particularly the high altitude electromagnetic pulse with something simple as better standards or better guidelines? For example, can we work with manufacturers to develop better standards for transformers? Can we work with utilities to have better shielding and better control buildings and better control centers for the high altitude electromagnetic pulse issue?

And lastly, this is really what Bill Bryan brought up, and that is the potential deployment of mobile generating sets. And

there's two ways you can go with this: One is the development for government needs, and second, the development for private needs.

Early commentary by the committee or subcommittee yielded that we would have to have a lot of generators, and then what are you going to burn in those generators, and how long will you burn it? But we're not dismissing the need to look at that, particularly since there's going to be a dearth of black start resources on our grid, and maybe some of these mobile units can be helpful in the black start arena.

That's grid resiliency. And if you look at the plan, it says 2012, 2013. What we're looking for first out of the box in grid resiliency is really to get a sponsor for their own interest to do the survey. And we're hoping to engage the Edison Electric Institute, OR EPRI, to see if they would sponsor that effort for us.

The second page is technology. And there's really two prongs in this. One is to take a look at the gaps in some of the efforts DOE is already going such as, well, we heard about ARPA-E, Sun Shop, and other Office of Electricity

programs. And the second is the next generation BMS. And I want to address the second first.

The blackout of 2003 certainly proved many gaps that we have in the grid, but some of those gaps actually have not been fulfilled yet. I guess the Southwest United States blackout is one of those examples.

But if you take a look at, in the future, if you think about larger control areas, probably smaller market intervals, large amounts of variable things, such as supply and demand, microgrids coming on and off, electric vehicles, and so on and so on, and storage, the dynamic of the grid is going to change significantly.

The energy management systems today are built on a seconds technology, but yet we're funding a lot of technology to deal with milliseconds on the grid, and these are the phase or measurement units. We have many hundreds of phase or measurements units out there.

And I'm going to borrow a comment that Merwin made in a taxicab regarding smart meters. He said, smart meters today are like the iPhone without apps. Well, PMU's are the same, they're

the iPhone without apps. The killer apps have not been developed to deal with the phase or measurement unit data that will come in in a millisecond fashion. Certainly in the West, much is being used with phase or measurement units looking at inter area oscillations. But in most sectors of the country, these phase or measurement units are relegated to servers and data collection in the corner of some center and used for forensics after the outage. I think we can do better than that.

What I want to make a reference to and actually read, recommendation number 13 from the U.S. Canada Power System Outage Task Force Report for the August 14th blackout. Recommendation number 13 is titled DOE should expand its research programs and reliability related tools and technologies. More investment and research is needed to improve grid reliability with particular attention to improving the capabilities and tools for system monitoring and management. Research and reliability issues and reliability related technologies has a large public interest component and government support

is crucial..

DOE already leads many research projects in this area through partnerships with industry and research underway at the national laboratories and universities. The major impetus -- a major effort by DOE in this area has been the phase or measurement unit. So as we look to the future, the next generation EMS is a necessity as we integrate our energy futures.

The hurdles are we're still living with the same algorithms that were developed over 40 years ago. It really hasn't changed much. But if you go into new control centers, it looks nice. There are flat screens there, some of which display CNN, but there are a lot of flat screens there and good visualization regarding voltage and line loadings, really good visualization, but it's every few seconds, in some cases every few minutes. What we need is really more into the millisecond range.

The vendors out there, we don't believe, have the wherewithal to move this. RTOs and ISOs are probably the best sponsors of development of these. However, RTOs and ISOs also have very lean

administrative cost structures, so they're not going to be funding the hundreds of millions of dollars needed. So where do we go from here?

So the subcommittee would elect to develop a document, a vision of what grid 3.0, as EPRI calls it is, the next generation EMS, and also recommend a road map to collaborate to get there. Certainly this committee, nor should DOE, be the only people working on this. We have to develop a road map forward. This isn't something that's going to come in the next year or two, but we would hope that in 2012 we would have a recommendation for this committee.

The second -- well, the first, which I'm taking second, is trying to find gaps in technology. We've had many conversations actually at the committee level here, and we've, at the subcommittee, have talked to Bill Parks and his staff. And yesterday I had the opportunity to spend a couple hours with his staff in brainstorming, and Anjan Bose was there, as well.

One of the areas that may come up is the advent of greater use of power electronics. Certainly, power electronics have been used for

many, many years. But in the United States, its penetration is not as great as other places in the world. I'm talking about HVDC fax devices and the like.

And the big issues with the power electronics, as I stated yesterday in the committee meeting, most of the focus is on delivering a quality asset, but once it's installed, it really takes a lot of technical expertise and a lot of operations and maintenance cost to keep these things running, and none of these things last 40 years.

The paradigm in Transmission is that the average asset is somewhere in the 40+ year range, but a lot of these assets are being retired before 25 years are up and we have to deal with that. So that's one of the gaps, but the committee hasn't really homed in on that, so the main has been the next generation, BMS.

The last item in the technology sector I'd like to -- Mike Weedall has been good enough to offer his expertise in non-wires alternatives using the successes of Bonneville Power Administration, and we're going to take him up on

that to offer a whitepaper for the subcommittee's consideration this year and then for the full committee's consideration.

So those are the two items that we're proposing to work on. It's pretty comprehensive, but in 2012, we're hoping to offer, again, the age, give a survey of the age of the assets and the notion of how much it would cost to replace, a position on mobile generators, a scoping on the next generation EMS, a non-wires whitepaper, and finding the gaps in the technology efforts of DOE relating to Transmission. And I would extend it to distribution, as well.

At this point, I'd like to turn it over to Ralph Cavanagh to offer commentary on the Power and Marketing Administration work we're doing.

MR. CAVANAGH: I do that with some diffidence. I'm in a room full of people who know the PMA's very well, including at least one administrator and one senior vice president. The PMAs, as many in this room are aware, are an extraordinarily important part of the U.S. electricity system. I think most of us know them as entities established to market federal

hydropower to preference customers who are public institutions, well represented in this room, but they're also, of course, a tremendously importance force in transmission.

The Southwestern Power Administration alone operating, I was surprised to learn, almost 1,400 miles of high voltage transmission, Bonneville and WAPA obviously being much larger operators. And the hope here through the recommendation that's before you and that Paula distributed in her last transmission, is to provide a recommendation that is calculated to inject more capital into the transmission budgets and plans, in particular WAPA and the Southwestern Power Administration, using as a vehicle Section 1222 of the Energy Policy Act of 2005.

And, in effect, moving the proposed statement, which is three paragraphs long, I'm going to offer one friendly amendment that Barry Lawson would like included, which I think is perfectly appropriate, and also to acknowledge the extensive involvement in the preparation of this statement by a number of folks around this

table.

I believe it represents a consensus of the PMA constituencies and all who have an interest in upgrading the transmission system. And it is in particular enough to realize the ambition and aspirations of Section 1222, which was a way to try to open the door for the injection of private capital into, in particular, the WAPA and Southwestern systems, where there is agreement by the preference customers and the other stakeholders that this makes sense, and where the transmission upgrades and enhancements are following a plan that's been developed for the region, and also where there's a federal identification of national interest in the form of a transmission quarter designation. The proposal is for this body, and so I want to highlight that this is a recommendation of the collective, and I hope everyone is comfortable doing it, recommend that DOE encourage WAPA and Southwestern to exercise their authority under Section 1222 following consultations with customers and other stakeholders.

The impetus for the recommendation is

that although this authority was created in 2005, it hasn't been exercised yet. Our hope is that it will be in cooperation with all of the stakeholders that matter. And the friendly amendment that I would like to move, at Barry's request, is that when we call out consultation with customers and other stakeholders, we make clear that we're talking about preference customers and other stakeholders since the preference customers are the core constituencies of the PMA's.

I'm comfortable with that. I hope everyone is. And I recommend that we issue the statement together through whatever formal means the Chairman deems appropriate.

MR. COWART: Okay, thank you. We've got two things in front of us and I'd like to take them up separately. We have the work plan proposal, and then we have this proposed recommendation on the PMAs. So let's take up the work plan first. And I'll ask for comments on it, and this will lead to a motion if it's appropriate to accept the work plan and encourage the subcommittee to go off and do great things. So first, any comments from

others about the presentation and the recommendations of the subcommittee and the work plan?

Billy, do you want to comment on this one?

MR. BALL: Yeah. Actually I'd like to comment on both, but I'll do this one first. Being new, I'm very good with the two items on the work plan, especially excited about the EMS work. As somebody who is, you know, 80 percent through with installing a totally new EMS system, I'm excited about looking at the next one.

You know, I would say on the resiliency side, as a major transmission owner, and I know this is not the intention, but we really don't need another report that highlights the age of assets and just gives opportunity for folks to, you know, throw their hands up and run around and say the world is falling apart, because it's, you know, as you know, Mike, old doesn't necessarily mean needs to be replaced.

But I do think it's a very good work and will be very helpful to all of us and I think it's a great thing. I just think we have to be careful

how we write the document so that it doesn't become another opportunity for 1,000 sound bytes and mass confusion and miss the whole point of the document. I've just seen that happen over and over again. The headline becomes, "The Grid is Going to Fall Apart," and I don't think that's what we're, you know, after here.

MR. COWART: All right. Thank you. Wanda.

MS. REDER: Yeah. I support the whitepaper and especially applaud the EMS piece. One of the things that I'd like to have some future dialogue on is just how this might be bound in terms of the distribution part and the evolving, you know, solutions that are coming on the distribution side.

I think particularly as it's coming out of the transmission area, you know, it could end up being, you know, more transmission focused, and I think as we look down the future, we're likely to have more and more solutions coming on from a distributed perspective. So we need to keep that in mind as we think about this goal.

MR. COWART: Brad.

MR. ROBERTS: One quick question to Mike. How does this relate to the transmission study that we issued, what, three years ago? Is this kind of like following on what we're trying to do on the storage side, is make sure that we pick up where that report left off and then update from there and add new and different stuff? So I just wanted to make sure that the two are going to relate somehow.

MR. HEYECK: Yeah, I think what we did in 2008 was more about establishing that world hunger is out there and we're going to solve it. What we're trying to actually do is, reduce the scope to something that doesn't grab hold of the third rail. For example, to be pointed, we wanted to focus on things that DOE can focus on rather than the general policy initiatives that are in the purview of NERC or FERC or someone else. So if I had to say anything from years ago, we're trying to narrow it to what DOE can do.

MR. COWART: Clair.

MR. MOELLER: Yeah, so I like the work plan so much, I'm going to join that subcommittee. One of the things that I'd like to --

MR. HEYECK: I'll offer you $20.

MR. MOELLER: I only got 25 cents out of the storage guy, so I'm liking the way this is going. I am up for bid to anybody else.

One of the things I'd like to reinforce in the -- both aging, a lot of the trouble planners have isn't in constructing the plan, it's in constructing the business case. So let's be sure to focus on the financial parts of that so that we can give folks tools to actually convince the State Commission that the investment is a good idea.

The second thing is, as we contemplate the EMS questions, let's think about predictive tools. Milliseconds. If all we do is look faster, we'll know we're in trouble quicker, that's not the same as staying out of trouble. So with those two caveats, I think it's a really good plan.

MR. COWART: I'm sorry. Oh, Barry.

MR. LAWSON: Thank you. Just a couple quick comments. On the resiliency side, I hope that when we do develop whitepaper, that we have some recognition regarding the high altitude electro magnetic pulse issue, that there is -- we

do depend on the federal government to help us defend against that from occurring in the first place. That's not something that the industry -- the private sector yet, as far as I'm aware, has the capability of doing. But I do hope we differentiate with that proviso.

On the technology side, on the -- let's see, the second bullet, we say, you know, until it becomes attractive for the private sector to deploy these technologies, maybe we can be a little more clear and just say until it becomes cost effective or something along those lines. I think that's what we might mean there.

And also, since we are talking apparently about transmission and distribution, as you mentioned, I think we might want to recognize that it might become cost effective for different types and sizes of entities at different times, so I think we need some recognition in that bullet of that issue. Thank you.

MR. COWART: Merwin.

MR. BROWN: Thank you. I don't know whether this is a fair question to ask since I'm

not on the subcommittee and haven't been on this committee except for a few hours. I notice that on resiliency, you focused on things like EMP and geomagnetic disturbances. And I realize there are consequences and don't see them as particularly likely events that have wide spread, but I can be corrected on that. But I guess one of the things I kind of see missing, and maybe you looked at it and rejected it, would be more work on hardening type things, such as fall current controllers. That's the best one that comes to mind. Perhaps better protection against earthquakes and fires, and maybe even wind, I don't know, protection against wind. Anyway, did you look at that kind of thing, looking at a hardening technology development program?

MR. HEYECK: Yeah, actually let me point you to the third paragraph, where -- I'm sorry, not the third paragraph, where we've dealt with hurricanes and wind, in addition to high altitude electromagnetic pulse and geomagnetic disturbances. And the issue is whether we should, you know, develop a hardened -- if we have a metropolitan area and there are three lines going

into it, why do all three lines have to be the same? Let's have one line be different.

