BEFORE THE
FLORIDA PUBLIC SERVICE COMMISSION

In the Matter of: DOCKET NO. UNDOCKETED

ELECTRIC VEHICLE CHARGING STATIONS.
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PROCEEDINGS: STAFF WORKSHOP

TAKEN AT THE INSTANCE OF: The Staff of the Florida Public Service Commission

DATE: Thursday, September 6, 2012

TIME: Commenced at 9:30 a.m.
Concluded at 5:04 p.m.

PLACE: Betty Easley Conference Center
Room 148
4075 Esplanade Way
Tallahassee, Florida

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P R O C E E D I N G S

MR. CRAWFORD: Good morning, everyone. I'm Ben Crawford with the Office of Industry Development and Market Analysis. Today is September 6th, 2012, and this is the Public Service Commission Staff Workshop on Electric Vehicle Charging.

With me is Mark Futrell also from the Office of Industry Development and Marketing Analysis, Robert Graves from the Office of Engineering, Lee Gilbert from the Division of Economics, and Charles Murphy from the Office of General Counsel.

Mr. Murphy, if you will please read the notice.

MR. MURPHY: Yes. We're here pursuant to notice for the electric vehicle charging workshop.

MR. CRAWFORD: Thank you. All right. This workshop is being held because of the newly created statute, Section 366.94, Florida Statutes, created by House Bill 7117 during the most recent legislative session.

This section addresses electric vehicle, or EV, policy. Subsection 1 exempts the nonutility selling electricity for EV charging from regulation as a utility by the PSC. Section 2 designates the Department of Agriculture and Consumer Services as the agency

responsible for setting requirements related to EV charging stations. Subsection 3 prohibits nonelectric vehicles from using EV charging parking spots.

Subsection 4 is the reason we are here today. This section requires the PSC to conduct a study of the potential effects of EV charging, both public and private, on energy consumption and impact on the electrical grid in Florida. The statute also requires the PSC to investigate the feasibility of using off-grid solar photovoltaic, or PV power as an energy source for EV charging stations. These three subject areas are reflected both in the agenda for this workshop and in our plans for the report itself.

The report is due to the President of the Senate, the Speaker of the House of Representatives, and the Executive Office of the Governor on December 31st of this year. The purpose of this workshop is to gather information to support the report required by this newly enacted statute.

We will begin this morning with presentations from speakers representing several different aspects of the electric vehicle industry. These presenters represent EV manufacturers, charger manufacturers, the solar industry, and Florida's investor-owned and municipal utilities. Following these presentations,

we'll break for lunch. In the afternoon we will begin with a technical roundtable discussion of the present and future of EV charging in Florida. Following this roundtable discussion, we will have a public comment period.

If you are interested in speaking during the public comment period, we have a sign-up sheet in the back on the podium. Please fill that out ahead of time; that way we can make sure we give enough time to anyone who wishes to speak. The amount of time allotted for public comment is going to depend on the number of people who have signed up for public speaking.

Following the workshop, we will ask for post-workshop comments to be submitted to me via e-mail on September 27th. All workshop material, including today's presentations, the post-workshop comments, and the report itself are going to be placed on the PSC website. We should have that up fairly soon.

One change from the earlier agenda that went out is Nissan Motors was unable to make the workshop. In their place we have a speaker from the Electric Power Research Institute, or EPRI, who will give an overview of the implications of EV charging.

One housekeeping note. All presenters, please speak into the microphone as this workshop is being

broadcast and recorded.

The first presenter will be Mark Duvall from the Electric Power Research Institute, who will give us an overview of information and statistics related to electric vehicle charging.

Mark.

MR. DUVALL: All right. Thank you, everyone. I appreciate the invitation to speak here. This is a little early for me, so hopefully I'll get through this with a minimum of errors and mistakes.

I'm going to talk a little bit about -- Britta Gross is going to give a fantastic overview on fascinating electric vehicle technology, and I probably wish I could give her presentation, but instead I will just talk about the kinds of numbers that we are seeing in the market and what you can look to for the future.

This is a marathon, not a sprint, but it is important to know that there are a couple of underlying factors driving the electric vehicle market, or the plug-in vehicle market that regardless of the early skepticism and some of the media reports you see are there, and they're not going to go away.

So the first thing is this is what you see today. July and August were very similar. Actually, I think the Chevy Volt set a record for sales last month.

So there's probably another six to 7,000 vehicles on this chart for July and August, but this is what you're seeing. I'm going to compare that to the market launch of hybrid electric vehicles, which started in 2000 with the Toyota Prius and the Honda Insight. Quite a bit lower, so, you know, essentially there's more models on the market now, the numbers are greater, and the slope of the curve is greater.

There are lots of models in the pipeline, and we can go and discuss our favorites or the ones that we are skeptical about, but there are a lot of models in the pipeline, and every major automaker has production programs in plug-in vehicles.

The second thing that is important to understand is -- and you're going see -- let me explain something to you. I've kind of put the cart before the horse a little bit. EPRI creates market projections, and we create a low and a medium in blue and a high in green, and we do that account for everyone between the super-pessimist to the super-optimist. And we don't mind being wrong, which is what is a requirement to be in the projection game, is you have to be willing to be wrong, and wrong on almost a continual basis.

I will show those for Florida. And one of reasons we do this is not to compete with the McKenzies

of the world or the Pike Research, the folks that do this for a living, but it's mostly because we do it on a county level. And since it's difficult to define a utility's service territory, we found the best way to do that is to drive all results down to the county level, let the utilities give us their service territory in fragments of counties, and then we can give them an adoption projection so they can understand the kind of numbers they are going to deal with. Because a million vehicles by 2015, or 10 million vehicles by 2020 doesn't mean a lot to the person responsible for city infrastructure or someone doing utility planning.

These charts here, and they mean a lot of different things, just sort of look at kind of the aggregate. These are the numbers required in California by the California Zero Emission Vehicle Mandate, and the eleven states that adopt California's vehicle emissions laws. Florida is not one of those states at this point in time, but what we're saying is that it drives a very -- you know, it drives sort of modest projections the automakers are required to provide in the largest automotive market in the country and a number of states whose combined market are actually somewhat larger than California's. So what we are saying is that this regulation -- you can't just comply as an automaker.

You can't just comply.

So before we talk about the new fuel economy standards or anything else, keep in mind this number is what they have to provide. And so there will be electric vehicles available everywhere. They have to be real programs. You can kind of squeak by in the early years, but these numbers start to ramp up very quickly and the percentages get very real. And you cannot make, I would say, a nonproduction electric vehicle. You have to be really serious about this market. So while there are only a few automakers that are displaying that level of seriousness, they will all have to get there.

So what does this mean for Florida? Florida we see somewhere, according to our model, between about, you know, eight and 20,000 plug-in vehicles between now and 2015. The model -- we have not adjusted it for actual 2011 and 2012 sales, so it's a little different from reality today, but these are the numbers that we will see.

This will drive a cumulative fleet by about 2030 of somewhere between 600,000 and over 2 million vehicles by 2030. And those are the adoption curves there, and you can kind of pick your one. We like this one. We have put a lot of faith in this one, and we encourage most people to be somewhere in their planning

between the purple and the blue line. This will drive the annual electricity consumption that is somewhere just over a terawatt hour a year by 2030 to '45.

Okay. So one of the things about plug-in vehicles is they are obviously not going to overwhelm the generation system. The average electric vehicle per day is somewhere in between 6 to 8 kilowatt hours. That's what early results are showing. That will grow as larger vehicles become electrified. As you get to the large sedans, like the Tesla Model S, or you get the, you know, sport utility vehicles, other vehicles become electrified, that number will grow because obviously they are bigger and they require more energy.

In terms of system impacts, and you can kind of look on this chart, and it's based on real driving statistics and real driving habits. You can look at the different behaviors based on where you plug in. So residential charging is a true 5:00 p.m. peak. So while the impact of the system is very low at just around, you know, 500 to 600 watts per vehicle. So if you were to look at the total impact of the Florida electric system at 5:00 p.m. you are about half a kilowatt per vehicle, so it's not a lot, but it's on-peak.

Workplace charging is decidedly morning. It's off-peak. It is generally completed before systems

start to ramp up, and then what you see and hear is the kind of noise based on how much availability of public charging you have. So public charging typically peaks at around noon when peak are out going out to lunch and running errands. So that's kind of how the different behaviors will drive your system level impacts.

But I want to caution everyone, and this is for a very high charge power rate; this is 6.6 kilowatts. It's very difficult to come up with a charge profile or a type of vehicle that has more than a one kilowatt per vehicle aggregate. Not everyone comes home at the same time. By the time the late arrivals come home, the early arrivals have finished charging, or many of them have finished charging. This is really how the system works, if you apply it to a large number of drivers.

However, the impact on the distribution system can be considerable, and it can be considerable locationally from day one. In general, what most utilities are doing is they are just responding on a case-by-case basis. There aren't many electric vehicles today. They typically charge at under 4 kilowatts. However, that's rapidly changing. The charge power of vehicles is increasing, and it can impact local distribution transformers. There's two lines on this

chart and a scatter chart of distribution transformers on a feeder, kind of a generic feeder. We have done a lot of studies in this area. So this first line here is basically the maximum charge power for a vehicle like a Chevy Volt, and you'll see there are very few transformers below this line that are heavily impacted. But as you move up to the charge rate of a 2013 Nissan Leaf or a Ford Focus electric, or some of the other vehicles, you see a lot more transformers in this range. So the higher this line moves the more distribution transformers are impacted at the location.

So it's all very locationally specific. And right now there aren't lot of electric vehicles, so there are a minimum number of locations, and most utilities can easily deal with it simply through a sort of -- I don't want to call it -- it's an initial process called early notification, where automakers during their sales process secure permission to notify the utility from the buyer. The utility is notified and they can choose to go and inspect the area and determine if there are any upgrades to be made.

Before we talk about, well, that's something that's good for California because the system has been under design for many years, we are seeing it in Texas, we are seeing it all over the place. So utilities are

taking this very seriously. Charge power is going to increase. And by the way, charge power, not time of day, is the dominant factor driving this impact. It's not the only factor, but it's the dominant one. So if you were to tell me -- if I was responsible for distribution planning, I would probably prefer lower charge powers on-peak than higher charge, much higher charge powers off-peak.

And charge power is increasing. The automakers generally prefer to see about a four-hour charge time, or at least the option for a four-hour charge time. So you can go buy a Chevy Volt, and it comes with a 120-volt charger, and that will charge the vehicle overnight easily. I have been driving that way for over 20,000 miles. Just come in, plug in at home, plug it into the outlet, no infrastructure, no cost, done.

However, there is an option for the 240-volt charger, and that gets you to this sort of three to four hour charge time. This is where automakers are comfortable, and so it is trending up. 19.2 kilowatts is the maximum, and Tesla makes a vehicle today that is priced competitively with its competition, which are large luxury vehicles, and charges at that rate. So a 100-amp dedicated circuit just for charging.

Those drivers still aren't going to use much more than the 6 to 8 kilowatt hours that vehicles are using, but they are going to take it at a much higher rate. And time-of-use rates and other off-peak charging programs can mitigate the upstream impacts, but if someone throws 20 kilowatts on a local transformer and it is already overloaded, if you're in an area where you have substantial air conditioning loads, and especially if those loads are active at night, you will still have impacts. Nothing that is difficult to deal with today, but there are more efficient ways to deal with it in the future when there are more vehicles and you have more locations.

My time is up, so I will leave you with one chart. And this chart was done by the Sacramento Municipal Utility District, also the capital of its state. For those of you that aren't familiar with Sacramento, it is a hot-weather state. You know, 100-plus degree summers, so it is a hot-weather state with air-conditioning. And there are a lot of curves on this line, but let me just point you there. They are clustered in three based on whether they go off an 8:00 p.m. peak, which is on-peak, 12:00 a.m., which is a nighttime charging profile, and 2:00 a.m., which is super off-peak. So in terms of total annual upgrade

costs, and SMUD, the Sacramento Metropolitan area is somewhere in the neighborhood of a million people, and they're in the neighborhood of, I think, half a million customers. 6.6 kilowatts of charge power is clustered way up at the top, 3.3 is down here, 2.0 is down here, and what they call smart charging, which is the intelligent modulation of power to perform all charging within the time that the drivers need it according -- but modulating time of day and power level is way down here. So you can start with a very big number, and you can drive it down to a very low number.

We're over here right now. So the total cost is relatively small, but if you have a completely hands-off approach to this, where you are just going to deal with it through distribution system capacity, you are going to get uncomfortable fairly quickly in terms of the costs. And those costs are completely in many cases avoidable. Manage first charge power and time of day, preferably both together. And I think I'll stop there. Thank you.

MR. CRAWFORD: All right. Thank you, Mark.

The next presenter is Britta Gross from General Motors, who will give us an overview of the Chevy Volt and GM's other activities related to electric vehicles.

MS. GROSS: Thank you and good morning. I think as the only automaker here, I want to make sure that what I leave you with is sort of the bigger picture on our perspective on all the various facets of a vehicle program from an automaker's perspective.

I can comment a little bit on Mark's comment about moving towards faster charge rates and so on, because we are also a little conflicted about this, too. We understand you can't do everything to the grid and remain invisible like we are, I think, today with the 120-volt charging essentially invisible on the grid. And even the 3.3-kilowatt charging, you can argue in many places it's just hard to even see that kind of load on the grid.

So I would like to leave it that way. As the energy and infrastructure person for the corporation, it's my recommendation not to pursue these higher faster rates of charge. But, you know, markets -- customers in the market always think faster is better, more HP, more horsepower, and so on. So I think we have some always conflicting positions that we have to keep our eye on. And so the trend possibility exists there, but I want to make sure that we understand that we are in some control of this, too.

So let me just try to run through everything,

and a little bit of everything, but I'm happy to answer any questions later on during the afternoon or whatever. All right. So the Volt is a little bit different. We have done -- we did the EV1 a decade ago. The EV1 was a pure electric vehicle. It was a two-seater, lightweight, very high-tech. And we decided that we believed the market was a little constrained. It would be a niche vehicle. You couldn't have a vehicle that had limited range and so on. So we decided this time around to do something very, very different, and that is we designed an electric vehicle.

So the Chevy Volt, for anyone who doesn't know, is an electric vehicle. It always drives off of electricity. Whenever you start the vehicle, if you have any charge in that battery, it's going to drive like a pure electric vehicle at all speeds, 100 miles per hour down the autobahn in Germany. Not, of course, over here ever. But once you have run out of charge, after about 40 miles, the vehicle just transitions without you doing anything to a long range gasoline-fed vehicle. The gas engine acts like a generator producing more electricity and drives the vehicle like an electric vehicle, but it is fed by gasoline.

So this is a long distance vehicle that you can take from Tallahassee today to Orlando, or to Los

Angeles, like any car trip you would ever take, but once you get where you are going, just plug it in every night, like Mark does with his Volt, and every morning you wake up and off you go with an electric vehicle that has 40 miles of electric range. And most Americans don't travel more than 40 miles a day, and so that's where that number came from. We could do an awful lot to get Americans off of our use of gasoline just by giving them a battery that does just enough but doesn't go overboard and add more unnecessary cost to the vehicle. So that's the premise of the vehicle. It kind of does -- it's almost two cars in one. It does it all. It's a little bit different.

We have had a really great track right now movement of sales. You can see from the beginning back in December 2010 when we launched the vehicle. We still have a very nice trend, upward trend of vehicle sales. As Mark mentioned, in August we had our greatest month of sales ever. We sold actually 2,831 Volts. That's a huge number compared to -- you know, it's a challenge to sell an alternative fuel vehicle. It's a challenge for a dealership to train their salespeople to come up with the right -- you know, to know all the right answers. You know, normally the customers who purchase the Volt or more astute and more informed than any of the

salespeople in the country, and so it takes time to sort of develop and communicate.

I would imagine this panel here -- in fact, I know this panel, almost everyone on it, we all know a lot more than the average person does, by a long shot, on the vehicle. So August was fantastic. Wildly successful sales, especially in California, especially in Michigan. Texas is also a big state for us. So things are really pointed in the right direction. We had a very quiet successful last six months, and that is exactly what you want to do. So from a foundation standpoint, have we done what we need to do at the automakers to make these vehicles successful? I think the answer is yes. It's starting to quiet down, and we are starting to get the results of a very successful, ambitious program.

Just some numbers for you. We have both in Europe and over here with the Volt and the Ampera, the Opal Ampera that is technologically the same as the Volt inside, we have exceeded over 20,000 sales. That was a June number, actually. Dealers across the country are selling the vehicle. On average, a Volt owner, because of this 40 miles a day, many days go by, many weeks go by, many months go by for many Volt owners where they are only doing electricity. And so the average is that

the average Volt owner only stops for gas once a month, and that's the average one. We know Volt customers who have only gone every six months they are stopping for a tank of gas, or whatever. They are also driving about 900 miles before refilling, so the fuel economy on these vehicles is stunning. Just look at the fuel economy; it is stunning.

GE is by far the largest corporate purchaser of these vehicles. They have committed to purchasing over 12,000 Volts, and we have already delivered over 1500. The beauty of the vehicles that we have sold, and I've talked about the August sales of 2,800 vehicles, we have already -- with just that small, small number of sales, which in the big scheme of things is a drop in the bucket for automakers, right, so far. In just the 20,000 or so vehicles we have sold here in the United States, we have already moved 78 million miles of travel over to electricity as opposed to gasoline. That's a stunning accomplishment, when you figure just sort of handfuls in different communities of electric vehicles. So it is a very, very big accomplishment. That is already 4 million gallons of gasoline. That is the equivalent of two tankers, supertankers of oil coming over here. So this is important. It's really important.

If I talk again about how foundationally have we done the right things and is this movement for real, I would just look at, and I would point out the awards that the Volt has won. It is a stunning piece of technology combining these two sort of technologies of an electric battery drive vehicle with a generator, a gasoline-fed generator system to use electricity. It has really never -- it has never been done, certainly not in a mass production vehicle, and it was very difficult to do. It has a lot of technical challenges to it.

It has got over -- God, I can't even remember the numbers -- 10 million lines of code. I can't even remember -- I think it is 10 million lines of software code. That's more than a fighter jet today. I mean, it is stunning, stunning technology that required a national industry of folks with IBM doing software, and a lot of, you know, general development, and a lot of folks working together to get this thing where it is. And it was recognized across the board as the most stunning piece of technology. So we, foundationally, again, have the right piece in place.

If you ask the customers what they think, the number one response is it is just fun to drive. Electric drive is fun. It's smooth. It's quiet. It's

comfortable. It just feels like the future. It feels like this is where we should be. It's the right time, the right place, we should be there.

And so we have taken a look at what some of value propositions are to try to keep moving this market forward. It is lower. In fact, lower fuel costs for almost every circumstance in the country. There are a few pockets where people pay very, very high-tiered rates. For example, in California where actually electricity prices can be challenging. But for broadly across -- I mean, I would think in the high 90 percent range, broadly across the United States where the average electricity rate is about 11 cents a kilowatt hour, you are paying $1.50 for a full charge of that vehicle battery. And here the rates in Florida are about on the national average. I think about 12 cents a kilowatt hour is what I pay in Orlando.

The fewer gas station stops is certainly a customer delighter. Great fuel economy I have pointed out. No tailpipe emissions, so communities are cleaner when the vehicle is driving on the battery. It is a quiet vehicle. It is amazingly stress free when you are driving this vehicle, because it is so smooth, elegant, and quiet. So there are certainly value propositions that aren't even broadly understood by the marketplace

yet. These are coming. People are going to really start recognizing what these vehicles have to offer.

It is very high-tech. I'm going to talk a little bit about connectedness with OnStar and the computer and what you can do as a consumer to manage your charging and what time of day you charge. I'm talking a little bit about Mark's point about the peak at 5:00 p.m. if you don't do anything about it. We have a lot of capability in the vehicle to move outside the peak, and I will show you what that looks like.

But bottom line, again, fun to drive. This is an excellent technology. It will be successful. I believe it is very inevitable. If you ask customers -- so we talk a lot about this 40 miles electric, and then a bunch of gas, you know, 350 miles plus on the gas range. It's a little confusing for folks, because it is sort of this two cars in one. What does 40 miles get? Five of these folks, and let me just start with Ted Ellyatt who was over in Fort Myers Shores. He has got 111 miles per gallon fuel economy after driving 34,000 miles on the vehicle. Over 100 miles per gallon. Stunning.

The Westlakes. This is a couple, Joseph and NylaVae, who live in Orlando. Their lifetime fuel economy is 178 miles per gallon. They have got over

12,000 miles on the vehicle. So why don't I just pick out a couple examples of folks that many of you guys actually do -- also recognize these are, for the most part, except for Bob Graham, who works at Southern California Edison, these are very normal citizens that are driving the vehicle. So excellent accomplishments here. And, again, proving how important it is to move the gasoline miles over to electricity.

We have a lot of ad campaigns now to stimulate the market, asking the customers themselves what they feel about it. The Kassars are also an Orlando couple. There are two Volts in their family. Both the husband and wife drive a Volt. Again, pointing out that this is -- it is really catching on. Florida is a big market for the technology. It fits right in here.

The Volt is the highest ever recorded customer satisfaction vehicle by Consumer Reports, and this was back in 2011, last year. The people who drive the Volt are wildly ecstatic about it. So, again, all I want to do with all of this is not brag. What I want to say is we have done something very, very important in this industry, and it's moving miles from gasoline that is imported over to electricity that's made right here. And this is really, really important to know that this can be successful. It needs feeding and care and we

need to keep moving this market forward and doing everything possible to collaborate with parties all over the country. But it's very, very important, and we think we are exactly on the right path. This will be very, very successful.

One thing I really wanted to say here is that we have a very large collaboration at General Motors with utilities around the country. This is how I got to know Tampa Electric and OUC. I see Jennifer out there, too. Florida Power and Light with Brian here. Progress Energy with James out here, as well. This was a partnership that we developed with EPRI. Oh, gee, Mark, I think this goes back to 2007, it's almost five years now, to actually almost in some ways codevelop the Volt program.

How does the grid work. What are your concerns on the grid. What if we designed a vehicle that plugged into the outlet? Would that be good? What if we wanted a 3.3-kilowatt charger on board for 240 charging, would that be okay? Where are your break points? What are you worried about? Are you worried about local transformers? Are you worried about overall grid load?

We wanted to understand the voice of the utilities, so we got this right. We don't want to solve

one energy problem with another energy problem. So this became very, very important. And this relationship is by far one of the most stunning symbols or recognitions of collaboration that I have ever seen in the industry, between the automotive and the energy industry. I have never seen anything this big. And it's important. A lot of the people here in this room deserve a lot of credit for making this thing happen.

Unprecedented power industry engagement. I probably don't need to even say much more than that other than showing again TECO's -- Keith, there is the famous picture. I have shown you that for three years on this picture. The PUCs of Texas, and the president of EEI have all been just broadly, broadly supportive across the entire utility industry, and also the commissions, as well.

Let me talk just really quickly about charging on the vehicle. So I mentioned that the vehicle has two modes of charging. One is at 120 volt. It just plugs into a very normal household outlet. Every Volt comes with a charge cord that is portable. You can carry it on a little wrap-around, just like that up there. And one end goes into the wall into your garage outlet or outside on your driveway, and the other end is the J1772 SAE connector and goes right into your car. That is a

low-cost option. You don't need infrastructure. You don't need an electrician, or, you know, wiring expert to come in and do anything. You simply plug it in and off you go.

You can also opt to purchase the 240-volt charging station. That it is the 3.3 kilowatt charger much like a dryer connection, and you can charge the vehicle in about four hours as opposed to about ten hours at the 120. When you are plugged in at 120, although I think all you guys are experts in this room, at 120 volts, the 1.2-kilowatt charging of the Volt, that's like a hairdryer. My hairdryer at home is 1,300 watts. That's less energy to charge my Volt than it is to run my hairdryer. Now, I'm doing it for ten hours, of course, that's a little different. I told that you was my hairdryer, but it's important to understand that is the load we are talking about, the hairdryer load.

