

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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RECORDING BY: JANE FAUROT, RPR  
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## P R O C E E D I N G S

1  
2           **MR. CRAWFORD:** Good morning, everyone. I'm  
3 Ben Crawford with the Office of Industry Development and  
4 Market Analysis. Today is September 6th, 2012, and this  
5 is the Public Service Commission Staff Workshop on  
6 Electric Vehicle Charging.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 broadcast and recorded.

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

6 Mark.

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

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

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

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

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

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

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

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

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

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

1 You can't just comply.

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

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

20 This will drive a cumulative fleet by about  
21 2030 of somewhere between 600,000 and over 2 million  
22 vehicles by 2030. And those are the adoption curves  
23 there, and you can kind of pick your one. We like this  
24 one. We have put a lot of faith in this one, and we  
25 encourage most people to be somewhere in their planning



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

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

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

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

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

7 But I want to caution everyone, and this is  
8 for a very high charge power rate; this is  
9 6.6 kilowatts. It's very difficult to come up with a  
10 charge profile or a type of vehicle that has more than a  
11 one kilowatt per vehicle aggregate. Not everyone comes  
12 home at the same time. By the time the late arrivals  
13 come home, the early arrivals have finished charging, or  
14 many of them have finished charging. This is really how  
15 the system works, if you apply it to a large number of  
16 drivers.

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

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

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

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

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

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

18 However, there is an option for the 240-volt  
19 charger, and that gets you to this sort of three to four  
20 hour charge time. This is where automakers are  
21 comfortable, and so it is trending up. 19.2 kilowatts  
22 is the maximum, and Tesla makes a vehicle today that is  
23 priced competitively with its competition, which are  
24 large luxury vehicles, and charges at that rate. So a  
25 100-amp dedicated circuit just for charging.

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

14           My time is up, so I will leave you with one  
15 chart. And this chart was done by the Sacramento  
16 Municipal Utility District, also the capital of its  
17 state. For those of you that aren't familiar with  
18 Sacramento, it is a hot-weather state. You know,  
19 100-plus degree summers, so it is a hot-weather state  
20 with air-conditioning. And there are a lot of curves on  
21 this line, but let me just point you there. They are  
22 clustered in three based on whether they go off an  
23 8:00 p.m. peak, which is on-peak, 12:00 a.m., which is a  
24 nighttime charging profile, and 2:00 a.m., which is  
25 super off-peak. So in terms of total annual upgrade

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

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

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

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

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

6           I can comment a little bit on Mark's comment  
7 about moving towards faster charge rates and so on,  
8 because we are also a little conflicted about this, too.  
9 We understand you can't do everything to the grid and  
10 remain invisible like we are, I think, today with the  
11 120-volt charging essentially invisible on the grid.  
12 And even the 3.3-kilowatt charging, you can argue in  
13 many places it's just hard to even see that kind of load  
14 on the grid.

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

25           So let me just try to run through everything,

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

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

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



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

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

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

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

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

1 the average Volt owner only stops for gas once a month,  
2 and that's the average one. We know Volt customers who  
3 have only gone every six months they are stopping for a  
4 tank of gas, or whatever. They are also driving about  
5 900 miles before refilling, so the fuel economy on these  
6 vehicles is stunning. Just look at the fuel economy; it  
7 is stunning.

8 GE is by far the largest corporate purchaser  
9 of these vehicles. They have committed to purchasing  
10 over 12,000 Volts, and we have already delivered over  
11 1500. The beauty of the vehicles that we have sold, and  
12 I've talked about the August sales of 2,800 vehicles, we  
13 have already -- with just that small, small number of  
14 sales, which in the big scheme of things is a drop in  
15 the bucket for automakers, right, so far. In just the  
16 20,000 or so vehicles we have sold here in the United  
17 States, we have already moved 78 million miles of travel  
18 over to electricity as opposed to gasoline. That's a  
19 stunning accomplishment, when you figure just sort of  
20 handfuls in different communities of electric vehicles.  
21 So it is a very, very big accomplishment. That is  
22 already 4 million gallons of gasoline. That is the  
23 equivalent of two tankers, supertankers of oil coming  
24 over here. So this is important. It's really  
25 important.