And I think I related to this committee an example, which we had a severe ice storm in Western Oklahoma, and we were putting the poles back up again, and our chief operating officer asked, are you putting them back up the same way? And actually yes, because of speed. But then we went back and we guided and strengthened about every few poles so that we didn't have cascades. So it's more than just the high impact, low frequency events. But I must say, the industry has been very resilient with respect to addressing hurricanes and tornadoes. Yes, they're bad examples, but we forget some of the good examples, which is Center Point Energy, when a hurricane came through and just devastated their area, they were back in a very short period of time. And also Southern Company with tornadoes a year or two ago. So, yes, Merwin.

I'd like to just address a couple of the comments that some of them made. Actually the aging asset issue, that is the target, to come up with -- not just to say that the assets are aging

and look how ugly they look. But some of the things that we are doing, and I'll mention some personal examples, there is reason why we put aluminum siding on our house: Because it's more maintenance free.

So as we replace assets and we replace them with assets that are less maintenance, perhaps they could be lower cost to the customer. If we replace assets with more efficient assets, perhaps they could be more efficient for the customer. And those are the types of things which you would yield. But we're not going to join the society that the sky is falling on that one, certainly.

Distribution site changes, I think the next generation EMS is going to deal with -- has to deal with the changes that are going on at the distribution level. That's where a lot of the volatility, as I call it, is going to occur, and challenges. Now, storage can mitigate those, we're definitely going to do that. On the next generation EMS barrier comments regarding size, I think this is not going to be size dependent, certainly small, big. We're all going to have the

same issues, the extent is to scale.

I'm not sure that this is going to be a very costly thing compared to building transmission and distribution in the United States. I think something on the order of hundreds of millions rather than hundreds of billions is probably going to be the end game with EMS in today's dollars. Thank you all for your comments on that.

MR. COWART: We have one more comment from Anjan, and then I'd like us to move to a motion and a vote.

MR. BOSE: Just to clarify from the DOE side as to what can DOE do in terms of the R&D space, I think the next generation EMS is very much on our radar screen. But we have actually looked at it a little more broadly like Wanda said. I mean it not only includes distribution, but if you think of that whole vendor area, they have actually developed many, many different systems that don't talk to each other, but are very much related. The Solution Management System is one, the Energy Management System is one, the Market System is one, the Outage Management System. And

I have now seen a paper that refers to this whole mishmash of systems as an XMS system, and none of them talk to each other, including the fact that whatever we have installed so far on the PMU System, to handle the PMU System, doesn't talk to the basic transmission system.

So I know this came out of the Transmission Subcommittee, but it actually encompasses the whole system itself, including the customer side, the microgrids that demand responses. So I would like -- that's at least our view of how the research part of it should be investigated. Thank you.

MR. COWART: All right, thank you.

MR. HEYECK: Anjan, our July -- Paula is here. Our July Transmission Subcommittee call, we would like to make that with the Grid Technology Team to make sure that we're not doing what you're already doing.

MR. COWART: All right. I think we just need to move to a decision to approve or amend the work plan. So is there a motion for approval?

MS. REDER: Move to approve.

MR. COWART: Is there a second?

COMMISSIONER CURRY: Second.

MR. COWART: Thank you. Any further discussion? All right then. All in favor, say aye.

GROUP: Aye.

MR. COWART: Any opposed? All right. Work plan is approved. Thank you.

Now, on the PMA question, do you want to comment?

MS. HOFFMAN: I guess I just want to ask the Transmission Subcommittee on the PMA, have we had some meetings with SWPA and WAPA on the 1222 process, and have any discussions occurred in that area? Because I have to admit, I apologize that I'm a little bit out of the loop on that one.

MR. CAVANAGH: The proposal was vetted widely through the public power community, but we haven't talked specifically to Southwestern and WAPA management. I am confident that if there were concerns, they'd have come back to us, but that's certainly an appropriate next step.

COMMISSIONER CURRY: With that, I move. Did I do the right thing?

MR. COWART: I guess the question

is -- yeah, a motion is in order, that's for sure.

COMMISSIONER CURRY: I move the acceptance of this draft submission?

MR. CAVANAGH: As modified, I hope by my suggested friendly amendment.

MR. COWART: One amendment, which I have. Thank you. Any second? Sonny? Question? Well, let's have a second or table it first.

MS. REDER: Second.

MR. COWART: All right, it's seconded. Discussion. Sonny.

MR. POPOWSKY: Yeah, I just have a question for you, Barry. I guess I don't know much about how SWPA and WAPA work, but when you limit the consultation to preference customers, who are you -- which customers are you excluding?

MR. CAVANAGH: Oh, Sonny, that's not the -- it says preference customers and other stakeholders. My assumption is, we are limiting it to -- we're limiting it at all, we're just calling out preference customers as the particular constituency that is of statutory merit in the PMA's operations. But there is no proposal here to limit consultation or exclude

anyone.

MR. POPOWSKY: Okay.

MR. COWART: Any other comments or questions?

MR. BALL: Again, pardon I guess my newness here. I'm struggling with what we're actually asking DOE to do, because before I came to this meeting, I read a letter I think that the secretary has already written to these folks doing this very thing. Also, I noticed in the news this morning that the secretary got a letter from a significant number of legislators or senators, however you want to call the folks, Congress folks, in response to the letter he just wrote, I think highlighting maybe some of the amendments that were made to this.

So I'm kind of thinking unless there's something specific we're asking DOE to do, we seem to be kind of a day later, because a letter from the secretary seems like a pretty good bit of encouragement. So I'm wondering what we're actually doing.

MR. CAVANAGH: Well, what we are actually doing is calling out Section 1222 and the

finance authority in it and encouraging the two -- encouraging, through the secretary, the two PMAs to use that, which they have not yet done. So this is a specific item that is not, as far as I know, highlighted in the secretary's letter, which we hope has consensus among this group and which will provide a basis less contentious than the one to which you are referring, to try to inject some capital into the transmission systems for those two PMAs.

MR. HEYECK: I'd just like to -- Jon Worthington had a good anecdote. There's a 230 KV line that needs to be upgraded somewhere in one of these PMAs. And some of these PMA's are subject to the budget machinations of the Congress. And given that, we may not ever have that 230 KV line built, and that was the gap. And so we are wondering, you know, Section 1222 was approved by Congress in, you know, 2005, so let's make sure that we use it and that's really all we're doing.

MR. COWART: Any comments? On the agenda, Mike, you were listed as someone who might want to comment on this provision.

MR. WEEDALL: Oh, I've got nothing of

value to offer at this time.

MR. COWART: All right. Thanks very much. Any further discussion? Yeah, Susan.

MS. KELLY: I would just offer for Mr. Ball that these are two separate and distinct items, so I can talk with you further offline if you wish.

MR. COWART: All right. May we have a motion? Oh, sorry, we already have that. Thank you. I'm ready to vote. All in favor, say aye.

GROUP: Aye.

MR. COWART: Any opposition? All right. The motion carries. We'll send the letter.

Thanks for the discussion and the correction. We have about 15 minutes. Please come back at 10:30.

(Recess)

MR. COWART: Okay, folks. I am going to ask you to quit your exciting conversations and start to get back in your seats.

Okay, folks. We are, in fact, reassembling. I've noticed that there's a serious dispersal of the committee members when the coffee is located across the street instead

of right next to the meeting room, so I think that's a lesson for future meetings.

Wanda, to you.

MS. REDER: Yeah, we've got a fair amount of discussion on interoperability and decided that we'd be best served if we just allocated some time. So Erich Gunther is with us today, he's with EnerNex. And that hat that he's wearing, he currently chairs the Gridwise Architecture Council. He's been very active on this topic. He has a number of hats, but that's the one he's wearing today. Erich.

MR. GUNTHER: Thanks, Wanda. I've had the privilege of working with Wanda for some time now in the IEEE Power and Energy Society quite a bit. So I do wear several hats, but as Wanda said, I'm here representing the Gridwise Architecture Council here today.

To just give you a little bit of an overview of what the council has been working on related to interoperability and sort of offering, you know, our support and expertise in some of the things that you're working on here. I'll just give you a little background of the Gridwise

Architecture Council. It was formed by the Department of Energy in 2004 to support a vision. There was a concept of the Gridwise vision that was created back in 2004, and that vision was related to transforming our overall energy infrastructure into a much more collaborative type of an environment for multiple points of view, a collaborative environment involving information exchange, more pervasive deployment of markets, high levels, low levels, through the use of information technology and the like.

So the overall mission of the Gridwise Architecture Council was to support that mission within DOE. In order to accomplish that, DOE gathered together 13 individuals initially to create the council, all coming from several different areas of industry, information technology, telecom industry, industrial systems control, markets, tradings, economics, the regulatory side of things, energy, electric generation, transmission distribution, as well as commercial and residential buildings, so these five different areas, stakeholder communities that the council looks to try and support.

So we're 13 different individuals with expertise in all of these different areas. A significant amount of the expertise or the concept of the expertise is that these individuals aren't necessarily representing their individual organizations, it's really more about the individual and their expertise, their life experience in various aspects of the energy sector, where they have presently or have, you know, both presently and in the past, made strategic impact in their industry, their companies, and various other organizations they interact with.

So a diverse team of leaders that are embedded within industry, again, within their own specific companies that they either, you know, run as entrepreneurs or have leadership roles in, as well as the organizations that they present.

A lot of the work of the council, especially early on, and I'll cover some of the, you history, of where we've been and give you the direction of where we're going, has been to shape the guiding principles for this highly interactive, intelligent electric power system.

And so we were sort of doing smart grid before it became fashionable, before the term was really claimed in many ways.

A lot of the work that the individual council members are engaged in, both individually and through our work on the council, is guidance overall for public and private infrastructure investment, trying to, again, set the fundamental foundational principals for determining where that investment should go, where the value might be achieved. So, you know, basically the nature of this group is that they have a propensity for volunteerism, generally all suffer from the same thing I do with ADD. I think we just can't seem to, you know, focus on any one thing. We do that for a while, but then we move on.

We have been focused most and we're most well known for our work on interoperability. So that's sort of been the core focus for the group even though we're engaged in a number of other areas that I'll talk about. At the core of it is this concept of interoperability. When we started working on this, no one had a clue what the heck interoperability meant, couldn't spell

it, didn't really care, didn't know what architecture was, didn't really care. And so since 2004, we've come a long way with moving the overall industry forward to understanding the value of interoperable systems.

The other industries have realized the value of interoperable systems for a very long time. Banking industry with teller machines, general commerce with things like point of sale systems have been taking advantage of the value of interoperability standards based interoperability for a very long time. And we saw a need to start and bring those concepts and value to the electric power sector.

And so we started off by, you know, identifying a variety of core principals around that. But we had to start first by trying to quantify the overall impact of interoperable systems, looking at how they can manage and reduce integration costs, reducing operating costs, reducing the overall capital information technology costs, managing installation upgrade costs, providing more choice and products, allowing you to buy best of breed technologies,

that when integrated in the system, you know, can work effectively because of the standards that they support, basically enabling new products that have a wide range or price points and associated capabilities and features.

All these things together have provided compounding benefits that interoperability can give as a whole. So we made a lot of progress early on in being able to begin to articulate that value.

So that is just one element of our overall activity areas. One of the areas that we're most well known for, and you may hear the term occasionally referred to, and I'll refer it a few times later on, is something called the GWAC stack. A little depiction of it is in the upper right corner over there.

It's basically a way of identifying what it means to be interoperable from several different points of view, you know, how information is exchanged at the most basic hardware level, standard types of sockets and connectors, up to the kinds of on the wire protocols you use, things like Ethernet, you know,

up to the kinds of protocols on top of that that are more distant from the hardware, like TCP/IP internet protocol, and then moving up into how we name things, standard names for standard things, standard like XML, and ebXML, and 68150, and a number of other standards that are out there, and then moving even further up the stack in determining how we're going to exchange actionable information within a business context or within an organizational context, and eventually identifying elements of interoperability that are related to business, and then finally, you know, policy, federal, state policy related aspects.

So there's many different aspects of interoperability that we've had to address. When an engineer thinks about interoperability, they very often think, you know, interoperability at the very basic, you know, the plug in the wall has the right prongs and it fits type of thing, but others think of interoperability in many different ways.

So we spend a lot of time trying to find a way to create a framework that helps us

articulate these different aspects of interoperability so that they're relevant for different audiences, whether you're applying at the policy level, the business level, or the technical level, as well as identifying the cross-cutting aspects, issues, you know, things like safety, reliability, security, you know, standardized naming conventions and things like that. So a key thing is also focused on these expectations of what we achieve from interoperability, the expectation of what we're going to get out of well understood information exchanges.

Another aspect associated with interoperability, once we can start to put together some interoperable systems, identifying system A, B, and C, and well-defined points of interoperability, we start getting to the point where we can have some relatively complex systems, especially in energy infrastructure. Everything is fundamentally interconnected, both electrically certainly, and even more so now from an information point of view. So managing the complexity for which there's much potential is a

major aspect of what we're working on.