Down here on the 240 at 3.3-kilowatts, that's half a dryer load. I think dryers run at 30 to 40 amps. We're only drawing less than 20. So we are half of a dryer load. And I run three loads of laundry every night, and that is about -- you know, in four hours that is probably the equivalent. So we're not talking -- the levels we're talking about in the Volt, and my recommendation to the corporation is I like these

levels. I like not pushing charge rate and speeding up. I wake up in the morning, even at 1:20, the vehicle is fully charged, and off I go. I think that that is very satisfying for consumers. I would like to -- you know, I would like to -- I think there is a strong voice that says I think we will always have a lot of folks doing the 120-volt charging. The question is where do the other rates go and how much push is there to ramp up to 3.3 kilowatts.

Here is where vehicles are. We looked at Department of Transportation data a couple of years ago when we were designing the Volt. This is what the data suggests is that seven days a week, so you see the seven days a week, the five red spots on the five workdays, Monday through Friday. The weekends are on the -- the Saturday and Sunday are on the ends. Green is when the vehicles are parked at home, so predominately the vehicles are parked at home. Red is where they are parked at work. So for us the priority was get home charging right; number two, get workplace charging right; and, number three, everything else.

Put some in public space, put it at destination spots like beaches or parks. Put it at shopping malls, stadiums, museums. These things make sense. But it didn't have to be -- we didn't have to

have areas swimming in infrastructure when, in fact, the charging between home and workplace is going to handle almost all of our charging needs. So that certainly is how we have worked it out. This is Mark Duvall's famous slide. Home, then work, then public in that balanced order.

I wanted to also just quickly show a little bit about what you can do on the Volt today. So when we understood about the utility industry about where the break points were, what they were concerned about, what we should not do with the grid. What they could offer to electric vehicles, you know, turn it around. What is the opportunity on the grid to help move loads around at night. We built some features into the Volt from the get-go that aren't really smart grid yet. We can do demonstrations on them where we have utilities sending signals up to OnStar and down to the Volt to either start or stop charging. So we are doing -- incrementally with EPRI's support, we are doing a lot of demonstrations of smart grid technology and smart charging of these vehicles, but today it's more manual in the vehicle.

There are features to change the charge mode on the vehicle. For example, here on this view I think you can see immediate charge. So I plug in, I start

charging right away. But there is also a charge mode, too, that says, no, it's going to be a delayed charge based on whenever I have it set for parker time in the morning. So I set my vehicle for 6:00 a.m. in the morning, and it is now 6:00 p.m. at night, it knows that it needs four hours to charge, and, therefore, nothing is going happen until 2:00 o'clock in the morning and my vehicle is going to start charging. And there are a number of customers that are using the charge mode to delay the charge to start a charge away from that 5:00 p.m. or 6:00 p.m. peak.

So these things are important. We are already starting to build into the vehicle the capability to better manage and make smart the charging of the vehicle. And then there is another feature, there is another mode on the vehicle that actually adds the price of electricity you pay to figure out when is the lowest cost opportunity in the evening to charge my vehicle, and that becomes a factor also in addition to when I want to leave with a full charge in the morning.

A couple of pictures of the screen. This is what I'm talking about with the delayed departure time settings. You can set different times for Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday, and it calculates that, and then it will just backtrack.

In the early morning hours what is the latest I can start and still get a full charge. And this is really -- I think this is -- I think you'll recognize that this is incredibly forward thinking, thinking about how do you move charging into that very deep valley. Almost broadly across the United States and North America, the utilities have these very low valleys of load in the early morning hours, and we'd like to move vehicle charging right into that sweet spot.

The three charge modes there. Summer rates. We have everything in the vehicle. Summer rates, winter rates, off-peak, on-peak rates. So a lot of capability in the vehicle already. The vehicles are stunningly smart. This is what part of the ten million lines of software code are doing. There are so many things going on in this vehicle. So we have a lot of capability.

I wanted to point out just a couple of facts about the charging. About 50 percent of all customers are charging at 120 volts. They don't call Charlie at SPX, and say, hey, I want a 240 volt charger. They are not participating in an incentive or a grant program. They are doing -- they are just -- they don't call us; they don't contact us, so they must be happy doing 120-volt charging just like Mark Duvall is.

The 240-volt charger installation grant

programs likely have been driving some of the 240-volt demand. So I wouldn't doubt that some of that 50 percent actually starts to increase as some of the grant programs and incentive programs go away. That people are finding 120-volt is pretty benign. It's fine. I'm charged in the morning fully on the Volt when I want to leave, so, you know, why not? So, I'm wondering what is going to happen with this mix, but I wouldn't doubt it if the 120-volt starts to increase in more demand.

Installation costs for the 240-volt -- Charlie can give you more information on this, but we had been seeing $500 to $6,000 depending on the circumstances of the home. How complicated, what kind of service level did you have already, and so on.

Let me just skip some of this data. We can actually talk later on about some of these other items. We need to talk a little bit about DC charging, fast charging. DC fast charging is kind of interesting. It's going to be expensive. You're probably going to have demand charges levied against for you for that instant demand. It looks like it may be 50 kilowatts to do this. It's an intriguing thought, if you can get sort of by the financials, but I wonder if instead of talking about long distance driving for a pure battery

vehicle, I don't think that we need corridors of fast chargers on tollways and turnpikes and stuff.

I don't think that people want to take long distance trips and stop every hour, every two hours. I want to get where I'm going and I want to get there fast and I want to be done. But I wonder if there isn't a real need that is going to develop around congested areas of multi-family housing, for example, apartments and condos like Miami and Manhattan where there really isn't going to be a good answer for home charging.

You're going to have these big parking lots and garages, and to wire these things is going to be expensive. The notion of having a fast charge at the gas station across the street where you normally work filling up with gas, that to me sounds like a really smart use of DC fast charge. You can spread the cost around the thousands of people that might use that station, so I think that that is, for me, the major opportunity is where you can't do convenient, and reliable, and safe home charging that DC plays a role.

So I think that we are going to start to introduce some DC next year on the Spark EV, that we are introducing the Chevy Spark EV. We will have some DC capability on that vehicle, and so we will start to learn what that looks like. But I think that this is

the vision of what I have for where DC does play a role.

I'm just going to quickly go through. There are a lot of resources to become informed about what the community is doing, the collaborative effort. We have collaborated with the NFPA on first responder training. We have collaborated with Rocky Mountain Institute on Project Get Ready, of which Tampa has got an organization, Orlando has got an organization, and others. The state task force in Michigan is one example. California has got a lot of task forces. Florida is very active in all these spaces. We have collaborated with electricians around the country on something called EDITP training for electricians to get really a deeper understanding of electric vehicles and what exactly happens. There is a lot of information out there.

Lots of great deals right now as we try to make sure that the market understands all the technology. The Spark EV I've talked about coming out next year. A lot of ways for states to get involved. This looks like the template that has been used by Orlando Project Get Ready in Tampa and others, sort of the balanced picture of all the things that can be done to stimulate the market for electric vehicles. Get your stakeholders at the state level, at the local level, get

your utilities on board, other regulators, of course, the permitters, local employers, universities, automakers, and so on. Get everyone together and think about building awareness, education, create a market where this can thrive.

Because it is -- like I said at the very beginning, it is not easy to sell an alternative fuel vehicle. You have to spend a lot of extra time explaining more things about why electricity and how does that exactly work. And what about that plug at home? It takes a lot of extra time. So it took a lot of effort to get through this transition period. It will be successful, but you have got to make it through this very difficult transition period, and I think that we are breaking through that right now.

Bottom line, what do we need to do to accelerate the market? We do everything possible. Thank you guys very much.

MR. CRAWFORD: All right. Thank you, Britta.

The next presenter is Joshua Caillavet from GE Energy Management -- did I get your name right -- from GE Energy Management, who will tell us about GE's electric vehicle chargers as well as their solar photovoltaic EV charger.

MR. CAILLAVET: Great. Thank you, guys. As

Ben said -- thank you, Ben. I'm Joshua Caillavet with General Electric. I'm very excited to be here. It's a great time in our industry. I see a few familiar faces out there. Britta, Mark, fantastic presentations. You guys did a great job.

Britta hit on a lot of the points that, you know, around EV charging, talking about home, public, workspace charging, Level I and Level II. Great job there. Thank you.

I'm just really excited to be here because, you know, we have got a lot of people in the room that I think we can really do something here and really help move this thing along. So, again, just excited to be here. So today rather than give you guys, you know, a product sales pitch, what I wanted to do is really kind of just talk about EV charging in a sense. I took out some of the things that Britta hit on. So, again, thanks for touching on those. But really kind of touch on how this affects the grid and some of the unique ways that GE has proposed to, you know, again, diminish those effects on the grid.

So with that, I will talk a little bit about our product portfolio of EV chargers. These are all Level II chargers, 240-volt charging stations. I will start over here on the right. That is actually our

DuraStation. That is the first line of electric vehicle chargers that we came up with. It's a very robust commercial/industrial unit. It comes in different configurations; double pedestals, single pedestal, wall mount and pole mount. It has a basic software system that can be used through RFID technology to actually track data usage at a local location.

The WattStation wall mount is actually a unit that we have launched. It's a simply unit. Basically no software. No access requirements. This is the one that will actually be installed in most residences. We are selling these at our big box -- you know, a lot of the big box retailers likes Lowes, Home Depot, Amazon, places like that. And then that brings us over here to the WattStation pedestal, which is our premier charging station. It has an integrated fully retractable cord management system, so there's no dangly cords kind of hanging out there for snowplows and things like that that come by and rip off. It has a much more sophisticated software package. It's a cloud-based package, so that would enable you to monitor the usage at multiple locations. So it's not localized like the software package here, the WattStation Connect. It has multiple forms of authentication RFID technology, and short phone. I will get into both that and the software

on the next couple of slides.

But, overall, again, this is our product portfolio. And, you know, we feel like that meets most of the needs of most of the consumers. This is the WattStation Connect software package. Again, available today with the WattStation pedestal, and we are working on a program to incorporate this software package into the WattStation wall mount, so that should hopefully be available next year giving a little bit more economical charging station.

Basically, what you have here is a software package that allows you to monitor usage. It allows you to dive in and diagnosis what problems you have, and it allows you to set up payment systems for time-of-use pricing and things like that. If you have a network of charging stations you can see over here, basically looking at your charging stations, setting up price points depending on what day of the week it is, what time of the day it is, things like that. And, again, receive e-mail notifications, text notifications that allow you to diagnosis that.

It does have the RFID technology. There is two forms. Just simple RFID. Perhaps if you have a fleet you could use your employee badge to authenticate that. There is another RFID technology. It's kind of

like an e-wallet or a toll pass. You put a certain amount of money on that over a period of time, and then as you us it that money diminishes.

The third form of payment used is the actual smart phone. So on top of the charging stations there is a QR code that would allow you to walk up to the charging station with your smart phone, scan that QR code, and then initiate a payment connected to your bank account or to your credit card account.

The last piece of the software, the connect software is actually the integration into building management systems, fleet systems, or your regular software platforms. It allows our connect software to integrate into your own personal company software.

Looking a little bit more at the mobile apps. Again, you have the app for the driver that allows you to find a station, allows you to access that station, again, through the QR codes, and then actually allows you to manage your own WattStation account. They have an app for the installer that would allow you to actually provision it. So if you are a contractor, or a utility in this case, you could install these things and provision it simply using your mobile app. And the apps are available at the Android marketplace and the Apple i-store.

So that's kind of an overview of the product, but I will get into a little bit more of the market at this point. As you can see, these are the numbers on a monthly basis almost all the way back to the beginning looking at the various different cars. You can see there are quite a few cars out last year. We basically had two cars available, the Volt and the Leaf, you know, with the exception of the Tesla at a higher price point, right? But, you know, this year there is quite a few cars. I believe, you know, twelve or so should be out by the end of 2012 giving a lot of choices and price points for different consumers.

You can see that, you know, since March we have basically seen in the area of 3,000 EV car sales nationally per month. This is an actual cumulative look of the actual car sales over the course of time, and I think that ties in close to what Mark said. You know, roughly 40,000 at the end of this month probably.

Down here I'll just point out, you know, depending on what report you pull it's going to show a number of cars available here in Florida. I think there was a report by the Center for Automotive Research last year that said that there will be 25,000 electric vehicles in Florida by the end of the year. But for the purposes of today's conversation, we used the assessment

of plug-in electric vehicle integration with ISO and RTO systems. And so in that document they basically said that there will would be 11,000 PHEVs on the road in Miami by 2019, which would, in fact, result in an increased peak load of 75 megawatts.

So with that, you know, the objective is -- with this added demand on the system, the objective is ultimately to stagger that load over a period of time in order to help avoid some of these problems. Insufficient generation is probably not as much a problem. If you asked most utilities, they will say, you know, we have the capacity to generate more electricity and that is not really a big deal. But Mark touched on this one.

Undersized transformers. I think, you know, there is a lot of transformers that are probably out there that are sized today, but aren't exactly sized for the coming of electric vehicles. So that seems to be one of the key issues that, you know, utilities are focusing on are these transformers, because typically they cool down at night. So with the added demand, and we are kind of telling people to charge at night during off-peak hours, we see that there could be some issues with the transformers.

Another thing, you know, typically when demand

spikes people use fossil fuels a little bit more to create electricity. So, you know, that is another grid issue. And then obviously when the load fluctuates, you either have overvoltage or undervoltage issues, as well. So, again, what we are doing is presenting, you know, the ability to stagger these and a couple of ways to do that. You know, time-of-use pricing and the communication. Britta touched on the communication a little bit. The ability of the car and the charging stations to communicate back to the utilities and then implement a time-of-use price.

Here's, if you look at it again, that same source. A typical, you know, demand curve of probably a utility for, you know, just about any given day. If you add in EVs, it essentially gets worse, right? I think some of the numbers say around 6:00 p.m. to 12:00 a.m. is the typical time for electric vehicles to plug in. And that makes sense, right? People come home at night and they plug in when they get off work and they charge. So you would actually see this increase down here.

So with the implementation of solar EV charging stations and battery storage, it gives us a unique way to leverage -- you know, to leverage the sun and harness that energy and be able to shift it around during times of demand. So, you know, if we put a

time-of-use price in there, what we would like to do is, again to Britta's point, set that perhaps at 12:00 a.m., which we can do through the car, and have that charging begin in the latter part of the night back here and kind of help levelize that curve. And that's really the objective that we are getting at through these technologies.

Here is sort of, you know, an overview or a example test site of what we are looking to do here. You have got the two-way communication between the ISO and the distribution system, and then given that your solar array here is typically intermittent depending on the clouds, or thunderstorms, or what time of day it is. You have that power that is either going to go directly to the distribution system, which is obviously a lot more efficient, or you can put it into a battery and store that, right? And then, again, shift that around helping to normalize or levelize that peak demand curve and even all that out.

You know, obviously here is some of the benefits of solar and EV: Help to accelerate the adoption of electric vehicles; develop a public electric vehicle infrastructure; make electric vehicles truly zero emission; mitigate the impact of EVs on existing distribution grid; and then an alternate revenue stream

for utilities, thus creating, you know, a bigger ROI.

Here is a look at one that we actually did at our headquarters in Plainville, Connecticut. It is a 100 kW grid-tied system. You know, it covers about 40 parking spaces, and it has about ten electric vehicle charging stations on it, which offsets the power of 13 EVs per day, or 20 homes per year. So, you know, it showcases a lot of our products. You know, we are not just making the electric vehicle charging stations, we manufacture safety switches and disconnects and a lot of the other components that go into -- obviously circuit breakers and things like that. So there is a lot of GE products in here.

And so, again, we kind of did this as a showcase at our headquarters in Plainville, and we got a great response out of it, and so we have actually begun building one at our headquarters down in Atlanta. Here are some pictures of the one in Atlanta. It's not quite as big. It's a little bit smaller. I believe it's like 30 or 50 kW. I can't remember. But, you know, as you can see it's only four charging stations, things like that.

But here is actually a pilot that we intend to launch 30 solar powered carports located in large public locations including 100 kW battery storage and Level I

and Level II DC fast charging. Again, just looking to basically put that out there as a way to help install infrastructure and, you know, offset some of the impact on the grid. And that's basically all I have today.

MR. CRAWFORD: Thank you, Joshua. The next presenter is Charlie Yankitis from SPX who will describe his company's charger manufacturing and installation operations.

MR. YANKITIS: Thank you, Ben. It's a pleasure to be here. For a guy from Detroit, this is my first time to Tallahassee. It's a very lovely city. I haven't been here very long, though. I got here last night. But I'm an auto industry guy. I have been in the industry for over 30 years. And, you know, Britta made the comment about the technology in these vehicles, and it is truly stunning technology for a guy that has seen the advent of fuel injection, and ABS brakes, and traction control, and hundreds of new technologies on vehicles.

You are probably not familiar with SPX, so I'm going to give you a little background. We are a Fortune 500 company based out of Charlotte, North Carolina. A $5 billion company. I am in the automotive group, which is based in the Detroit area, which is a billion dollar portion of that company. And we have been around for

about 100 years supporting the auto industry on a global basis. And our traditional business is tools and equipment, diagnostics and technical publications, all involved with the support and the repair of vehicles.

In fact, the chances are your car at one time has been worked on with one of our products at a dealership or an after-market facility. And then also in our automotive group we have offices all over the world to support all the different manufacturers.

Now, in January of this year Bosch, which you are probably a lot more familiar with, made a purchase offer for our automotive division. So that offer or the deal is expected to close by the end of this year. So we will be part of the Bosch Group, which we're pretty excited about, because it is a very large automotive supplier and a very progressive company.

So, you know, you have heard from the research institute, you heard from General Motors, from GE, a charge station manufacturer. Well, we have taken kind of a role here in this new industry as an installation expert, so we have been installing charge stations in people's homes all over North America and also other parts of the world. And to date in this new industry of the modern plug-in electric vehicle, we have installed over 30,000 home installations, 97 of those in Florida,

and we have distributed over 12,000 electric vehicle charge stations, and 425 in Florida, about half of those in dealerships and half in homes. And then we are -- also, as an installer, we are also a distributor of multibrands of charge stations, including our own and the GE product, too.

And when we got into this business a few years ago, we decided that we would hire local electricians all over the country, because we felt it was important to the consumer to have somebody local that understands the local codes, knows how to get the job done, and is literally close by to the residents. So we have over 800 certified electricians across North America in place.

We also have -- while we work very closely with the GM Volt team as they were developing the processes to support home installations, and we have a global agreement with them to support the launch of the Volt around the world. We have now done a lot of the installations in the U.S., but we also have done installs in Europe. We also have charge stations in China that are in use. And we also have a global agreement with Daimler, so we are supporting their current electric smart car, and then we will be supporting future Mercedes-Benz plug-in electrics.

And then we also have a very close relationship with some of the key utilities, including Florida Power and Light, in supporting some major incentive programs that they have to promote electric vehicles in their areas and also to do research, you know, on the load to the grid. And they include other utilities like Detroit Edison, LA Water and Power, Austin Energy, Consumers Power, et cetera.

And then our process is designed around holding the hand of the customer through the complete installation process. For instance, when you buy a Volt now, your dealer will make you aware of SPX, and then the consumer will call SPX. Our agents on the phone will discuss 240 charging with consumer. We will also make them aware if there is any incentive programs in their area, any Department of Energy programs. And then if they are ready to get a quotation, we will then dispatch one of our certified contractors to their home so they can provide them an estimate for an installation.

And then we follow that customer all the way through the process from cradle to grave, basically, and we log everything into our system, so we are tracking this throughout the process. And we want to make sure the permit is pulled, and we want to make sure the

inspection is done, and everything is complete to the consumer's satisfaction. We call it Never Let Go Customer Support.

And in Florida, here is a map of where we have contractors in Florida. Again, these are local electricians that we have under contract. They have all been through a third-party certification, background checks, financial stability of the company, so we want to make sure we are sending quality people into your home. And then we are continuously recruiting new contractors. We still have areas in the country where we are looking for contractors, and there is some, you know, turnover, too, where we have to replenish.

Another important part about this that people don't think about is once you have your car, you have your charge station, it's in your house, if you have a problem in your house with your charge station, you know, your dealer, the dealer service technician isn't going to come to your house. So we, on our technical support line, will help a customer determine what the source of their problem is, and then we'll make a determination, is it the charge station, is there something wrong with the infrastructure, do we need to send an electrician in, or is it simply where the customer might have to -- maybe their breaker popped and

maybe they didn't realize it, or something else like that happens. So we take quite a few calls now that there is a lot more charge stations out in the field with questions like this.

And as we have been doing installations, we are collecting a lot of data now from all over North America, and I just have a few highlights here of some of that data. We asked a question of the consumers, is it okay to share your information with the utility company, and 85 percent of them say yes. So that's a good thing. As I mentioned, we have already shipped 12,000 charge stations; 30 percent of our installations, too, have second meters, and that is where the utility company in that area requires a second meter for a secondary circuit to measure the energy usage of that electric vehicle.

And then permit rates are interesting. For electrical permits, you can see on the high side, in California the average is $208 for an electrical permit, and then Colorado is, what, $15 average. And Florida is right at near the middle there at 167. So they vary tremendously across the country.

And then we also get data on the styles of homes and different information about the homes. Single family homes, I think Britta had that same statistic.

The ranch split level, other, or tri-level, pretty even distribution there. And then slab, crawl space, basement, again, about one-third each. And then most of the homes have been built in the, what, 1950 to 1990 time range. And then most of the chargers are put inside of attached garages.

We have also -- now, some people say they think 23 percent of the homes having a 240-volt outlet in the garage is a small number. I think it's a big number. I never expected 23 percent of the homes to have a plug of some kind in the garage, and the reason why people might have one is, and it was mentioned before, you might have a dryer. In some parts of the country they put dryers in the garage. Sometimes people have a welder or maybe a woodworking piece of equipment where there was an outlet put in there. And a lot of times people might have bought a house, and they don't even know why it's there. So if you have an outlet like that, that can make the installation less expensive, because you already have a circuit available.

And then the main panel locations. We show the different areas. Basement, and garage, and then outside. I think in California typically a lot of times it is outside. Not so much in other parts of the country. And then there is a subpanel in the garage

28 percent of the time. And we also ask about 120-volt outlets. So if somebody is thinking about using their cord set and not having a 240 station put in, we are getting them thinking about, well, okay, how many plugs are actually in your garage, and where are you going to plug that cord set in. So most of them only have one outlet, too.

And if you have multiple outlets in your garage, and as Britta mentioned, a hair dryer, if there is a bathroom near your garage, you might be on the same circuit as your garage circuit. So if you plug your car in and your hairdryer at the same time that might pop the circuit breaker. So you might have to put either a dedicated 120 circuit in or that may be a good reason to put a 240-volt unit in.

And my last slide here is just about our own SPX charge stations. We have our basic unit on the right there is our wall mount charge station. It's a very robust unit. It can be used in a residence, it can be used outside, it can be used in a commercial environment. It can be a plug in; it can be hard wired. We had a customer in California, he had his install done himself; we didn't actually do it for him. But he had a dryer in his garage, and he wanted to use the dryer and charge his car, so he put a switch in so it could switch

from one to the other. And he mounted our charge station upside down so he could plug it into the same circuit. But it works for him. His dryer is right next to his car, so you can dry his clothes and then switch over and charge his car.

And then we take the same charge station and we put it inside of a bollard so it can be used in a commercial parking space. And another unique thing about us is because we are automotive, we know how important it is to task your product on the cars. So our product has been tested at General Motors Engineering, at Ford Engineering, Toyota Engineering, Honda. Every time we get the chance to do engineering level tests we will take advantage of that.

And my last slide. This is Electric Avenue in Portland, Oregon, and that's our charge station there. There is eight or so different manufacturer stations there. It has been in use since August of last year, and we have had very good feedback from the people. And it's being used every day by people that drive Leafs, Volts, Fords, and Toyotas, and everything else. And of course we have a Volt in the picture there.

Thank you very much.

MR. CRAWFORD: Thank you, Charlie.

The next present is Bob Reedy from the Florida

Solar Energy Center, who will discuss solar powers potential for EV charging.

