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CALIFORNIA ENERGY COMMISSION

STAFF WORKSHOP

In the Matter of:	) Docket No.
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Merit Review: Electric Vehicle	) Fuels and Transportation
Charging Infrastructure Project	) Technology Merit Review:
Success	) Electric Vehicle Charging
	) Infrastructure Project
_____	) Success

CALIFORNIA ENERGY COMMISSION

THE WARREN-ALQUIST STATE ENERGY BUILDING

FIRST FLOOR, ART ROSENFELD HEARING ROOM

(HEARING ROOM A)

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

MONDAY, APRIL 25, 2016

9:00 A.M.

Reported by:
Kent Odell

APPEARANCES

Commissioners

Janea Scott, Lead Commissioner, Transportation Committee

Carla J. Peterman, California Public Utilities Commission

CEC Staff

Tim Olson, Fuels and Transportation Division

Workshop Presenters (* Via telephone and/or WebEx)

Leslie Baroody, Zero-Emission Vehicle and Infrastructure Office

Colleen Quinn, ChargePoint

Charles Botsford, AeroVironment

Mark Triplett, Green Charge Networks

Bill Boyce, Sacramento Municipal Utility District (SMUD)

Kitty Adams, Adopt a Charger

Matthew Marshall, Redwood Coast Energy Authority

Kapil Kulkarni, Burbank Water & Power

Matt Henigan, CA Government Operations Agency

Reviewers/Commenters

Jacob Ward, U.S. Department of Energy

Mark Duvall, Electric Power Research Institute

Nancy Ryan, Energy and Environmental Economics (E3)

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David Greene, Howard H. Baker Jr. Center for Public Policy at the University of Tennessee, Knoxville

Joshua Cunningham, California Air Resources Board (CARB)

Public Discussion (* Via telephone and/or WebEx)

Dan Davids, Plug In America

Lisa McGhee, San Diego Airport Parking Company

David Greenfader, Envision Solar

Matt Zerega, Shell

Marc Geller, Plug In America

Richard Schorske, EV Communities Alliance

I N D E X

I N D E X (Cont.)

I N D E X (Cont.)

P R O C E E D I N G S

APRIL 25, 2016 9:05 A.M.

MR. OLSON: Hello everybody. We'd like to start our workshop here. Sorry if we're a little late here and some of our speakers and reviewers will just join us when they arrive.

So we'd like to begin our workshop today to discuss electric vehicle charger and infrastructure project successes. This workshop will be led by Commissioner Janea Scott who is the Energy Commission's Lead Commissioner on Transportation and who oversees all the transportation topics and issues.

My name is Tim Olson. I'm with the Fuels and Transportation Division. I will be a co-moderator throughout the day.

The workshop should last most of the day and we'll have one break at lunch hour. Feel free to use the restrooms outside the first floor here, outside the door of the first floor. There's also a snack bar you can use on the second floor up the steps. And in case of emergency we will leave this room, go out to the left through the double doors, and then head to the park on the corner of 9th and P Streets.

This workshop is one of a series of activities conducted by the Commission under a relatively new

function. We refer to it as the Technology Merit Review. And today we're going to focus on the merits of EV charger, connector and infrastructure projects co-funded by the Energy Commission under the Alternative and Renewable Fuels and Vehicle Technology Program, which we refer to as the ARFVTP. You'll hear that acronym today.

If we can think of a better name for that, we're open. Actually, it might be a good test today. What's a good name for this?

Previously we completed two other series of merit review workshops, one on biofuel, biomethane production plants in September; and another on medium and heavy-duty vehicles in December. All of that information: background material, presentations, all that -- transcripts of those workshops are on our website under the Merit Review Docket.

And to begin today, Commissioner Scott will provide some overarching remarks. And Leslie Baroody will describe the context of our programs, historical spending, and upcoming plans for future investment in the electric vehicle connector business.

You can see from the agenda that the rest of the workshop will involve a series of presentations by the funding recipients and comments from independent reviewers after each presentation. The agenda lists the order of each presentation and the review sessions. And all that

combined effort should last no more than 45 minutes for each segment.

We've asked the speakers, the presenters to do no more than 20-minute presentations. And then 25 minutes of question and answer type of discussion.