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

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

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

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

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

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

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

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

11 But bottom line, again, fun to drive. This is  
12 an excellent technology. It will be successful. I  
13 believe it is very inevitable. If you ask customers --  
14 so we talk a lot about this 40 miles electric, and then  
15 a bunch of gas, you know, 350 miles plus on the gas  
16 range. It's a little confusing for folks, because it is  
17 sort of this two cars in one. What does 40 miles get?  
18 Five of these folks, and let me just start with Ted  
19 Ellyatt who was over in Fort Myers Shores. He has got  
20 111 miles per gallon fuel economy after driving  
21 34,000 miles on the vehicle. Over 100 miles per gallon.  
22 Stunning.

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

1 12,000 miles on the vehicle. So why don't I just pick  
2 out a couple examples of folks that many of you guys  
3 actually do -- also recognize these are, for the most  
4 part, except for Bob Graham, who works at Southern  
5 California Edison, these are very normal citizens that  
6 are driving the vehicle. So excellent accomplishments  
7 here. And, again, proving how important it is to move  
8 the gasoline miles over to electricity.

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

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

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

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

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

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



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

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

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

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

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

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

1 levels. I like not pushing charge rate and speeding up.  
2 I wake up in the morning, even at 1:20, the vehicle is  
3 fully charged, and off I go. I think that that is very  
4 satisfying for consumers. I would like to -- you know,  
5 I would like to -- I think there is a strong voice that  
6 says I think we will always have a lot of folks doing  
7 the 120-volt charging. The question is where do the  
8 other rates go and how much push is there to ramp up to  
9 3.3 kilowatts.

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

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

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

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

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

1 charging right away. But there is also a charge mode,  
2 too, that says, no, it's going to be a delayed charge  
3 based on whenever I have it set for parker time in the  
4 morning. So I set my vehicle for 6:00 a.m. in the  
5 morning, and it is now 6:00 p.m. at night, it knows that  
6 it needs four hours to charge, and, therefore, nothing  
7 is going happen until 2:00 o'clock in the morning and my  
8 vehicle is going to start charging. And there are a  
9 number of customers that are using the charge mode to  
10 delay the charge to start a charge away from that  
11 5:00 p.m. or 6:00 p.m. peak.

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

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

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

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

17 I wanted to point out just a couple of facts  
18 about the charging. About 50 percent of all customers  
19 are charging at 120 volts. They don't call Charlie at  
20 SPX, and say, hey, I want a 240 volt charger. They are  
21 not participating in an incentive or a grant program.  
22 They are doing -- they are just -- they don't call us;  
23 they don't contact us, so they must be happy doing  
24 120-volt charging just like Mark Duvall is.

25 The 240-volt charger installation grant

1 programs likely have been driving some of the 240-volt  
2 demand. So I wouldn't doubt that some of that  
3 50 percent actually starts to increase as some of the  
4 grant programs and incentive programs go away. That  
5 people are finding 120-volt is pretty benign. It's  
6 fine. I'm charged in the morning fully on the Volt when  
7 I want to leave, so, you know, why not? So, I'm  
8 wondering what is going to happen with this mix, but I  
9 wouldn't doubt it if the 120-volt starts to increase in  
10 more demand.

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 on the next couple of slides.

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

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

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

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

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

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

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

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

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

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

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

6 So with that, you know, the objective is --  
7 with this added demand on the system, the objective is  
8 ultimately to stagger that load over a period of time in  
9 order to help avoid some of these problems.

10 Insufficient generation is probably not as much a  
11 problem. If you asked most utilities, they will say,  
12 you know, we have the capacity to generate more  
13 electricity and that is not really a big deal. But Mark  
14 touched on this one.

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

25 Another thing, you know, typically when demand



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

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

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

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

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

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

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

2 Here is a look at one that we actually did at  
3 our headquarters in Plainville, Connecticut. It is a  
4 100 kW grid-tied system. You know, it covers about 40  
5 parking spaces, and it has about ten electric vehicle  
6 charging stations on it, which offsets the power of 13  
7 EVs per day, or 20 homes per year. So, you know, it  
8 showcases a lot of our products. You know, we are not  
9 just making the electric vehicle charging stations, we  
10 manufacture safety switches and disconnects and a lot of  
11 the other components that go into -- obviously circuit  
12 breakers and things like that. So there is a lot of GE  
13 products in here.

14 And so, again, we kind of did this as a  
15 showcase at our headquarters in Plainville, and we got a  
16 great response out of it, and so we have actually begun  
17 building one at our headquarters down in Atlanta. Here  
18 are some pictures of the one in Atlanta. It's not quite  
19 as big. It's a little bit smaller. I believe it's like  
20 30 or 50 kW. I can't remember. But, you know, as you  
21 can see it's only four charging stations, things like  
22 that.