Dealing with managing multiple versions and mixtures of technology is a core element, and I'll refer to that again in a little bit. We've got to deal with the fact that we've got all this infrastructure that's deployed out there, that we're not going to rip everything out and put new stuff in. We've got to be much more intelligent about how we upgrade infrastructure.

Some people will use the legacy word, but, you know, legacy infrastructure, everything you put in, you know, yesterday is already a legacy. So we've got to deal with how we apply new technology and make the best use of both it and the existing technology that's in place. In our industry, we spent we lot of time optimizing systems and did so in many ways at the expense of having competition. Many utilities picked a vendor, stuck with it, and, you know, basically got into this vendor lock-in scenario..

One of the major benefits of interoperability is to support best of breed, to support multi-vendor interoperability with products where they can compete on an open market

and not just because they happen to have the only product that will interface with the existing system. That adds some additional complexity and we've been working on guidelines for how to address that.

Various services that need to be implemented in the back office, in the information technology arena that have to integrate with field devices, and multiple organization structures, all of these are different aspects of interoperability.

I spent a lot of time working with utilities trying to figure out how the IT organization can work with the field services organization, can work with the corporate IT organization, because generally they don't like each other very much, and we've spent a lot of time trying to get the organizations just to interoperate within the overall utility, or even that happens in some large vendor organizations, as well. So we're spending a good amount of time on that right now. Another area that we've been working on is in the area of transactive energy. This gets back to one of the earlier overall

vision and missions of the Gridwise Architecture Council, which was to work towards understanding how we can create a more collaborative grid that extends markets, you know, way down further from the bulk markets we have, you know, today, way down to the residential level, and maybe even have technology that allows something as far reaching as homeowner to homeowner, you know, markets and transactions someday.

So a number of concepts that are required in order to support that, standards that are required, regulatory challenges to be addressed, and so we're spending quite a bit on that. And we've been holding transactive energy workshops over the past couple of years to begin to flush out what some of those key issues are.

The other area of activity that our council is focused on is, in general, providing a strategic forum for not only the Architecture Council members, but for the third parties who come and join us, to serve as a forum for information exchange, to address big problems.

Three or four times a year we have our two or three day meeting in which we have the

council members come together with a number of invited guests to really address some of the longer-term, far-reaching strategic issues that are facing us today that we'd like to gather some insight on and then exchange that information with the rest of the community. So we provide this strategic forum, some might call it more a strategic think tank in some ways, to address some of these big problems.

We also spend a lot of time on organizational support, support of NIST, the SGIP, DOE as examples. On the NIST front, when EISA 2007 came out and NIST was given the role developing the interoperability framework, the first place NIST came was to the Architecture Council to help support them in figuring out how to fulfill that mandate.

And one of the first things the Architecture Council did in support of NIST was to create a series of entities called our domain expert working groups to begin to address areas like the building-to-grid interface, home-to-grid interface, industry-to-grid interfaces.

Those domain expert working groups eventually were rolled into what is now the Smart Grid Interoperability Panel. But we spent a lot of time working with NIST early on, helping them fulfill that role.

In effect, really since that time, since around 2008, a significant amount of the Architecture Council's time has been spent on leveraging the early work we did in interoperability, and some of the publications we created I'll show in a minute, to, you know, help NIST get the SGIP up and running. We chaired the original Domain Expert Working Groups. We were heavily involved in creating the initial charter and bylaws of the SGIP. As a matter of fact, the initial charter and bylaws of the SGIP were very, very heavily influenced, we could say copied from, the charter of the Gridwise Architecture Council. And from that time on, we've had significant involvement within the SGIP.

Even, you know, currently, the chairman of the SGIP's Smart Grid Architecture Committee is Ron Ambrosio, who's past chair of the Architecture Council and current member. The

chairman of the Testing Committee within the SGIP is Rick Drummond, past chairman of the council, current member. The chairman of the home-to-grid Domain Expert Working Group is an Architecture Council member. I'm the administrator for the NIST SGIP. So council members are heavily embedded.

We have two council members who are currently on the governing board of the SGIP, two others who are ex-officio members on the Governing Board of the SGIP.

In addition to SGIP, we've been heavily involved in a number of other activities, heavily involved in the international standards community, also involved in DOE. So we have Tom Sloan here, being a member of this council, you know, here. So we've been heavily involved in organizational support from many different fronts. Sometimes we're not overtly, you know, visible from that point of view. We don't exactly do a lot of marketing from that point of view, but we're heavily embedded in many other organizations.

So just to give you an idea of some of

the things that we've been working on and how we got to where we are so I can get into more of where we're going, starting in 2004, we spent a lot of time creating some foundational principals. A lot of it was based on, you know, work that a number of people had been fooling around with, to put it in simple terms, some initial work that the Department of Energy had been doing, a lot of work that EPRI had been doing with their IntelliGrid Program, and we tried to coalesce those into a set of core principals we called the Gridwise Architecture Council Constitution.

We've recently just updated the Constitution. Many of you here may have been interviewed for that Constitution process. But it identifies literally very foundational, fundamental constitutional principles that underlie everything that we're working towards for grid modernization. It addresses things related to core principals from a regulatory point of view, from technical points of view, business points of view and the like.

We had a constitutional convention in Philadelphia in which we had 300 people. Ben

Franklin was there, so some of you may have been there. And it was a very good event, several hundred people attended, but that led us and got us the information to produce the framework on how to get it done, how do we effect these core principals, and that resulted in the framework, that GWAC stack that I mentioned earlier, a clear set of actionable guidelines on how to begin to address interoperability at all those different levels, from the pure connectivity all the way up to the business and policy, you know, levels.

In 2008, we spent a lot of time on industry engagement, and that was all made possibly in many ways through the SGIP, again, a lot of work through the SGIP. More recently, in the past couple of years, we've been working to support utilities and vendors on procuring and implementing technology that implements these concepts from an interoperability point of view, helping utilities create good RFP's, for example, using our decision-makers checklist.

So we created a decision-makers checklist for use by both the regulatory community that might want to consider when making

a decision to fund a particular, you know, provide recovery for a particular utilities project, or for a utility to consider when evaluating a vendor's product. And that's been, you know, very successful. And many of the concepts have shown up in some of the procurements, have shown up in our principals, in grant requirements and the like.

Now, though, we're trying to move forward into sustaining all of this activity. We've I think made good progress in trying to create a pervasive interoperability community to some extent. You know, folks seem to get and understand the basic value of interoperability, but we need to sustain that and keep it being applied through the application phase.

That foundation phase that procure and implement focused a lot on ARA-funded projects, a lot of grant-related, you know, projects, but now we need to move on into this more pragmatic phase of implementing and sustaining, you know, these concepts in the real world, the non-green field world, and I'll address a little bit more on that here in a minute.

So as far as the work products go, if you go to our website, and I have the URL at the end, gridwiseas.org, all the different work products I've talked about are available there. We've got the Constitution, we have the interoperability framework, the how to guide for interoperability, including the GWAC stack and how it's to be applied.

We've got a series of publications that assess the benefits of interoperability from an environmental point of view, a reliability point of view, and an overall financial benefit point of view. And, you know, those have been very popular, you know, publications, providing the basic reasons why you want to use standards-based interoperable systems. We also have a series of proceedings from our conference. The Grid Interop Conference is one of the major, again, we call it now Smart Grid Conference that existed before the term "Smart Grid" was really around. But the Grid Interop Conference we have every year, and all the proceedings from those are available online for free. Every presentation ever made at any Grid Interop Conference, you can go, look up

the particular author, search it, it's all there, so all of this information is available through the website for folks to use.

And as the word continues to get out, we're doing a little bit better on our outreach. We're continuing to see a significant increase in the utilization of our work products.

One thing that we're starting to focus on now, it's a wonderful thing to have all these different publications and the like, but, you know, applied in what context. And a lot of what we're -- several of our members are looking at now are looking at what it means to adopt technology in a, you know, manufacturer context or in a utility context. What does it take to adopt a new technology, a new standard?

This interoperability stuff is all fine, well, and good, but generally it means I've got to buy some new stuff that uses some new standards that I'm not familiar with, and there's an impact on doing that. And a lot of the work that we've done allows you to manage that overall technology adoption life cycle. You know, EPRI recently published a whitepaper end of last year on

technology adoption, and I think it's a paper that's also being used or considered as a beginning point for the new SGIP Implementation Methods Committee. But it identifies that there are a lot of challenges for bringing in a new technology. And a lot of our work products are really there to help you manage that process.

The Interoperability Constitution, those constitutional principles, you know, let you manage the overall picture, but you get into the context setting framework, it helps you through the envisioning process, the planning and architecture process, the design process, with some actionable guidelines at a relative high level.

It also provides the background again for the values. You can make the early business case to support those first three steps, the financial, environmental, reliability, and safety value elements.

Our interoperability maturity model, which is a relatively new work product that we have out in a beta form right now, second or third beta I think, allows us to really assess how well

we're doing, you know, how far we made it from implementing interoperability. It allows us to manage our way through the development and test process, the deployment, the operate and maintain process. It allows us to see where we are to determine when we need to get to the point we have to upgrade, or, you know, we're at end of life for some of these things, before we start the whole thing over again. So our work products are really designed to support this overall technology adoption life cycle.

So we're starting to capture metrics more than we've done in the past, and we're just starting to capture some of that now. So I've just got some of the metrics up here from 2011, you know, document downloads. And we just are getting the data coming in for 2012.

The bottom line is, we're seeing a significant continued increase in the number of folks who are using our documentation, the context setting framework being one of the most, you know, popular of all those documents, decision- makers checklist, and surprisingly enough, the meeting minutes. People like seeing

what we're doing. There's a lot of good information that comes out in those meeting minutes.

So another thing we've been looking at is where we have access, and in this particular case we have access because I chair this group, but IEEE Power Energy Society's Intelligent Grid Coordinating Committee reviews all the papers that come in for conferences for IEEE PES activities. And so we've been going through all of those, and 40 percent of all of the IEEE Smart Grid related papers to date, in 2012, 40 percent of those papers have referenced Gridwise Architecture Council work products, specifically in these stats, the GWAC stack, versus 25 percent for the NIST and SGIP framework, as an example. And that's double the rate. We went back and we looked at the same thing for 2011. So the metrics are trending up for use of our work products, which we're really pleased to see.

There's also an index out there that I hadn't heard of until we had some academic folks point it out to us. But there's this index called the H Index, similar to an impact index that's a

measure of productivity impact for publications and researchers. And ours is 21, which I'm told is a good number. So, I mean, for those who are used to the H Index as a means of looking at your publications, that may have more meaning to you than it did to me initially, but it's a good thing.

So we've got a lot of challenges ahead that the council is looking to address. I mentioned transactive energy, more markets, more distributed, more players, smart devices and systems acting intelligently, you know, on behalf of individuals and businesses in a business context, so we're spending quite a bit of time, you know, on that, figuring out what are the new -- how do the interoperability principles we created, how do they apply, what new elements are needed.

We're also looking at enhanced reliability and quality. One of the things that we've been recognizing and looking at is that as we move into a more modern grid that is characterized by pervasive deployment of electric vehicles, distributed energy resources, photovoltaics, and the like, the metrics that we

currently use for measuring a liability, well, actually they have for some time been too coarse. Five-minute resolution of whether, you know, the grid was operating well or not, it hasn't been good enough for some time, but even less so as we move forward in smart grid. So new metrics are needed. Very few utilities use what I would call high- precision metrics, looking at power quality related things, looking at momentary interruptions as opposed to five-minute outages, things like that. So there are some new standards and new interoperability guidelines that are necessary there.

You talked about microgrids early on. There's a number of concepts necessary there. Microgrids in campus locations are great, we've been doing those for quite some time, there's a lot of stuff we're learning about, that technology needs to be deployed in that environment. But when you start moving microgrids out into, well, the grid, putting them on distribution systems so that we can do things like, you know, minimize the number of people that are out while major restoration is taking place

during a storm, after a storm, you know, those types of things, there's a whole other level of interoperability that's required for system disability, to support the worker safety in those scenarios, to support load energy balance on distribution feeders that are segmented on an ad hoc basis during a storm restoration. There's a lot of really interesting and difficult problems that need to be addressed on that aspect of microgrids, sort of my definition of microgrids.

Regulatory aspects, you know, a lot of the folks we talk to, you know, talk about the various regulatory, use whatever word you want, regulatory reform, change in regulatory practice, you know, whatever, but there's a number of elements that are limiting in many ways.

The uniformity issue, the balkanization issue that I know many vendors are concerned about that I deal with is something that is important. So we're spending a lot of time trying to work with the regulatory community, you know, with some core concepts that would be nice if they spread across regulatory boundaries.

Another key area is education. And so

the council has been working to develop a variety of work products, working with the universities, that can be used to try and help bootstrap up the creation of smart grid engineers, as well as others to just understand the complexity associated with multi systems interoperability, systems of systems engineering. So we're trying to work and support those who need it for, you know, providing regulators information on what's possible, what's necessary, universities, you know, on what is needed by industry in order to build products, to engineer the systems, the utility engineer's skill in order to deploy these systems.