And then at the end of the day we'll have an open, general comment period. If you'd like to speak during the general comment period, please fill out -- there's a stack of blue cards out on the front desk. Or you can just come up to the podium here and ask a question. We'll also open the questioning up to people on the WebEx.

I also would like to remind you that a verbatim transcript of the workshop discussion will be made available on our public docket. And audio and PowerPoint presentations are broadcast and shown on WebEx.

For those people in the room here please speak into the microphones very carefully. We have a lot of people on the phone and the WebEx listening. And also let people know who you are if you're using the mic. And also our court reporter may be asking you for business cards just to get your correct spelling of your name.

For those here in the room or on WebEx you may submit comments in writing through an e-filing process. And that would be included in our docket too. That docket is open-ended; there is no closing date on that. You can

browse through that and see comments from other people, you can comment on their comments if you're interested.

And the agenda and copies of the PowerPoint presentations are available on the table near the hearing room front door there. And also most of them are posted on our website now; probably at the end of the day all of them will be. And it's under the "Transportation: Alternative Fuels Technology Merit Review" category.

Also like to note that there are two other related events scheduled this week: a workshop on the commercialization of electric vehicle chargers and infrastructure conducted by UC Davis STEPS Program; that's tomorrow in Davis. And Paul Gruber, who's in the room back over here is the point of contact for that workshop. And U.S. Department of Energy has invited relevant parties to a roundtable event on Wednesday as part of its EV Everywhere Initiative. Jake Ward, one of our reviewers here and Rachel Nealer, are points of contact for that event.

So now I'd like to introduce Commissioner Janea Scott.

COMMISSIONER SCOTT: Great. Thank you so much, Tim.

Good morning and welcome everybody. It really is a true pleasure for me to share today's Merit Review Workshop that's going to highlight the progress, the

challenges, and the successes of electric vehicle charger and infrastructure installations in California.

First I really want to say a hardy thank you to our panelists and our reviewers, who are all around the table with me here. We really appreciate the effort that you've put in and the preparation for making today's workshop a great meeting.

So, since 2009 the Energy Commission has provided roughly $60 million in co-funding for the Alternative and Renewable Fuels and Vehicle Technology Program, in partnership with several entities to install nearly 50 percent of California's Level 2 public access electric vehicle charger connectors, 28 percent of DC fast charger connectors and Level 2 installations in over 4,000 residential and multi-unit housing dwellings.

We've been able to leverage our dollars, because each funding recipient provides a match share, which is a private investment equal to or oftentimes greater than the amount of the ARFVTP award. Additionally, we have also provided funds to local governments to plan and implement regional planning guides and are working in partnership with Treasury as well to try to entice some small businesses into installing chargers as well.

We appreciate the contributions that all of our award recipients have made to achieve the multiple policy

and business objectives. And today we will hear testimonials from eight co-funding partners about their experiences and insights including the descriptions of their successful projects, key reasons for the progress and success, and how some of the obstacles and challenges they encountered were overcome, the significance of their efforts to advance electric vehicle market growth, any pitfalls or lessons learned for us, pitfalls to avoid, successful business models that others might be able to implement, insights into market expansion and any remaining challenges that we all may need to work together to address.

We also appreciate the participation of our distinguished members of our Merit Review Panel who will have opportunities to make comments, ask questions and probe into the details of each project.

The commitment of time spent by the presenters and reviewers is of great value to us. And especially I want to note that many of you have traveled long distances to join us and we really appreciate that.

So why is this workshop so important to those of us here at the Energy Commission? Periodically we need to check in and see how things are working from a number of perspectives. One of those perspectives is the Governor's Zero Emission Executive Order, which directs the state

government to ensure that the infrastructure is in place to support 1 million electric vehicles by 2020 and 1.5 million electric vehicles by 2025.

Success of the California Air Resources Board, ZEV Mandate, which requires automakers to make specified numbers of zero emission vehicles available for sale in California through 2020, is also dependent on the availability of statewide charging infrastructure. The Energy Commission would like further input into how our programs are working and to examine the future deployment of the ARFVTP funding and the funding mechanisms through our Annual Investment Plan, particularly as we substantiate market expansion and look at the near-future role of utility investment and infrastructure related to EV chargers.