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

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

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

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

20 You are probably not familiar with SPX, so I'm  
21 going to give you a little background. We are a Fortune  
22 500 company based out of Charlotte, North Carolina. A  
23 \$5 billion company. I am in the automotive group, which  
24 is based in the Detroit area, which is a billion dollar  
25 portion of that company. And we have been around for

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

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

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

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

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

7 And when we got into this business a few years  
8 ago, we decided that we would hire local electricians  
9 all over the country, because we felt it was important  
10 to the consumer to have somebody local that understands  
11 the local codes, knows how to get the job done, and is  
12 literally close by to the residents. So we have over  
13 800 certified electricians across North America in  
14 place.

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

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

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

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

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

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

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



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

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

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

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

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

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

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

1 28 percent of the time. And we also ask about 120-volt  
2 outlets. So if somebody is thinking about using their  
3 cord set and not having a 240 station put in, we are  
4 getting them thinking about, well, okay, how many plugs  
5 are actually in your garage, and where are you going to  
6 plug that cord set in. So most of them only have one  
7 outlet, too.

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

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

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

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

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

23 Thank you very much.

24 **MR. CRAWFORD:** Thank you, Charlie.

25 The next present is Bob Reedy from the Florida

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

3 **MR. REEDY:** Thanks, Ben.

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

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

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

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

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

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

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

13 Some more information to argue that, you know,  
14 prices are coming down for PV. This is some national  
15 data, but Florida is actually quite representative. So  
16 if you put all that together, you come to the point of  
17 saying that PV instead -- we like to talk about PV as  
18 compared not to electric rates and the grid parity  
19 argument, but we like to talk about gasoline parity.  
20 And we are well below today without any question, almost  
21 without anyone can argue we are well below. We are  
22 \$1.08 a gallon equivalent for PV in Florida residential.  
23 So that's great.

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

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

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

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



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

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

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

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

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

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

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

4 Let's review the advantages and disadvantages  
5 for large ground mount installations. We have got the  
6 ability for lowest capital cost because of economies of  
7 scale. We have the disadvantage of the step-up in  
8 transmission and distribution and step-down losses. So  
9 that is a minus on the energy side. We don't do  
10 anything about the feeder impacts for the EV charging.  
11 There is also that problem in parking lots in particular  
12 where to get the power levels we need we can't cut up  
13 the parking lot and do all that sort of thing. There is  
14 options for converting the parking lot lighting to  
15 600 volts and doing some things locally to mitigate  
16 that, but it's still a problem there.

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

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

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

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

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

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

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

25 And then they put the two together, and I

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

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

10 **MR. CRAWFORD:** Thank you, Bob.

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

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

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

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

1 leveraging those lessons now to make good prudent  
2 decisions on our current activities. We were actually  
3 the first utility in the United States to put into  
4 service a hybrid electric bucket truck. That was in  
5 2006. And then in 2008 we put into service the first  
6 plug-in bucket truck. So we are actively using this in  
7 our fleet now. Our fleet is one of the greenest in the  
8 country. We continue to convert that fleet to cleaner  
9 fuels as they become available.

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1           Because of the importance of getting -- a lot  
2 of what we see up till this point, and even a study we  
3 did back in 2008 that we presented as part of our  
4 questionnaire in May, was built on a lot of assumptions.  
5 Well, now that vehicles are in the market, our goal is  
6 to get real world data. So what we have done is we have  
7 launched a pilot to install Level II chargers in early  
8 PEV buyer homes. Our total expected study group is 40  
9 to 50 vehicles, and installations have been occurring  
10 this year. We will complete installations by the end of  
11 this year, and complete our data gathering in the end of  
12 2013 and report soon after that.

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

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

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

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

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

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

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

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

1 that payback can be a very, very long time.

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



1 vehicles and others.

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

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

25 And once we have this understanding, then we

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

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

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

1                   **MR. CRAWFORD:** All right. Thank you,  
2 Christopher.

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

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

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

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

1 Coulomb in a very short period of time.

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

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

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

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

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

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

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

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

17 The next thing we realized we needed to do was  
18 start with data collection. We are putting in now up to  
19 20 stations at our facilities so that for our vehicles  
20 we can start capturing some data and getting information  
21 off those vehicles. The do have -- the public  
22 infrastructure is developing pretty rapidly over the  
23 last few months in our area through the Charge Point  
24 America Program. So through that to date there are 50  
25 public charging stations in our area. That could be,

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

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

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

1 further along than we were. They had some projections  
2 out, so we looked at their projections, Southern  
3 California Edison, Fortune Magazine, J.D. Powers, and we  
4 took those along with EIA, and we kind of put together  
5 what we thought would be the projections in our area.  
6 And did, again, the low, medium, and high, which we feel  
7 would be between 10,000 on the low side, 20,000 on  
8 the -- 50,000 on the high side between, you know, by  
9 2020.