MR. REEDY: Thanks, Ben.

Thirty-plus years before FSEC with utilities, and now with the Florida Solar Energy Center, FSEC, which is part of UCF, University of Central Florida. A lot of acronyms. The bottom line is I'm a state employee, even state employees are allowed to have opinions, and in some narrow band even an expert opinion. So with that, I'd like to offer that my first opinion is that the electric vehicle is the second most wonderful thing to happen to the electric utility industry and the energy industry in general.

The first most wonderful thing -- most wonderful, that's redundant -- is PV, so we put the together together. And then I was going to use my -- I just discovered that my last slide in the backup section really should have been my first slide. So I'm not even going to try to go there because of the trouble with the slide changes, and it just simply establishes very clearly that we are nearing grid parity. I'm sure most folks in the room understand what we're talking about. We are nearing that, residential rates, in 2013, sometime in 2013 without question in Florida. We are there now and have been for probably a year at grid

parity on peak with time-of-day rates. So that's an important distinction.

I have a number of slides that I don't need to use which establish that the electric vehicle is really a very efficient economic way to drive. And so as we go through this we use typical numbers. You always can argue about them and such, but it's already been said that this is very effective. If we follow through, we have a very reasonable argument that if you plug into your wall you will get an average of right at a dollar a gallon equivalent in Florida today, using the electric rate as the basis for that and some typical numbers that are average and representative and conservative, I will have to say, because we wanted to be sure not to stretch it. So we do that.

We note that PV modules are decreasing very rapidly. The price of those things, and are going to continue. They will bounce around, but we will definitely be driving down through economies of scale and high production through some strange things in the marketplace, which always fascinate us. Also, we recognize that as we get lower and lower in cost, and that's something that's well appreciated in this room is that grid parity becomes sort of an ever-elusive thing, because as we have higher and higher penetration of PV

and we reach that point, we begin to talk seriously, and most necessarily about unbundling the energy from the demand, or, you know, creating essentially a residential demand rate that allows the proper energy to be weighted against instead of aggregated.

So I know I have opened that subject, but everyone here probably understands that. So good parity will bounce around. But, again, arguably on-peak PV generation is a wonderful thing, and it is very economic, and it is very healthy for the utilities because it really is offsetting those very highest incremental rates of generation.

Some more information to argue that, you know, prices are coming down for PV. This is some national data, but Florida is actually quite representative. So if you put all that together, you come to the point of saying that PV instead -- we like to talk about PV as compared not to electric rates and the grid parity argument, but we like to talk about gasoline parity. And we are well below today without any question, almost without anyone can argue we are well below. We are $1.08 a gallon equivalent for PV in Florida residential. So that's great.

I mean, this news is just astounding. And the other astounding thing about it is that this fuel

doesn't come from Texas or Saudi Arabia, it comes from the sun and the capital investment in Florida, which is forever, and the jobs. And so when we start thinking about not only is it $1.08 a gallon, but all that money stays in Florida, especially if we use PV from a manufacturer in Florida like Bluechip or some others that are coming in. We are really doing a wonderful thing for the State of Florida.

I don't need to talk about the price of gasoline. It will go up and down, but it inevitably will go up over the long-term. And, again, PV is a fixed fuel. It's not even like natural gas, which is going down right now because of more and more exploration. It is fixed forever and is strictly a capital investment. Very, very minor almost negligible maintenance component, O&M component.

So we go on with the price -- I'm spending too much time on the gasoline argument. I'm going to move on now and start talking about PV charging stations. That was my job, and I have only less than eight minutes left. So we are clearly established. There's some more argument that you can see in the recorded slides about jobs, and displacement of fuel, and that sort of thing. So we are at that point that we are going to have -- we are going to drive PV, because PV is at grid parity

on-peak and will be on residential within a year or two on average. And we are going to drive electric cars because it is cheaper by a third, it's about a third cheaper or a third the cost of gasoline.

So how do we charge them and where does it go? Where does the PV go? That was my assignment, really, is to talk about where this PV is going to be that is going to be linked up with charging of electric vehicles. And I have to do this, and I'm not even going to go through this carefully. I'm just going to state globally that the inverters that are assigned to bringing the PV, the DC to AC, and bringing it onto the grid through other projects that we at FSEC are working on and the whole industry is working on are very, very good for utilities. And I say that as a long time utility engineer. Those inverters are wonderful devices that allow us to eliminate capacitors, to stabilize voltage, to reduce wear and tear on tap changers, and all of this keys on the utility controlling that inverter, or at least being able to talk to it, and also having some sort of compensation arrangement made with the owner of the inverter if it is not the utility.

So all of that is a whole another workshop, but we have to say it now because we are talking about installing PV to offset electric vehicle charging. It's

a wonderful opportunity with the dual meter arrangement, as well, because we're talking about installing a dedicated circuit typically, as we have heard, and that is something that the solar installation on a home, for instance, requires a dedicated circuit. And here is that opportunity for synergism, and it is also something that generates on-peak.

We are at a point where we are able to say, look, you're putting in an electric vehicle charging station, let's merge it and create the balance -- let's lower the balance assistance costs for both, and we are going to be able to do peak, or time-of-day rates for the PV generation, as it should be, because we have unbundled our rates, for instance, and here we go. And now we are ready to offset some of that peak that we have heard about that could happen and could be an impact to the state.

So where you put it is always a typical question, cost and risk. And I have thought of several options that are obvious to everyone. The physical location is one category of where you put it, and then how you connect it electrically is an independent, largely independent consideration except for the stand-alone off grid. That stand-alone off grid typically would be in a place like maybe a state park in

a parking lot with a parking canopy where there is no electrical infrastructure and they are using solar powered lighting at night or something of that nature.

Let's review the advantages and disadvantages for large ground mount installations. We have got the ability for lowest capital cost because of economies of scale. We have the disadvantage of the step-up in transmission and distribution and step-down losses. So that is a minus on the energy side. We don't do anything about the feeder impacts for the EV charging. There is also that problem in parking lots in particular where to get the power levels we need we can't cut up the parking lot and do all that sort of thing. There is options for converting the parking lot lighting to 600 volts and doing some things locally to mitigate that, but it's still a problem there.

Okay. Then we can be grid tied and have it distributed generation rather than central station. This is on your residential rooftop, or your business, or your institutional, your school rooftop. We do help a lot. We have a lot of good things going here that we can mitigate the impacts of the feeder on-peak in particular, because there is no PV off-peak, but off-peak we have that inverter there to do wonderful things for us. Everybody doesn't realize that. Those

inverters still can generate bars at midnight. They don't have to be generating real power to be useful.

So except for the needle peak that in Florida we all know about on a cold winter morning, we're good. And we use all of the energy. There is no losses there because we are grid tied. This is the advantage of being grid tied versus stand-alone is that every kilowatt hour that that PV system generates is useful to someone. And it is useful on-peak, so that is doubly useful. So you can hear a theme here that I like grid-tied.

For the off grid stand-alone, obviously we don't impact the feeder with charging, but we also don't help it. So there is no impact. The parking -- if it's a parking canopy arrangement, as we saw that GE had there, those are really neat. You know, you can work out your ratios. That are practically difficult when you have a lot of cars you want to charge, because it takes a huge area, and we can sit down and do calculations about how many parking spaces per kW, that kind of thing, and it's tough. It's a stretch. But it is wonderful because it doesn't add to the water runoff problems; it cools the car; people like that, unless they are going to have PV on their rooftop, on the roof of their car. You know, it has got all those

advantages, and it doesn't impact the wiring of the parking lot already.

But you can go through these pluses and minuses, which I'm not going to do. And then I'm going to wrap it up with a little summation. You know, we have -- I call it the EV effect. You know, here they go. These things are regenerative. The better electric vehicles create more demand, et cetera, and now we see better use of our baseload generation, because most people go to school, go to work, and charge at night. I mean, we have got other issues to talk about on-peak at the office and that sort of thing, and we address it, but basically we are talking about lowering, overall mitigating the increases in electric rates through this. And therefore bringing on more EV utilization.

The same kind of thing goes on with PV. You know, the lower the PV costs are the more we lower super peak generation costs because we are offsetting that very highest four hours of the day, especially in the sunbelt, and then we mitigate rates and then that drives competition. And we're saying, okay, PV, you have got to be even cheaper in order to mitigate because we are helping electric rates. So this thing is actually very regenerative.

And then they put the two together, and I

think we have a nice picture. And there is a wonderful set of -- I call them wonderful because I'm an engineer -- but there is a wonderful set of technical challenges, but they are absolutely just challenges. They are very doable, and we have already heard how they are being addressed, and I think we can.

So I better stop with that. My time is up. I've got backup slides and all that later in the day when we talk about more details.

MR. CRAWFORD: Thank you, Bob.

The next presenter is Brian Hanrahan from Florida Power and Light Company who will give us an overview of FPL's experiences with electric vehicles.

MR. HANRAHAN: Good morning, everyone. Thank you for the opportunity to talk today about some of the work FPL is doing in electric vehicles and understanding the impact of electric vehicles on the grid.

Plug-in electric vehicles aren't new to FPL. We actually had a program back in the '90s very involved with the EV1 and other products back then, and we were recognized as one of the leading utilities at that time in that industry.

Although the market never materialized, and like many other utilities, we discontinued our program at that time, we learned many lessons, and we are

leveraging those lessons now to make good prudent decisions on our current activities. We were actually the first utility in the United States to put into service a hybrid electric bucket truck. That was in 2006. And then in 2008 we put into service the first plug-in bucket truck. So we are actively using this in our fleet now. Our fleet is one of the greenest in the country. We continue to convert that fleet to cleaner fuels as they become available.

By 2009 we had identified some activities in the market that indicated there was a comeback of electric vehicles. So these signs included announcements from major auto manufacturers such as Nissan and GM that they would be bringing products to the market. We also saw that the passing of the American Recovery and Investment Plan included substantial funding for PEV development. We believe PEVs this time around are here to stay as we have heard from others. You know, the debate is more around at what volume, but we think that technology is here to stay this time around. It's good for economic development, energy independence, and environmentally.

So as we recognize this market development, we relaunched our EV program in 2010, late 2010, and we really categorized it into four different areas;

ensuring reliable service, meeting customer PEV expectations, supporting market expansion, and utilizing EVs in our fleet.

I already talked a little bit about our fleet, and let me spend a moment or two talking about our activities in supporting our customers and supporting the market expansion, and then I will close with grid reliability. In terms of meeting customer expectations, we have established processes to ensure our employees have the information they need to address customer questions when they call, write us, or respond to us in e-mail. We have developed brochures and fact sheets on various EV topics and we provide those at many different events. We have launched a PEV website as part of FPL.com, and we have a dedicated e-mail site where customers can ask us more technical questions that our frontline employees aren't able to handle. Those requests come to my team and our group responds to them.

In terms of supporting the market, we are working closely with local, state, and federal entities, large fleet operators, and other stakeholders to share information -- sorry -- to share information and help remove barriers to EV adoption. We have partnered with the South Florida Regional Planning Council and the Gold Coast Clean Cities Coalition on a half a million dollar

DOE grant to bring down barriers in South Florida for EV adoption. We are one of sixteen cities throughout the country to receive this grant.

We are also involved in many EV events across the state in our service territory. In fact, to date this year we have supported over 50 EV events, and we consistently receive questions or requests from our customers to support them with their EV events. For example, we will be attending Plug In 2012 in Sarasota at the City of Sarasota's request to support their activities where we take and show our vehicles to our customers, and they are always happy to see us there.

It's going to be some time before we see electric vehicles in the majority of our customer driveways. However, education and outreach are extremely important to making this a reality some day.

Now I'm going to focus my activity or the rest of my topic on impact to the grid. FPL, like all utilities, have been managing load growth since the beginning. If you think about it, electric vehicles are very comparable to air conditioners, or central air conditioning units. We have already heard that today, but they do have a different load shape.

In some parts of the country where electric loads are very small, an electric vehicle on a Level II

charger can actually double or triple the house load. Here in Florida and some other parts of the country that is not the case. We are used to dealing with heavy load associated with air conditioning. We believe relatively slow penetration of electric vehicles allows us to prudently plan for them, and it allows us to make solid data base decisions to support them.

We have included our EV forecast penetration into our ten-year site plan, so we are already planning -- it's already included as part of our generation and transmission planning. Our early modeling reinforced by early real-world data has shown there is little threat to our generation or transmission reliability. For now, though, we are very much focusing our attention on the utility assets closest to the home. We call this the last hundred feet. So that's like the transformer end, so we believe at this point of the game that is where we need to be spending most of our time.

One of the most important ways to ensure continued reliable service is to know where these things are at and what level they are charging at. As we have heard already today, that rate of charge is very important to understanding the impact to the grid. For now we are using a number of different resources to try to identify where they are and map the concentrations as

you will see here in the slide throughout neighborhoods to identify clustering.

The problem is we are having trouble getting this information. We have twice queried registration information from the State of Florida, and while that's good, and we have identified -- we just got a report a week ago, and we have identified 1700 vehicles in Florida, plug-in electric vehicles. About 50 percent of those, or 858 are in FPL's service territory. The problem is we get that data at zip plus four level. So it doesn't help us much in terms of identification of transformers and feeders so that we can do our analysis with that information alone.

Some auto companies are providing us with buyer addresses when approval is given by the customer. The most success we have had with this is with General Motors. They provide us a report on a recurring basis. We haven't had as much success with some of the other auto manufacturers for various reasons in getting that information.

This is really important to the future of us being able to do it ahead of time. One of the challenges even with General Motors now and that type of information is we get it after-the-fact. So it doesn't allow us to do that precheck of assets, but it does

allow us to go and look at that stuff and then extrapolate it across other parts of our business or other parts of our grid as we go forward.

What would be helpful in the early years, and if I just had to, you know, ask for a perfect scenario it would that be we got consistent information from the state that gave us not only where a vehicle is, but what rate of charge it's going to have. So whether it be through some sort of permitting process, the registration process, I don't know what the answer is, but that would be the ideal. The permitting process, at least if you are notified right away, it's much earlier in the cycle so you could do that assessment maybe even before the installation is done.

We have also heard a little bit about the higher charging rates and some auto manufacturers may be pushing toward the higher charging rate. But on the other side of the aisle, just as many folks think that a lower charging rate will be sufficient. We have already heard 50 percent of Volt owners and I believe 15 percent of Leaf owners are charging with the 110, and they are finding that to be perfectly acceptable. Which way that trend goes, we don't know at this point. However, if the lower rate of charge, you know, suits most people's lifestyles, it is certainly much cheaper.

Because of the importance of getting -- a lot of what we see up till this point, and even a study we did back in 2008 that we presented as part of our questionnaire in May, was built on a lot of assumptions. Well, now that vehicles are in the market, our goal is to get real world data. So what we have done is we have launched a pilot to install Level II chargers in early PEV buyer homes. Our total expected study group is 40 to 50 vehicles, and installations have been occurring this year. We will complete installations by the end of this year, and complete our data gathering in the end of 2013 and report soon after that.

The Volt and the Leaf make up the bulk of that population. We have already got 20 Volts installed as part of that pilot, and we are very close to completing our number of Leafs. We had hoped to have either some Ford Focuses or some Teslas to round out the 50 by the end of the year. However, some delays and other issues have prevented that so for. But hopefully we will be at 50 by the end of the year.

We have also selected two different charging types. We are mixing and matching cars with chargers. The goal there is to try to understand if there is differences in power quality or consumer behavior between using different types of charging. One of those

chargers provides back-office information, so all that charging information can be compared to smart meter information. And, yes, we have gotten approval from the customers to have all that information as part of their participating in the pilot.

The other charger is just a standard dumb charger, and we don't get any specific information from that, but we do have the smart meter information for that. So we are looking into those various differences. One interesting finding so far from the pilot is that we are finding that most customers are charging after our peak hour without any incentive. It's just natural consumer behavior when they get home. And then, you know, you get some home at 5:00 o'clock, some at 5:30, some at 6:00. You get that compounding effect, and roughly around 7:00 o'clock is when we get most of our PEV impact, if you will.

The other thing we have noticed is that the charging times are very short right now. The average charging time in our pilot is only about an hour and a half. So, you know, people are driving for whatever their needs are during the day, well within the range of the vehicles coming home and charging for about an hour and a half.

Again, this is very early. We have a lot of

other preliminary data which we are not ready to draw any conclusions about. But you can see, you know, this is going to be a very helpful effort to help us gather this real world information in our service territory and how it affects our assets. You know, it's great to look at all the studies going on throughout other parts of the country, but, I think each utility has to assess their assets and how those are impacted.

PEV charging rates. This is a popular topic throughout the industry and the reason for implementing a discounted rate is generally one of two reasons. It's either to push that charging load off-peak or to incent purchases by improving the economic equation, if you will. That's great, and we are supportive of EV rates. The challenge right now is that it generally requires a separate or submeter, so the kilowatt hours used to charge the car can be differentiated from the whole house, from the house consumption. This approach can be expensive both for customers and the utility, and in many cases it erodes away the savings that the customer would get from the EV rate by having to pay for the additional meter can and the associated connection to the meter panel, especially if the rate -- if you have a generally low regular rate anyway and then the EV rate is lower than that. If that delta is not significant,

that payback can be a very, very long time.

Also industry peers of mine in California and Detroit who have these EV rates have told me that the installation process -- because you have to do the separate metering, the installation process can be kind of drawn out because you have got a number of different parties now involved. And in many cases, that creates frustration with the customer and delays on the overall installation.

I'm also aware of one utility that is doing a whole house time-of-use rate, and, you know, that avoids the necessity for a separate meter. What we don't know for sure at this time, because they started it not very long ago, is whether they will actually achieve their objectives with a whole house time-of-use rate. And, again, that achievement of objectives may be based on the delta between the on-peak and the off-peak rate. So we will have to see about how that goes.

So in our opinion, it is premature to institute a PEV rate in Florida without more data to show that it is cost-effective and it solves issues here in Florida. So far we are not overly concerned with the on-peak impact. As I mentioned, most of that is occurring naturally after peak anyway, and our rates are relatively low, and, again, we get into the delta issue.

So simply put, the current means of instituting a PEV rate adds costs which may be hard to recover with a slightly lower rate, and, you know, technical improvements, though, may negate this in the future. You know, maybe at some point as things are thrown around as a revenue grade meter within the charger, you know, at some house someday smart meters can disaggregate the EV load. So, you know, those are things we are monitoring in the industry and certainly openminded to, but, again, right now we are trying to avoid that additional cost for the customer that doesn't makes sense.

I'm going to talk a moment about solar. And Bob and I probably agree on most of these things. I may not have quite as optimistic a view on it, but I think most of the stuff we agree on. We recognize that this is part of your deliverable to the legislature, and he also recognizes and probably know that as a company we have extensive experience in this area. We also have installed a solar charging canopy at our corporate facility in Juno Beach. Coincidentally, I think it's a GE. It is a 40 parking spot overhang with eight charging stations underneath it.

The benefits of charging with solar power are obvious, right? Zero emissions and no impact to the

grid. However, there are significant hurdles that at this time make it what I would say impractical as the only source to serve the charger, and I want to emphasize that as the only source. A number of panels are needed to meet the kW requirements of a Level II charger. A Level I might be a little easier. With an all-in cost of about $5 a watt, the costs are significant. Another hurdle is that the timing of maximum solar output is unlikely to align with when the charger is being used.

On-site energy storage may solve the kW requirement and the output timing issue, but unfortunately it doesn't improve the economic equation at least at this point. The most practical way to integrate solar with PV charging is similar to how we have done it in Juno Beach, right, where the solar feeds the building, the building feeds the chargers, and in this case the solar helps offset some of the kW used by the EV charging, but eliminates the need for stand-alone energy storage.

Just a few final thoughts to close on. Electric vehicles are good for our country and our customers. They are reliable, dependable, cost-effective to operate and maintain. Electricity as a transportation fuel is cheaper and has less price

volatility than gasoline. Reaching PEV critical mass, however, won't be easy. There are many hurdles to adoption. Britta knows this as well as any of us. It's a difficult thing. But that's okay. It allows us time to evaluate the market as it changes.

One of the things I want to emphasize, we want to make sure that we are planning for the future market, not making long-term decisions, expensive decisions based on the current nascent market. You know, what are people going to be charging at in the future? Where are they going to be charging, how many of them, and those types of things. So the work we are doing now is really to help us predict the future and make good sensible decisions.

Nothing is indicating that we are having any major concerns with the grid at this time. However, we need to continue to monitor the industry and consumer behavior for changes that could impact the grid otherwise. These include things like fast charging rates, higher capacity batteries, charging patterns, and increased daytime charging.

Our involvement in the industry and with the automakers gives us a seat at the table in making these decisions as well as monitoring changes as they occur. So thanks for the opportunity to come today and talk to

you about the work that we are doing. We look forward to the afternoon discussion, and we will be here all day and happy to answer any questions. Thank you.

MR. CRAWFORD: Thank you, Brian. The next presenter is Christopher Gillman from Progress Energy Florida who will tell us about his company's expectations for electric vehicles.

MR. GILLMAN: Well, good morning. Thank you for inviting Progress Energy Florida to participate in the discussion today. It's an exciting discussion, and I appreciate the opportunity to go after a lot of the presenters that have already kind of set the stage for a lot of the activities in the marketplace.

I won't try to repeat a lot of things that have already been said, but I do just want to reiterate that the electric vehicle revolution is real. And as Brian mentioned, we expect it to be here to stay. There is debate on what that forecast will look like, what the penetration in the marketplace will be, but we expect it to be here to stay. And almost all vehicle manufacturers are selling or planning to sell plug-in electric vehicles. Many models are available in Florida today, and many others are coming soon. However, again, that forecast of plug-in electric vehicle penetration into the market varies greatly, and that depends a lot

based on customer acceptance, policy, economics, and technology development.

So from our perspective, from our focus it is pretty simple. Providing electricity to our customers is our fundamental focus. Whether that is to power their refrigerator or a vehicle, the focus remains consistent. Our goal is to meet the energy needs for all of our customers. Electric transportation is an emerging technology and we want to understand it and support it.

So what I wanted to do today is get a little bit into our approach towards electric transportation initiatives, and our approach consists of three basic pillars. It is collaboration, investigation, and education. And what I will do now is kind of take a little deeper dive into each one of those separately.

So starting with collaboration. Of course, the power of collaboration brings unique stakeholders with diverse expertise and different perspectives to the table. Britta mentioned that throughout this market development, from the beginning to today, that we have stayed in a collaborative motion. And that's important when you look at this technology, because it is bringing a lot of unique individuals that haven't otherwise sat at the table together. Vehicle manufacturers and

utilities are not typically talking together and discussing the change of the marketplace. So it's important to stay collaborative.

Our focus on collaboration, you know, for the entire industry, I think, begins with the customer and that shared customer between the vehicle manufacturers, utilities, electric vehicle supply equipment vendors, and many others. And once we better understand the customer and the technology, then we are able to respond to that developing market. We are also able to more effectively respond to very important issues and objectives like safety. And, of course, the utilities and vehicle manufacturers have a longstanding focus on safety.

Sticking with the collaborative theme for just a minute, these are just a few of the partners where we have collaborated to reduce some obstacles, advance technology, and develop infrastructure. In short, to support the advancement of electric transportation.

Using the model created by the Rocky Mountain Institute, we helped establish two Project Get Ready chapters here in Florida, Get Ready Central Florida and Get Ready Tampa Bay. In addition, we have helped advance activities within the DOE Clean Cities on electric transportation initiatives. And if you go back

to 2009, Progress Energy was one of the initial sponsors of the Edison Electric Institute's electric vehicle market readiness pledge, a commitment to making electric transportation a success. The focus areas within that pledge included infrastructure, customer support, customer stakeholder education, incentives, and utility fleets.

So we move from collaboration to investigation. I think we have heard a lot today about how this market is developing. It is certainly not a static market. It is very dynamic, and so it requires a lot of investigation, a lot of research. And this is a new market for us, and we recognize there is a lot to learn, so that research is a critical component.