One thing that we've been seeing is the need for more leadership. And this is an area where I think DOE and this committee has a lot to offer. We do have, you know, the issues with the state-by-state differences, which are there for very good reasons, but there's also a lot of challenges associated with that, as I noted a minute ago.

And there is an opportunity, and we've seen some good success story I'll talk about in

a minute, where some leadership at a federal level or a federal entity level can go a long way in getting something accomplished very quickly. And that example is, what you may have heard of, is the green button.

I've been working on this since last year in a variety of ways through my work with the SGIP, and it's a really good example of how we, with a little bit of leadership, without a mandate, a budget and the like, we can mobilize a lot of folks to address a common concern. So in the case of green button, a common sense idea, you might say, consumers being able to own and use their own energy consumption data, have access to it in a standard format, there's the interoperability pieces, have applications and services available to use it, so a market, a community. Essentially, you know, the really interesting thing about green button is, it's a combination of a policy, a brand, and a set of technologies, a set of interoperable technologies.

So the federal leadership, in this case White House Office of the CTO concept, was developed last year, and from the time it was, you

know, that idea came about and was really being pushed by Aneesh Chopra at the time to the first implementation was 90 days. I've never seen anything implemented in our industry that fast before.

And basically, you know, utilities applied this new, fast-tracked interoperability standard. The energy service providers provided interface in order to make that happen. And that standard embodied, through the work of all of our members and the council who are heavily involved in the SGIP, in ESPI, in the UCA, the Utility Communication Architecture and national uses group, worked together to apply these core principals from the GWAC Constitution and utilized almost all the layers of the GWAC stack in order to make that happen.

And when we brought that to bear, I mean there was, you know, it was a win-win-win in many cases. You know, we had a big policy win from the political side, satisfied customers, because they had access to this information. A market was created for these applications. And we had a low cost of implementation. You know, we were to do

this very quickly. Through the SGIP activity, we managed to create a development kit that implemented the standard in an open source way to allow it to be very quickly implemented.

So the endgame was 10 million customers now have access to that data if they so desire, 20 million more on the way with the utilities that have committed. Five utilities have already deployed, another 13, 14 have already committed. More than 70 vendors are offering products and services, 55 entrepreneurs participating in the Apps for Energy contest, all starting with a simple idea, a little bit of leadership, and a statement, a request that, you know, it would be a really good idea if we did this, you know, using an interoperable standards based approach.

So we know that this can be helpful. And I'm sure there are other areas where, Department of Energy, you know, this committee, through recommendations, can probably identify some other areas and provide some additional leadership, and we can get similar successes in other areas.

So the next steps for the Architecture

Council, again, in that graph I showed earlier, we're in the sustainability phase. We want to ensure the success of what we've achieved to date, the fact that people know what interoperability is, they seem to see that the value is there, we need to make sure that that's sustainable. As folks start to move away from green field implementations, where the interoperability value is obvious, you know, when you're dealing with all new stuff, you know, it's very obvious, move into more pervasive deployment, where we've got to integrate with these legacy systems, we want to make sure that the concepts and methods are there so that we don't get discouraged when we see it's a little bit harder to do this when you integrate with the real world and what's already there than a green field scenario. So that's an area of our focus, is to focus on -- is to develop those guidelines for how to deal with the legacy and the existing infrastructure.

The other thing that we're, you know, looking to do is increase our outreach capability, allow us to articulate our observations on industry deployment progress, so applying the

regulatory checklist, the decision-maker's checklist rather, applying our interoperability maturity model, basically looking at what industry is doing and being able to provide some sage advice on whether that is meeting these long-term goals, and continuing our support for public and private entities with our, you know, independent informed ideas, views, support, to help enhance that leadership of DOE and other organizations.

So just to summarize the council, we've got this collection of diverse industry experts that are all donating their time to provide independent viewpoints, strategy, ideas, and multiple context for this very diverse stakeholder community that we call both smart grid and just, you know, energy infrastructure in general, and with the guidance and administration support of DOE. Pacific Northwest National Labs is the administrator for the council, so all of our members donate their time. But the DOE, you know, provides some funding to PNNL as our administrative staff to help us manage the meetings and the like.

We've got a very successful historical record in developing these concepts for interoperability. We've got a really strong track record reputation for developing this overall strategy for grid modernization, the benefits associated with interoperable systems, and we intend to continue focusing on those areas.

So the council asked me to offer our support, not only to DOE, but also to the members of the EAC here, you know, to help you fulfill your mission further, so we're there and at your disposal with our expertise. And we'd also like, you know, for DOE and the committee here to provide us advice on how we might leverage our membership in your activities and any activities of others that you engage and influence.

We also would like to invite you to participate in our numerous venues for a strategic discussion. And, of course, you have your venue here, which appears to be some very good discussion from the little bit that I've sat through here today. We have a number of venues that we like to have big thinkers, if you will, from groups like this participate in our

strategic discussion. So we'd invite you to participate in the meetings that we have during the year.

We have, you know, three or four meetings, you know, per year. Our next meetings are coming up in August, the end of August in Seattle; and in the Dallas, Texas, area in October. We have our monthly teleconferences where we discuss all manner of issues. We have the Grid Interop Conference, which essentially is the conference of the council. It's also now become a co-venue with the SGIP. It was the birthplace of the SGIP, and connectivity week, which we just held a few weeks ago.

We also have workshops that we participate in and develop, including the Transactive Energy Workshop, which we just completed another one, the proceedings of that are available, and our Interoperability Maturity Model Workshops. So with that summary of what we're doing and request for your advice and input and our offer to support you, I'll be glad to take any questions that you might have. Thank you.

(Applause)

MR. COWART: You have a comment or question, Wanda?

MS. REDER: A question I guess, maybe just further discussion on, where are we on the journey to true interoperability? Can you comment on that?

MR. GUNTHER: Yeah. You know, there's no end game, so, you know, that means we have an infinite way to go, if you look at it from that point of view. But I think we're well on our way, because we have folks who understand the value. I'm seeing standards specified in RFPs. There's products from multiple vendors available that support some of the core standards that NIST initially recommended in the SGIP activity, and others that follow the principles the Architecture Council has.

So, you know, we seem to have a will out there, procurement practices are beginning to change, but a lot of it is being implemented right now in green field or the low hanging fruit, the easy implementation, so that's why we're really focused on the sustainability piece. So, you know, we're well into the game, but we've got a ways to

go to make it pervasive.

MR. COWART: Tom.

MR. SLOAN: Thank you. Two observations, one yesterday when we met with the secretary and he was basically encouraging us to take a systemic approach as we're looking at the various subcommittee activities, and I would suggest that the Gridwise Architecture Council has that as its philosophy. And then secondly, we have talked times here about how do we continue to modernize, whether it's with the smart grid or new technologies that are evolving or aren't even here yet, with the legacy systems that utilities have. Again, I would suggest that the interoperability focus of the Architecture Council, where they're integrating legacy and new systems by having evolving standards, is something that we might want to keep in mind.

MR. GUNTHER: Okay, thank you.

MR. COWART: I actually have a couple of questions which I'll toss in at this point. You said at one point federal entity leadership was needed in order to dispel or combat or mitigate what you called regulatory balkanization at the

state level, and I guess my question would be, can you give me some examples of that, where state regulation has somehow locked in standards that would then not be interoperable?

MR. GUNTHER: Well, I mean, you know, there's a number of, you know, both general examples and specific ones. One thing, for example, that's always a bad idea is when a regulatory body specifies a specific standard, because if that happens, you know, such has been done in some states by specifying 1547 as a mechanism for dealing with distributed energy resources and the interconnection rules with the utility.

When you specify a specific standard, generally that standard is probably going to be already, you know, obsolete in some way by the time the ink is dry on the regulation, and you couple that with how long it takes to support a standard, you're stuck. And so, you know, now we have a standard, for example, that's embedded in a regulation that fundamentally doesn't allow, you know, islanding to occur, and so we've got to, you know, undo that part of the regulation, and

we've got to fix the standard, so that's one example.

Others are, you know, a wide variety of pricing type, you know, structures. You know, the vendor community would like to be able to have some core capability in appliance, the smart appliance, for example, and at least understand the structure of what a rate structure might be to support prices to devices, if not the actual, you know, tariffs, so getting some, you know, homogeneity there.

But there's a wide range of things, some uniformity in allowing utilities to do some of the infrastructure upgrade work that's necessary to support grid modernization. And there's a number of examples that I could go on and on about over that I won't here.

MR. COWART: Well, I guess the question would be, have you had this conversation with NARUC?

MR. GUNTHER: Well, that's one of the things that we've been working with to try and get some additional interaction with NARUC. We've had limited success, you know, in the past in

doing that. We've had some offers of assistance from some folks here, you know, recently, so we're working to do that. We're going to be holding a webinar in the not too distant future to support some of that educational outreach, again, you know, what's possible, what's needed, so that is an area that the council is looking to do more in.

MR. COWART: So at the other end, my other question has to do with security. It's frequently observed that having a lot of different types of devices that interact in different ways means that it's less vulnerable to hacking or attacks or what have you. And getting everything to talk to each other in a seamless sort of way creates a nice opportunity for viruses to spread. So what's the answer from the council on that?

MR. GUNTHER: The security aspect is I guess one major area that the council is not specifically drilling down into, because it's a little bit more than I think that the council really wants to get into in a specific discipline. The principals that we've identified at a relatively high level and from an

interoperability point of view are really good guidance for developing some of the concepts of interoperability from a security perspective..

DOE funded a project, for example, called Lemnos to develop some core concepts for how -- interoperability concepts, you know, for security. So, you know, the Gridwise Architecture Council products and the like were used, you know, for that work. But other than that very high level, we don't have a lot that we've currently said about security, and we don't really intend to. We're sort of leaving that more to the SGIP activity, UCA International Users Group and some others.

MR. COWART: Merwin.

MR. BROWN: Thank you. Erich, first my question is in the interest of finding some things DOE can do to help move things along in this area. Our organization, CIEE, has been asked by the California Energy Commission to look into research needs on a distribution level of high-penetration renewables. And in particular we're trying to put in place in the state a monitoring system that would develop a very fine

granularity data system as a baseline, and you mentioned the fact there was a lack of that.

As a matter of fact, what we're finding now is, not only is there a lack of data to support -- to understand what's going on on the distribution system, when we ask the engineers on the distribution side, unlike on the transmission side, what are the problems, they really can't even articulate them as well as transmission can.

So I see a knowledge gap here that's needed, at least from our perspective, leading to here. Is this also seen as a barrier in developing interoperability architecture for the distribution side or is it kind of irrelevant?

MR. GUNTHER: Well, I mean, you know, there's a barrier aspect there. The main thing, again, just getting back to the leadership, you know, piece, we have plenty of technology to deploy to address those things, we've got really technology to capture those metrics, the appropriate metrics that you're talking about.

There's a lot of proprietary schemes out there that still exist and there are some standards based ones. So a significant request,

if you will, from a federal leadership point of view is, if you're going to fund a project, you know, to capture some of those metrics, require that they be, you know, standards-based.

We have standards that specify how power quality should be measured, how the information should be represented, how the information should be exchanged, and there are vendors who produce, you know, standards capable systems out there.

So federal government, state governments start drinking the Kool-Aid themselves and leading with these procurement practices. So, you know, when you put out an RFP, require that they use standards based implementations, that they follow the testing guidelines being created by the SGIP, for example. If federal government in their procurement required that the test, or that the devices that that procure meets the interoperability and testing guidelines that were developed in the SGIP, for example, that will bring the rest of industry going. So that's another example of the kind of leadership, you know, that we'd like to

see from the federal level, as well as the state level.

And your procurements, you know, and the research that you do at the universities to -- and others that you procure to use standards based implementations for these things.

MR. BROWN: But do you think you have the right standards in place to handle the potential issues? For example, data seen from Sandia Gas and Electric say if you look at the usual data of 15-minute increment, everything looks fine with the photovoltaic system, but you start looking down into the minute and second range, you find out they're in violation of voltage regulations.

MR. GUNTHER: Absolutely, and that's just good engineering. So, you know, measuring at an appropriate rate for the requirements of the problem is something that's important. So good, sound engineering practices need to be implemented. But we've had the standards to support that since, you know, the early '90s.

I was the author of IEEE 1159.3, which is the power quality monitoring standards, how to

represent microsecond level trending information, for example. So we have the standards to support this, and they're in multiple generations now. So a lot of this is -- any competent engineer can glue a couple of systems together that make it work, but to do so in a fashion that's manageable, secure, sustainable, extensible, requires a little bit more thought, requires some systems engineering, and looking around to see what standards are actually available.

MR. COWART: Ralph and then Ralph.

MR. CAVANAGH: Erich, I just want to clarify or get you to clarify the response you gave to Rich when he was asking you what you wanted from state regulators. And I think I heard you say you wanted uniformity in tariffs for prices to devices.

MR. GUNTHER: One level up, in at least the framework for how they can be represented so that the vendor community can write software and systems that can support the variances there will be in the details from state to state, you know, if not country to country.