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

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



1 know, the improvements would work.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4 Short commute results. The first piece I'm  
5 going to show you is if there is no charge in the  
6 vehicle at all. Then there is essentially a -- it looks  
7 like a regular Prius. If any of you drives a Prius, a  
8 hybrid vehicle, you'll get about 45 miles per gallon.  
9 We have got some folks, employees that work that tell us  
10 that's what my car gets. It's not converted to plug-in  
11 electric. It's just a plain old Prius. And that's what  
12 we experienced here if the car started out with no  
13 charge in that five kilowatt hour pack, it got about  
14 45 miles to the gallon. I'm going to throw some cents  
15 per mile values up here for us to kind of reference.  
16 This was when gas was a good bit cheaper than it is  
17 right now.

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

25 Cost per mile using electricity and gasoline



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

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

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

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

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

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

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

25 This is a little bit different look. This is

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

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

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

25 But, again, the numbers are small, the

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

5 **MR. CRAWFORD:** Thank you, Bob.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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

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

1 location where they are going to be charging the  
2 vehicles. That's important to remember that, you know,  
3 80 percent of the charging will occur in the residential  
4 segment of our market. So this is really for public  
5 awareness more than anything else, and also to ease  
6 range anxiety.

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

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

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

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

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

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

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

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

24 (Lunch recess.)

25 **MR. CRAWFORD:** All right. I think we would

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

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

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

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

10 These are the numbers that -- we sent a data  
11 request out back in May to the utilities in the state  
12 trying to, you know, the first part of gathering  
13 information for the study. This slide shows the number  
14 of EVs the utilities in Florida reported during that  
15 process. You know, and also they projected out through  
16 2021 when that was available. Because there is no  
17 comprehensive source for the numbers, these numbers are  
18 estimates at present and, of course, the projections are  
19 going to vary. We've seen that with the presentations  
20 we have seen so far.

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

1 1.8-kilowatt range. That's the small at-home chargers  
2 for the most part. And the Level II, the larger Level  
3 II chargers those can be home, those can be office  
4 chargers, but that's where we get into much more likely  
5 to have some affect on the system. And then, of course,  
6 the Level 3, we're talking about the quick charge  
7 stations, and based on all the numbers we have seen,  
8 there don't appear to be any in the state at present  
9 right now of Level 3 chargers.

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

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

1 hurting the roll-out of electric vehicles in the state?

2 And anybody who wants to speak, just indicate.

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

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

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

22 **MR. GILLMAN:** I apologize, Ben. That was  
23 Christopher Gillman with Progress Energy Florida.

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

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

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

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

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



1 think, are really important.

2 The last comment I wanted to make on the slide  
3 that I saw a second ago with the DC or the Level III  
4 charging, we actually -- we should just probably take  
5 this off-line -- but Level III is actually not the  
6 terminology, at least through the Society of Automotive  
7 Engineers, for quick charging. That's actually a DC  
8 Level II when we talk about anything from 50 to  
9 92 kilowatts. So we should just review that. It's a  
10 different level of -- the levels are defined differently  
11 for AC and DC, but if we would all get on the same page,  
12 that helps us nationally, as well.

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

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

20 **UNIDENTIFIED SPEAKER:** No, no.

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

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

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

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

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

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

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

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

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

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

25 I mentioned earlier the grant we are part of

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

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

13 **MR. YANKITIS:** Charlie Yankitis with SPX.

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

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

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

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

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

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

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

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

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

25 **MR. CRAWFORD:** I was thinking of a requirement

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

5 **MS. GROSS:** Okay.

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

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

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



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

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

9 I think that it is interesting, and as we have  
10 done in the 3.3-kilowatt at 240, we share data,  
11 notification data, this customer agreed-upon data  
12 broadly across the United States, probably with 20 to  
13 30 utilities, and they have been analyzing where these  
14 homes are. And almost without exception there have been  
15 no anomalies, no unusual, oh, we have problems here.  
16 And once in awhile a transformer will get upgraded or  
17 something, and I don't know how we didn't upgrade that  
18 transformer last year anyway, because the neighborhood  
19 was using a lot higher loads than we had planned for  
20 originally. So the vehicles are sort of just that last  
21 thing that they noticed, and it causes them to go look  
22 at it.