We also warmly welcome feedback about how future investments can include charger infrastructure for medium and heavy-duty vehicles.

Successful implementation of the Air Resources Board Low-Carbon Fuel Standard also requires the appropriate crediting of low-carbon intensity reductions generated by electric vehicle use. And that will be measured through the EV charging infrastructure.

And last, but certainly not least, the California Public Utility Commission's successful implementation of

SB 350 to ensure growth of renewable electricity to 50 percent of the state's power mix by 2030 includes the relationship of electric vehicle use and charger infrastructure to achieve that goal.

And I'd really like to extend my appreciation to CPUC Commissioner Carla Peterman, who will be joining us later this morning and also I'll say it again when she arrives. And she's going to be part of our discussion today.

So thank you so much, to all of you, for joining the workshop. I really look forward to the presentations, the comments and the recommendations. And I just want to also start off with a hardy thanks to Tim Olson and Matthew Ong, because they've done a great job getting us organized for today. Thank you.

So let me turn it back to Tim.

MR. OLSON: Thank you, Commissioner.

So we're going to go right into the first presentation, which is kind of a landscape setting presentation by Leslie Baroody, who's our Senior Electric Vehicle staff person here at the Energy Commission. So Leslie, please come up and wow us.

MS. BAROODY: I'll try. Good morning everybody, it's great to see you here today, thanks for joining us, thank you Commissioner Scott for that great introduction,

and Tim.

So I am Leslie Baroody. I'm part of the EV team here in the Fuels and Transportation Division. And I'm just going to give you kind of an overview of where we've been with charging infrastructure deployment and hopefully where we're headed.

Many of you know the Alternative and Renewable Fuel and Vehicle Technology Program or ARFVTP was funded for $100 million per year extended through AB 8 through 2024. And the purpose of this program is to transform California's transportation market into a diverse collection of alternative fuels and technologies and reduce Californians' dependence on petroleum. Commissioner Scott gave a pretty good overview of the key policies underlying our charging infrastructure work, so I won't review all of that again for you.

So as you can see sales of plug-in electric vehicles in March continued to increase in California and the nation. Although the rate of increase slowed last year, likely due to lower gasoline prices. Total plug-in electric vehicles in California have more than doubled in the past year and now number about 200,000 on California roadways. There are now at least two dozen PEV models available in California and new models are regularly being announced by the automakers. And if the Tesla preorders of

400,000 Model 3s are any indication of future interest I think we have reason to be optimistic about the future.

The Center for Sustainable Energy shows in this chart that PEVs account for about 5.2 percent of new car sales in the last year with about half battery electric vehicles and half plug-in hybrid electric vehicle sales. Also, a recent study by Bloomberg New Energy Finance showed that EVs are expected to account for 35 percent of global new car sales by 2040. They also expect the battery prices will be reduced sufficiently to enable electric vehicles to be competitive with conventional vehicles by 2025 even with continued low oil prices.

This slide shows a breakout of 1.5 million zero emission vehicles by 2025 and the National Renewable Energy allows a trajectory of zero emission vehicles through 2025. As you can see, this year California has already surpassed the expected plug-in vehicles on this trajectory.

So what is the status of charging infrastructure in California right now? Well, in April Level 2 chargers numbered 7,890 charging outlets or "connectors" as we are now calling them at the Energy Commission instead of charge points.

Also, DC fast chargers are numbering 859 throughout the state. And this is from the Alternative Fuel Data Center Database.

The Energy Commission has contributed significantly to this existing network of chargers in the state. The portion dedicated to EV charging infrastructure is $49.5 million for 80 agreements with over 8,700 charge connectors, including 242 direct current fast charge connectors. The Energy Commission's total investment in nonresidential connectors accounts for about half of all public nonresidential connectors in California and 28 percent of the DC fast chargers.

In addition, the Energy Commission has funded $2 million for the California Pollution Control Financing Authority Loan-Loss Reserve Program. So far there haven't been any takers on that program, so we'd definitely welcome your feedback and recommendations on ways that we can increase participation in that program.