MR. CAVANAGH: Okay. But give me a sense

of what are you looking -- so you're obviously not looking for uniform tariffs, but you're looking for a uniform tariff structure?

MR. GUNTHER: Uniform ways to either, you know, uniform ways to discuss and code those tariffs in hardware and software. If we're going to have and realize this goal of prices to devices and transactive energy, at some point you've got to get, you know, your engineers and programmers to be able to represent those in an inexpensive way in the devices, also in a way that a consumer or someone on their behalf can readily program to respond.

And I used to write software many years ago for representing a multitude of tariffs that, you know, that exist, and not only we didn't, you know, had the same tariffs, we had, you know, so different structures, it took years to write that software.

MR. CAVANAGH: No, I see the point. Have you developed a model proposal, for example, for NARUC members as to the kind of structure you'd like to see them adopt?

MR. GUNTHER: I wouldn't say

we've -- certainly the council hasn't gotten to that point, but there are other, you know, folks within the SGIP community within the UCA International Users Group community, a few other communities who have some ideas on that front, but they're having a hard time figuring out whether there is an interest politically in doing that and how to, you know, and how to make that connection. And that's why we're starting in the Architecture Council to try and see if we can have that conversation, so we can figure out what the path might be for that. We just don't know at this point.

MR. CAVANAGH: I just strenuously encourage you to do that. But you've got to make very clear to them what you want them to do, because I don't think they have any idea at the moment. And I think you've got a lot of good will toward trying to get there.

MR. GUNTHER: And we're starting to get some of that request coming from the vendor community. So we're working closely with major vendors of smart appliances and the like, and they're starting to tell us, you know, some of the

things that they would like to see.

MR. COWART: Do you want to follow up directly, Paul?

MR. CENTOLELLA: Yeah. So, Ralph, one of the things that's going on within the business and policy domain expert working group in SGIP is an effort to -- and we've got all of the RTOs involved, as well as the appliance vendors and the consumer electronics association talking about can we express in a standardized way at least the energy prices coming out of the RTOs with the idea that eventually we could get to the point where we could broadcast out a signal that would be current in some indicative indication of future interval prices so that a water heater could know, I should operate now or I should operate an hour from now, and that's a starting point. It's not all the way to expressing the full detail of retail pricing. And, of course, in states like California, you have layers of things that go on top of that that are rather complex, but, you know, we can at least get a start on some of the things that matter to the resiliency of the grid.

MR. GUNTHER: For example, I work

closely with one ISO and some IOU's to develop a concept of what that ask might be, and we wrote up a whitepaper that I know, you know, Paul has seen, but we were never able to publish it because everyone was too scared to, you know, from a political point of view. So we have those, you know, some of those challenges, as well. And basically, you know, the up side, the down side of wanting to do things differently sometimes could be a challenge in getting folks to communicate effectively.

We're hoping the council, as an independent entity, and, you know, we don't really care if people think about us to some extent. We are well known for being independent. We're going to see if we can work this out and do something with it.

MR. COWART: Ralph.

MR. MASIELLO: Erich, a discussion of testing inevitably leads to certification.

MR. GUNTHER: Yeah.

MR. MASIELLO: And I think a year ago NIST had a concept of going through a process to identify test labs that would be certified.

MR. GUNTHER: Yeah.

MR. MASIELLO: How do you see that unfolding today?

MR. GUNTHER: We're getting very, very close to making that a reality, you know. We have the first version of the guidelines in the SGIP are available. We have a couple of organizations, one in particular that I'm also the chair of, the UCA International Users Group, who already runs a testing and certification process for one standard.

We're going to adopt, as an experiment, to see, you know, how it works, adopt the SGIP recommended guidelines, and we're going to be adopting it for use for the 61850 standard. But right now we have a fast track process to adopt and use it for the green button certification.

So we're working to define what green button means from a brand point of view, what you expect to get if you see the green button on the website, and how the standard will behave so that we can quickly get to a point of doing the interoperability test and then certification for that. So we're in the process of doing that now.

EPRI has just announced a project, trying to get 10 utilities to sign up to get some additional funding to accelerate that process. And the schedule for that is around six months or so. Before end of year, we should have the first actionable real guidelines, you know, for implement and beginning to certify a couple of things.

MR. MASIELLO: Yeah, but do you see the manufacturers as self-certifying or an organization like EPRI announcing that it certifies or a NIST process that says NIST will certify the certifiers?

MR. GUNTHER: Yeah, there's a whole echo system that has developed. There will be no one entity, you know, that's certifying. It's certifying the certifiers and actually there's even one more level of indirection. So initially we have the NIST SGIP developing the processes, then we're looking for some existing entities that already do vendor, you know, lab accreditation.

So, for example, the UCA IUG does lab accreditation for 61850, so getting them to adopt

that. Other organizations, you know, such as UL, could decide to adopt those SGIP processes and use it in their accreditation process. So there will be multiple entities that accredit, multiple entities that are actual labs that will be, you know, will be accredited, and they are the ones who give the certifications. That's an extension of a model that already exists. What we needed was the framework for smart grid.

MR. COWART: All right. Wanda, I think we're back to you. Thank you very much.

MS. REDER: Okay. This next section is going to be the Smart Grid Subcommittee. And the way we're going to approach it, Joe Paladino is here from DOE, we're going to take a few minutes to have him highlight the activity that he's currently overseeing with the projects that are in flight. And then following that, I will talk through the outline of the whitepaper, some of the challenges that we were trying to address in the whitepaper. And then ultimately, the objective of the discussion that will conclude then before lunch is to get approval on the whitepaper to go forward. So okay.

MR. COWART: Wanda, we also have a bit of unfinished business from yesterday.

MS. REDER: We do.

MR. COWART: We didn't officially sign off on the work force work product, as well.

MS. REDER: Yeah.

MR. COWART: And if you don't mind, when we get to the discussion, it would be great to take up both of them.

MS. REDER: Okay, we can do that. Joe, why don't you come on up? We will have your slides here projected momentarily.

MR. PALADINO: Thank you, Wanda. Thank you, everybody. I'll be brief because I know that you folks have a lot that you want to discuss. What I really wanted to do was give you just a quick status report snapshot on where we are with the Smart Grid Investment Grant Program and show you some results that we're received to date.

So where we are right now is, we're about half way through the deployment of these technologies. And so a half of the funding, and we're talking about $9 billion worth of funding here, if you take the fed share, as well as the

government recipient share and put it together, we're talking 131 projects if you include the demo projects, 99 projects if you're talking about the Smart Grid Investment Grant projects, okay.

About half of that funding went into meters, the communication infrastructure behind allowing those meters to communicate back to the utility, and meter data management systems. And we're expecting that by the end of this program, we probably will have installed about 16 million, mostly residential meters. If you believe the numbers that others have come out, we're expecting to have about 60 million residential meters in place by 2019. The Smart Grid Investment Grant Program will contribute about a quarter of the meters that are actually deployed in the nation.

With respect to distribution automation, about a quarter of the money to a third of the money goes into devices and systems to improve reliability, for instance, automated feeder switching and things like that, again, with all the background communications that's required there, and data management systems that

are required to be able to manage that technology, as well as technology to optimize and better manage voltage levels in distributions circuits. And so we'll impact about 6,500 distribution circuits through the program. If you believe our estimate that there are 160,000 distribution circuits of various types in the country, we'll impact about 5 percent of those, okay.

Now, one caveat here is that distribution circuit technology is going to advance significantly over the next 20 years, to be able to accommodate things like electric vehicles, to distributed energy resources, energy storage. These systems are going to have to get much more flexible. We're very early on in really advancing the capabilities of distribution circuits even with the deployment of these technologies. That's a very important point to make.

Finally, with respect to transmission systems upgrading, most of this effort is installing phaser measurement unit technology, and again, the underlying communications systems to communicate information from PMUs back to

operators.

At the beginning of the program, there were about 166 network phaser measurement units around the country. Most of these are in substations. We expect by the end of this program to have over 1,000 of these networked across the country. What that will permit, we're expecting what the goal is here, is that will permit an operator in one part of our interconnection, (inaudible) interconnector, whatever, to actually be able to see conditions on a different part of the system, whereas before they really didn't have that visibility. So we're going to hopefully really impact the ability of operators to have this wide area of visibility capability.

The analysis focus, and again, this body, the group review have mentioned to us we really need to focus the analysis, and we have, and we're actually looking at these five areas. We're looking at how advanced metering infrastructure with pricing, with customer systems will actually affect peak and overall demand reduction. And again, that leads to improved asset utilization, deferring generation

capital expenditures and energy requirements, et cetera.

The other place we're focusing is how meters and that meter data infrastructure actually improves the operational efficiency of utilities. This has to do with automated meter reading, this has to do with remote connects, disconnects, this has to do with actually having meters being able to communicate to outage management systems, so that the operations of a utility will be greatly improved with operation maintenance costs coming down.

With respect to distribution automation, we're looking at what kind of reliability improvements we can get with respect to systems that can reconfigure circuits. And with respect to some of the projects, we're also deploying sensors on devices so that we can actually understand what the condition of those are in real time and be able to manage the system to optimize how they operate enough to overload those devices. And we're also looking at efficiency improvements in distribution systems, mostly because due to our ability to be able to

better manage voltage levels within circuits.

And then finally, we're working, again, at the impact of PMU technology, super phaser technology, on improving operational efficiency at the transmission level, as well as reliability there. And again, you'll see on this slide how many projects we have in the SGIG program are actually focused in these areas.

So we've got some consumer behavior studies going on. We have 11 of those. In addition to those rigorous consumer behavior studies, there are a number of other utilities that are trying out pricing programs. Some of the early data that we've gotten, and this data is from Oklahoma Gas and Electric, shows that when they implement a variable peak pricing program, and you can see hopefully how the rates vary according to time of day on the right, that Oklahoma Gas and Electric is seeing significant reductions in peak demand.

And their goal, their objective was to achieve a 1.3 kilowatt reduction per customer in peak demand, and they've tested this right now on 6,000 customers, and they're achieving that goal.

In addition to that, they're hoping to get 20 percent participation of their service territory in a pricing program with variable prices. They believe they're on target to being able to do that.

And so they're going to be rolling out the pricing program to an additional 40,000 customers at the end of this year, and hopefully by 2014, roll it out to about 150,000 customers..

And you'll notice that the blue line there, okay, there's a solid blue line up above that you probably can't see very well, there's a dotted blue line, and the delta is how much energy savings we're getting, because the dotted blue line is the controlled group and the solid blue line is the treatment group that actually had programmable controllable thermostats.

And the peak that's coming down basically shows you how much peak demand reduction we're getting. And Oklahoma Gas and Electric is playing with when they actually have these critical peak periods, because they really want to make the peak reduction that they're seeing with their customers coincide with their

system peak load, okay. That's the trick, so they're playing around with that. But they actually believe that they can achieve significant peak demand reduction and that will allow them to offset building and natural gas-fired power plant, and by 2016, two natural gas- fire powered plants. So by instituting these kinds of programs, there's a great deal of efficiency in asset utilization that we can get out of deploying smart grid technology.

Talquin Electric is a rural utility in Florida. Their territory spans four counties. They have about 60,000 people that live in that area. Previously they had -- their customers actually write back to the utility to tell the utility how much energy they were using. It was an honor system. So they really didn't have a sense at all about how much energy they were really using per customer.

Talquin installed meters to all of these customers. Prior to the meters, they basically rolled trucks out to their customers about 15,000 times a year. And if you take a look at $40 to $50 per truck roll, we're looking at a

cost of about $750,000 that they had to undertake, expend, to be able to determine whether the meters were -- to determine whether they were actually reading the meter correctly, and to also be able to undertake remote connects and disconnects.

Now, with the meters in place, they don't have to do many of those truck rolls. They're expecting to save about a half a million dollars a year just by the application of meter technology.

There's another company with a large service territory in the southeastern part of the United States, and they deploy 230 automated feeder switches on 75 circuits. We looked at their reliability data for a six-month period last summer, and there are, again, significant SAIDI improvements, and that basically translates to saving an average of 17.7 minutes of outage duration time on a per customer basis.

We work a lot with the Lawrence Berkeley Lab, and we've been working with them for years on looking at reliability statistics in the country. They've done analysis to really determine what the value of service is with

respect to outages and what those outages really cost to consumers, whether they're industrial, residential, or commercial consumers.

The upper table are the value of service values, of coefficients. So, for instance, if you look at the survey data and so some statistics, what Lawrence Berkeley has determined is that a residential customer basically loses $2.60 if their power is out for at least an hour. A small commercial firm loses $373, et cetera. If you apply these numbers to the numbers that we're seeing at this utility and assume there were about 120,000 people that were affected by these feeders where we're deploying this automated feeder technology, we were able to save or avoid about $21 million of outage costs to those customers. Now, these numbers aren't typically used by -- some utilities use these numbers and some utilities do not use these numbers, okay. We introduced this in Naperville. We have a calculator on -- that once Berkeley Lab developed for us, which is on the smartgrid.gov website. And Naperville has looked at that calculator and likes it and we're trying to introduce that

calculator to the industry.