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

25 **MR. FUTRELL:** Yes. This is Mark Futrell

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

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

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

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

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

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

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

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

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

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

1 that might be more critical to our future distribution  
2 planning.

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

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

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

25 What is pertinent is that they have shown up

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

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

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

1 source because it is pertinent data.

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

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

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

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

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

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

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



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

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

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

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

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

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

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

17                   (Laughter.)

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

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

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

11 **MS. GROSS:** This is Britta Gross, General  
12 Motors.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

17 **MS. GROSS:** Britta Gross, General Motors.

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



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

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

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

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

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

1 and we needed AC kilowatts. So the Ford Focus is  
2 7.2 kilowatts, and so it's 30-amp. It's basically a  
3 30-amp continuous draw. And the BMW seems to have  
4 settled in at 7.7, which is 32 amps, so they run on a  
5 full 40-amp circuit. And then the RAV IV EV, which is  
6 not sold in this state, is 9.6 kilowatts. So we're in  
7 agreement, but those numbers are trending up.

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

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

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

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

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

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

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

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

1 near-term issues.

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

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

12 **MR. REEDY:** Yes.

13 **UNIDENTIFIED SPEAKER:** And give us the data.

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

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

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

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

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

1 identify those stations?

2 **MS. GROSS:** This is Britta Gross, General  
3 Motors.

4 The Department of Energy has funded an effort  
5 through NREL, the alternative fuel vehicle database, and  
6 it's a longer term project to aggregate all the known  
7 publicly accessible stations, explain whether it's a  
8 120 outlet, or if it's 240, or whether it's a fast  
9 charger. They visually confirm every one of these  
10 sites. I know that, for example, Coulomb has done a  
11 wonderful job of keeping it updated and refreshed with  
12 data where all the Coulomb installations are going, and  
13 I have been working with Clipper Creek and others.

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

1                   **UNIDENTIFIED SPEAKER:** Go ahead.

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

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

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



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

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

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

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

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

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

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

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

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

25 I want to be able to use the GE WattStation

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

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

20 And then the latest DMV records show we have  
21 113 vehicles in our service territory, and we have only  
22 been contacted by one customer. Actually we were  
23 contacted by one customer putting in a public station,  
24 and we have been contacted by one residential customer  
25 that was putting in one. But other than that, we have

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

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

6 Robert.

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

6           **MR. McGEE:** This is Bob McGee with Gulf. Just  
7 a comment about the dual metering. In our particular  
8 circumstance, we have the benefit of having had this  
9 Energy SELECT program running for a good period of  
10 pipeline already, since the mid-'90s. We got about ten  
11 10,000 customers on it, so it's easy to say to the  
12 electric vehicle customer, hey, come on and use this  
13 because it's already out there and available.

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

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

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

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

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

25 **MS. GROSS:** Britta Gross, General Motors.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

1 they have a very high vehicle adoption rate, I think you  
2 could construct some scenarios where a utility might be  
3 looking at the business case for upgrading the system  
4 all the places they need to, and the business case for  
5 paying people to charge at different rates, or maybe  
6 even doing something like they are doing in Japan.

7 There could be some interesting stuff done there. Here  
8 it seems to be a stretch that that would be feasible.

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

14 **MS. GROSS:** Britta Gross with GM.

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

22 I will point out that the average cost today  
23 of a new vehicle is -- new vehicle, cars and trucks,  
24 light duty vehicles, the average cost these days is over  
25 \$30,000. So with the federal incentive right now at

1 \$7,500 on these vehicles, our vehicles are being brought  
2 down to the point where they are at the level. So I  
3 think a lot of people don't understand these are still  
4 relatively competitive, given where the market is today  
5 for new vehicles. But to move this thing beyond the  
6 first early adopter and into the mainstream you have got  
7 to attack costs.

8 So things like V-to-G, V-to-H, all these  
9 things, even the fast charging, they add cost to a  
10 vehicle and so we have to very carefully evaluate, as  
11 Mark said, what is the value to the customer. What is  
12 the customer willing to pay for these things, and then  
13 what are the downsides. For example, extra cycles on  
14 the battery, which it's going to -- by definition it's  
15 going to take away some of the life of the battery at  
16 some point. Does it mean it is from 16.9 years to  
17 16.899 years? I don't know, but it has an effect.

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

1 what is going to sell.