The research begins with understanding the product. It begins with understanding the electric vehicles, and there is no better way to understand the product than to experience it. That's why we have tested prototype vehicles like the Ford Escape, a prototype PHEV, as well as integrated commercialized ones into our fleet. Currently in Florida we have eight Chevy Volts, one Nissan Leaf, a converted Toyota Prius plug-in hybrid electric vehicle. Overall, if you look at the entire Duke fleet, we have over 60 plug-in electric vehicles, including Dodge Ram pickup trucks,

Chrysler Town and Country minivans, and plug-in bucket trucks, as Brian mentioned earlier today.

In addition to the research on the vehicles, of course, it's very important that we understand the charging technology, customer usage patterns, and the potential impacts to our grid. So we are working with organizations like the Electric Power Research Institute and Mark to understand that technology better, to understand the impacts better. We are doing projects with load modeling on respective circuits, distribution circuits to understand the impacts in the near term and the long-term. And we are also looking at testing electric vehicle supply equipment with manufacturers like GE, Voltech, Clipper Creek, Snyder, Eaton, and Air Environment.

And beyond those tests, we are also looking at the demand response activities. Brian talked a lot about when people are charging. And, of course, the charging patterns are subject to debate and development, but what we do recognize is there is going to be a lot of different opportunities to manage some of those, those charging patterns. Demand response can certainly be one of those technologies, and we are working with EPRI and others to look at the new technologies like OnStar plug-in smart phone apps that support the plug-in

vehicles and others.

We move on to education, the third component to our approach. One thing that is very important to us is that we continue to disseminate the information that we learn and we work with our peers and fellow stakeholders to share that knowledge through organizations like Project Get Ready. We are also investing with organizations such as the Electric Drive Transportation Association to promote information rich websites like goelectricdrive.com, and we have incorporated the message of electric transportation into several of our normal communication channels, such as social media events, brochures, and other ways to connect with our customers.

Moving on to some our initial results and next steps. So where is this approach of collaborating and investigating and educating gotten us to date? Well, we have some initial results, and what we see is in the near term we expect minimal impacts to our grid. However, there is much more to learn. There is much more activity to be done in the research around this market space, and we need to better understand the customer, their behaviors, and, of course, the impacts to our grid.

And once we have this understanding, then we

can develop products and services that meet our customers needs, while maintaining a safe, reliable, and affordable power supply. I think, you know, Mark mentioned it well when he said this is a marathon, it's not a sprint. This is a marketplace that is not static; it is very dynamic. And as we move through the research there is much to learn not only today, but also what that feature is going to look like. What are the charging options going to be? How are customers going to charge? What are the different vehicles, different charge rates? All those things that can dynamically change the landscape around what our products and services need to be to support our customers.

In summary, electric transportation presents a lot of positive value propositions to our communities. As a Florida utility, our electric transportation focus is to meet our customers energy needs associated with moving people and goods. As I described our approach, it's based on three pillars of collaboration, investigation, and education. We are prepared to meet the near-term impact, but it's early and there is much more to learn within this marketplace.

So with that, I thank you for your time this morning and I look forward to addressing any questions you have later on today.

MR. CRAWFORD: All right. Thank you, Christopher.

The next presenter is Keith Gruetzmacher from Tampa Electric Company who will discuss TECO's role in the electric vehicle industry.

MR. GRUETZMACHER: Good afternoon. And I would also like to thank the Public Service Commission for allowing Tampa Electric to come and speak today.

It was about three years ago next month in October that I got a call from Progress Energy and they were asking us what our plan was for electric transportation. And at that time it was like, well, we really don't have a plan. They said, well, we would like to come down and maybe talk to you about the Tampa Bay area and what is going on in that market. And so we said, you know, we'd love to come down and find out what is going on. So they came down and started sharing information.

They invited us to a little meeting, a seminar that they were having in their location with SPX and GM to talk about things that were going on in that. So we started getting involved there. Shortly after Nissan came and started meeting with us on what's going on in the Tampa Bay area, and then the charging companies came; GE came and meet with us and also Helga with

Coulomb in a very short period of time.

So at that point we realized that, you know, the State of Florida was being looked at for electric transportation, and the Tampa Bay area, so we had to determine what our role was going to be in this market.

So we had several things that we had to look at. You know, we knew things were happening quick. That the people around us were looking at doing things, so we needed to determine what our role was going to be. How were we going to facilitate the adoption of electric vehicles into our area; what do we need to do now; what do we need to do later, and also how do we do this with ensuring an excellent customer experience as we went through that part.

Today, one of the things we realized is, you know, we need to get some experience in this ourselves and we needed to get some vehicles. So today we have 16 Chevy Volts, three Nissan Leafs, two plug-in hybrids, and we do have 21 plug-n electric boom trucks. Most of these vehicles are being used in the marketing area or energy conservation area and our meter reading and community affairs areas, so that we have those out where people can see them, and when asked questions, these team members of ours can explain what we are doing and about electric vehicles.

So the one thing that we have all heard here is we saw educating the customers as a very important key component of what we needed to do. We were starting to get events coming into our area with Ride and Drives (phonetic). GM was holding press events in our area where they had hired a PR firm that was going around meeting with all the news media and those organizations, so we became very involved with putting a communication plan together, putting an internal speaker bureau together so that we were able to, you know, be educating our customers and knowledgable of what was going on in the market.

At that time we were also getting involved with the Clean Cities Coalition, the Project Get Ready, Electric Drive Transportation Association, and the Electric Vehicle Institute. And one reason I'm talking about that is all those groups and the companies and the people that I mentioned before are part of that collaborative effort. And it's great, you know, I think to see that the industry is all working together and that we have been working together for the last few years. And I just think that is important because it's helping us in Florida learn, because everything is changing. All the time it's changing. Every time we go to a meeting or conference we are learning new things.

I just think that that has been a great collaborative effort and to see that that is continuing.

So in addition to that, we put together a website. We, you know, thought that we needed to send customers when they had questions, or if we had team members that were out in the field driving these vehicles that they could hand someone the information to go to our website where they could get a consistent message about our program and about electric vehicles.

So we started doing that and getting a pretty robust education program. We do link PEVs to a sustainable energy future to strengthen our environment and what our utility commitment is and also promoting our product. As everyone knows, it's reliable, they are domestic and environmentally friendly, so we are doing it for those reasons, also.

The next thing we realized we needed to do was start with data collection. We are putting in now up to 20 stations at our facilities so that for our vehicles we can start capturing some data and getting information off those vehicles. The do have -- the public infrastructure is developing pretty rapidly over the last few months in our area through the Charge Point America Program. So through that to date there are 50 public charging stations in our area. That could be,

you know, higher than the 50 that we were mentioning, but there is about 50 that we know of. And the important thing there is our next step is to get that information so that we can start getting data on the public charging.

It has been a little slow on getting that information. We did start getting some information in this week, so we are looking forward to getting that so we can look at the charging habits of the customers at the public stations.

The other thing that we have looked at also is obviously what is the impact going to be to our grid. But before we do that, we had to determine what the marketing potential was in our area. And as we have talked about today and you have heard, that is kind of a little difficult to do, but what we did is we -- our approach was using EIA's methodology, and we kind of applied that to the Tampa Electric service territory. And so we looked at the percentage of new PEV sales by year -- I'm not keeping you all up to date here. But we took those and we compared them to some other forecasts. We looked at some national forecasts and local forecasts. OUC, which is very aggressive at the time -- well, they still are. I didn't mean at the time -- it already is, but they were ahead of -- you know, a lot

further along than we were. They had some projections out, so we looked at their projections, Southern California Edison, Fortune Magazine, J.D. Powers, and we took those along with EIA, and we kind of put together what we thought would be the projections in our area. And did, again, the low, medium, and high, which we feel would be between 10,000 on the low side, 20,000 on the -- 50,000 on the high side between, you know, by 2020.

So taking those numbers that is we got from our scenario, we started putting together our distribution system impact. And, again, we looked at our residential underground circuit, residential overground, and the commercial to determine -- you know, obviously we wanted to know what the penetration was going to do on that system; will the existing residential and commercial transformers be able to handle this; and are there significant differences when charging on-peak or off-peak.

Basically, as a result of that, our overall finding was that the residential transformers and service cable ratings were adequate for the modeling of the PE load that we did, based on the market potential we looked at and the studies that we had looked at. Based on taking that information and applying it, you

know, the improvements would work.

We found also that the T&D planning process cycle, you know, we would be able to identify that and accommodate the incremental residential load that we modeled on our system and system improvements could be made during the regular budgeting cycle at least for, you know, the term that we looked at at this point.

Looking at the commercial was a little different. We took, you know, a high-case scenario with, you know, a shopping center that was, you know, one of the high-end shopping centers that we thought vehicles would be -- where they would go. In looking at that, there would be would be lines and upgrades that could be required, especially if Level 3 charging is installed. You know, we determined basically on the commercial is something we need to really watch and identify where they are going into the market.

One thing we have found also going back to that on the residential side, it has been -- and I would like to reiterate it, because Brian mentioned it, but it has been difficult finding out where these vehicles are going. And originally we had plans, you know, through the permitting process. We thought we would be identified -- getting information. We have been fortunate. Brian has shared some information with us

that he said on what is in our county, so that's the kind of the things that we are having to get from and kind of pull because it's not readily available.

So that has posed some challenges on determining exactly where these vehicles are going. But overall, in conclusion, we are looking at, you know, our growth and saturation for the PEV is widely speculative. You know, depending on the market penetration and the charging patterns, PEVs may impact our generation expansion plan, but we haven't really looked a lot into that. We know that residential home charging will have minimal impacts for now to the distribution system. And, again, we see clustering as being the main issue at this point. In the commercial charging stations, we do need to pay more attention to those, and will require some of our attention looking at that going forward.

So that's where we are today and the work that we have done. Again, as everybody has heard, we are changing daily and going with what we learn from everybody. We just appreciate the opportunity to speak today and the help that we have gotten from everybody in this room. Thank you.

MR. CRAWFORD: Thank you, Keith. The next presenter is Robert McGee from Gulf Power Company who will describe his company's electric vehicle policies.

MR. McGEE: Thank you. I appreciate the opportunity to speak on behalf of Gulf Power on our electric vehicle process and what we have done. We'll talk briefly about our current status and forecast and give a slight update on the data filing that we provided on June 1st, and talk about a research project that we have been working on for a little while, and a pilot that we have undergoing right now.

The number of electric vehicles in our service area right now is about 30, and that's the update. We have recently received some Florida DOT information that helped us understand that we had a few more vehicles in our service area than we had previously estimated. Twenty-eight of these are Volts, three are Leafs.

Our forecast is to reach about 10,000 by the year 2021, and this is based primarily on Pike Research data in combination with some ratios between -- population between our service area and the State of Florida.

The number of charging stations in our service area is approximately eight. The information on this piece of data is much less certain, much less available. Three of these are customer homes, the other three are at Gulf Power's facilities, and two are at dealerships in our service area. So we really don't have enough

data to forecast charging stations yet, and a lot of the information we have heard already here today kind of plays into that. We estimate that there is no material impact on our grid based on the very small numbers that we are seeing here up to this point.

So I will talk briefly about our research project. Gulf Power was in the unique position a couple of years ago to pick up a Prius, modify it to make it a plug-in Prius, and marry it with our Energy SELECT Program, an ongoing program that we have been implementing for a good while under our DSM set of programs. I'm going to speak briefly about that so that you understand what that is and how that works hand-in-hand with the electric charging.

The Energy SELECT Program is a residential advanced energy management system. It gives customers control of their electric use and a variable pricing system. Now, the customers typically control HVAC and the electric water heater and possibly a pool pump. And what we are doing here is simply using that, leveraging that to control plug-in electric vehicles, and you'll see the results from that.

Just briefly, the system includes three main pieces of equipment. The thermostat, which communicates with the load control relays and communicates with the

meter outside for recording purposes, and it can be programmed either at the thermostat or via web through a portal.

The load control relay is a simple box that is told when to turn off and when to turn off. It's a pretty basic piece of equipment. This same piece of equipment is used for water heaters, pool pumps, and we used it in this application for charging electric vehicles. It's probably not necessary now that the vehicles are sophisticated enough to program themselves, but at least we are able to do it in this pilot. I'm sorry, in this research project.

This is the heart of the matter, the rate, residential variable pricing, RSVP. It's a four-tiered rate, low, medium, and high. The low, medium -- and then the critical price. The low medium and high components are time-of-use. The critical is kind of a floating at the need of the utility rate call.

So you can see, based on that line down at the bottom, that this rate structure allows a customer to purchase electricity at slightly below our standard residential rate. About ten cents a kilowatt hour is our standard rate, so they can purchase it during the low price periods at 7.2 cents currently. These are our current rates. And you can see that 20 percent of the

time they have this opportunity. Most of that is nighttime. The low price period runs from 11:00 p.m. until 5:00 a.m. in the winter, and 11:00 p.m. until 6:00 a.m. in the summertime.

We took a 2009 Toyota Prius hybrid and added to it a plug-in module. These are after market add-ons. It's a 5 kilowatt hour lithium ion battery pack, and it essentially adds to the battery capacity of a typical hybrid vehicle and makes it a plug-in hybrid vehicle.

This is a picture of what it looks like. You take out the spare tire and drop in this unit. It has got a charger built into the battery pack, and then you run a plug to the back of the bumper, and that's the essence of it. It's not optimized for electric use, but it was very helpful in gathering some data.

We also added some data collection equipment to gather data from the car's computer system, from the battery pack, and from the GPS, which gave us some positioning and travel information. And we participated in a project with the Idaho National Laboratories. They were monitoring our Prius along with 200 others across the country, so we were able to get some data from them that was helpful.

This is a photograph of in-garage charging. The primary mode of this was in-home residential

overnight charging, which I think we have heard a lot from the panelists so far about that being a very viable option. We believe so, as well, based on our experience with this.

You can see in the photograph here a standard, what they call kilowatt meter. It's very traditional. Plugged into a 120-volt outlet, standard outlet. That was to manually calibrate or make sure that we had good data coming through the sophisticated data collection equipment. It all lined up really well, so that was a good verification. The power runs through this load control relay run by Energy SELECT through the extension cord into the car. Pretty straightforward.

We collected information, such as electricity consumption, gasoline consumption all the way down to the grams, which in these cases you have got to measure it in very small amounts, battery charge, distance, et cetera.

I'm going to show you the results in two categories, short-drive mode and a long-drive mode, or compute. The first one, the short commute was -- data was selected that I'm going show you. We collected over a longer period of time, and I'm going to show you the results from the middle of November of '09 to December, and the second one was June of 2010. In between we had

a little bit of a battery problem. The vendor came out, changed the thing out under warranty, and it wasn't an issue at all.

Short commute results. The first piece I'm going to show you is if there is no charge in the vehicle at all. Then there is essentially a -- it looks like a regular Prius. If any of you drives a Prius, a hybrid vehicle, you'll get about 45 miles per gallon. We have got some folks, employees that work that tell us that's what my car gets. It's not converted to plug-in electric. It's just a plain old Prius. And that's what we experienced here if the car started out with no charge in that five kilowatt hour pack, it got about 45 miles to the gallon. I'm going to throw some cents per mile values up here for us to kind of reference. This was when gas was a good bit cheaper than it is right now.

Okay. Here is the short commute results. When the car started out with some battery pack, and this is anything above 10 percent. In this data set there were 72 trips covering 385 miles. The average mileage, and this is gasoline only, was 90 miles per gallon. Remember it's using electricity, as well. The maximum mileage was 358 in this data set.

Cost per mile using electricity and gasoline

is 4.6 cents. And this is probably the salient point here, you are about 18 percent lower cost than the previous slide without the assistance of the battery pack.

Miles per gallon equivalent. This is another way to look at it. In other words, you would have to have a gasoline-only vehicle that could achieve 56 miles per gallon on average in order to get the same operating cost as this vehicle was on gasoline and electricity.

Switching to the long commute results. These were more like a 26-mile commute. The last one was more like a 7-mile commute. Just in the hybrid mode, the numbers look very similar, 46 miles per gallon. These numbers bumped up a little bit just because the price of gas changed. As Britta mentioned earlier, driving this thing is an interesting phenomena. You quit looking at gas prices after a while. I got the privilege of driving this, and you only fill up about once a month. You don't worry about whether it changes from week-to-week.

Long-term commutes. Trips with some battery charge at the start. This consists of 72 trips that average about 18 miles per trip. Average mileage was 68. Again, that is gasoline only. Cost per mile, 5 cents. Again, about a 15 percent decrease in your cost.

An equivalent gasoline-only vehicle would have to achieve a 53-mile per gallon rating in order to be equivalent in operating costs.

Okay. Here is where the Energy SELECT component comes in. This is the charging profile over an entire month, and this is data provided to us from Idaho National Labs over the month of January 2010. You can see down here is noon. This is midnight. And you can see the vehicle essentially not being charged during that time period. And I can tell you what's happening is just as many of the presenters have mentioned, the vehicle is brought home, put in the garage, plugged in. You walk away from it and don't think about it anymore. Wake up in the morning, unplug it, and take it to work.

But what is happening here is the load control relay is suppressing the charge until 11:00 p.m. when the low price tier kicks in. It begins charging, and then when it's finished it cuts back off. And you can see several of the charges were completed before they ever got to 5:00 a.m. This represents a total over this month of about 67-kilowatt hours at today's low price level, which is what this time period consists of, that would be about $5 in that month that the individual is paying for the fuel.

This is a little bit different look. This is

one day look at the demand, the 15-minute demand. We put a load research device on that outlet to see what it looked like. Of course, it's zero throughout the day. When it hits 11:00 o'clock, the relay kicks in and allows it to start charging. It builds a little bit, does some funny things here at the end to finish off the charge, and then by 5:00 a.m. it's done and completed.

This is 5.6 kilowatt hours put into the battery. And as Britta mentioned, you know, we are running -- this left axis here is in watts, so you're talking about 1,000 watts, essentially a hairdryer load at this 120-volt charging.

Lastly, I'll mention the fact that Gulf requested from the Commission and the Commission approved a pilot program in our 2010 DSM plan where we are permitted to give a $1,000 rebate for individuals who purchase an electric vehicle in our service area and commit to charge that on Energy SELECT at their home for a year. We have got one customer participating in this. We have had a couple that we have had to turn down because they fell just outside the program parameters. One of them was a lease, another one was just outside the 60-day window, so we are kind of working through some of that.

But, again, the numbers are small, the

participation is small, the market is young, but we anticipate that this will be a beneficial program in the future. And that's all I've got. Thank you very much. I appreciate the time.

MR. CRAWFORD: Thank you, Bob.

The final presenter is Jennifer Szaro from Orlando Utilities Commission who will describe that city's plans for the electric vehicle rollout.

MS. SZARO: Hi. Thank you for having me here, and we appreciate you giving OUC the opportunity to speak with you today about our electric vehicle program.

First, I'm going to just briefly go over OUC's plans for electric vehicles and give you some background information about our historical experience. We started with electric vehicles back in 2009 with a plug-in Prius, and we have grown our program significantly since then. So one of the first things we did was develop a road map for electric vehicles. We started with near term planning looking at our transformers, doing some load modeling, and then we formed partnerships with groups like Nissan, and GM, and Coulomb Technologies. And I'll talk more about our Coulomb partnership shortly.

We really focused on collaborative efforts and customer education in the near term, and then we are

going to look at demand response in the mid-term. So probably starting next year. So to date we estimate 700 vehicles in our territory and we expect that to grow moderately over time. Right now this is a little more than our forecast, which was based on the Toyota Prius.

One of the things we looked at initially was how much this would impact our generation need, and what we found was that we have plenty of generation in the near term and the long term to support electric vehicles, roughly 78,000 vehicles off-peak and 30,000 vehicles on-peak.

So as I mentioned, one of our first R&D efforts was to work with a grant that we received from the U.S. Department of Energy through Coulomb Technologies. This grant allowed us to install 100 public charging stations throughout our service territory. Some of those were customer owned and some of those were actually installed by us and operated by us.

We had some challenges with the project, which I will discuss, but essentially we were able to collect a good amount of data from this project and also in the meantime educate our customers and build awareness about electric vehicles in the local community. We started by either installing the units -- we got the units for

free, and we installed the units at an installation cost of roughly $2,500, or we offered a rebate of $2,500 to our customers to own and install the units themselves.

And we looked at specific public venues such as our airport, hotels, restaurants, and shopping malls, areas where we thought we'd get the most visibility and have the potential for future usage. We didn't anticipate a lot of usage in the near term. It was really more to ease the issue of range anxiety in the near term, but with the plan of having these units placed in areas where they would be used in the future.

So to date, we expect to have just actually over 100 of these charging stations installed, 78 of those are owned by OUC and operated by OUC, and I will go over some of the usage statistics with you shortly. To date, we have had 2,575 charging sessions, and that was actually a few days ago. So we have some daily charging going on. And then just under 10,000 kilowatt hours sold to date.

So, again, it has not been terribly active, but we have had some particular areas that we are seeing a lot of usage on the system. And most of that is actually workplace charging where we are getting significant usage. Our average session time is about four hours, and the average session usage is 5.8

kilowatt hours, which is not dissimilar from what I heard from FPL.

So here is a quick look at some of our usage statistics. As you can see, as the vehicles began to enter our market and we got more installations out there in the field, we saw a significant ramp up in usage of the public charging stations.

One of our hottest locations is the Orlando Science Center. We actually have a few employees who use the stations as well as people visiting the science center, and that makes sense. We are also expecting significant usage at our local hotels. We are a very tourist driven area, obviously, and some of the rental car agencies are working with us to develop a plan to promote electric vehicle usage while on vacation.

So one of the things we were monitoring was the total installed cost for putting charging stations in the public. And what we found was the range is significantly -- there is a significant range between charging stations, and it's all dependent on what you have to do to get the charging station interconnected. So on the low end we saw a price of $885 to install the station, that includes permitting. And on the high end over 10,000. Those stations -- this was a factor in our decision-making process of where to put the stations.

Those stations that were on the more expensive side were at locations like our convention center, and it was just a really long wire run for us, or we had to do a step-down transformer to be able to install the unit. So that's really why you are seeing those high end costs. So if I were to recommend where to put these charging stations in the future, I would look carefully at those costs and what that would mean for the utility, or a third party, or a customer to install the units there.

And then, finally, just to go over some of the challenges that we experienced with the program. We really had a difficult time with site identification. We did meet with our Project Get Ready team members to help us place the systems based on where they thought the need would be, and what we found was even though we received hundreds of applications for placement of charging stations, and had planned on doing 300 of these, we found that customers were wary of owning that risk and of owning the equipment and operating from a long-term standpoint. They didn't want the operation risk of the unit.

We also were challenged by easement negotiations for those that we would own. We had a real issue negotiating those. It was death by legal

negotiation really. I mean, we couldn't get past that. So in many cases we had some extremely ideal sites, like one of our larger shopping malls, and we just couldn't get around the easement process. So maybe in the future -- we do have another rebate program that we are offering where the customer can just get the rebate and put it anywhere they want on their site. We are hoping that through that program we will see some of the infill occur in your geographic gaps.

We also struggled with limited parking availability in many of our areas. OUC is a very dense service territory. We are extremely urban, and parking is usually at a premium. So many of the restaurants, especially in our downtown region, where we have a lot of condos and apartments in the downtown area, they just couldn't afford the parking, to give that up, given that the market was so new.

So we really struggled with that issue. Even though 55 percent of our customers are multi-family, we just had issues getting the EV stations to them. Even condo associations, you know, they also ran into legal issues and concerns about parking.

So bottom line, placement is tricky for public stations. And, again, we did this more as a customer outreach and education effort rather than a primary

location where they are going to be charging the vehicles. That's important to remember that, you know, 80 percent of the charging will occur in the residential segment of our market. So this is really for public awareness more than anything else, and also to ease range anxiety.

So I think we are still going to be okay, even if we can't get a ton of public charging stations out there. I think 100 for us is probably going to be good for a good long while. We don't anticipate needing additional stations.