Finally, the last thing I want to say is with respect to conversation voltage reduction. The utilities that we're working with are either trying to address line losses by using capacitors, okay, or they're trying to reduce peak demand. And so, for instance, Southern Company wants to reduce peak demand on their feeders to be able to achieve about 200 megawatts of peak demand reduction by actually using capacitors.

And so many of these utilities are trying to manage their voltage levels to reduce peak demand, so there's a great deal of efficiency improvement there. And then some utilities are actually trying to apply conservation voltage reduction techniques to be able to keep the voltage levels down for a longer period of time. That means less power being used by customers, but still being able to meet customer's needs. And there's potentially a huge amount of energy efficiency that could come out with that practice.

So this is data that American Electric Power actually saw. They applied voltage

optimization technology to their system. They've got line sensors, they've got a distribution management system. That distribution management system is actually communicating to the low tap changers, voltage changers, and capacitors, and they're able to actively manage the voltage levels in their system and bring those voltage levels further down.

Previously, a lot of utilities now don't have this kind of communication with these devices at all. They'll set what the voltage level is at the head end of a feeder, at the load tap changer, they'll manually set the voltage regulators and the capacitors manually by sending crews out. And they're hoping that they're going to be keeping their voltage levels at the right levels. And they've sort of modeled their system so they know sort of where to set the load tap changer depending on the weather conditions.

Now with smart grid technology, the ability to communicate with these devices and actively control these devices allows utility to have a much better control with respect to what their voltage levels are. So American Electric

Power is seeing significant energy reduction, 2.9 percent energy reduction, as well as peak demand reduction on these feeders. And if you take a look at these numbers and you can extrapolate a little bit, there's a significant amount of energy efficiency savings that you can get out of this, there's bill savings as a result of this. And by bringing peak down, you can defer again the building of peaking power plants.

This is an issue for utilities because they don't generate revenue when customers are using less electricity, okay. So there's a great deal of potential here, but not a lot of incentive to apply this technology in this manner. And that's it, that's all I have for now. And I just wanted to, again, just show you some of the results that we're seeing to date. Thanks.

(Applause)

MS. REDER: Okay. I thought, especially for you, having been involved in these conversations, that it would be useful to get a little bit of background on the amount of projects and the volume activity that's underway here on the Smart Grid Subcommittee effort.

Just to give you some sense of scale, out of the projects Joe talked about, there's about $8 billion of projects that are underway. And really we're in an interesting state right now, because those projects are three years into a five year window. Some of them are well along, some of them are not as far along. So, you know, some places there's lessons, some places there's lessons yet to be learned.

And yet we also know that from a grid modernization perspective, what's coming out of this ideally will be scaled. And, of course, there's been big numbers forecasted. EPRI, for example, 500 billion; Brattle, 800 billion, with these. So I think the question, you know, like Erich said, is, you know, we've been involved with kind of this green field pilot perspective, how do we ultimately scale that? What are the lessons? How do we cascade the best practices? Where are the barriers? And how does that ultimately impact the R&D agenda, the policy reform that needs to occur, and other efforts in order to actually remove the barriers so that we can scale efficiently and effectively?

And that is really what the subcommittee has been trying to focus on, the best way to, you know, target the efforts through the whitepaper. The objectives really are kind of focused on outreach primarily because of the lessons and gaps that are evolving through the projects, but also being able to obtain feedback from stakeholders so that adjustments can be made, and that we can establish a vision in order to go forward from this grander scaling perspective, if you will.

We also think that it's really important to connect this effort to broader reliability and sustainability infrastructure goals. So often it's easy to hone in on the technology for technology sake, and I think as an industry, we've kind of missed the big picture messaging. So, you know, fortunately, there's been some broader goals that have been established at DOE in terms of reliability and peak reduction efficiency, but, you know, how these projects all fit together and what the game plan is in order to ultimately achieve the overall infrastructure goal is a messaging piece that I

think probably needs more work, and, you know, ultimately that can drive incremental R&D efforts, as well.

So in the whitepaper, we suggest that we start with a preface on those objectives and then give a brief overview of the projects for context sake only, staying pretty light on the review, but we thought it would be important at least to put us in a state of the journey.

And then we intend to go into a bit of review of the gaps. And actually, the gap analysis is thought about in terms of ultimately assessing the current outreach strategy, what's happening now, what needs to be done, and then also, in addition, figuring out when improvements can happen.

We think that the gaps are really the crown jewels here and can drive incremental efforts. We've got to do a pretty good -- put pretty good effort around trying to figure out what those are. We want to assess and promote the end use consumer acceptance. And I mentioned the criticality of understanding the obstacles for broader deployment, because ultimately, that's

what we intend to do. And then, of course, that will ultimately drive DOE research and educational efforts going forward. So that is the plan on the gaps. And the subcommittee suggested that we actually do our best at articulating what we think the recommendations would be, they're highlighted here. Definitely want your comments and suggestions as we put a stamp on this outline and go forward.

But we think we'll wrap up with recommendations around focusing the value proposition with near term emphasis on reliability benefit and improvements to operational efficiency, again, getting back to that concept that we really want to focus on the benefits and value add streams as compared to the technology itself, and we think that reliability and operational efficiency are the front runners.

We also think, though, that this should lay some type of a framework for a multiyear plan. None of this happens in a short verse. The time and to the extent that we can at least cast a bit of a framework that will lead to efforts going forward, that would be good.

We do realize that a formal dialogue with NARUC and other stakeholders is critical. We've talked about the importance of convening. Certainly Secretary Chu emphasized that several times, and we realize that the NARUC relationship is quite important for the scalability function. And, of course, along that line, the smart grid communication plan would encompass education strategy, knowledge transfer in the value based messaging. Another recommendation is likely to institute specific industry focus groups for input and forward looking dialogue and outreach. Interestingly enough, there's already focus groups that are underway that are kind of project based. And we think if we expand their role a little bit, we could use that as an input into the process for course corrections and gap identification that could ultimately feed forward looking efforts.

And last, but certainly not least is, cast a road map to describe the DOE R&D and education efforts for smart grid over the next five years. So that's how the outline is crafted right now, and I look forward to your input.

MR. COWART: Thank you very much.

MS. REDER: Okay.

MR. COWART: Can you give us an estimate of the size of the document you have in mind, the length of the document?

MS. REDER: Yeah, that's a good question. And I think we kind of vacillate right now between getting into the details versus staying at a higher level. And we think we'd be best served at staying at a higher level with a few pages as compared to, you know, the half-inch approach. But that's my tendency, is 10 or less.

MR. COWART: All right. Comments, questions? Phyllis.

MS. REHA: Hi. I think your whitepaper has really hit the nail on the head. I mean the focus on the communications and communicating that value proposition, especially the state regulators who have to do the cost recovery on this, is right on the button. For example, in Minnesota, our utilities and our coops add their technologies at different times and in different ways and different structures, and, you know, there's a value I think synergistically with

adding the technologies in this way.

And I think there's really been a gap in communicating that value to commissioners. And we really struggle with aligning the cost with the benefits. And so I really think the communications emphasis is extremely important. And that dialogue with NARUC I think is extremely important, as well. So I commend the subcommittee on this whitepaper, it's great.

MS. REDER: Thanks.

MR. COWART: David.

MR. NEVIUS: I suggested in the references section you can cite some other work that's been done, and therefore, keep the product that you developed a bit small. And there was one about a year and a half ago that NERC did on reliability considerations for integrating smart grids. And I think there's a lot of material there that you can draw on and just cite it as a reference.

MS. REDER: Okay. I'd be glad to do that. Actually, the subcommittee has made a vow not to recreate anything in reference -- reference was the existing, so I appreciate that comment.

MR. COWART: Paul.

MR. CENTOLELLA: Well, I'm new to this group, and I'm looking forward to working with Wanda and the committee on smart grid efforts. And I, you know, earlier, in the last couple of days, spoke with both Joe and Wanda. But I think that there is a real need to sort of get more specific and step up these dialogues in some very important ways, and I'd like to see the subcommittee take the lead in understanding what the best way to do that is.

And so I've talked with them about four specific areas where I think there's a real need to step up. The first is the one I mentioned with Secretary Chu yesterday, about understanding what reliability will look like in a smart grid world. This means getting at questions of how you look at metrics, it means looking at how you do business models, it means looking at how you both integrate renewables and electric vehicles, but also how you take advantage of being able to optimize demand and reconfigure systems in order to improve and enhance reliability going forward.

And I think today, and we started, you

know, laying the groundwork for this discussion while I was at the commission between EEI and NARUC, but today I think we don't have a really clear idea about how to take that forward, and I think that's a dialogue which is important to occur between EEI and NARUC, but also important I think ultimately to involve a broader set of stakeholders. And I'd really like to see us figure out a way to elevate that discussion to a point where DOE was offering national leadership about how to make that happen, taking advantage of what's gone on at NERC already, but also understanding that many of these issues will occur at the distribution and customer level, which is, of course, outside, and there's bulk power jurisdiction, and we need to figure out how to make that work together.

The second area where I think there is a real opportunity and need for dialogue, and, you know, we touched on a little bit of it here earlier this morning, is in the area of demand optimization. And I'm talking here about something that's broader than what we think of as traditional demand response, which has been

really focused on how to reduce peak, but recognizing that, you know, that we're going to have further discussion here today about storage, but recognizing that we already have a lot of storage on the grid, in effect, because we've got a lot of end uses that have thermal inertia associated with them. We have a lot of end uses where there is an ability at least within some limits to schedule when they actually drop power off at the grid, and we don't take advantage of hardly any of that today, because we've got end uses which increasingly are having chips built into them, and they're smart, but they're simply not grid aware. And so some of the work that we've been doing in SGIP is taking a step towards that, but there is additional elements in terms of how do you allow consumers to be able to finance energy management systems in terms of ultimately how do you move towards more dynamic pricing at the retail level that require a broader sort of policy and programmatic perspective.

And I think, you know, that there is a need for the department to take a lead in figuring out how that happens, because I ultimately think

that the largest benefits from doing this is important as the reliability and operational efficiency improvements are. The largest single benefit is in the area of being able to get demand to optimize vis-à-vis the operation of the grid system consistent with device and consumer preferences, but to really pull that into the operation of the grid, and I think we need to have a focus on how to do that.

The third area which comes closest to what Wanda is talking about is, and it was mentioned here a little bit in Erich's presentation, is to go beyond just lessons learned at a kind of broad level, but really get into the implementation method, you know. And how can we really take lessons learned from one utility in one part of the country at an implementation level and make them available to people in other utilities in other states so that they can benefit from that? Now, some of that is happening in standards-based implementations through the new Implementations Method Committee and the SGIP, but there may be ways to built on and expand on that, and I'd like to see this

committee try to figure out what the best ways are the department could interact with that work.

And the final area that I'll mention, and it goes beyond smart grid and cuts across really everything that we do here, but I mention it here because there's been some interesting work happen in the smart grid area that provides an opportunity to be built upon, and that's the area of cyber security. And it seems to be, you know, largely missing from the recommendations that I've seen from the subcommittee so far, and I think we need a way to address that. And I realize I just said a lot for being a new person on this committee, but I'm hopeful that these are topics that we'll find a way to bring up.

MR. COWART: Usually what happens after making such a pithy, you know, dense statement is, somebody volunteers you for the committee, but you already volunteered yourself, so we can't do that.

MR. CENTOLELLA: Yes.

MR. COWART: Merwin, and then Mike.

MR. BROWN: Thank you. I noticed the last time on describing the DOE R&D and education

and road map, maybe you said this and I didn't catch it, was this looked at in the context that we came up to this point with a fairly anemic program, then all of a sudden injected 8- or $9 billion into it, and then all of a sudden it's probably going to drop back to the anemic program? Is that being done in that context?

MS. REDER: Yes.

MR. BROWN: Okay.

MR. WEEDALL: So a question actually for Joe. The last point you were making about the lost revenue and the, you know, fixed portion of the bill, et cetera, are you aware of any regulatory entities that are taking this on or, you know, dealing with it, or is that just a general warning?

MR. PALADINO: I haven't done enough homework on it. I'm told that there are some. There's a couple papers out there, I read one paper. It's in a state of flux a little bit. I know that PEPCO had mentioned that they actually did get some recognition from the Public Utility Commissioner to really be able to claim their expenses with regard to improved volt var, et

cetera. I haven't read that.

I know that -- and I don't think I'm revealing anything by saying this. I've had a lot of discussions with Tom Weaver at AEP. They're trying to make a major decision now as to whether to roll out this conservation voltage reduction across their system. But there is a tremendous uncertainty that they're seeing, and they're one of the most advanced utilities. Dominion Power is also extremely advanced in this area. They're actually approaching it from a different perspective.

But they feel that they don't have their regulatory certainty yet to really move forward, but they're trying to make a corporate decision whether to move forward or not. They really want to actively engage with regulators. I think we should look into it, we should do a study to answer your question, because I don't have an answer for your question. I think it's variable. But there's incredible potential there. But the industry is a little bit stuck with respect to where the certainty is.