The Energy Commission has also funded 34 Regional Readiness Zero Emission Vehicle Planning and Implementation Grants for $7.6 million. Typically, applicants for Energy Commission funding need to coordinate their sites with the regional readiness plans to ensure the siting of the infrastructure fits in with local plans.

Here's another look at our funding by category, connectors by category. Clearly, the residential and commercial sectors we have funded the largest number of connectors at 46 percent and 40 percent respectively.

So this slide summarizes the ratio of plug-in electric vehicles on the road in relation to the number of ARFVTP-funded charging connectors. At the end of 2015 there were around 185,000 PEVs in California. And based on the number of DC fast chargers that we had funded at that time we had a ratio of about 1,542 PEVs per 1 ARFVTP fast charger connection.

Now suppose that the ARFVTP maintained its current course of funding for charging infrastructure. And then looking ahead to 2020 when we might support about 950,000 PEVs the ratio will have grown to 1944 PEVs for every ARFVTP-funded fast charge connector. You could see a similar growth in this ratio for the various types of chargers. Underlying this particular ratio analysis is continued funding, about $17 million per year for charging infrastructure. And this is cumulative over that time period and then funding a similar portfolio of charger types as before.

In addition, the cost per charger doesn't change significantly. Also, we discontinue funding any single-family residential chargers.

So these numbers suggest that if we were to rely on our funding alone we would quite likely be falling short of the need for future chargers.

Just to give you kind of an overview of where

we've been, the different phases of our deployment, in 2010 we partnered with the federal government and the American Recovery Act funds, the stimulus funds, led by Department of Energy for the EV Project in Charge America. In case some of you don't know, this was a fairly large demonstration over 3 years, with 8-300 privately owned plug-in electric vehicles in 22 cities with 6 million charging events analyzed.

Our particular funding contributed to this as collateral to attract as much of this federal stimulus money to California as we could. We awarded over $16 million in grants for over 4,200 charge points to ECOtality and Coulomb, which is now ChargePoint. During that time, we also awarded a manufacturing grant to ChargePoint for $1.1 million dollars to develop and manufacture their Charge Point Communication Processor, which links the charger to the Smart Grid (indiscernible) multiple services.

So in Phase II we continued our funding with solicitations. And most of these were given to EV charging companies, mostly at low-cost sites in major metropolitan areas. We also provided funds to upgrade the Legacy chargers through Clipper Creek. The awards were for $7.5 million for residential workplace fleets and DC fast charger demonstrations.

In Phase III we had $6 million available. And these were awarded mostly to public agencies and nonprofit groups. And this particular solicitation was oversubscribed, so we awarded $13.6 million. And in this case applicants had to coordinate with the Regional Readiness groups that were just formed of the year before.

And then most recently we have developed solicitations for DC fast charging on California corridors to continue the West Coast Electric Highway through California. And right now we have an open solicitation for other key corridors in California and those applications will be due at the end of June. And these also must be coordinated with the PEV readiness groups.

Here's kind of a summary of our regional PEV readiness regions, we have 12 electric vehicle regions. And each of these has a plan for infrastructure siting, streamlining of the permitting and inspection processes, building code updates, consumer education and outreach among other things.

And last December Commissioners Scott and Peterman held a workshop here on PEV readiness and we had really great participation from many of our PEV regional leaders, some of whom are here today as well. And we certainly gained a better understanding of the local planning processes with regard to charging infrastructure

deployment.

So I'm just going to touch on a few of our projects that we have funded. And many of these we'll hearing a lot more about today.

So last week the Energy Commission participated in a ribbon cutting at the Tasman Garage in Santa Clara where 48 Level 2 chargers and 1 DC fast charger was installed with Energy Commission funding. This is a six-story garage; also has a 370 kilowatt solar installation with battery storage from Green Charge Networks, who we'll hear from later today.

We funded the California State University in Fresno for a little less than half a million for four workplace Level 2 chargers and two DC fast chargers to serve the university and the local population. Special destinations are important for extending the range of electric vehicles. And state parks are a really good example.

Kitty Adams, with a nonprofit, Adopt a Charger , will speak later to us about their projects. The Energy Commission funded 61 charging stations through Adopt a Charger at 12 state parks with 30 Level 2 and 30 Level 1 and one DC fast charger. These sites are going to be free to visitors and will also have accompanying signage that educate park visitors on EVs and charging.