Again, I mentioned the difficulty with wire runs and having to bore through concrete and asphalt to place the units. That added significant costs to the project. And we also had some issues with revenue collection. Right now we are using our general service non-demand rate, and that has been fairly effective. And we didn't plan on really being able to have cost-recovery with this project, but cost-recovery would be a challenge for us were we to do something in the future with this using this model. We might take a look at using a flat rate model where a customer can go anywhere within our territory and charge, plus have a monthly fee on their bill and help them maybe put a charger in their home. That's something that we are

taking a look at and would be considering in the future.

And we are also going to be looking at things like demand response and time-of-use rates for the future as our customer needs develop. Right now we have no plans for either of those, but should the market grow, we'll be ready for that.

And, again, our transformers as they are designed are ready to take on additional load, so we don't have any issues yet in the cluster areas, but we do anticipate that we will be monitoring that carefully to make sure we don't have issues.

And with that I will close. And I think we are close to lunch, so hopefully I'm not standing in your way. Thank you.

MR. CRAWFORD: All right. Thanks, Jennifer. It is just before noon. I think we're going to go ahead and break for lunch, and we will come back at 1:15 and start on the round table discussion.

There's a few places to eat in the area. There is our state worker canteen just down that way, and a few other places in the area. If anybody has any questions they can just ask me. Anyway, enjoy your lunch, and we'll be back at 1:15.

(Lunch recess.)

MR. CRAWFORD: All right. I think we would

like to get started again, if we could, please. I want to make a brief announcement before I get on to the rest of the presentation. We have got a sign-up sheet in the back at the podium over on this side over here for people who would like to make public comments. I looked over the sheet and just two signed into it so far. Some of the presenters have signed into it, so it's really -- if people would like to make a public comment during the public comment period, if they could please indicate that on the sign-in sheet, because what we're really trying to do is figure out how much time we need to allocate for that.

All right. We have got about three hours, I think, for these -- to handle the remainder of these topic, so I think we're going to do about 45 minutes per and then get going to the public comment period. I think we'll start with the background data on electric vehicles. Something that has come up with, I think, several of the presenters and something we found ourselves is that trying to find really concrete numbers for how many electric vehicles are in the state, how many chargers are in the state, how many of what type has been a bit difficult. So keep that in mind when we're sort of going through the numbers we have aggregated, and also, of course, what all of y'all have

come up with. And that's one thing we do want to look at is where can we get better sources on that data.

But in any case, we see the primary areas under this section. We're going to be looking at the types of electric vehicles and chargers in Florida, the numbers of electric vehicles and chargers, and the future deployment of both in the state. We also looking at, like I said, potential data sources for all this information.

These are the numbers that -- we sent a data request out back in May to the utilities in the state trying to, you know, the first part of gathering information for the study. This slide shows the number of EVs the utilities in Florida reported during that process. You know, and also they projected out through 2021 when that was available. Because there is no comprehensive source for the numbers, these numbers are estimates at present and, of course, the projections are going to vary. We've seen that with the presentations we have seen so far.

And, again, this is the charger classes that we have been using. We did a division in the Level II chargers because there is some variety in that and sort of how widespread and how they can be applied. The Level I chargers usually you see in the 1.1 to

1.8-kilowatt range. That's the small at-home chargers for the most part. And the Level II, the larger Level II chargers those can be home, those can be office chargers, but that's where we get into much more likely to have some affect on the system. And then, of course, the Level 3, we're talking about the quick charge stations, and based on all the numbers we have seen, there don't appear to be any in the state at present right now of Level 3 chargers.

This is how the numbers break down. Again, this comes from the PSC data request. All the chargers we have reported at present in Florida are Level I and Level II chargers, and reporting has come from -- we have run into some of the same problems. We are dealing with a variety of sources, none of which really claim to be complete. There's no central source that aggregates all charger installations.

I think we're going to move on to the discussion. I'd like to ask the speakers to be sure to identify themselves and please speak into the microphone. You'll have a little white button right in front of you on the microphone, just make sure you press that to start talking, and push it again when you want to turn it off. But opening just very generally, what sort of policies do people see as possibly helping or

hurting the roll-out of electric vehicles in the state? And anybody who wants to speak, just indicate.

MR. GILLMAN: Since not everyone is jumping at once, I would just mention the need for uniformity. I think right now there's a lot of activities that are going on. There is a lot of good work on collaboration within communities like Project Get Ready Central Florida and Tampa Bay chapters, as well as others in other parts of the state, as well as DOE in the Clean Cities, and lot of different things that are going on.

But ultimately to help promote electric vehicles to the mainstream, there needs to be that uniformity of signage, and methods of billing, and all those kinds of things. I know a lot of the activities with the legislature, of course, is looking for DAX (phonetic) to manage some of that, but I think that would be at that point a step in the right direction to promote through policy.

MR. CRAWFORD: And let me repeat, please identify yourselves before you speak. We are having a transcript done of this.

MR. GILLMAN: I apologize, Ben. That was Christropher Gillman with Progress Energy Florida.

MS. GROSS: This is Britta Gross with GM. I think I would emphasize the word simplicity. Keep

things simple and uncomplicated because we are all learning. There are things that we have reversed our opinion on from three years ago before we began launch where we just couldn't anticipate how difficult certain things would be or how easy other things would be.

Time-of-use is a great example. Time-of-use three years ago sounded really appealing. Yes, let's get everyone a low EV rate, or a preferred EV rate, and then the minute we started executing and started to see how complicated it was in California, and the extra expense that customers incur, it was very clear that you are not going to go to that trouble unless you need to do it, and your rates in a state are higher than the national average, for example.

But here in the state, I agree with Brian Hanrahan of Florida Power and Light earlier, his comment that it just doesn't seem like if you already have pretty agreeable electricity rates, we don't have to fight that hard in that direction. So keep things simple. Keep them uncomplicated.

Some of the grant programs for infrastructure were quite complicated. It would be nice just to sort of have it offered across the state, no zip codes, part of the rulings, just broad first come first serve one customer after the other. Those kinds of things, I

think, are really important.

The last comment I wanted to make on the slide that I saw a second ago with the DC or the Level III charging, we actually -- we should just probably take this off-line -- but Level III is actually not the terminology, at least through the Society of Automotive Engineers, for quick charging. That's actually a DC Level II when we talk about anything from 50 to 92 kilowatts. So we should just review that. It's a different level of -- the levels are defined differently for AC and DC, but if we would all get on the same page, that helps us nationally, as well.

MR. CRAWFORD: That is something we found in some of our preliminary work was that there seemed to be a number of different classification systems that were in use, and that, I think, speaks to what you have been talking about.

MR. HANRAHAN: Brian Hanrahan, Florida Power and Light. I'm sorry, did I beat you to the mike?

UNIDENTIFIED SPEAKER: No, no.

MR. HANRAHAN: Okay. Incentives, you know, are not always supported in many areas, but there are some states that have -- you have the federal incentive for purchase of vehicles and also some states that have state incentives for purchase. And then I'm going to

talk about an inhibitor, and I know this is something, at least the last time I talked to Britta about it she feels really strongly about, there is a push in some areas to tax EV buyers to make up for lost gasoline tax, road tax.

And, you know, our feeling, I think we are both totally aligned on this issue, is it is premature to go after that type of, let's say, revenue loss, if you will. It is certainly not incenting the markets in any way. There is probably a time and place to go back and recover that, but this early in this delicate market we think that would be premature. So that's something at some point the state probably is going to have to address.

MR. DUVALL: With respect to electric vehicle rates -- Mark Duvall, Electric Power Research Institute. EPRI did consumer acceptance surveys in Atlanta and in Tennessee for the Southern Company and for TVA respectively, and the responses of those customers to time-of-use rates, were they willing to delay, basically were they willing to delay charging for financial gain, I think it would be useful to the Commission and to the utilities here, if you go to Southern California where we did the same study with the same questions, they are very interested in delaying charging because their rates

are historically very high. And when you go to places that have lower electricity rates, they are a lot less willing. And, in fact, I would characterize it as almost entirely unwilling to delay charging for the likely incentive that they would get from doing so. And we could provide those reports.

MR. FUTRELL: Mark Futrell with staff. I have a follow-up question about some of the comments about uniformity and encouraging that. Are you seeing any issues at the local level as far as issues with that regarding codes, or how, you know, the local entities are dealing with installation charging stations, particularly at commercial businesses?

MR. GILLMAN: This is Christopher Gillman with Progress Energy Florida. I think to your question there is maybe two parts to it. The first thing you said was are you seeing challenges with it. I think the other thing is are you seeing some positive opportunities. Early on some of the things we saw was like from permitting standpoints. If you go to Get Ready Central Florida, there was Orange County and there is Orlando that were both participating within the same collaborative group, and they looked at permitting in totally different ways. Orange County was very straight forward and came up with a streamlined process of

getting it through, and Orlando wanted to kind of fit it through their normal practices, which was a lot more arduous and time consuming. So I think in some cases that lack of uniformity creates challenges.

In other cases you can see where by getting everybody together on the same page and talking about some of those challenges we have been able to make strides in improving those. I think when you look at signage and those kinds of things, there is certainly a goal to have clear signs of where there's EV parking and how you manage the EV parking and everything. There is not the uniformity yet of what that sign would look like, but certainly everybody is kind of getting on the same page of what are they, what are the key first steps of standards that should come out of those discussions.

UNIDENTIFIED SPEAKER: I would like to comment on the inspection process, as well. We have dealt with it quite a bit in South Florida and we have seen even within the same county where one city requires no inspection at all and another city isn't familiar with it, and kind of, you know, it goes to great extremes to gather excessive documentation or whatever. So the spectrum of what is required is very different even within the same regions.

I mentioned earlier the grant we are part of

with the South Florida Regional Planning Council, and one of the deliverables to the DOE is through the permitting and inspection process, and what we accomplish in that seven-county area could essentially be replicated statewide.

I think in the case across the nation we see -- some others may know better, but on-line permitting for EV charging is kind of the most efficient, maybe the Holy Grail for permitting, and then you see the total extreme the other way. But I think that is the quickest, easiest I have heard of. I think that is in the northwest somewhere. Charlie might know.

MR. YANKITIS: Charlie Yankitis with SPX.

Yes, we see a wide variation across the country of the permitting process. Some are very complicated. In some areas they actually aren't even required, which is hard to believe, but usually those are some of the small towns. But there is definitely -- and I'm not that close to exactly what's going on in Florida with the different cities and counties and all, but there is likely a lot of improvements that could be made in that process to standardize it.

MR. McGEE: Bob McGee with Gulf Power Company. A slightly different comment on the permitting process. We heard earlier a desire to gain more information from

the field, and maybe one way to do that is through some permitting or requirement for reporting. And my only concern there is that we not put up additional potential barriers to the marketplace in doing that. So simplicity, ease of use, and reducing barriers if we can. Thank you.

MR. CAILLAVET: This is Josh Caillavet with General Electric. One of the things that we have seen out in Hawaii that, you know, again, I don't know if it fits you guys and what you all do, but what they have done is every so many parking spaces they mandated that one parking space be EV, EV ready, or have an EV charging station. So, again, I don't know if it is you or a different commission that perhaps it could be a joint collaboration effort to sort of mandate that across the State of Florida. That's, you know, something that could be done.

MR. YANKITIS: Charlie Yankitis, again, SPX. Another point on adoption of electric vehicles is, you know, certainly with a BEV, a battery electric versus the extended range vehicle, the use of a 240 charger in your home is very important. We see with the Volt about a 50 percent adoption rate of 240 charging. But even with a Volt, it just makes the whole experience much more seamless for the consumer.

I drive a Volt myself, and having that charger in the house for the weekends when you're taking a short trip and everything, and you know you can run it on electricity, again, you're saving money, and it is just more convenient than having to get your cord set out of the vehicle.

Anyways, in the areas where the vehicles are most popular now and where we are seeing the highest adoption rate are where there are incentives for the consumers to get them over the edge. And that is kind of the icing on the cake. You know, the first decision is to buy the car, and then it's whether or not they want to put a 240 unit in their garage. And if there is some kind of incentive program, that really helps in making that final decision.

MR. CRAWFORD: One thing that has come up, it has been suggested in at least one of the presentations is the idea that electric car owners need to make -- it might be required to report purchasing of an electric car to the utility. What do you see as the benefits and the drawbacks of such a plan?

MS. GROSS: I'm sorry, this is Britta Gross, General Motors. Did you say the benefits of a customer reporting the purchase of a vehicle to its utility?

MR. CRAWFORD: I was thinking of a requirement

that a customer have to report purchasing an electric vehicle to a utility. I mean in that it would give us better statistics, but would that provide a barrier to entry, or would that slow growth, or anything like that?

MS. GROSS: Okay.

UNIDENTIFIED SPEAKER: Everything in the data has been voluntary. There are no mandatory programs to date.

MS. GROSS: Yes. So I think that that is -- yes, definitely as a automaker, you definitely get very quickly into privacy issues. So requiring customers to report something in a private purchase is a real stickler, and you are probably not going to get that approved. So we have been very, very careful at GM, for example, of getting permission by all these Volt buyers. First, do you mind, do you agree that we could share your address. No name attached, just the address with your local utility, yes or no. And we do have a high percentage of agreement, like 85 percent or so.

I think that what I really -- I know that it is interesting to know how many electric vehicles are there. I just think that one thing that is important to keep in mind is that I always get concerned that we are going to move in the direction that says that somehow electricity in a car is different than electricity in my

dishwasher, and I'm trying to be very careful that we don't sort of make electrons look different in one application or another.

So when I look at a 120-volt charging of the Volt or any other electric vehicle, and I know that the load looks like a hairdryer, I can't imagine why anyone feels that has to be -- anyone has to be notified about that appliance.

I think that it is interesting, and as we have done in the 3.3-kilowatt at 240, we share data, notification data, this customer agreed-upon data broadly across the United States, probably with 20 to 30 utilities, and they have been analyzing where these homes are. And almost without exception there have been no anomalies, no unusual, oh, we have problems here. And once in awhile a transformer will get upgraded or something, and I don't know how we didn't upgrade that transformer last year anyway, because the neighborhood was using a lot higher loads than we had planned for originally. So the vehicles are sort of just that last thing that they noticed, and it causes them to go look at it.

So I think that it is -- I think I will just leave it at that point, then.

MR. FUTRELL: Yes. This is Mark Futrell

again. I think the question Ben has raised is something that I have kind of picked up on in the presentations is this notion of what's data sources, and what I heard from many of your presentations was you were citing multiple sources, some different from others. Some of you were citing the same sources, but it seemed like there was not consistent sources of data. And so agreed, it looks like for the time being and for the foreseeable future there is not going to be a significant impact on the grid or on the utilities. But if some of these adoption rates out 10 or 15 years come to pass, we could have, you know, some more significant impacts.

And so the question that I think we have all got is, you know, what do we need to look at, or do we need to look at some changes in the way either through vehicle registration or some other way to maybe flag these vehicles to be able to better inform the utilities and policymakers about the growth in this industry and then potential impacts in the grid.

Particularly since it looks like for now the distribution transformers in the neighborhoods are going to be, mostly likely to be impacted in the near term. And so being able to provide the utilities that information to measure that impact and get ahead of any

upgrades they have to invest in. And that kind of, I think, one of the issues Ben is kind of getting at is data sourcing for that. If you have any thoughts or knowledge of other states, what they may be looking at, or none, that would be helpful.

MR. HANRAHAN: Brian Hanrahan, Florida Power and Light. I mentioned in my presentation, you know, that we could use help in that area because we are struggling with sources. Personal experience, I mentioned that we have pretty good success getting data from GM. When we get to the higher rate charging is really where we start getting concerned, right. So I will use Tesla as an example who has the capability to charge at that 19.2.

I tried to work out an arrangement with them where we could get that same sort of information, but I wanted to do it without a contract. Well, we can't do it without a contract, right? So that is just one example of that's a hurdle that we can't overcome if they are not willing to do it with some sort of contract and privacy and all of that. So we have got to go in a different direction.

Somehow we have got to be able to get that information in a different way. And then we have had various hurdles with other manufacturers that we can't

overcome at this point, either. So we certainly, in an abundance of caution, support some sort of mechanism in which we can be notified.

You know, we have seen several hundred vehicles now that we are able to track at the transformer level, and we are yet to have a single case where we have had to upgrade or do anything. However, you know, we have got 4.5 million customers out there, and I don't think that's a valid enough sample at this point. So at least early on we think that -- I don't know of any other state's processes that would help us at this point.

MS. SZARO: This is Jennifer Szaro with OUC. While the vehicle data would be helpful, I think what would be more pertinent to the utility would be the information about Level II charging stations going into the residential sector and the commercial sector. This is the information that would help us from our distribution planning standpoint. Because as Britta mentioned, even if, you know, you buy a Volt, you may not charge at Level II, and Level I charging, a hairdryer is really not going to have a huge impact on our system. So if there were a way similar to what we do with solar installations with an interconnection type agreement, something hopefully more simplified than that

that might be more critical to our future distribution planning.

MR. FUTRELL: Has that been thought about by others? Has that seen any -- you know, does that seem like something that is a viable alternative? Has anybody looked at that in any depth at this point?

MS. GROSS: This is Britta Gross with General Motors. They are trying different things in different states and in different locations within those states. Everyone is doing -- you know, people are doing a few different tests.

Certainly we are providing the Volt data, but that is just a portion of the entire PEV market to the utilities. I think that Jennifer's point is exactly right. The word is pertinent. What is pertinent information that really needs to be reported. And then you go back to Brian's comment about where can the data come from? Well, it can come from the OEMs, but then you are going to, what, aggregate all the different OEM data and put it together? That already has an obstacle attached to it. Plus, we get the data after the fact, too. The people go to the dealership, they purchase a vehicle, they take it home, and we only know days or even weeks later that there is a vehicle.

What is pertinent is that they have shown up

and they have contacted an electrician locally, or they have contacted the permitting office, or the DMV has registered the vehicle. Those are single source locations.

Now, the problem with the DMV data that they have tried to identify in certain areas, the DMV in California, for example, has tripped also over privacy issues in handing the utility data. So they are saying you know what, we will give you the zip, but we won't give you the address. Well, the zip doesn't help you very much when you are trying to figure out the transformer that sits on a pole with eight houses attached to it. The zip code is of no value to you. Even the zip code plus four.

So you really need to know the location of the address. And that's why the pertinent, for me the pertinent answer goes back to permitting, inspection offices where they are engaged in the process and they have the address, they know whether service upgrades are required. They have that relationship already. It's the same thing with spas and pool heaters and the big loads that you have in the home. These get reported naturally to a utility when there are some issues in the way. And I think that is -- I would much prefer, I think the much smarter idea to get the data from that

source because it is pertinent data.

MR. CRAWFORD: This is Ben Crawford. We have contacted the Florida Department of Highway Safety and Motor Vehicles, and the way that they track in Florida right now electric vehicle sales, there is purely a voluntary check box that you can check or not check if you have an electric fuel vehicle. It doesn't differentiate between plug-in hybrids and conventional hybrids. And because of that, at least in Florida, that is not really -- you know, up until now anyway that has not been a resource that provides the kind of information that I think people have been looking for.

UNIDENTIFIED SPEAKER: Well, I can only share that in other parts of country it's the same level of uncertainty. The system now works because there are very few models of vehicle out there. And in the future, as the number of models and automakers begins multiplying, so you take the number of automakers, which is still very small, but you start multiplying it by the number of utilities and it gets to be very -- it gets to be very difficult.

And there is no one silver bullet. You know, one option is to filter VIN numbers of new vehicles. I think California -- Britta, did California pass that legislation or did they consider it?

MS. GROSS: I think they passed it, but they are stumbling over the privacy issues. They got tripped up as they were executing it.

MR. DUVALL: So the legislation, as I understand, was written to allow the utility to receive the addresses of someone who purchased an electric vehicle, but only for the purposes of inspecting the distribution system. So they can't -- if they have a program that benefits electric vehicle owners, they can't market it, they can't -- you know, I think there were several limitations on it.

So, in other words, there has not been a silver bullet. So obviously in the near term the priority of most utilities seems to be, okay, we don't want any black eyes. It's easy to go out -- it's easy to go out and upgrade the transformer, if necessary. It's easy to go out and do an inspection. We don't want any -- and this is especially true in California -- you don't want any public relations issues around this, so let's go be very conservative and do this.

As the number of vehicles begins to multiply, the system that is currently in place isn't going to hold up. I mean, you just heard the sort of -- I mean, Britta is sort of tepid on the system now, and they are by far the most supportive, so it only gets worse from

there. So it's probably not going to hold up in the long-term right when you need it to. You know, right when utilities may be looking at options and starting to look -- you know, utilities like SMUD are sitting there from the chart that I just showed saying, hey, it's time to get in front of load management and start coming out with some programs that are going to get people charging at the rate they need at the right time of day.

And we don't know what those programs look like right now that will be most effective. Obviously the industry uses time-of-use rates to manage load, and, you know, residential demand response for air conditioners and other things. So, I mean, there are some traditional tools, there are new tools. And we don't know what the silver bullet is yet, but none of it works if you don't actually know who is out there buying the vehicles. And so if someone can come up with a one-size-fits-all to put people in touch with their utilities, or at least make sure the information is in front of them and to get those locations out there from a purely technical standpoint, because EPRI does not comment on policy, that would be advantageous.

MR. REEDY: Bob Reedy with a comment. It seems that at that point that you speak that there would be a reward to the consumer, like a new rate --

UNIDENTIFIED SPEAKER: Yes. I didn't say that, but, yes.

MR. REEDY: -- an incentive. I mean, frankly it may well take -- I'm just offering and it may well take care of itself, because there is a reason for you to identify yourself because you get a gold star coupon, or a one percent discount or, you know, that sort of thing.

UNIDENTIFIED SPEAKER: But from a probability standpoint, any incentive is going to be more effective if you can guarantee that you are broadcasting it to every single person who is eligible for it as opposed to them having to see an ad or notice -- I mean, when was the last time you looked at your bill fliers in your utility bill?

MR. REEDY: Never. It comes by e-mail.

(Laughter.)

MS. GROSS: I think in the spirit of learning in which we find ourselves right now, because it's so dangerous to mandate a solution when we really don't know what the best practice is, I would sure support any effort to just do a trial of a couple of county permitting offices and just try it around the state and see what develops. Are they able to just notify any time there is a 240-volt install going in or higher, and

what is the relationship, how does that relationship develop with the local utility? Can we see how that works and then evaluate it and see if that might be the way to go.

MR. CRAWFORD: You know, if there was a central -- you know, if it's an agency, if it's a branch of state government or local government, or if it's the utility company, what would be the most appropriate party, I guess, to aggregate that, to be the central location for that information?

MS. GROSS: This is Britta Gross, General Motors.

Again, I think if you want to aggregate it single source in one location, you are going to have to go, like, to your DMV. And the dilemma then, of course, is then you are going to get everything. You don't know whether it was 120 or 240. So if you want to refine the information and get the important information, the pertinent information to the utility, I think you're going to have to talk more locally, unfortunately. It means it's not aggregated, but it means it's right, and it means you are going to know about a Tesla install, or a 19.2, or a 6.6. You're going to know that.

MR. FUTRELL: Let me follow up that since you -- I'm sorry, go ahead.

UNIDENTIFIED SPEAKER: There would be a lot of value out of a one shop. I mean, if the DMV gave you all the addresses of -- there would be value to that, even if you didn't know who was on 120. I mean, you could make reasonable predictions. Utilities could maybe look at some AMI data. I mean, there would be a lot of value to that. I mean, it wouldn't be perfect. But if there's perfect, we haven't come up with it yet.

There have been talks of -- there have been suggestions that the Electric Drive Transportation Association, which is the 501(c)(6) that counts among its members both the OEMs, automotive OEMs and the utilities and other stakeholders. And, you know, there have been at least suggestions of creating more or less an umbrella that would do all of this interaction.

OEMs would send their data and it would send to the utilities their exact data set that they needed. I done think -- it didn't get very far. I mean, something like that is perfect, but our industry has a history of figuring out something hard and calling it safe. This is where an aggregator makes it easy for everyone and calling it a day, so I think many are settling on DMV filtering of VIN numbers as maybe being an acceptable middle case that is acceptable to everyone.