MR. COWART: Let me just make sure I

understand this conversation, because is this about cost recovery for the devices, or is this about lost revenue from the reduced kilowatt hours? It's a straight decoupling question?

MR. PALADINO: It's a decoupling question, exactly.

MR. COWART: Okay. That ought to be relatively straight forward, at least to go to the regulator with a proposal.

MR. PALADINO: Well, what I'm hearing from almost every utility I talk to that it's an issue. And when I've read -- I just read a paper on decoupling, okay, it's variable, it's still morphing. And so there is -- that's my sense. I'm not an expert in this arena, okay, but I think it's very much decoupling.

MR. COWART: Well, I think it's a good topic to take to the regulators, I'll put it that way.

MR. CAVANAGH: Well, and to complete the colloquy, Mr. Chairman, there is within DOE the C action forum which obviously has taken up this issue extensively. So I think the important thing for my DOE colleagues when you're engaging on this,

I mean, it really isn't acceptable in 2012 for there to be a problem conceptually with an obviously public interest oriented cost effective road reduction, with the response to it being, well, we can't make that work with the business model. Of course, we know how to make it work with the business model.

Equally, of course, Joe, you are absolutely right, there are a whole host of jurisdictions that aren't finished with doing that yet. All DOE can do, but it is critical to do it, is to make clear, and I think the C action initiative, which is an engagement with the states, is probably the right forum, is just to make clear in how many contexts this problem persists, and how urgent it is to solve it, because it really is unconscionable that a straightforward application of smart grid technology that will greatly reduce the cost of doing something we've all known how to do for 50 years, we used to call this conservation voltage reduction, now we're calling it voltage optimization, fine, it's the same thing, it's an easy 3 percent load reduction, 3 percent peak

reduction. And it's a business model regulatory glitch that's preventing it from being aggressively engaged. And this is a public power problem, as well as an IOU problem, as my colleagues in APP and NRECA know very well. Let's just make sure that, at minimum, we alert people to the availability of tools for resolving this.

For about a third of electricity sales in the U.S., this is no longer an issue. For the other two-thirds, it very much is an issue. And if we don't resolve it, we'll keep leaving enormous opportunities like this on the table.

MR. COWART: Thank you. And I am sure Phyllis knows where the regulators can go for advice on this topic. Oh, Barry.

MR. LAWSON: Thank you. In the document, there's a statement about promoting end use consumer acceptance, and I know there was a lot of back and forth on that I think in the subcommittee. But what's missing in the outline to me is any identification of cost savings and benefits to the end use consumer, and, you know, what those are, if they do exist, with regard to certain smart grid technologies, and I think

that's something that needs to be included in any document such as this. Thank you.

MR. COWART: Responses, comments?

MS. REDER: Yeah. I guess as I'm hearing it, I heard the neighbor comment, I appreciate that, Phyllis, and the existing papers will definitely make a concerted effort to get those in the references. In terms of Paul's comments, I really appreciate them, and I think you're right on..

A way that we could handle that, as a suggestion, is perhaps a friendly amendment to the recommendations with some supporting text above around the lines of convening direct dialogue for reliability management, optimizing demand, cascading best practices in cyber, and that might tee up the opportunity to get the right folks involved and cascade a bit more of a vision to, you know, the effort at large. And you're going to be there to help write it, so that's great.

And then the other thing that we could do for Barry's purpose is perhaps say that some commentary on -- well, no, it was -- tools and

metrics were brought up by somebody. That wasn't yours, that was the prior comment. Who made that? Anyway, I was thinking, you know, to the extent that we need distribution tools, or if the metrics aren't quite right, you know, we could kind of embed that into the paper, as well, along with the cost-benefit needs from the consumer side need to be recognized any way, good point. So a couple amendments to the whitepaper.

MR. COWART: All right. Thank you. I think it's appropriate at this point to ask for a motion to encourage the committee to go ahead with the work with these modifications.

MS. REDER: Okay, yeah. From the committee, I move to approve.

MR. COWART: Is there a second?

COMMISSIONER REHA: Second.

MR. COWART: Thanks, Phyllis. Any further discussion? All in favor.

GROUP: Aye.

MR. COWART: Any objections? All right, thank you. Feel empowered to go forth.

MS. REDER: Go together.

MR. COWART: Now, and while we're at it,

how about on the work force proposal? Can you turn your head to that for just a second and let's advance that for approval?

MS. REDER: Sure. There was an outline that was put forth on the work force piece, as well, and that was distributed earlier. So essentially it's around basically highlighting, you know, opportunities to collaborate. There's a lot of functions in there in collaboration, and making ware the efforts that are currently available, the gaps, of course, some scenario analysis to try and paint the picture on the potential varieties of outcomes. So that's the direction we're headed on the work force, and with that, I would move to approve.

MR. COWART: All right. Is there a second?

SPEAKER: Second.

MR. COWART: All right, thank you. This is going back to the conversation at the very end of the day yesterday. Any questions, discussion on that? All right then. All in favor of encouraging them to go forth on that, say aye.

GROUP: Aye.

MR. COWART: Any opposed? All right. Thank you. Feel secondarily -- feel empowered twice, Wanda.

And we have a couple of announcements, though, before we break for the noon hour. Elliot.

MR. ROSEMAN: Great. Hi. So a couple of quick administrative announcements as we break here for lunch. For the new members, you know who you are, we will be having the annual ethics briefing. It'll just be down the hall here in the California Room. Also, those of you who were not here in March who were prior members should also attend that briefing since it is an annual requirement. It'll take about 15 minutes or so and you'll be able to have plenty of time still to have lunch, so just down the hall in the California Room after we break.

I want to point out that we do have the dates and locales established for the 2013 EAC meetings, they're shown right here. We'll be sending this around, as well. But you might want to just scrawl these down and take note of March 6th and 7th, June 5th and 6th, October 2nd and 3rd.

They are all Wednesdays and Thursdays next year, 2013. And all of the meetings next year will be at the NRECA buildings out in Arlington, the Ballston area of Arlington, Westin Hotel right next door, as opposed to being right downtown. We've been at the NRECA for these meetings many times and that's where we will be returning in 2013.

We've mentioned a couple times the sign-up for the subcommittees, for the new members in particular. What we're going to do is, we're going to bring the sign-up list to the ethics briefing so that you'll be able to, if you haven't already, expressed your preference and sign up, you'll be able to take care of that right then. There actually is this Thursday a Transmission Subcommittee meeting. Mike Heyek had to leave here, but he encouraged me to get the folks who are logically part of that Transmission Subcommittee, that will be 2:00 Eastern on Thursday actually, so that would be terrific to get as many as appropriate to that meeting in particular..

And then lastly, I think we are, as Rich

said, right on schedule. And the schedule shows that we will be reconvening at 1:45. We do have the Storage Subcommittee and other business to take care of after lunch. There's a list of restaurants also that Paula and Susan have here in the back. And I also just want to use this opportunity to thank Paula and Susan for the work that they have done in helping to put this together. And Sheri Lausin also who worked on a lot of this who wasn't able to be here, so thank you guys very much.

MR. COWART: Yeah, thanks to you all. And I think Paula actually baked the cookies that appeared earlier today, so a special thanks for that.

So we will reconvene, I want to state the time exactly, 1:45, we will be here. And we want to hear from the Storage Subcommittee, so please get your lunch and be back so we can get that taken care of.

MR. DELGADO: And be sure to sign up for the Storage Subcommittee.

(Recess)

MR. COWART: If you'll take your seats,

we're going to get going. We are going to begin, folks.

MS. HOFFMAN: We plan on being quite efficient.

MR. MASIELLO: Richard, dare I ask how many signed up for the Storage Subcommittee?

MR. COWART: That was happening in another room and Elliot has the list, so he could tell us. Look what's going to happen, we suddenly have an influx.

MR. MASIELLO: Those decisions are irrevocable. Once you see the work that has to be done, you may not (inaudible).

MR. COWART: While we have a moment to remind people, we had to save these dates notice up there earlier for the 2013 dates. But there is, of course, the October meeting in 2012, and we just want to remind you that that will be October 15 and 16, and I think the meeting is here.

Good, let's kick it off, Ralph.

MR. MASIELLO: Okay. The purpose of this discussion is to review the draft outline for the required report to Congress on storage, and hopefully approve it so that we can get on with

the work of writing it. And you all received that outline, including active review comments I believe with the material for the meeting. So I thought the simplest thing to do was to put it up on the screen, albeit, with a larger font so that we can all read it. So the best thing is, I should go through the outline, Richard, yeah, okay.

MS. HOFFMAN: And I guess before you get started, I just want everybody to acknowledge that Dr. Imre Gyuk is here from the Energy Storage Program, so he'll be helping.

MR. ROBERTS: One quick comment. Is it appropriate for maybe some of the new members to kind of hear some of the background? Because a report to Congress was done in 2008, now we're doing the next required one, and so it will build on that previous one, which can be made available to the people who maybe don't have it from the previous time.

MR. COWART: That's good background. And can you say anything about the required content, anything in the legislation that needs to be made?

MR. MASIELLO: I think the legislation

was scant on that, right. It said there shall be a Storage Committee.

MR. COWART: Shall be a Storage Committee report on storage?

MR. MASIELLO: Yeah.

MR. COWART: All right.

MR. ROBERTS: It was also kind of a report card back on DOE's activity.

MR. COWART: Yeah.

MR. MASIELLO: Right. In 2008, there was a little added excitement because the ARRA legislation was in the works, right. Okay. And Brad was the chairman of the Storage Subcommittee at that time and led the drafting of the report. So every report should have an executive summary, and we will not write that until the meat of it is done, obviously. So the outline that's here in the report is innocuous without particular observations and conclusions, it's just stating what would be in the report at the headline level.

The second section is a discussion updated since 2008 on the applications of storage for grid operations, distribution, end user, as a generation or TND asset, as an end user asset.

And Brad has volunteered to draft that, and Brad, I think you're already well begun, correct? Yeah. And taking advantage of numerous collateral out there, the EPRI handbook, the DOE handbook and so on. And the conclusions, again, we won't know until Brad has drafted it, but things that we believe will be pointed out, the first one is, there are projects where the storage has actually multiple benefit streams, is used as a combination of functions that look like a generation asset or a transmission asset.

Right now the regulatory process in many jurisdictions makes it hard to get those benefits, to monetize them or accrue them to the developer. And a great example is, if the storage asset is going to play in the ancillaries market, it would have a tough time also being a source of transmission reliability, so that's one.

Two is, it's moving out of the lab. There are plenty of instances, and we'll get to those in the report, of merchant developers or utilities doing this without DOE inducements, doing it because they think that it's profitable. So it's time for the market structures to catch

up with the physical and economic realities. And third is the technologies evolve. We may see new benefits arise that are not anticipated today, okay.

The next section, ICF agreed to prepare for us, which is a survey of the projects underway. DOE-funded, either through OE or through ARPA, and then other domestic, non-DOE developments and international where they're identified. And so this is a list, if you will, of the summary of the projects, okay.

Imre, we had agreed that you would provide a section on the OE five-year plan, a synopsis to be included. And Clark is not here, but were he, we would tell him he's drafted to write a summary on EPRI activities on storage, okay.

The next section, I foolishly volunteered to put together as best we can a summary of what the worldwide manufacturing capacity is by different technologies and what the prognosis of that looks like over the near horizon, and then also comment on the commercial viability and maturity of the different

technologies, so we have a team of folks working on getting that together.

Then possible conclusions of this section, and again, these will be drafted once the section is written. Do we need more demonstrations? Do we need more cost sharing? Where are there overlaps and gaps? Okay.

So then the next section would be regulatory activities and legislative activities that Brad and Tom are going to draft. And here we had envisioned reaching out to the states to try to get a response from each state about what legislative and regulatory things are happening with regard to storage. And we've run afoul of I guess the Paperwork Reduction Act, on the one hand; and second, David, you can help me with the specifics, but it's not possible to go out and ask the states for information as a government, as a federal entity, without OMB approval, correct?

MR. MEYER: Yes. We are limited to any survey activity where we ask more than nine entities to respond to the same question or provide the same kinds of data or information. Now, any such requests have to be approved by OMB,

and they are fairly thorough in scrutinizing in such requests.

Now, the alternative that has been offered to us by general counsel is that if DOE wants to publish a notice in the Federal Register where it would ask everybody, you know, the world, to respond to questions, then it could do so. But the -- it's odd that that would be offered under the auspices of the Paperwork Reduction Act, because --

MR. MASIELLO: Yeah, but nonetheless, we think it would be useful to get a summary of where things are with the different states. In California, for instance, there's already legislated mandates that utilities have to include storage in the planning, and discussions even of goal setting about how much storage. Other states are probably not thinking about storage as yet.

So what we'd like to do is request everyone on the committee to research your own state or states quietly, not make a formal inquiry, in other words, as we talked with Mike Heyek about, or Billy, in your case, the multiple states, right,

not make a formal inquiry of the commissions or the legislators, but you must have staff who would be aware of any pending discussions, right. And if we can collect that as much as possible, we think it would be useful to have as a picture, so that's the legislative.