New charging models are beginning to emerge and this is one example. In the City of Burbank the Energy Commission funded eight Level 2 EV municipal curbside chargers, the first in California and possibly the nation. These chargers are installed and operated by Greenlots and they are very, very accessible, visible. And they are already getting really good use by EV drivers. And we'll be hearing more from the City of Burbank today.

As I mentioned last year the Energy Commission released a solicitation to complete the West Coast Electric Highway from British Columbia to Mexico. And nine agreements were approved by our commissioners at the April 13th business meeting. And these will result in 61 DC fast chargers and 42 Level 2 chargers at 41 sites along Interstate 5 and Highway 99 and U.S. 101, south of San Jose. And those are shown as the red markers on this map. Existing DC fast chargers are shown by the purple markers on this particular map.

In addition to the West Coast Electric Highway funding we have another open solicitation, GFO 15-603, and these will deployed once they are approved at the business meeting. And we'll be receiving those applications later in June.

As you can see they will cover Highway 101 to the north of San Jose as well of portions of I-80 and other key

corridors including Southern California, the I-10 and the I-15.

So, I mentioned the EV Project earlier and there was some lessons learned from that particular project. And I thought I'd go over some of the highlights from the EV Project. The majority of charging was done at home and at work. And it was found that -- and first of all, the participants in this project were -- they all had garages, so this really doesn't address the multi-unit dwelling issue at all. But half of charging was done at home exclusively. And half charged away from home less than 5 percent of the time. Of those that charged away from home three or fewer spots were favored.

Also the demand for DC fast chargers and Level 2 chargers were high in certain hotspots and the factors that influence those hotspots were very community specific. Also DC fast chargers along corridors received the highest usage. And then workplace chargers were very useful for those that had access to them.

Ninety-eight percent of charging events were performed at home and work on workdays. And also the workplace charging extended the range of EV drivers. And 30 percent of drivers only charged at work on most days. So these are some of the things that we take into account as we are looking ahead to funding.

The Center for Sustainable Energy does a survey through its Rebate Project and this chart shows that access to workplace charging is a key to PEV adoption in California. Thirty-seven percent of respondents from their survey said access to workplace charging was very or extremely important in their decision to acquire a PEV. Fifty-one percent of respondents did not have access to electric vehicle charging, however. So this will be an important area for us to consider, going forward.

Here is a chart showing ZEV registrations by county on the left and then on the right the percentage increase in zero emission vehicles between 2013 and 2014. It's interesting to note the increase in adoption rates in the metropolitan counties, such as Alameda, which was up by 40 percent and a huge increase, for instance, in Fresno County for 227 percent. So we're looking at these penetrations and seeing where plug-in electric vehicles are growing rapidly and where there might be need for charging.

So the Energy Commission's goal now is to really understand at a more granular level where to strategically site charging infrastructure across the various cities and regions of the state. We know a few things about consumer behavior and preferences from the EV Project, but much more information is needed to inform our EV infrastructure investment decisions.

The National Renewable Energy Lab tracks all the network public stations in the nation, including California. Our team will be working with NREL to receive streaming data from chargers that can be analyzed to help inform our strategic investments and infrastructure. Our goal is to eventually be able to collect this data directly from our Energy Commission projects.

So NREL will be revising their statewide PEV Infrastructure Assessment and they will be using EV market data and real-world travel behavior characteristics of light-duty vehicle drivers in California.

We'll have a much more robust model that will allow state and local governments the flexibility to run various PEV market scenarios between 2017 and 2025. And NREL will also be developing a web portal to assist local government and PEV planning regions with assessing their need for charging infrastructure. And also accessing lessons learned from one another.

So to date the Energy Commission has funded about half the state's charging infrastructure and established a framework for future deployment through the Regional PEV Readiness plans. As we collect more data on the use of the chargers we will be able to see where, how many, what kind of chargers should be deployed. Now is really the time to double down on rapidly deploying charging stations in order

to achieve the one million zero emission vehicle by 2020 goal. The goal is to maximize PEV adoption and enable all Californians to access charging stations.