MR. HANRAHAN: Brian with Florida Power and Light. The only thing I would say about it is the timeliness aspect of it, right? The more parties you get involved the longer it generally takes, and there is value in having it after, but it's not as valuable as having it before.

MR. FUTRELL: I just wanted to follow up. You have kind of started mentioning vehicles, and one of the bullets on Ben's slide to address in this section of the discussion is the types of vehicles. And certainly in the presentations and in some of the responses to the data requests we have gotten some good information about the different generally on the road, if you will, vehicles. But one area we would like to -- you know, I heard more about at the recent energy summit in Orlando was the alternative vehicles that may be more prevalent in neighborhoods and certain developments that are not necessarily going to be out into the general on the road, if you will.

Is there any -- do you have any information, or the utilities, or any of the other folks have some information to share with us about kind of where that market is in Florida, where you see that developing? Is that something that is going to be a significant growth area that you're following? And I'm particularly

thinking about vehicles like -- essentially golf carts that are, you know, more substantial than a traditional golf cart that we're seeing. You can see in our Southwood neighbored here there is -- you see several folks driving around in those. Is that something that folks are looking at for -- in the future?

UNIDENTIFIED SPEAKER: Electric vehicles, no? Okay. I didn't turn my mike off, so I will go first. They charge almost exclusively at 120 volts. There have been a number of studies done that are available because NEVs were a big thing in California due to regulatory compliance reasons, and there is quite a body of information on them.

In communities, planned communities and things like that they can actually displace a lot of -- they actually can be fairly useful. I think there is occasionally a push from the industry to sort of make a mini -- something in between like a NEV with slightly higher range because they are speed limited to 25 miles an hour or less, and they can drive on roads of 35-mile an hour speed limit or less. I believe I'm correct. But they have minimal safety equipment. You know, they are very much specialty vehicles.

So, other than that, I don't know if there is any entity that tracks their numbers or tracks their

proliferation. They are almost exclusively 120-volt charging, and there actually have been power quality analyses done on what happens if you have a neighborhood where everyone has -- a development where everyone has one of these NEVs. And it turns out that while an individual NEV has very poor power quality, at least back in the day it did, in the 1990s it all sort of averaged out and it was okay. So that's about the sum total of my knowledge on NEVs.

MR. GILLMAN: Chris Gillman with Progress Energy. I would just mention that, you know, when we talk about electric vehicle charging, to your point, it's not just the vehicles on the road. There is also non-road vehicles like electric forklifts and other types of vehicles that are kind of, you know, converting over.

But I think in general, you know, from a utility perspective, we are constantly looking at load and system planning, and that is pretty normal for us. What is different about the electric vehicles is perhaps the transformational change, the size of the charging, this specific load at a certain time. How that maybe changes behavior; how that behavior around the customers is something that we are not used to, so that kind of changes our system plan. Those are the kind of things

that the on-road charging is pretty unique, and the other component is a little bit more mainstream to our normal system planning.

MR. CRAWFORD: This is Ben Crawford. Getting back to types of electric vehicles. I mean, we know that there have only been a handful of electric vehicle types that have been on the road for any substantial amount of time. But looking forward at some of the new ones that are coming out, while we have heard something about, for example, the Teslas having 19.2 chargers, is there a substantial difference in the charging characteristics of the vehicles absent the chargers? Is that just something that is going to come down to the charger type they have, or are we likely to see a real difference with these new car models coming out in terms of how they impact the electric grid?

MS. GROSS: Britta Gross, General Motors.

I will just kick this off, because I don't always watch all the competition. But Ford and Nissan have announced 6.6-kilowatt chargers in their next generation vehicles, and I don't know exactly the timing of that, but they have talked publicly about that. GM, we have not announced anything about that. And back to my personal opinion, the 3.3 and the 1.2 seems to be very satisfactory, so I'm not quite sure I am in total

agreement with the direction, but I don't speak for the whole company on this, of course.

We have talked about the DC fast charging, but that is going to be a commercial or industrial application. You wouldn't find that kind of stuff at home. So we're talking 50 kilowatts or 30 kilowatts or something, that is also a possibility in some limited areas, and we have announced that for next year's Chevy Spark EV. It's a pure BEV vehicle, and that will be in limited markets to start out with.

And there are others. Leaf has got a fast-charge capability today of 30 to 50 kilowatts, and others, I think, are slow -- BMW has also announced a fast-charge capability for next year, as well. And so, again, we are talking, but those are not home applications. Those are in industrial/commercial locations where you can actually make that work with the grid.

So as far as the 6.6-kilowatt home use goes, and then the Tesla, which is the exemption at 19.2, I think that is sort of all that is out on the public streets about what has been announced.

UNIDENTIFIED SPEAKER: And so an entire generation of utility distribution modeling was off slightly because the automakers talk about DC kilowatts,

and we needed AC kilowatts. So the Ford Focus is 7.2 kilowatts, and so it's 30-amp. It's basically a 30-amp continuous draw. And the BMW seems to have settled in at 7.7, which is 32 amps, so they run on a full 40-amp circuit. And then the RAV IV EV, which is not sold in this state, is 9.6 kilowatts. So we're in agreement, but those numbers are trending up.

The second thing that is happening is that more and more automakers are focusing on the DC connection to the vehicle. So now a lot of battery electric vehicles have an optional DC charging port, and that connects directly to the battery, so there is talk of home charging appliances. So basically it frees up the automaker. The automaker can put a very small AC to DC converter onboard the vehicle, and if they have a fast charge port, that port can be used so you could buy, basically, an off-board AC to DC converter, a home charging appliance.

And in Japan they are actually making and selling today bidirectional charging appliances. So one of the issues is they currently have a power shortage because their nuclear plants are -- almost all of their nuclear plans are still off-line. So it allows you to go drive a Nissan Leaf or a Mitsubishi IME, and when you get home it can offset your house load for extending

your battery, and then charge it back up with the same appliance. And that is interesting. It's no real near -- this is not near term, but this could be three to five years out for the United States if those companies -- if those automakers determine that that has value and they want to bring an American, a U.S. spec unit over, or develop a U.S. spec unit, because you would see an increase in focus on the DC port, which means they push that cost off the vehicle and make it an owner option. And so I think these will not be extremely widespread, but they would be out there.

And if you operate off the DC charge port according to the standard, you can do -- well, then you could do almost any amount of power, and you might see a few residential locations like this. It's hard to say, but it is becoming a renewed focus.

MR. REEDY: Bob Reedy with a roll-on comment. That's is a perfect fit for photovoltaics, of course, because we can avoid the losses in the inverter from the PV inverting back up to the AC, and also avoid the cost and save that opportunity. So it's a real good fit.

UNIDENTIFIED SPEAKER: I think the utility would need to do another run-through to make sure that the current body of standards would allow safe operation of that. Because if the vehicle is actually considered

a backup generator, there would be a different set of standards than currently apply to grid type solar inverters. So in Japan the issue with -- the vehicle functions in that case much as a -- it functions very much like a solar inverter. It's putting power onto -- it is tied to a grid signal, and if there is an outage it goes off-line.

In the U.S. I think we would probably find a lot of folks adopting that as a back-up power source. You know, storm outages have been in the news lately, and that's really a different application, so then you have to make sure that you have a transfer switch. In every jurisdiction you may a -- you may need a visible make/break. So, I mean, it could become a lot more complex. And I think that -- so I think that the utility industry -- I talk about this mostly because I think the utilities really need to get in front of it not because we think it's going to happen, only that it can easily happen because the hardware is already out there. And once you take the extra cost of the hardware and probably with it much of the liability off board the vehicle, you are more likely to find acceptance among the OEMs. And Nissan and Mitsubishi have accepted this in Japan already, so it's something to keep an eye out. It's not near term. There are clearly more pressing

near-term issues.

MR. REEDY: I completely agree. And I wasn't really speaking about the vehicle-to-grid option so much as just if we have the DC charging option on the vehicle, then we can use the DC PV without running it through an inverter. So that option is there. There are some standards to make sure of how it is connected. You can't do both at the same time, that sort of thing, but --

UNIDENTIFIED SPEAKER: We should get Josh to build that system next.

MR. REEDY: Yes.

UNIDENTIFIED SPEAKER: And give us the data.

MR. REEDY: No question that it's ready already.

MR. HANRAHAN: Brian, Florida Power and Light. I think there is a common theme here. There is a whole lot of uncertainty and a lot of these things technically can be done. I think the big missing piece is what are consumers going to want and what are they going to pay for, because a lot of this stuff comes with a cost, right? And some people, if you are going to get to critical mass, you are going to get any sort of scale that GM and them are comfortable with and can build vehicles at a reasonable cost, you have got to get

beyond the folks that are buying them right now, which, you know, tend to be the affluent. But to get to critical mass, you have got to get to the every day Joe. And he can't necessarily afford all kinds of additional add-ons and complexities, if you will.

So, you know, that is the uncertainty we deal with right now, planning for all of that, but recognizing that scale will probably come with basics. Keeping it simple kind of stuff, so --

MR. FUTRELL: I have a question, follow-up. We talked about data for the actual vehicles themselves, and, you know, following along with Jennifer's good point about the real key from their perspective is the Level II charging stations. And obviously from the information we have, we have what appears to be some voluntary sources of charging stations. Are you seeing any concern with reporting on locations and the level of the charging stations? Do you know of any other states that have any other policies established to identify that? I think Keith with Tampa Electric raised that in his presentation about how do you ID these commercial charging stations, and how do you get ahold of that information up front. Is there anything you can help us with that as far as what you are seeing in other states, or what you might recommend as far as being able to

identify those stations?

MS. GROSS: This is Britta Gross, General Motors.

The Department of Energy has funded an effort through NREL, the alternative fuel vehicle database, and it's a longer term project to aggregate all the known publicly accessible stations, explain whether it's a 120 outlet, or if it's 240, or whether it's a fast charger. They visually confirm every one of these sites. I know that, for example, Coulomb has done a wonderful job of keeping it updated and refreshed with data where all the Coulomb installations are going, and I have been working with Clipper Creek and others.

None of these databases are perfect. You may know of a parking spot or a charge spot at work, but, frankly, if it's not accessible to visitors, then that one will not go in that database. So you have to be careful about what you are expecting to find on a website. But that is at least one national effort to put all the data in one place. It's the one that I do tend to tell everyone to visit. There are some private websites, too, companies trying to aggregate the same information, and for all I know they are equally good. But the NREL one is the one I first and foremost try to point people to.

UNIDENTIFIED SPEAKER: Go ahead.

MS. SZARO: Jennifer with OUC. We have taken a voluntary approach so far with our commercial customers. And obviously, since we own some of our own units, we have been able to collect excellent data that way. But in the long-term, we do view that as an issue unless we are reaching out directly to those customers.

The worst-case scenario would be that we would have an issue at the transformer level there and not catch it until the aftermath, which is not desirable by any utility. So I haven't really seen any good approaches at this point, but I think that it's important that we focus on a solution for that issue now rather than wait until we have issues in the field.

UNIDENTIFIED SPEAKER: I agree that there is no perfect way to do this. The NREL effort is largely an after-the-fact. It's not going to do any prenotification, and even -- there are several companies, software companies -- there are several start-up companies who track and develop applications to allow electric vehicle drivers to find charging stations, and I have had a staff member extensively testing them, and general dissatisfaction -- I mean it is still evolving. It's still not -- it's still tough. It's still not there.

So I don't think there is an easy way to do it. And it is probably only going to get worse because we are coming to the end of the fairly large federal and other grants that have funded infrastructure. And now going forward it will largely be sales-based, or some municipal projects will be easy, but the privately owned stuff, the private investment will be sales-based, and it won't be one or two -- you know, right now two companies in the U.S. put in -- have probably put in, you know, three, a handful. A handful of companies have put in most of the charging stations. And when that goes up to lots of -- you know, their distributors, and you start multiplying the number of folks that are in the pipeline for you all approval of product, and it could get -- I think it's going to get very chaotic on the retail side, as well.

UNIDENTIFIED SPEAKER: Yes, just a follow up to those comments. Most EV SE manufacturers all have some sort of data collection. Today I talked about our WattStation connect software. You can go to GEWattStation.com today, and you can see all of the charging stations, or most all the charging stations that we have had sold and installed to date. Some of them are networks, so you can actually see if they are being charged or utilized at that point in time.

To Britta's point, some people actually choose not be on the grid, so to speak, or not to be seen. Darden (phonetic) headquarters down in Orlando a perfect example. We have a few WattStations there, and they chose not to make those commercially available.

But, you know, in addition to NREL, you can go to Google, you can type in electric vehicle charging stations, and you can basically pull up a lot of the charging stations that are out there. They are working to kind of collaborate. So all of the different manufacturers have their own app or website that you can see where theirs are, and then there are the NRELs and the Googles of the world that are trying to collaborate that. And that is really -- we're kind of in the middle of that right now. So there is no one place.

There's a number of sites, a number of apps. You can go -- Plugshare is another good one. When you look at it today it basically shows a bunch of dealerships, right, because that's primarily where they are right now.

MR. FUTRELL: Do you see a need to interface with, like, local code authorities to identify that, or is it just something that we're just not at the point where it's critical at this point, but Jennifer kind of alluded to some potential solutions, but I was trying

to, you know, wrap this segment up, seeing if there is any other thoughts you have on, you know, how to identify this going forward.

UNIDENTIFIED SPEAKER: I think it is definitely beneficial to have sort of one place where you can go and find a charging station as you are, you know, driving down the road. Just for example today I've got a Volt, and I've got three different apps. One of them is our biggest competitor, Coulomb. I've got his app, because he has got quite -- you know, they have got quite a few stations out there. I've got the Plugshare app and I've got the GE WattStation app. So I'm kind of using three apps right now to make sure I can find the local charging station to charge my car whenever I can.

You know, there is that, and then there is the networking aspect. So you've got the Coulomb network, you've got the GE network, and there's multiple different networks. Right now we are all sort of talking to make sure that there is this ubiquity and that each network sort of works in the same -- call it the ATM model. So you might bank at one bank and someone else banks at another, but you can go to any ATM and get your cash, right? So it's the same thing.

I want to be able to use the GE WattStation

card, or RFID, or whatever, and perhaps use it on a Coulomb technology. We're working together collaboratively to make that happen. To answer your question, I don't know if there is any policy right now that sort of speeds that up. I think it's more of a internal EVSE manufactured or manufacturer to kind of ramp that up. And as far as just finding them, you know, it's up to, I guess, the Googles and the NRELs of the world to really make that happen.

MR. GRUETZMACHER: Keith Gruetzmacher of TECO. What I was talking about earlier is we had met with all of our building inspectors in the area and thought we would have a process worked out where we could get notified from them. But then what we have found out is we have 50-plus public chargers put in, we haven't received notice, or known of any of those 50 until after the fact; basically by looking on a website or pulling into a, you know, Walgreens or Publix and seeing a station.

And then the latest DMV records show we have 113 vehicles in our service territory, and we have only been contacted by one customer. Actually we were contacted by one customer putting in a public station, and we have been contacted by one residential customer that was putting in one. But other than that, we have

had -- you know, we haven't received the information or had any contact.

MR. CRAWFORD: Unless anyone has anything they wanted to add on this topic, I'm happy to move on to the next one.

Robert.

MR. GRAVES: Robert Graves with Commission staff. Mr. Duvall, in your presentation you indicated that you had a lot of faith in the low forecast of the EV rollout. Were you just simply saying that you are very confident that that is kind of the baseline, or are you saying that is what you feel the rollout will look like?

MR. DUVALL: We generally tell people that they should be as optimistic or as pessimistic as they like, because I'm not going to change their mind on that. However, if you are not at least ready for the low, I think you are asking -- you are sort of asking for it. And, I mean, that could mean lot of things. It could mean -- you know, it could mean looking at that and figuring out how many -- you know, if you have got a call center, how many calls are we going to get; how many questions are we going to have; how many building permits is the building permit office going to have to issue on this. It could mean anything. You know, grid

impact. It could mean anything. But, you know, we don't feel it will be below the low in the long-term. And probably somewhere between the low and the medium. And by the way, I checked the numbers you had there and they were right on the medium, the medium forecast that I gave there. And I will leave the spreadsheet with you so you can dig through the numbers.

Keep in mind that, you know, every time new data comes out it's wrong and it gets updated. But, I mean, it's a snapshot of what we believe at this point in time, and I will leave it with you for your use.

MR. CRAWFORD: All right. With that, I think we will move on to the second topic. This is effects on energy consumption. This section is going to focus primarily on generation effects, especially regarding peak. We'd like to discuss how EVs are likely to effect electric demand now and in the future, and whether Florida will need new generation to keep up with this demand. We would also like to examine whether EV charging is likely to affect rates, and what the effect of EVs will be on vehicle fuel consumption.

This is based -- these numbers that you see up there, they are derived from the utility responses to the FPSC data request. This is what we can expect just based on utility responses, the effect to be on peak.

And what we are dealing with is fairly small numbers, you know, at the present around 4 megawatts. You know, it doesn't get into triple digits until around 2020, but we are not dealing with particularly large numbers, especially when you look at our reserve margins that we have projected over that period for over the next ten years.

For that reason, you know, based on what we have seen so far, we don't see electric vehicles driving new generation in the short-term. We're not seeing a whole lot of problems with generation.

Now, when you look at the typical electrical utility system peak profiles, this is based on real data from 2011. You'll see where the typical summer and winter peaks are from last year. The purple line is summer. The green line is winter. And you will see that the summer peak is in the late afternoon and evening. This should square with what you see for most data, and the winter peak is in the morning, and there is sort of a minipeak in the evening.

Now, when you look at our -- we have seen at least one maybe both of these numbers before in utility presentations. The red line is Gulf's time-of-use rate graph. It's the same as the one that was in Bob McGee's presentation earlier. The blue line is FPL's electric

vehicle use rate that they reported that is not based on a time-of-use rate. And what you will see when you look at the blue line is you will see -- it peaks around the late end of when the system peak is during the summer, and around when that minipeak is for winter.

So if the additional generation need for EVs far surpassed the expectations, we could have a problem. But because we are looking at those reserve margins, we are not likely to see a problem in the short-term. But what this also gives us some sense of is that time-of-use rates may be a valuable tool in the future, as has been discussed, if we do need to start shifting that usage into later in the day.

I think I would like to move on to discussion and ask very generally what do you see as the biggest challenges to energy consumption from electric vehicles?

UNIDENTIFIED SPEAKER: I'll make a comment since my chart is up there. I don't really see any challenges to the consumption issue. I just wanted to reinforce a point earlier where we said EV rates in the future we think have great potential. We are already seeing that it works. Our only concern in the near term, we don't want to lose sight of the cost aspect of the way it's being done right now with the dual metering. That's a concern for us now.

We are hoping that technology, whether it be in the car, or in the charging station, or in the smart meter mitigates that, overcomes that additional expense for the customer and the utility. So, you know, I think I agree with your conclusions so far.

MR. McGEE: This is Bob McGee with Gulf. Just a comment about the dual metering. In our particular circumstance, we have the benefit of having had this Energy SELECT program running for a good period of pipeline already, since the mid-'90s. We got about ten 10,000 customers on it, so it's easy to say to the electric vehicle customer, hey, come on and use this because it's already out there and available.

In that case it's a whole house meter. It's not a separate meter, so there is no additional cost to the customer to sign up and be able to utilize it. And it sort of fits the mentality of somebody who would be using an electric vehicle anyway. Somebody who is concerned about energy consumption might be willing to shift electric consumption from one place or time to another.

MR. GILLMAN: Christopher Gillman with Progress Energy. I think what I would just first state is there is still a lot of learn. You know, we are making some assumptions on near term sales and usage,

and there is a lot more to understand about when customers are going to charge, how they are going to charge, where the technology is going to go. And as we learn more about that, we can start to see kind of what is the right product and service mix that would support, you know, the charging of the vehicles.

At this point, you know, time-of-use has a potential. Demand response has a potential. There is a lot of other options out there, too. And I think first we need to see is there really a need. You know, if we start to see that, you know, charging is happening on its own off-peak, then perhaps it's a nonissue. So I think there is a lot more to research before we get down the path of what is the right mix of product and services.

MS. SZARO: Jennifer Szaro with OUC. From our perspective, we are trying to just view EV as another load in some ways. And in this case with determining a time-of-use rate, I think our focus will be in the future to look at the whole house load or the whole building load and not really have a separate EV rate, but rather just a whole house time-of-use rate. It's going to impact our system the same way pretty much, so, that is just our approach.

MS. GROSS: Britta Gross, General Motors.

I think that I like Christopher's comment right now about if there is a need. If there is a need, we are actually doing a lot of things right now to prepare and pave the way for that. For example, at SAE and at EPRI's IWC meetings, we are working, the industry is working together to develop communication language as a protocol so that we can communicate between vehicles and utilities and whomever, grid operators. So these fundamental elements are being put in place for the time, if there is a need, that we need to actually do something actively to manage our vehicles charging on and off.

Even today you can take your cell, your i-phone, for example, and you can demand your Volt to either start or stop charging remotely. So, I mean, these things are -- everything is possible. In fact, some of these things are already possible today to sort of make it completely smart. We just need some protocols established so that nationally we can all do the same things.

The only last comment I have about the whole house time-of-use simplifies things. Lower cost. You don't need the second meter. But it doesn't work for every household, right? It's great if you're not home during the day and you don't care if the air conditioner

is running a little bit lower. The problem is, of course, if you have got family at home, or kids, or someone is working from home or whatever and you can't benefit. The penalty you pay during the day is not offset by what you're benefiting by the reduction at night. So you have to be careful about, you know, whom it works for and for whom it does not.

UNIDENTIFIED SPEAKER: So California is one jurisdiction that is going full speed ahead with submetering. And I will say that from a practical standpoint, I don't think there are any utilities that I know of that have deployed second meters for EVs that really were crazy about it. I mean, they did it for certain reasons, and I suspect that most of the SPX meter installs, second meter installs were done in Michigan because that is part of the incentive program. So they are collecting data for research; completely understandable.

But other than that, I don't think that anyone is really very excited about that long-term. Where it plays a role is in California where you have tiered rates and virtually every EV owner is probably in the upper tiers. It allows them to set a baseline just for electric vehicle charging, and I know there is at least one utility here that has a -- maybe not as complex a

tiered rate as California, but there are some rates tiered by usage elsewhere.

The second thing is California has begun tracking for their low carbon fuel standard, and that is obviously not in Florida's near term, but we can never predict what the future will hold, and so they are proceeding on that basis, and it's very complex. This is a much longer term issue than I think Florida has the luxury of waiting on, but that's where we are at.

There has been lot of debate about where the meter goes. If you were going to meter electricity from vehicles, where does it go? You know, is it a conventional utility submeter where they put a metering can upstream of the EVSE and they just have a single dedicated EVSE circuit? Do they integrate it into the EVSE? Do they integrate into the vehicle? How do you report it out? I mean, these are all things that the California PUC is going to be struggling with, you know, this year, over the next 12 to 18 months. It will be interesting to see what comes up with that, but, you know, cost to the consumer is going to be one of the issues.

MR. CRAWFORD: Sort of tying this back to what we were discussing before, do people see time-of-use rates as possibly being something we could tie -- we

could use as an information gathering measure? I mean, in terms of finding out what sort of chargers are installed by tying them to time-of-use rates or something along those lines?

MR. GILLMAN: This is Chris with Progress. I think I would just mention that, you know, rate development, rate design is pretty complex. And to suggest that it would be used just from an information gathering standpoint I think would be difficult.

UNIDENTIFIED SPEAKER: One of the things -- if you are interested in information gathering, I would encourage all the stakeholders to consider just doing direct vehicle data collection, because that is one of the issues is when you -- and in the utility industry we are used to stationery things that you can put a meter on, or you can put a power quality meter on and then you can get all the data you need. But with the electric vehicle you really need to know how they are using it, and so one of the issues is to actually just follow the vehicle around, and then you can see how they are accessing workplace charging and how they accessing public charging.