We need someone to put together a summary of standards activities relevant to energy storage. And it's more than just NIST and Gridwise Architecture Council and SGIP, because there's other standards issues that arise. For instance, a lot of the battery standards for backup are written around lead acid technologies, and the manufacturers of new technologies complain that those standards don't fit lithium ion, for instance. So IEEE has at least one committee looking at this, for instance.

So I'll repeat, we can draft somebody who's not here and hope that they're not a draft dodger, or someone can volunteer to help on this. And then very interested in getting anecdotal input of war stories that are useful, of things that you've encountered. For instance, EPA rules may lead the data center world more towards

storage and away from backup diesel. This is something, as I said, anecdotally that you see happening in places, okay. So that's that section.

Then we'll draft a section on barriers or obstacles today. I mentioned the multiple value streams and how they accrue to different stakeholders, or actually prohibited by regulatory constructs. Technology barriers, where there's regulatory uncertainty, utility barriers, cost recovery issues and so on, and also the low impact of low natural gas on the prospects for storage, which is very real.

And then a discussion of storage evaluation tools which would factor in the state-of-the-art from the national labs and others, and the OE five-year plan, and also our observations about where evaluation tools are coming up short today with respect to storage, okay.

And then recommendations, and that's it. And we won't write the recommendations until we have the other sections. So I think, Richard, with that, that's the outline, and open for

discussion.

MS. HOFFMAN: I guess one thought I'd ask you to consider is, we talk about storage from technology point of view, the different types of storage technologies, but I know in a prior committee in the EAC, we talk about what services it provides. And, you know, I struggle with organizing a report via technology versus application service --

MR. MASIELLO: Right. That's why we put applications up front.

MS. HOFFMAN: Yeah. Could you look at the market potential, but it's really how big is the, you know, frequency regulation market out there, you know.

MR. MASIELLO: Right.

MS. HOFFMAN: So I'm hoping that's what you meant when you said you were going to look at the market potential.

MR. MASIELLO: Yeah. Okay. So I think what you're saying, Pat, is right here, market potential for different applications, right?

MS. HOFFMAN: Yeah, because I think what people are going to really want to look at is, yeah,

I'm sorry, you just said it, so I'm not going to repeat it.

MR. MASIELLO: Yeah. And this brings us back to Secretary Chu's comment yesterday about tell me the price point, right.

MS. HOFFMAN: I was going to bring that up, as well, what is the price point? I'm glad you brought that up.

MR. MASIELLO: Okay. Let me comment here that I think what we'll do is site existing publications and analyses, not perform new such, correct, and possibly identify a gap where maybe that analysis doesn't exist.

MS. HOFFMAN: Yeah, I agree. As much as possible, like with the smart grid, is to site the existing, as many existing sources as possible. This does not have to be an extremely large document even though we're required to do a report.

MR. MASIELLO: Yeah.

MS. HOFFMAN: Volume is not what we're -- if we can keep it focused and fine tuned.

MR. MASIELLO: Right.

MS. HOFFMAN: So if we don't have an area,

even though we're interested in it, I don't think it has to be a must, that it must be in the report.

MR. MASIELLO: Okay.

MR. COWART: David.

MR. NEVIUS: Ralph, how do you see this work being differentiated from what was done earlier in the report? Is there going to be like a little citation or a brief summary of what was done and then this just builds on that?

MR. MASIELLO: Yeah. The version that was sent to you has got comments in the first section --

MR. NEVIUS: Yeah.

MR. MASIELLO: -- pointing to update these tables from the first report and so on.

MR. NEVIUS: Okay. I mean more than just the data, but I mean actually what did the first report say were the issues and challenges and recommendations --

MR. MASIELLO: Right.

MR. NEVIUS: -- and it just builds on that.

MR. MASIELLO: Correct.

MR. ROBERTS: This report had targets,

it had goals, near term, mid term, long term, so there's a lot of things that need to be updated. You know, a lot has been done. So there's a lot of good things that are going to be in this report.

MR. MASIELLO: Yeah. What is not in here explicitly, but would be incorporated by reference, is how do the storage technologies map to the applications. And I think there we would just site the Sandia work and attach it as a reference, because we're not going to do anything better than that, that's for sure.

MR. COWART: Good. David.

MR. MEYER: One of the parallel activities that's going on right now, there is just a burgeoning literature about the impacts of large amounts of low cost natural gas, and the implications for the electricity sector, so that that part of this report is going to get a lot of attention.

MR. MASIELLO: Yeah.

MR. MEYER: And it's going to be one of the most important subsections of the report, I would say, and people are really going to be interested in what you'd have to say on that

subject.

MR. MASIELLO: Yeah. Cheap gas undermines the time arbitrage and renewable firming value of storage. It sets the price point lower, if you will. Imre.

DR. GYUK: I just wanted to call your attention to a number of projects we have going. One is the international database which we are putting online, in fact, it's online already, which deals not only with projects, but also with policies. So whatever new material on policies you come up with, we would love to incorporate, and we may have material there that can be of use to you. The other one is, we have an activity underway to develop an interim performance based standard for storage applications, which is intended to be essentially the basis for a future IEEE standard, that's on the way. We have almost concluded that work.

MR. MASIELLO: Okay. Can you, Imre, provide us with the specifics of that offline?

MR. GYUK: Sure. And finally, PNL has produced a very detailed paper on the economics of the frequency regulation market, coming up

with the conclusion that the structure of the grid requires about 10 percent of the renewables generation to be storage or demand response or something.

MR. MASIELLO: Yeah. And I think that and other studies that have looked at that issue would all be sited. Good. Other comments or feedback?

MR. COWART: Well, something that we've talked about a few times is that, in addition to electricity back to grid storage --

MR. MASIELLO: Yeah.

MR. COWART: -- there's thermal storage, and many of the -- what many of the services that storage offers to the grid can be accomplished through thermal storage or the smart charging of vehicles or what have you.

MR. MASIELLO: Yeah.

MR. COWART: And that's such a big resource, and the technologies are relatively close at hand. So I assume that's in here, and I'm just --

MR. MASIELLO: It deliberately didn't list all the technologies here. But thermal

storage, mechanical storage, compressed air, new variations on compressed air, there's a scheme underway in Germany to put hydrogen into the gas pipelines and then extract it and use hydrogen as storage, so yes.

MR. COWART: Whatever, but, you know, that sounds fairly reasonably fancy, but just --

MR. MASIELLO: I'm just saying, we didn't list all the technologies here. The report will draw on accepted references for how technology has mapped applications and discuss what we know of others, okay.

MR. COWART: The one reason I'm persisting in this bit is that when the secretary, for example, said what's the price point for -- he just mentioned batteries --

MR. MASIELLO: Yeah.

MR. COWART: -- and based on current technology, we could name some numbers. But what's the price point for managing the times of the day in which we heat hot water in hot water heaters, the price point is different.

MR. MASIELLO: Yeah.

MR. COWART: And it's pretty cheap.

David.

MR. NEVIUS: Just one other thought, Ralph. Is there a place in this report to talk about how energy storage -- some of the challenges for modeling energy storage in system studies? Are there any unique modeling challenges associated with the different technologies that we're talking about?

MR. MASIELLO: There's a place in here where we talk about gaps and evaluation tools, but we could certainly factor it in as something that's --

MR. NEVIUS: Yeah, already that's even more evaluating the economics than the system reliability effects.

MR. MASIELLO: Yeah, okay. So that would be I think right here, right, evaluation tools, right.

MR. NEVIUS: It would be like system analysis, for system analysis purposes.

MR. MASIELLO: Yes.

MR. NEVIUS: Okay.

MR. MASIELLO: Okay, good.

MR. COWART: Other edits as we speak?

MR. MASIELLO: Yeah.

MR. COWART: Any other comments, contributions, volunteers to co-author? Tom.

MR. SLOAN: Mr. Chairman, I'd move to adopt.

MR. COWART: Moved and seconded. Any further discussion? All in favor, say aye.

GROUP: Aye.

MR. MASIELLO: Okay, good. Let me discuss timeline for a second. Tom, Brad, and I are busy drafting. ICF has said that their team is busy researching. So we'll have a draft in a month circulated among the contributors and I think ready for the full committee by September, right, which should give us plenty of time for review and editing before year end. Pardon?

MR. ROBERTS: October meeting.

MR. MASIELLO: Yeah. Well, we'd like to discuss it in the October meeting.

MR. ROBERTS: And then I think the report is due at the end of the year. That's what it was last time.

MR. MEYER: I would say calendar year 2012 is sufficient.

MR. ROBERTS: Yeah.

MR. MASIELLO: Good. And then we still do need a volunteer on the standards front. Don't all rush forward at once. Did you note that, David? Elliot is volunteering to contribute there. Okay. And, Richard, you had also brought up that RAP could possibly assist with putting together the information about the states.

MR. COWART: Well, you know, we've been speaking for Clark, and he's not here, but I think his organization has done so much work in that, we will get contributions from him.

MR. MASIELLO: Yeah. I'm sure Clark will be happy to lend EPRI to this. Okay. We had a lot of discussion about large-scale storage and whether or not to create a whitepaper on the subject, and decided to fold it into this. So pumped hydro especially will be discussed, ongoing programs, not only from OE, but from other parts of DOE on improving the efficiency of pump storage and discussing the benefits of large-scale storage.

And then we covered the whole issue of trying to do a regulatory survey already. Okay,

good. Nothing else.

MR. COWART: Anything further concerning the work plan of the subcommittee?

MR. MASIELLO: No, not at this time. I think once we have the next con call of the subcommittee, Richard, we might discuss what other things arise out of the microgrid panel to take up. But it would be speculative to talk about that right now, but maybe in a month we'll have some idea.

MR. COWART: There's an item on the agenda here under this topic, power marketing administration comments to the public process.

MR. MASIELLO: Not for this.

MR. COWART: I'm just wondering how that ended up on that? Do you know, Elliot, on the agenda at this point? It's fine. If it's taken care of, it's taken care of it. Okay.

MR. MASIELLO: Can I save my edits? Can I use this computer to save the edits? As soon as I can save the edits, I'm done, because we captured them right here.

MR. COWART: Go right ahead, it's done.

MR. MASIELLO: I'm just waiting..

MR. COWART: All right. So this is the time in the agenda where we have an opportunity for --

MR. MASIELLO: Where is the other --

MR. COWART: -- any public comments. But I'm informed that no member of the public has signed up to address the committee, and I just want to note that for the record. And at this point, it's general committee discussion on the work plan and any other matter. Joe.

MR. KELLIHER: I just had a question on something that, you know, is not really related to the agenda items, but it's something -- it's related to a topic we've discussed at multiple meetings, including I think our first meeting, and that's just reliable impacts of potential EPA rules, and in particular the pending legislation in the House. There's legislation moving through the House that gives DOE some authority to act to prevent a generator from being in a situation where that -- which law to violate, the Federal Power Act, Section 202, or the Clean Air Act, and that legislation has been approved by the House and it's coming to full committee and it gives the

department an important role. And I was just curious whether the department has taken a position on that legislation. And if so, what position do you have? And if not, I'm curious why not.

So anyway, that was something I just thought I'd ask because it's timely, it's moving, and I think it's something we talked about at our very first meeting.

MR. COWART: Right. Any comments?

MS. HOFFMAN: I'll just address it to the best I can. The administration doesn't have a position on the bill at this point in time, but I know that there are some technical comments that are going to be provided to the committee, so that's about as far as I can -- what I can say at this point in time.

MR. COWART: Any other comments or questions on that topic? All right.

Any other business before the committee this afternoon?

MS. REDER: I'd just encourage people to sign up for the subcommittee, so if they haven't done so, please do.

MR. COWART: All right. We'll be checking the list and following up. Thank you very much. And let me just -- Phyllis.

MS. REHA: I was just going to -- a point of information. I don't recall voting on the motion that Tom made on the storage.

MR. COWART: Yes, we --

COMMISSIONER REHA: We did vote?

MR. COWART: Everybody voted yes.

COMMISSIONER REHA: Okay. Thank you.

MR. COWART: At least I'm happy to ask, are there any in opposition? All right. I think we can record it as unanimous.

In closing, let me congratulate everybody actually for getting this meeting. We covered a lot of material, we got it done, we're going to adjourn early. And I want to close by welcoming all of the new members and thanking the long standing members for all of your present and future service, past, present, and future service, and it's great to see you all. We're ready, I'll take a motion to adjourn.

SPEAKER: So moved.

MR. COWART: Seconded?

SPEAKER: Second.

MR. COWART: All right. All in favor?

GROUP: Aye.

MR. COWART: Any opposed? Anybody who is opposed, stay and talk to me, I'll be here.

All right. See you next time.

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I, Irene Gray, notary public in and for the District of Columbia, do hereby certify that the forgoing PROCEEDING was duly recorded and thereafter reduced to print under my direction; that the witnesses were sworn to tell the truth under penalty of perjury; that said transcript is a true record of the testimony given by witnesses; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this proceeding was called; and, furthermore, that I am not a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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