It's also critical that these charges are reliable in order to attract the early majority and mainstream consumers. Both the electric vehicles and the refueling experience should really exceed expectations. Drivers want to be able to easily access chargers and need to count on the reliability.

As a point of interest, recently PlugShare shared some of their data on reliability. And out of 3,200 sites over the past 12 months users reported that 23 percent of them had at least one report of a broken charger. So to me that is a cause for concern and we are hoping to do something about that. In our recent solicitation we did provide funds for maintenance.

So the Energy Commission has funds available to continue expanding the charging network in California. In 2016 there is $6.8 million for charging infrastructure in addition to the current open solicitation that I mentioned for $9.97 million. We're in the process of developing another solicitation for zero emission vehicle readiness planning and implementation for $1.9 million.

Finally, the 2016-2017 Investment Plan allocates $17 million for charging infrastructure and $2 million for

Regional Readiness planning.

We are going to have another workshop in early June on EV infrastructure and we certainly invite your participation at that time. I encourage you to sign up on our listserv if you haven't already done so to hear about our workshops and our funding.

Thank you for your attention.

MR. OLSON: So we would like to now go into the presentations and the peer review. Given we started a little late Commissioner, I could just kind of present a description of all the different panel members and their backgrounds. But we do have a handout here, so maybe I'll just quickly go through the room on the dais and introduce people. And then we won't do that in front of every presentation.

Starting right down here in the front row is Colleen Quinn, who is Vice President of Government Relations of ChargePoint, a longtime executive with that company, even when it was Coulomb. And actually she worked in this area prior to Coulomb and other technology companies.

Next to her is Charles Botsford, Project Manager of Business Development of AeroVironment. By the way, he said we can refer to him as Charlie, so Charlie, welcome.

This company AeroVironment has pioneered several

technology innovations in multiple areas, including electric vehicles. Charlie conducts business development in the Efficient Energy Systems Group and Project Manager for the West Coast Electric Highway.

Mark Triplett is not here yet. He will be sitting next to Charlie. We'll introduce him when he arrives.

And then next on the list is Bill Boyce, Supervisor of Electric Transportation for the Sacramento Municipal Utility District. He's going to give you a glimpse of the role that public utilities play or has played in deploying electric vehicle chargers. He's been a longtime electric vehicle -- if there's anybody in the room who knows the most about electric vehicle chargers and utility integration, Bill has probably the longest tenure in that area.

And then Commissioner Scott, next to you is Kitty Adams, Executive Director and Founder of Adopt a Charger. This is a nonprofit organization of the pioneered a strategy to secure sponsorships, investment in electric vehicle chargers including locations like museums, universities, working for us in the state parks and the disadvantaged communities. And she'll talk more about that kind of model.

And then next to her is Matthew Marshall, who is

the Executive Director of the Redwood Coast Energy Authority. And he manages that as a joint powers authority. He manages activities and functions related to several things: energy planning, policy, implementation endeavors and one of those is the EV Infrastructure Deployment.

Next to him is Kapil Kulkarni and he is the Marketing Associate with Burbank Water and Power, another municipal utility. And some of the things he'll describe are the curbside charging efforts that that utility has introduced; more than ten years of experience in energy efficiency Smart Grid programs, lately EVs, but also knowledgeable of the Grid interaction.

And then next to him is Matt Henigan, who is the Deputy Secretary for Sustainability for the California Government Operations Agency. He oversees state government deployment of EV chargers and connectors in the Department of General Services garages and facilities. He'll also note that there are other agencies and state governments that also have oversight of other facilities. General Services provides bidding procedures and guidelines that other agencies, state and local, can follow.

And then I'd like to introduce the Reviewer Panel that's right in front of here on, let's see, the left side of the room from the audience. And beginning with Joshua

Cunningham with the California Air Resources Board, he's the Branch Chief of the Advanced Clean Cars Branch, manages a number of programs related to zero emission vehicles. He is one of the longtime strategy originators of the zero emission -- most of the background work for the zero emission forecast and now manages a bigger program

And then next to him is David Greene, who is a Senior Fellow with an Institute at the University of Tennessee, formerly with the Oakridge National Lab; retired from that. And many of you know David Greene as the author of some really significant studies related to electric vehicle market penetration.