This is one of the ways, and then the utilities can take the data to help them understand this. Your state environmental agencies can take the

data from the vehicles to understand, you know, and then you can kind of parse the data out to the stakeholders.

This is something that a few places are already starting to do, but I would really put that out there that you can probably get a local more from -- you can probably get a lot more data from picking a select cohort of vehicles. You might not need more than 100 or so residents statewide if they are well selected, collect data from those vehicles for a period of time, a few months, and then parse that out to the stakeholders that need it.

UNIDENTIFIED SPEAKER: That makes a great project for a University. I know U.C. Davis, I believe, I had seen some data they had done on following some vehicles around. I thought it was one of the best real world reports I had seen, but it's a great project for a university.

MR. GRAVES: I have a quick question for Ms. Gross. You indicated that the Volt has the technology to kind of do its own off-peak charging. Is that common across all electric vehicles, or is that exclusive to the Volt right now? And will it be in the Spark, as well? I'm assuming that is a little bit lesser cost vehicle.

MS. GROSS: To be really honest, we haven't

announced anything on the Spark, so I first can't comment on it. As for broadly, I think that broadly automakers are taking the opportunity with electric vehicles to try things that actually could have been done on any vehicle. You could track with a phone, you know, with your phone theoretically whether the doors are locked or unlocked or whatever. We have just never done it.

Now, with OnStar we have quite an advanced ability because we have got such an established network of telecommunications ability to our vehicles. So we have quite an advanced ability, and so we are taking advantage of that on the vehicle. But I think that we are already seeing this tendency to try things on electric vehicles that, again, could have widespread implications on gasoline vehicles in the future. So I think the answer is broadly yes.

What is not automated is just the full, the full pathway. So I can manually tell the vehicle, okay, I want to wake up at -- or I want to leave the house fully charged at 7:00 o'clock or 8:00 o'clock each morning, or whatever. I can put in the rates, but I have to type them in one time upfront. This is not smart grid. This is sort of a manual way to practice what it might be like if you had utilities downloading

to your vehicle the rates that are changing each evening or in each season or whatever. So it's sort of we are building in a software capability into the vehicle that anticipate a day when the standards are written and we have got a communications system all set up where the utility then can feed the rates and the hours and the plans and the -- would you like to change your option today for the whole house time-of-use? We can switch you over tonight and you can take advantage of this Thanksgiving Day special or something.

So there is an awful lot of ability. So those things are all evolving right now for the time when there is a need. And, again, we are sort of practicing and learning. We have already found some weaknesses in the software. We are going to try to -- you know, who knew that utilities, some utilities across the country plan six different seasons, not just four, and they plan five different peak rates, peak, and super peak, and critical peak, and off-peak. So we didn't know all this stuff in the beginning. We sort of tried. So there is a lot of learning as you go along on what to do with these features.

MR. CRAWFORD: Something that was -- that I remember seeing frequently when electric vehicles were starting to rollout was there was some speculation that

the batteries on electric vehicles could be used to offset peak to a certain extent. Is that -- I have seen very little about that recently. Is that an idea that has looked -- that's looking a lot less realistic than it did before, or is that idea still in play to some people?

MR. DUVALL: Mark Duvall. This is exactly what they are doing in Japan right now. So there are some issues. First of all is can you make money at it, okay? So the University of Delaware has done a lot of pioneering work in the idea of vehicle to grid where the vehicle owner gets paid because they are actually bidding in the electricity markets and selling ancillary services. And this works great in PJM (phonetic), and it is not clear to me how well, and it's not clear to me it works well through the entire southeast, because there's no balancing market in most places. So there is no ISO. So that potential revenue stream which could be, depending on how you want to configure your assumptions, could be fairly large. You know it could be 1,000 or more dollars per vehicle.

I think our analysis show that it is probably more like a few hundred per vehicle, and you still have to account for lot of costs. From the automakers perspective, and I will let Britta do that, but they are

going to be worried about warranty and liability. If a car is providing power back to the grid and something happens and you burn something out, who's responsible? Who's going to fix it? Whose warranty? Is there extra wear and tear on the battery?

I think that right now in my mind the two primary concerns with managing battery life is first -- well, first, the objective is batteries have to last the life of the car for this to go anywhere. I think there is preliminary evidence that that is achievable and will likely be achieved in most cases by the first generation of vehicles, more or less, although it's too early to state that conclusively. However, I think the two key issues with battery life are thermal management, can you keep the temperature within reasonable levels, and calendar life. The third would be cycle life.

I think over time they will become more confident about these vehicles having sufficient cycle life, and at that point there may be more of an indication that, sure, you can maybe use batteries for this. But this is still off into the future. And I would state that the financial incentive for doing so in Florida is not likely to be very high.

If you go to Berkeley, California, where the system is old, the houses have small connections, and

they have a very high vehicle adoption rate, I think you could construct some scenarios where a utility might be looking at the business case for upgrading the system all the places they need to, and the business case for paying people to charge at different rates, or maybe even doing something like they are doing in Japan. There could be some interesting stuff done there. Here it seems to be a stretch that that would be feasible.

You know, that said, this is an issue. I manage the stationary storage program at EPRI, as well. And in general this is an issue with stationary storage, can you generate enough benefits to cover the significant costs.

MS. GROSS: Britta Gross with GM.

I will just, I guess, reinforce what Mark just said. Anything that adds cost, weight, more stuff to package on a vehicle is a problem because we are going in the wrong direction. What we are trying to do is get the cost of electric vehicles and plug-in vehicles down to something that is a lot more competitive with something that the mainstream market will accept.

I will point out that the average cost today of a new vehicle is -- new vehicle, cars and trucks, light duty vehicles, the average cost these days is over $30,000. So with the federal incentive right now at

$7,500 on these vehicles, our vehicles are being brought down to the point where they are at the level. So I think a lot of people don't understand these are still relatively competitive, given where the market is today for new vehicles. But to move this thing beyond the first early adopter and into the mainstream you have got to attack costs.

So things like V-to-G, V-to-H, all these things, even the fast charging, they add cost to a vehicle and so we have to very carefully evaluate, as Mark said, what is the value to the customer. What is the customer willing to pay for these things, and then what are the downsides. For example, extra cycles on the battery, which it's going to -- by definition it's going to take away some of the life of the battery at some point. Does it mean it is from 16.9 years to 16.899 years? I don't know, but it has an effect.

So we look at all these things. Everything is possible. Certainly going down to the road to the DC capability, the fast-track capability takes you part of the way there to get to a V-to-G capability. So sort of everything is moving a little bit in the direction that enables a lot of different capability, but really you just have to keep your eye on the consumer and what is really -- what is the consumer really demanding here,

what is going to sell.

UNIDENTIFIED SPEAKER: Something comes to mind, I don't know if you have ever heard of the Gartner hype curve. You could pull it up on the internet, and it basically is a curve that when new technologies come out there is this hype, right, where it can do this, it can do that, it can do that. And then what happens is you begin to fall into this valley of reality around, well, does it really have to? Is anyone going to pay for that, right? And then you kind of begin to come up and levelize with real business plans, things that make sense and people are willing to pay for it. It's really interesting. I have in-home technologies, too, so I use it for that, as well.

But I think we saw some of that. And you say you heard a lot about it, right, when the cars were coming out, you hear a lot about it. And I think we are kind of approaching this valley a little bit, and then you're going to start seeing real solutions come out of it. And whether that is vehicle to grid or vehicle to home, I'm seeing more discussion around vehicle to home now than when we first started with this stuff. A lot of vehicle to grid. So, anyway, I just thought it was interesting.

UNIDENTIFIED SPEAKER: Those are very good

points. And I would agree with Britta that cost is everything. There is no electric vehicle sold that I'm aware of that includes the DC charge port at no extra cost. So even though the automakers are going to go out there and say this is absolutely critical in neighboring technology, mostly implying that we should all install DC fast chargers, understandably they still don't offer it. You know, no one has come out and said, yes, it comes included. Someone will eventually, but the point is, hey, that extra cost is extra cost, and even in a limited volume vehicle it's too much.

The thing about the DC charge port that probably keeps me awake at night is that it enables a whole host of applications that I felt were only out -- were in the future primarily because the added cost to do them on the vehicle would prevent the automaker -- you know, right now job one at GM is to get a 3.3-kilowatt charger down as inexpensive as possible. You know, get that component as cheap as possible if you are the charger guy. You are not really worried about a bidirectional version or this or that. But once someone offers to build -- once GE offers to build an off port appliance, then that really changes the equation. Does it mean a lot of people will do it? No, but it means the people that want to do it have access to maybe much

more impactful technology and capability than they would have in the beginning. You know, are any of these greater impact than, say, tankless electric water heaters? Probably not in the near term. Probably not in the near term.

MR. CRAWFORD: Beyond, I guess, the challenges that we have talked about so far to total energy consumption, does the panel see any other potential problems in terms of challenges to the generation system or challenges to the transmission system? We'll get to distribution here in a bit, that cause them any particular concern regarding EVs, or could be benefits to the generation or transmission system regarding electric vehicles?

MS. GROSS: I mean, the opportunity. I mean, no to anything that says it's an impact to generation or transmission. I don't think we have seen anything and I think that is broadly supported across the board.

Opportunities, maybe not here in Florida. I don't know if the situation is with wind, but certainly the opportunity is that where you have wind you have got states with these high renewable portfolio standards. The perfect time to charge these vehicles is overnight when the wind does tend to blow. So, I mean, you have got these opportunities to capture wind. I know that is

a big initiative in Texas and around the Great Lakes, as well, to see what we can do here to help beef up the use of wind that is sometimes very difficult to find a use for.

MR. McGEE: Bob McGee at Gulf. I would say the benefit to the generation transmission system, to the extent that the charging occurs off-peak, is just a more efficient use of our system which overall is a benefit to the system. And on the generation/transmission side, as some of the other presenters have talked about, we have got enough capacity that it's not an issue especially in the near term. So we don't see much downside there either.

MR. CRAWFORD: I get the impression that there is just a general consensus that we don't have a significant problem with the generation system resulting from electric vehicles. I think we might want to go ahead and move on to the distribution system, since I think that is where we are most likely to see some real challenges develop unless anyone has anything to add on the generation side.

Let's move on to the distribution side of things. We are going to -- here we are going to be discussing the impact on the distribution network. One of our biggest areas of concern here is the impact on

the residential distribution system, as we have been discussing, especially if you get clustering of electric vehicles in a neighborhood. I think we also need to examine the impact of public charging stations, especially quick charge stations which can draw fairly heavy electric load.

Finally, I think we can discuss the specific challenges of at-work charging as well as any costs or savings to consumers from that. This chart came from Progress Energy Florida's response to staff's data request. What it shows is the number of electric vehicles that can be charged simultaneously by a given transformer class in addition to their current load.

What we see is while the smallest chargers can be supported by all transformer classes, and I think that is something that has come up, you know, that we are talking essentially about a hairdryer. There are some risks to the reliability of the residential distribution system if multiple Class 2 chargers operate on the same transformer simultaneously. This is certainly a cause for concern moving forward, and I think this is really the area where we have been discussing wanting to get the reporting up until know.

Also, quick charge stations provide a different sort of challenge. They are expected to be

installed only in commercial or industrial locations with only rare exceptions, because these chargers which can charge an EV in 15 minutes or less draw a very high load, 50 kilowatts or more. They carry a different challenge to the distribution system. Additionally, they are likely to be highest use during morning and evening drive times which could coincide with peak.

It's important to note that we currently have no charging stations of this type in Florida, at least that we are aware of. Together clustering and quick charging both create potential challenges in the industry. Utilities may need to know when a customer installs an EV charger, especially one that is Level II or above in order to perform any needed upgrades to the distribution system.

Furthermore, this raises the question of who should pay for these upgrades. One option may be contribution-in-aid-of-construction, or CIAC. With that, customers necessitating distribution upgrades would be assessed the cost of these upgrades as part of their electrical service.

Moving on to discussion, I would like to ask our presenters what they see as the biggest impact to the electrical grid from electric vehicles and how that can be addressed.

MR. FUTRELL: Well, let me follow that up. And it sound like from the presentations and a discussion earlier, was that it looks like the transformer level is going to be the critical point that you are going to be monitoring. But how do you -- obviously you're trying to gather data from various sources. That's pretty clear. You're making pretty extensive efforts to gather the information, but at what point are you able to identify that you might have a problem and how quickly are you going to need to be able to address that at the transformer level?

I think that's something that seems to be coming through here is when do you get that information and how quickly can you react before you potentially might have an issue?

MS. SZARO: Jennifer Szaro from OUC. Just with our limited experience with our customers in our territory, our distribution folks have asked for one week to be able to respond appropriately in case we don't have the equipment in inventory. We usually do. So we're hoping to get notified within one week.

We haven't had any issues so far of all of our customers. We have zero issues at the distribution level to date with failure, but we have yet to find a transformer with two vehicles being supported. So we do

know that that is going to happen, and at that point -- we are trying to monitor to catch it in advance, but, again, without being given that information from the customer in advance, it's too late if we get it after-the-fact.

MR. GILBERT: Lee Gilbert with staff. I have a question for all the utilities. You know that you need to be monitoring these. Are you keeping track -- are each one of you keeping track, or is it now to the level, or is it just something that you are thinking about right now? But, you know, is each one of the utilities keeping track of locations of where charging stations are put in, or electric vehicles are located, you know, where they are housed?

MR. HANRAHAN: This is Brian with Florida Power and Light. As part of our reliability study we are tracking every single one. We are looking at every single transformer. We found one location where we have a cluster. We have two Volts on a single transformer. It happens to be a three-phase service, so it's large homes. It's the only case so far of clustering. Now we have seen some within a mile of each other, so there is that type of clustering. But we are tracking every transformer at this point. It is data gathering and evaluation. We haven't seen anything to raise any major

red flags. We haven't needed to go out yet and change any because we felt they were at risk, but I will reiterate the point that it is early on, you know, and we want to gather a lot more information. We want to gather enough information where we feel we can extrapolate it across the population and it be valid, right, versus a couple hundred vehicles that we have checked the transformers on and say, hey, it's all good.

So we will be in this mode for -- I mentioned through 2013 at least, and hope to report out in 2014. And, again, a lot of it depends on the trend of the rate of charge and things like that. We can take the existing pilot customers we have, and we have detailed data on their charging habits and all of that, and if we see 6.6 is kind of going to become the norm, you know, we can replicate that with what we have seen, just double the rate of charge. There is a lot of work we can do. A lot of work going on, and we are doing it at the level of detail we can possibly -- the lowest level of detail we can do it at.

MS. SZARO: Jennifer Szaro from OUC. We took a look at what we were doing with our solar installations on the PV installations and decided that we would take that approach for tracking. So we actually enter the information into our customer

information system as a note when they have a charging station or a vehicle and contact us. Obviously we don't always get that information, but when we do, we do track that. Not only in any our customer information system, but also in our GIS system.

MR. GRUETZMACHER: This is Keith Gruetzmacher at Tampa Electric. We are just beginning to be able to get data and track the public stations that we have. On the residential side we are having a little more difficulty, and are looking at ways that we can start tracking those as we can find where those vehicles are located.

MR. GILLMAN: Christopher Gillman with Progress. I think I would reiterate that. When we know, we track it. You know, the question is are we getting information and learning about it. We do have a Tesla customer that had an upgraded service, and that situation worked according to our normal process and there was an upgrade of service that went through a permitting process. Of course, we contacted our engineering department. They engineered and upgraded the transformer and it worked seamlessly. That's something that we do normally with other types of load increases like an add-on to the home or what have you. So that process works well. It just doesn't filter down

to the new market around electric transportation in all cases.

MR. FUTRELL: Chris, did the customer contribute to that upgrade or can you say how those costs were apportioned?

UNIDENTIFIED SPEAKER: (Inaudible; microphone off.)

MR. GILLMAN: That's the resident expert behind me.

MR. FUTRELL: Is that kind of -- that's one of the issues we have heard that has been kind of raised associated with the CIAC, but is that kind of the general thinking or can you maybe address your thinking about when they are going to be needing some upgrades. To the extent they can be identified as being caused by, for example, a Level II, or a Tesla coming onto the system, can you talk about that decision-making process that you may be thinking about?

MR. GILLMAN: I think I would just, you know, highlight that our desire is to work things through our standard process. To say that, you know, we figured all of that out yet I think is premature, but that is our desire.

MR. HANRAHAN: Florida Power and Light, Brian. Exactly the same, how we would handle any other

situation, generally through the CIAC.

MR. GRUETZMACHER: Keith Gruetzmacher with Tampa Electric. And that is our same process.

MR. REEDY: Bob Reedy with FSEC. I'm sorry I don't have the citation. Maybe EPRI could help us. I have heard a report of a high association of PV adopters with EV adopters for understandable reasons. It may be in the first wave that will help mitigate any kind of clustering problems.

MR. DUVALL: Almost certainly not. Most residential charging is at a very low level. I mean, by the time you have plugged in -- I mean, Brian's data over there, I think, is a 7:00 p.m. peak. The EV project data is typically around an 8:00 p.m. peak. We show a 6:00 p.m. peak. So, you know, you're not going to have much solar there.

In fact, I would almost state the case that in residential circuits the amount of solar -- and this is something that has actually come up in California. It's at a zero net energy home that includes an electric vehicle has to have that much more solar, so it relies on the grid to store that much more solar energy in order to be truly net energy. So I don't think we could state that the impacts are lower with solar or not with solar. I mean, I think they could well be higher

depending.

Now, if you can find an entire subdivision of people who work from home, oh, yes, I totally agree. But, in general -- and actually if you look at a data set of real drivers, we would all be depressed at how many people don't have to drive to work during the day. So, I mean, it's not -- yes, your own anecdotal story isn't accurate. You have got to look at the full data set, and there are lots of people who work from home, or who don't work, or are retired. You know, so there are completely exceptions to that, and I'm not trying to criticize solar. We spent most of the last two years building solar charging stations with storage. So we have been taking a close look at the technology.

I did want to say a couple of things about fast charging. So, first of all, it's important to understand what fast charging is good for and what it's not good for. It works well when a vehicle is at or near end of state of charge, so when it has very little energy left in the battery. And at that point you can recover, you know, typically around 80 percent of the battery within a half hour, okay? So it's not a half hour recharge. It's not even a 15-minute recharge. It's 80 percent in a half hour.

Even Tesla Motors, which has much larger

batteries, so they are technologically fundamentally very different from the rest of the industry, and they have their own charging system and their only charging network and their own connector. So their own completely system optimized for their technology. They look at it as recovering half the stated charge of the battery in an hour.

So it works best if you just need to get somewhere to -- and we are doing lots of studies, there are lots of studies going on about how many fast chargers do you need to account for how many of a state's vehicle miles traveled. So it's important to understand that it works best if, hey, I didn't quite make it home. I need five minutes. In that five minutes you can recover four or five kilowatt hours and you can go home.

Virtually all of the fast charger installations in the United States have been funded through grant funding. I do not believe there is more than one or two or three privately or personally funded. I mean, EPRI has got -- EPRI has done some fast chargers as part of our R&D department. (Inaudible) Gas and Electric as one behind the fence. I mean, they are out there, but the public ones have been funded by grant funding. Costs are high. There is some data finally

emerging on costs from Chicago and some other places that we can get and add to the mix. Costs are high and demand charges are a key issue with operating a fast charger.

If you have a very large facility, if Wal-Mart wants to put in a fast charger, or someone like that, then it is less of an issue. But if you have a medium or a small size -- the idea of a fast charger at a gas station or somewhere like that, or a parking garage, the demand charges are certainly a huge, huge issue with the financial viability of the fast charger.

MR. HANRAHAN: Brian with Florida Power and Light. Yes, I totally agree with that. I don't think DC fast charging is going to sneak up on the utilities. It's just not going to be plopped in and we didn't know about it. There is going to be a lot of prep work. There is probably going to be engineering and design work that needs to occur. And the economic equation is a challenging one. We are not sure who is making a business out of it at some point in the future, but I would be really surprised they are going to pop up and we're not going to know about them, just because of what needs to occur to get them ready.

MS. SZARO: This is Jennifer Szaro with OUC. I do want to mention that we did have our first

commercial customer approach us. They installed ten Level II charging stations at their facility. We worked with them on their rate to determine the most appropriate rate with that. And so, again, just to reiterate, those customers generally will come to us because they might be rate impacted before -- and if they didn't come to us, they are going to come to us when they get their next bill.

MR. GRAVES: I have a quick question for Mr. Gruetzmacher. If I understood your slide, TECO performed a study and that indicated that they would need line and substation upgrades because of these charging facilities. What is the time frame for that? Was that within the next five years or ten years?

MR. GRUETZMACHER: That was when we got to a certain level that we could need to have these that we were looking at. But that was not anytime soon. We were anticipating that that would happen at some point based on our projections, you know, when they got to that point.

MR. CRAWFORD: We have heard a lot about distribution risks, for example, having two larger chargers on a single transformer. Are there distribution issues that we may have to be concerned about beyond that about having too many cars -- you

know, I mean, it was mentioned having two cars within about a mile of each other, which I don't anticipate being a problem, but if we had ten cars within a mile of each other, even if they are on separate transformers, or some level of clustering beyond a single transformer level. Do we have any distribution risks that could come from that?

UNIDENTIFIED SPEAKER: I'm lucky to have my distribution expert behind me here. Certainly you get to some number, and, again, some rate of charge, you know, depending on what that mix is. You know, you might need to pay attention to the lateral at the lateral level.

Really, at this point, you know, that is some of the stuff we are trying to understand with the reliability study I tried to preference everything with. You know, we are still studying it. That's part of what we are going to learn over the next, you know, 16 months or so. We are already starting to learn, but that's the kind of stuff we are going to learn. But, it's possible, you know, depending upon the mix.

MS. GROSS: This it Britta Gross with GM. I guess I would just try to remind everyone that -- and I believe the number is like three or four plasma screen TVs look like an electric vehicle. So I can tell you,

my brother has got four plasma screen TVs in his house, and I think there are a lot of houses like that, and so if you look at sort of rolling up local loads on a transformer, or local, you know, loads onto the substation and so on, it just -- obviously there are points you reach with the next plasma screen TV, or the next three. Or, you know, again, the pool equipment or whatever that really can sort of tip you over the top and you have to go put in, you know, and upgrade the transformer service. So I just always hate to sort of isolate the car as the bad guy that came in, when frankly there are lot of things we do in our homes that are pretty heavily loaded.

MR. CRAWFORD: We have also discussed to some degree at-work charging. I know right now here at the PSC we have got -- if you have seen the solar panels out in the parking lot, I guess out that way, we have got hook-ups for electric vehicles there right now, and we have, I think, a couple of people who work in the complex who have signed for those. But that has been essentially free for them right now, and I think that is not an unusual experience. We have seen sort of the free workplace charging elsewhere, as well.

Moving forward when we get to the point where that may actually impose something of a burden on the

workplace, just giving away the power, how feasible do you see -- or how do you see the rollout of at-work charging going when it sort of gets beyond this level to, you know, a normal charged amount or something along those lines beyond the hook-up types that we have seen so far where somebody is just plugging their car into a 110, or a 120, or a 240?

UNIDENTIFIED SPEAKER: So workplace charging can almost certainly be Level I, or very low power Level II, or if someone wants to make a Level II with two connectors, I mean, it's the only place where you dwell for a long period of time. And so 1.4 kW, 2 kW, and you're fine, so it can be very low power level. The issue with cost is an interesting one. Google just held a workplace charging symposium, and one of the things they said, so they originally started with networked charging stations, so they could tab it to someone's account. They could -- you know, Google offers, you may have heard, they offer a few benefits to their employees like free food, and -- free gourmet food, and all these other things. So they have a system for adding that to our benefits and then plussing it up for taxes. And so they started by doing all that stuff.

I don't know if they still do it, but what they determined and what many others have determined is

that many others have begun to find it de minimis, so they just define it as de minimis. And some have said, well, it's about the same price as a year of coffee for an employee. And I drink a lot of coffee. It is certainly less in my case, but the issue here is that -- and this isn't a criticism of network charging stations, but they carry a networking fee. They carry an upfront cost and the hardware costs more.