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

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

25 **UNIDENTIFIED SPEAKER:** Those are very good

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

12 The thing about the DC charge port that  
13 probably keeps me awake at night is that it enables a  
14 whole host of applications that I felt were only out --  
15 were in the future primarily because the added cost to  
16 do them on the vehicle would prevent the automaker --  
17 you know, right now job one at GM is to get a  
18 3.3-kilowatt charger down as inexpensive as possible.  
19 You know, get that component as cheap as possible if you  
20 are the charger guy. You are not really worried about a  
21 bidirectional version or this or that. But once someone  
22 offers to build -- once GE offers to build an off port  
23 appliance, then that really changes the equation. Does  
24 it mean a lot of people will do it? No, but it means  
25 the people that want to do it have access to maybe much

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 to the new market around electric transportation in all  
2 cases.

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

6 **UNIDENTIFIED SPEAKER:** (Inaudible; microphone  
7 off.)

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

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

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

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



1 situation, generally through the CIAC.

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

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

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

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

1 depending.

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

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

25 Even Tesla Motors, which has much larger

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1 workplace, just giving away the power, how feasible do  
2 you see -- or how do you see the rollout of at-work  
3 charging going when it sort of gets beyond this level  
4 to, you know, a normal charged amount or something along  
5 those lines beyond the hook-up types that we have seen  
6 so far where somebody is just plugging their car into a  
7 110, or a 120, or a 240?

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

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



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

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

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

1 what carries the day in workplace charging. And then  
2 also note that, you know, the installation costs can be  
3 very reasonable; they can also be very high. I mean,  
4 EPRI's workplace installation at Palo Alto involved a  
5 stepdown transformer and finding, you know, a  
6 30-year-old conduit under the parking lot, and it turned  
7 out to be very, very expensive. And others can be very  
8 cost-effective.

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

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

1           And that is actually a really good fix. I  
2 actually charge my vehicle after day at work with a  
3 solar workplace charger. I'm getting about an  
4 80 percent solar fraction of usage, so it does work in  
5 those cases when you have a 9:00 to 5:00 type facility.  
6 They have already got solar or they are interested in  
7 putting solar, very minimal impact to peak, very minimal  
8 impact to load really.

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

14           **MS. SZARO:** Yes, I would.

15           **MR. HANRAHAN:** Brian, Florida Power and Light.  
16 One of the more lively topics in the industry, workplace  
17 charging. We have about 60 chargers installed on our  
18 facilities, various facilities to support our fleet. At  
19 this point we have taken the approach that we are not  
20 going to offer workplace charging. There are many  
21 things that need to be considered. We don't want it to  
22 be a take-away in the future, right? So if I do it now  
23 when I have ten employees with vehicles; do I do it with  
24 50; do I do it with 100. Do I do it only in my Juno  
25 facility? Do I do it in a service center in Palatka

1 when an employee gets it?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

25 These are taken from some of the utility

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

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

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

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

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

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

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

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

4 **MR. DUVAL:** So we -- EPRI is currently  
5 building, with the Tennessee Valley Authority we built a  
6 solar charging station with, I think it's about  
7 36-kilowatt hours of energy storage. Six spots,  
8 12 kilowatts of solar. I can see if we can provide some  
9 of the printouts showing the data flow, or showing the  
10 energy flow of solar, vehicle draw, et cetera. We did  
11 do a study, and one of the things that we determined is  
12 that, yes, the system was potentially self-sufficient.  
13 Of course, our utility gives you some sort of feed-in  
14 tariff or some sort of incentive, so basically we ship  
15 the solar to the utility and we draw through, you know,  
16 a different meter. So we don't do that. But it is  
17 self-sustaining on 2 kW of solar as long as you have  
18 storage. You don't need a lot of energy. You know,  
19 6 to 8-kilowatt hours per vehicle. So if it's a  
20 workplace charging setup and you have six vehicles, you  
21 should be able to do it. So it really will come down to  
22 the cost of the storage.

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

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

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

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

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

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

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

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

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

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



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

3 **MR. DUVALL:** Us, too.

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

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

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

17 **MR. CRAWFORD:** That would be very helpful,  
18 actually.

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

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

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

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

18 **UNIDENTIFIED SPEAKER:** 2014 Volt?

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

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

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

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

25           Is there anyone else who wanted to speak?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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

16 Thank you.

17 **MR. CRAWFORD:** Thank you.

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

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

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

1 report.

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

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

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

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

1 approved and finalized.

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

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

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

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DATED THIS 25TH DAY OF SEPTEMBER, 2012.



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