And next to him, coming this way toward me is Nancy Ryan. She is the Director of Policy Strategy for Energy Environment Economics, also known as E3, been very helpful to the Energy Commission, ARB and the California Public Utilities Commission in helping us design strategy and thinking through that connection of electric vehicles in all of the electric utility system. She's also a former California Public Utility Commissioner and executive in that state agency.

And then next to Nancy is Mark Duvall, Director of Energy Utilization for the Electric Power Research Institute. And he directs all the end use research at EPRI, including transportation and energy storage, micro

grids, and a lot of collaborations between EPRI and electric utilities, auto companies.

Next to him is Jacob Ward, who we all know as Jake Ward. And he is the Analysis Program Manager in the Vehicle Technologies Office at the U.S. Department of Energy. His area includes work in advanced vehicle energy efficiency, market, technology forecasting and a whole range of economic analysis and oversight of a lot of the DOE's electric vehicle and infrastructure work.

So thank you very much. Welcome to the workshop today and look forward to the presentations and your comments.

So, Commissioner, back to you.

COMMISSIONER SCOTT: So I'd like to echo Tim's warm welcome to everybody. And I'm going to turn it over to Colleen Quinn to start her presentation. And you're welcome to do it from here at the table. Or if you'd like, to do it from up there at the podium; whatever makes you most comfortable.

(Colloquy regarding slide presentation.)

MS. QUINN: Good morning everyone, and thank you Commissioner Scott and to Tim and to Leslie, for putting this together. And also, I'm obviously pleased to be here to represent ChargePoint.

ChargePoint has had a longstanding working

relationship with the Energy Commission. We have a great deal of experience with the 118 Program. I guess that's what Tim meant when he said, "She's been around for a long time." And that's great. I have been around for quite some time.

Today, I think because of our longstanding activity with the Commission, Tim asked me to talk at a little bit more high level about our experience in California with really focusing on, I think, two elements. One, a public-private partnership that we've had with the Energy Commission and also to approach this as the state being an investor in EV charging infrastructure.

So I'm going to share some of our company evolution, some of the market learnings. As well as make a few recommendations for investment strategies, going forward.

So from the very beginning of the Energy Commission's Deployment Grant Program the purpose was really to seed the market and understand charging infrastructure relationship to EV adoption. So I use this particular chart, because I think it's important to understand that in addition to just putting numbers in the ground, just putting a 50 percent as Leslie mentioned, the number of EV charging stations now that the Commission has funded. It really, though, has even more importantly

created this exponential growth. And the results have been increased savings in gas, reduced Co2, electric miles driven, increased energy dispensed and increasing, obviously, the number of total charging spots.

So I think these kinds of impacts in addition to just the actual numbers that have gone in the ground, I think all of us obviously from the very beginning feel, of course, very important also in reaching the Governor's goals.

This is a list of all of the programs that we've participated in since the very beginning. Since 2010, when I will never forget, we were sitting in this room and the Commission said, "Look, we want to go after this federal money. We want to do as much as we can to make sure that as much of it can come to California." And they did something I think unprecedented, which was they said, "Look, you all apply to us. We'll give you a match letter. You then go to Washington and then hopefully -- in other words, we're behind you. We at the Commission are behind you all that are really trying to bring this funding to California." And I thought was a -- it gave all of us a very big shot in the arm, so to speak. And we were able to bring, as Leslie mentions, $16 million to California.

We participated in that program. We called it, "ChargePoint California." We also participated in all of

Leslie's Phase I, Phase II, Phase III and Phase IV. Significantly I think it was Phase III we worked with over 40 cities to, along with EV Alliance Richard Schorske here, to really coordinate. They were the applicants. We participated as a partner.

So in many of the charging, the deployment programs here at the Commission, in some cases we've been an applicant and in some cases we've been a partner. We've also participated in R&D, we're working on EPIC funding and recently we'll be working on the DC fast charging as well.

So one of the things I think that everyone certainly at the Commission cares about, we certainly care about as well, which is utilization, utilization, utilization. The Commission wants to put these assets in the ground and they want to be sure that they're used.