So you have to -- if you are going to charge for -- if you are going to bill for charging, whether it's public or workplace, you have to weigh the cost and benefits of the networking, the data, possibly control, you know, so if you are going to hit peak demand charges and these guys come in and solve it for you, that's a very strong potential benefit. If it's about billing for -- if it's just about billing at the workplace, that one is going to be tough because you're dealing with maybe 60 cents to 80 cents per employee per day on average.

And so recovering that, you know, hopefully someone is encouraged to work out an interim solution that is not as costly as what we have seen to date. So there can always be new products that keep that cost lower and make it more sensible. But low power, simplistic, as simple as possible. That appears to be

what carries the day in workplace charging. And then also note that, you know, the installation costs can be very reasonable; they can also be very high. I mean, EPRI's workplace installation at Palo Alto involved a stepdown transformer and finding, you know, a 30-year-old conduit under the parking lot, and it turned out to be very, very expensive. And others can be very cost-effective.

MS. SZARO: This is Jennifer Szaro with OUC. We have installed 20 workplace charging stations to date at our own facilities, and we have nine vehicles plus some employee vehicles using those charging stations. Demand has not been an issue for us, so from an added load standpoint, again, it's a 3.3 kW charge. It's not really impacting us.

We did develop an internal billing system for how to have those employees pay for the electricity usage, which has worked quite well for payroll deduction using an RFID card to track, and that's the method we are sticking with. I will say this is a perfect opportunity, and what we are seeing in Orlando is many of our commercial solar customers are the same customers that are interested in workplace charging. That is probably just the culture at those organizations. So we see a lot of overlap there.

And that is actually a really good fix. I actually charge my vehicle after day at work with a solar workplace charger. I'm getting about an 80 percent solar fraction of usage, so it does work in those cases when you have a 9:00 to 5:00 type facility. They have already got solar or they are interested in putting solar, very minimal impact to peak, very minimal impact to load really.

MR. CRAWFORD: Would you consider delaying the start of your workplace charging facility? In other words, if it is tied to your solar installation, would you say, okay, well, those chargers are going to come on at 10:30 or 11:00 to increase that solar fraction?

MS. SZARO: Yes, I would.

MR. HANRAHAN: Brian, Florida Power and Light. One of the more lively topics in the industry, workplace charging. We have about 60 chargers installed on our facilities, various facilities to support our fleet. At this point we have taken the approach that we are not going to offer workplace charging. There are many things that need to be considered. We don't want it to be a take-away in the future, right? So if I do it now when I have ten employees with vehicles; do I do it with 50; do I do it with 100. Do I do it only in my Juno facility? Do I do it in a service center in Palatka

when an employee gets it?

I mean, there are a lot of things to consider. The de minimis is defined as about $240 a year. If an employee chooses, say, 40 miles each way, I can get there without charging at home, you are going to exceed that in a year. We have talked to the IRS. The IRS at this point is kind of not taking a position on it, monitoring it, but at some point they will. And, you know, one way is like the gym fee, right? Five dollars a month, or ten dollars a paycheck, whatever people charge to recover that. But we are concerned about the -- again, we are planning for long-term. I agree with the slower rate of charge. It works just fine for workplace charging.

The other thing is I struggle -- and I'm less bullish on this than some of my employees are. I struggle with the why would I buy a car I can't get home with, right? I think in the future -- now you decide do I buy an SUV, a van, a sedan. I think in the future you will decide that, plus you will decide what sort of engine do I need. Can I get an EREV? Can I do just the BEV? It's just one more decision in the buying process.

And I don't know about this conditioning consumers to rely on their employer for electricity. I have a fueling station at Juno, gas fueling station for

fleet vehicles, but I don't let our gas -- you know, we don't let our employees put gas in their cars. And I know of one utility, I won't mention them, but told me that they had a lot of employee pushback from their gas owning employees. You know, hey, you don't give me free gas; why are you giving them electricity?

So we are kind of watching and monitoring to see how some of that shapes out. But at this point we have decided not to go forward with workplace charging.

MR. YANKITIS: Charlie Yankitis, SPX. You know, with all the residential installs we have done, we have gotten, some of our residential customers have asked us about their workplace and about an installation in their workplace. And as it has been mentioned already, when it's in a commercial environment, you know, the install can get a lot more complicated than residential. And you have to deal with going under, you know, parking lots and getting from the power panel in the building to where you really want that charge station. And usually where you really want it isn't where it's going to be most cost-effective.

So one thing from a building code perspective is -- and we have already consulted with car dealers on this. If they are building a new facility, even if they are not planning to put charge stations in immediately,

if they just run all the conduit and everything and make sure that the site is prepped for it in the future, or even if you put one unit in and then it's expandable to put more units in. And the cost would be -- you know, is much less money.

And that is also true, and there has been some talk in residential even with building codes to require a 240-volt circuit in the garage in a new home. So, again, that's a big part of the installation cost.

MS. GROSS: Britta Gross, GM. As far as workplace charging goes, again, we are at a very important time for electric vehicles. This is always that time when we just started, it looks like it's taking hold, it looks like it's going to be very successful, but you want to just -- you need to nurture that environment. And, you know, the incentive for employees to charge for free or a nominal fee at this point, I don't think we have very strong opinions either way. But the new customers of these vehicles are really taking a lot of extra steps that the rest of the consumers in three or four years are not going to be taking.

These new consumers here for the first couple of years, they didn't really know what they were getting into. They didn't know what the experience would be.

They didn't know if all the hype was really going to be true, and that it would be, you know, one of the best technologies they have ever driven before. They also incur a lot of costs that the ones down the road won't incur.

When I think about just the early home installs we did, and, you know, permitting offices didn't know what to charge, so they would throw in 200 bucks instead of the normal 25 bucks for the permit fee. And these things get ironed out over time. And then there are best practices, and we beat everybody up, and we make them talk together, and we try to streamline processes. So from every angle the new buyers of these vehicles, they step forward and they take on a risk or they take on costs that will not be there in five more years.

And so I don't think it is -- I don't think it's unfair. I think it's just the reality of trying to do something very, very big and knowing that it will have to change over time. It will and it needs to. Some of it needs to be temporary. You need to be adaptable and flexible. And when you don't need the vehicle incentive, or you don't need an infrastructure incentive, or you don't need to nurture and feed as carefully and so much hand-holding, then we need to back

off of some of these things. But you have got to keep on your toes and watch what the market needs.

The workplace is so important for a market for us for right now, because you're getting the attention of really three kinds of audiences. Number one, the executives become part of decision-making at the corporation. What are we talking about here? What do you want to do next at my company? So they are getting engaged. Then you have got the fleet operators of the company and the company vehicles themselves, can they start seeing their way into some of these vehicles? And then you have got all the employees that start looking around and say, hey, what's going on out there in the parking lot?

So for an automaker, the market of a workplace is really, really significant. I mean, you've got the early adopters, and the technology geeks, and the environmental guys, and so on, but the workplace is sort of that next place where we are making a very big effort right now to go talk to corporations across the country and work down through the organizations. It is a very important leverage point for growing this industry.

MR. CRAWFORD: I think one last question that I wanted to ask on this topic; I want to go back to this chart I got before, this came from Progress. We see,

you know, the various transformer classes and sort of what they can handle in terms of the load, and this is partially a question for now, but this is also partially a question to think about moving forward and possibly set for the post-workshop comments. But what is the relative prevalence of the different transformer classes? I mean, how many customers are only on, for example, the lowest size of transformer? How many are on the highest size? Where are most of the customers?

That will give us a little better sense of what we can expect moving forward, you know, as the electric vehicle rollout becomes a little more prevalent. I guess this is mainly directed at the utilities more than anybody else.

MR. GILLMAN: This is Christopher Gillman with Progress. It's, you know, our side, so I feel compelled to speak. But I will tell you that I'm not the best, most knowledgable person in our distribution network to give you the numbers of transformers that are out there.

I mean, over time, obviously, as loads have increased, our transformer sizes have increased, too. Some newer communities certainly have larger transformers than older ones. As the older ones, you know, kind of go through the cycle of life of a transformer they get upgraded. But to give you the

numbers of the classifications, I couldn't do that today.

MR. CRAWFORD: Like I said, in some ways that's a question more for moving forward, but I wanted to sort of show the slide when I was asking just to keep in mind this is something we would like to see in post-workshop comments from people if they have got information on that.

And unless anybody has any more questions regarding the distribution effects, I think we'll move on to topic four, the feasibility of solar photovoltaic for off-grid charging. For this we've got a few things we're going to need to look at. We will need to factor in the generation needed for each station as well as the relationship between solar production times and charging demand times.

And I think something that I'll show here in a minute is that the solar production cycle does not align very well with what we expect the charge cycle to be. So we have suggested -- we were going to suggest a couple of possible workarounds for that. One of which has been suggested already, energy storage, of course, and the other would be some sort of battery swap option which we have not seen much of at least in this country.

These are taken from some of the utility

responses, and it says the PV requirements for charging stations. This is just how many panels you need to charge simultaneously. This doesn't factor into energy storage. And this assumes a steady charge which, of course, is not something you are necessarily going to see from solar PV.

This is sort of the most important slide I want to show from this. It compares the solar production cycle with the EV charge cycle. This goes back to the FPL submission from earlier. And that means -- and I don't think this is going to be as far as direct solar charging, you know, solely off-grid is not going to necessarily be a realistic option for most EV owners.

Like I said, there's two main options we saw as potential workarounds. There is energy storage, which seems to have been present in a lot of the off-grid solar stations so far. And then the other option that my understanding is that there is going to be limited capability for is battery swaps. But just in general terms, I would like to ask the panel how feasible do you see off-grid photovoltaic for electric vehicle charging?

MR. REEDY: I will try going first. Bob Reedy at FSEC. And I think you -- I hope you heard from my

presentation I'm not a fan of off-grid stand-alone. Only in the exceptional cases, and we can think of those where there might be some value. I would always want to take every kilowatt hour that can be made and get it into the grid and lay it against that peak of the day, not just the peak of charging. And I think I have to preface everything else with acknowledging very clearly, as Mark mentioned, that the coincidence for residential charging is very lousy, coincidence factor.

But we do see that these things incrementally increase over time, and we believe that there will be increased workplace use. The most effective electric vehicles known are forklifts and delivery trucks and this sort of thing. So we see those things really going up at the same time that we see PV going up. So we disconnect them as long as they are well located in the grid, the generation occurring at a different time than the consumption for that particular application, you can't distinguish electrons and electrons.

So I think when you put the PV and the EV together, you have a very complimentary story that can be supported by rigorous analysis. But we would much rather see the capital that's spent on canopies and the extra issues involved with off-grid and storage, certainly storage and the energy loss, the capital and

the energy loss in the cycle times. You know, cycles be laid against installing non-emission PV that works against your peak.

MR. DUVALL: So we -- EPRI is currently building, with the Tennessee Valley Authority we built a solar charging station with, I think it's about 36-kilowatt hours of energy storage. Six spots, 12 kilowatts of solar. I can see if we can provide some of the printouts showing the data flow, or showing the energy flow of solar, vehicle draw, et cetera. We did do a study, and one of the things that we determined is that, yes, the system was potentially self-sufficient. Of course, our utility gives you some sort of feed-in tariff or some sort of incentive, so basically we ship the solar to the utility and we draw through, you know, a different meter. So we don't do that. But it is self-sustaining on 2 kW of solar as long as you have storage. You don't need a lot of energy. You know, 6 to 8-kilowatt hours per vehicle. So if it's a workplace charging setup and you have six vehicles, you should be able to do it. So it really will come down to the cost of the storage.

The issue that we have run into as we are building three more of these with Chattanooga, Nashville, and Memphis, is that every site has its own

unique engineering and construction costs. It is literally impossible, and we have tried to create some sort of cookie-cutter design that you can just sort of Xerox off and start dropping down into, because every location is different. And so we have come up with what we call a mini -- we called the first one the SmartStation for smart modelaria recharge terminal (phonetic). You run out of acronyms at EPRI. You have to work pretty hard to come up with new ones. The nuclear folks have stolen the best ones.

So we came up with something that we call a mini-station, so that is two spaces and 4 kW of storage. And I could see, you know, you are out somewhere in the middle of Florida, and the State of Florida is determined that a charging station has to go there for public safety, and you put it -- I can see doing it, I just can't see doing a lot of it. So, yes, it's possible. I think we can tell you very closely how much you need. I just can't see doing a lot of it.

MR. HANRAHAN: Brian with Florida Power and Light. I would agree with both prior comments, and I guess if you are out in that area and you are running low on power, and you are counting on that charger, that could be risky if it's, you know, disconnected from the grid. But, yes, I think it is probably not so viable.

MR. DUVALL: We are already starting to see battery backups for fast charging to minimize the size of the connection you need, to minimize installation costs, offset peak demands. And if you design -- designing for average use is relatively easy and can get you to a low-cost solution. And inside EPRI we always say the power level of charging doesn't matter, because you are going to get charged eventually, even if you are only charging at one kilowatt. You are going to get charged eventually. So it never matters until it matters. So it never matters until you are the guy siting there waiting for this station to charge your vehicle, or waiting in line because you are five deep behind the only fast charger in the area, or something like that.

So we can spend -- we will spend a lot of money designing for the extreme cases. And that's unfortunate because probably the people in the extreme cases really needed something badly or really tremendously inconvenient. But I don't know that you can do much about that without really extraordinary costs, and most of the sort of big iron approaches to infrastructure where you are like battery exchange, or, you know, fast-charging corridor, so interstate -- you know, fast-charging corridors where you have a fast

charger every 50 miles along a 500-mile stretch of road.

These things are very expensive relative to the value they provide. They are more about enabling something to happen rather than -- rather than letting technology and people's overall requirements, aggregate requirements sort of drive what is needed. And so I think this tends to fall into that area, but we are happy to provide some data, because it is a topic of your report. And I assume you can't get out of it, so we have a -- I think we have a report that we can probably just try and see if we can make it publicly available, and it should answer this question.

MR. CRAWFORD: Yes. The reason we are specifically examining off-grid is because that is specified in the legislation. And it does kind of bring up the question, if you wanted to build a solar EV charging station, would it be a better use of your money to make it off-grid and put the money into energy storage, or would it be a better use of your money to grid connect it?

And I suspect what we would find is except in certain extraordinary situations that connecting it to the grid would probably be a better use of your money, if you just decided to use solar power for vehicle charging. That being said, I'll admit we have had some

difficulty finding some good data on energy storage costs, and --

MR. DUVALL: Us, too.

MR. CRAWFORD: -- and I was going to ask the panel, does anybody know of any good resources for energy storage costs? But Mark may have just answered the question.

MR. DUVALL: You got me, and I think they are open for business.

MR. CAILLAVET: Yes. GE, I believe we have a stake in A1, 2, 3, and then we also -- we have our global research center in New York. They do a lot in this type of area. Unfortunately, it's not my area of expertise, so, you know, I'll be happy to get with you guys and e-mail you some information and try to get you an answer for that.

MR. CRAWFORD: That would be very helpful, actually.

MR. DUVALL: Our facilities are actually lead acid, so it was disappointing to me originally because we are a research institute. I figured we could come up with something better than lead acid, but if you don't need to use it all the time, you know, if you are not discharging something every day or multiple times per day, lead acid can be a solution. And, yes, you can --

lead acid is approximately 150 to $200 per kilowatt hour, and you can pin that cost down. You know, if you say 8 to 10 kilowatt hours per vehicle, you can probably come up with some reasonable costs. I can ask. We can come up with something that's very rough of an estimate, and, you know, more advanced technologies are catching up with lead acid on costs. They are just not -- they are not as mature, but they will catch up. So that is probably a good interim placeholder.

MR. CRAWFORD: Getting back to one other option that I think I know the answer to, but I wanted to ask the panel just to make sure. Are any currently available EVs in the United States set up for battery swaps at all, or is that something that is just not a realistic option right now?

MS. GROSS: No. Britta Gross, General Motors. No, they are not.

UNIDENTIFIED SPEAKER: 2014 Volt?

MS. GROSS: No. We have not announced any such plan. And really the -- it really comes down to the economics of it. I mean, anything is -- again, we are back to the anything is doable. Of course we could pull out batteries in five minutes or less and make sure the vehicles were safe and robust, but the issue is if we don't have a business case for a single battery in a

single vehicle, how is there a business case for two, three, four, five, 18 batteries that are associated with a car stacked on a remote highway somewhere so that you can do these long distance trips or whatever you are going to do with the batteries.

You can go to really cheap, less robust batteries, but then who really wants -- I mean, would we really want to do that? No way. So the economics of the case are really not in your favor, and then it basically demands that you have quick charging everywhere. And we have already discussed at length today the issue with the economics of fast charging, because you don't want to have a bunch of batteries sitting there driving more inventory because you are taking eight hours or twelve hours to charge these things. You are going to want a quick, rapid charge. So the economics of DC fast charging, the economics of so much battery inventory when the battery is the single largest cost on the vehicle just don't make any sense.

MR. CRAWFORD: I think we will go ahead and move on to public comment, then. Looking over the sign-in sheet, I've got Helda Rodriguez and Cyrus Osgiani (phonetic). Are they both here? Well, I guess, Helda Rodriguez, if you would like to speak.

Is there anyone else who wanted to speak?

Helda, if you will just please come up to the microphone up here.

MS. RODRIGUEZ: Thank you very much. My name is Helda Rodriguez, and I am with NovaCharge, and I'd like to thank you for the opportunity to address you this afternoon.

So NovaCharge has the largest installed base of charging infrastructure in the State of Florida. We are the largest provider of charging infrastructure in the southeast. So one of the things that I wanted to do was share with you some of the experiences that we have had as we have placed about 700 units throughout, you know, the Central Florida and the South Florida area.

So we found out, first of all, that our definition of residential and workplace charging became very broad, because we started to see that even though folks initially wanted just a residential charger if you have a garage at home, if you live in a condo, if you live in any kind of an apartment complex, or you are one of the 254 million EV owners -- or, rather car owners that have only 54 million garages across the U.S., you are going to have to have a solution other than a residential garage.

And so in order for all of those people to be part of owning an EV, they have got to have a place to

charge, and at-work charging seems to be the most logical next step. So what we anticipate is, you know, based on the growth of our commercial charging at this point is that that segment of our market is going to continue to grow so that it is maybe even an upside down triangle from residential being a little bit more expanded if you look at a nontraditional garage owner owning an EV.

So to make that possible, we are putting charging stations in large parking lots. Most people will park -- you know, pay for parking, especially in urban areas for a space on a monthly basis. And those seem to be very, very popular as far as preparing in order for folks to turn that backwards so that they are not charging at night at home, but actually would be during daytime charging.

What we are also seeing is from an economic basis it's cheaper to put in dual units than it is to put in a single unit. So what you're looking at is, in many cases, a pedestal with two charging units on it, each pulling a 40-amp load, so it's a significant upgrade to a panel in a parking garage, so to speak, to put this infrastructure in.

The other thing that we learned is regarding charging at home. We wire in series in our garages. So

when you plug into a 110, the odds are you are plugging into one of the cheapest possible pieces of equipment that your builder was able to pick up, which means that it's not really designed for hundreds of mate/demate cycles. The odds are it's probably going to be in series with perhaps a freezer or refrigerator that could have a compressor that could kick on at any point in time increasing the load from the 15 amps that it was originally designed to handle to being something significant now.

So making sure that, you know, there's a professional quality charging infrastructure, I think, is a very, very important part. Because we just didn't build to handle the load of that vehicle being in series with multiple other appliances, or in many cases the first bathroom that's off the garage area also being serviced by that one 15-amp breaker. And so we are seeing that drivers, because of the fact that it is a small feed that is going out, but ten hours of a small feed tends to really put a strain on that unit that wasn't designed for that kind of use. So that would help us to solve the problem also of the visibility. Because when someone could just plug into a 110 outlet, you have no tracking capability whatsoever. Whereas if you require -- you know, as opposed to, you know, you

visited your friend and you plugged in so you could make it back home. We're talking about on a regular use you are an EV driver and you have got to plug in every night. Having a professional charging station there creates a second layer of security, but also gives us the opportunity from a permitting process to have visibility to the fact that that unit has gone in, and for, you know, to give our utilities the ability to handle clustering, because it is a very, very real thing.

We have seen it in Oldsmar. We never imagined in a tiny little town like that, when we put four charging stations pretty much off Main Street, yet all four were in use the other day. And we saw that one person in one building bought it, and the next thing you know there is three other ones on the street. So a very, very real phenomenon. And that, you know, the visibility of the grid, even on a 110 charge, is something that we need to address.

Brian Hanrahan hit it on the head. Streamlining the permit process is critical, critical. We sometimes will go two weeks arguing back and forth and providing drawings to a permitting official, and some streamlined clear guidelines as to the process would make this available to everyone.

Important factors. We've noticed that in the absence of a solution, people will find a way. So, for example, we have seen extension cords running straight across from the inside of a house to, you know, the outside carport. Worse yet across sidewalks. That presents problems when you have lawn people who aren't really careful and they are just -- you know, they're doing their jobs, but they are going to clip cords. And, you know, that presents a whole new level of work for us in this industry. So, you know, we'd like to, you know, be able to see that there are some clear, you know, guidelines from a utility standpoint as to, you know, this is what we can and cannot do in this industry, and put clear, you know, guidelines that will prohibit that and encourage the proper, you know, processing purpose to service those drivers.

And last but not least, you were talking about workplace charging, and one of the concerns that we ran into -- and, in fact, the architect of the capital has just recently passed a bill -- is the question of parity. And they had an issue because federal dollars could not -- you know, they had no mechanism to give away the energy. They also had no mechanism to put in a charging station that would be used by nonfederal employees, so the new bill addressed that. But what we

are seeing with our employers is that they don't provide gasoline to their fossil fuel employees. So providing free energy to their electric vehicle drivers is also something that they feel is an unfair situation.

So with our experiences, in fact, at Google what they ended up doing was treating this very much like another employee benefit, where someone can elect to have EV charging and have a fee collected in association with that, which kind of keeps it all even.

So these kind of learning processes that we have gone through, some of them, you know, we were just right up to the finish line and then went, oh, wait a minute, this presents this challenge. So I just want to share with you a little bit of what we have learned in the last three years on the infrastructure.

Thank you.

MR. CRAWFORD: Thank you.

Does anybody have any questions for Ms. Rodriguez? All right. Thank you very much.

Next up we have Cyrus Osgiani. All right. Well, I guess that's it for public speakers, then?

All right. Moving forward just to wrap up. In closing, I would like to thank all our presenters and other participants for joining us today. It has been a valuable experience and will certainly inform our

report.

There is a few pieces of information we still need as part of any post-workshop comments. We have discussed these as they have come up. First, we already had asked about if anybody has any solid information on energy storage costs.

Second, we would like any additional information you all can provide on risk distribution system. That would go in, like I said earlier, regarding things like beyond simply the multiple vehicle chargers on the same transformer to any other issues we need to be made aware of when we are preparing our report.

And, finally, and like I said, this is directed to utilities. We would like to know what classes of transformers are most commonly deployed and in what proportions, if we can get that.

As I said earlier, the FPSC website will have a page where we will be putting all the EV workshop materials up. I'm hoping to do that quite soon, maybe sometime tomorrow if we can get everything worked out properly. That will have everybody's presentations on it. It will have the agenda, it will have the post-workshop comments when they come in, and, of course, it will have the report once that has been

approved and finalized.

I would ask anyone submitting post-workshop comments to send them in by September 27th so we can get everything in time. Send them to my e-mail address, Benjamin.Crawford@psc.state.fl.us. Some of you may have the B.Crawford address that you have been communicating with me, they're the same account, it just has two different names associated with it essentially. So people that have been e-mailing me, they can continue using the same account.

We are currently planning on bringing a draft report to the Commissioners at the Internal Affairs meeting on November 28th. There is also a date in December, if we need it. The report is due to the Governor and the Legislature on December 31st of this year.

Thank you all. Have a good afternoon and evening. Thank you very much for coming here, and the workshop is adjourned.

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STATE OF FLORIDA)

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