And this graph represents the unique drivers on the charge point network that are participating or charging their vehicles, just in the ARRA Program, the original program that we were funded in, well 2010, starting in 2011. So you can see close to 60,000 unique drivers have been taking advantage of the public charging infrastructure that was provided in that grant by the Energy Commission.

I think the other thing that was important, and Leslie mentioned it as well, is that it's very critical that we participate together in these partnerships. The

important outcome is really to leverage the private investments into this market. And what that does is it maximizes the effectiveness of these grants. We saw that in the original DOE Electrification Transportation Grant, the one that I've been talking about, we provided a very unique formula for the DOE where we put together the match formula whereby the DOE financed the equipment and the network. But we had to go out and get all of the customers or all the other hosts to commit to paying for the installation costs.

So what that did, that forces these participants to have skin in the game. It's very important, because then they are going to make a commitment. They're going to think about what they're doing, they're going to think about putting the charging in the right place, they're going to think about what kinds of activities that they anticipate on their property. So I think that's important. That is a lesson that we've learned and we continue to use that. We think private investment and skin in the game is very critical to leverage public funding.

The other thing that Tim asked me to talk a little bit about was sort of ChargePoint's evolution. And I think that this is a very interesting graph, because it demonstrates that early on in the market -- and again I think this was anticipated -- when the early funding came

there were no cars, so many of the companies like us and others were really dependent on public money. So now, however, we have been able to grow our business organically and less than 2 percent of our business revenue is dependent on federal grant funding.

And I think again that demonstrates the idea that as Leslie said the Commission is not going to be able to support the full amount of public infrastructure that's going to be needed -- and private for that matter, workplace, etcetera -- to support the electric vehicles. So you want to have a market that is successful to be successful.

The other thing that has been, I think, really exciting at least for us -- and I think we've also shared a lot of our learnings with the Commission, but basically we have grown in an understanding of this market. We have strong partnerships with auto makers, utilities, as well as governments and municipalities.

Early on we targeted markets such as the MDU market and we are now participating in the DC fast market. We've continued to invest in R&D with new products and services. As many of you may know we introduced our home product at the Consumer Electronic Show last year. We've expanded our sales team. We have a very sophisticated support team.

Interesting when Leslie put up the numbers of the cars, our business is totally dependent on electric vehicles. So we track where the cars are, where they're going and frankly where they're projected to go. Now we have analysts in our company that actually track those numbers.

We've also internally created something called an "attach rate," which demonstrates how many vehicles are needed, how many charging stations are needed to support those vehicles. And frankly we also look at an attach rate based, of course, on our product and where we stand. I think last year we put out a "The Ten Top Cities for EV Charging Infrastructure" based on this attach rate.

So those kinds of market understandings, we've now internalized those things. We've also shared them with the Commission. As Leslie mentioned things like understanding the importance of workplace charging. Workplace charging has been the most successful market for us. And all of us now understand that there's a halo effect on workplace charging.

We're also now working directly with Southern California Edison and SCG&E to share this kind of knowledge to accelerate the market in a collaborative way. I think that's also very, very important. All of us that are in this business have a great deal of experience of

understanding how to deploy and how to engage hosts in accepting EV charging infrastructure.

The other thing I wanted to mention is that this industry is also creating jobs. ChargePoint has experienced a 29 percent job growth year over year. We're also enabling small businesses to participate in this market. Our business structure is such that we have channel partners. We have 68 channel partners throughout the U.S. We've created jobs for manufacturing, packaging, shipping and O&M.

And we've also, together along with other colleagues, have put together an EV Charging Industry Association headquartered in Sacramento. And we put out a white paper last fall to really demonstrate again how this industry is growing and has already created over 2,000 jobs in California alone, with 17 percent annual job growth in total.

So these kinds of numbers, this kind of representation of the EV charging industry is another thing that the acts of the Commission has contributed to, because the Commission has never picked winners and losers. The Commission has always been completely technology neutral. And that has helped different business models emerge, different companies emerge. And again, I think that there's plenty of innovation and product and business

models now emerging in California and throughout the country. This is just an example of some of them.

But you know competition and innovation are good for the drivers. So I think again this is an important part of the Energy Commission's philosophy. And I think it's worked well for California.

The other thing that I'm really excited about is the fact that we are participating in the LCFS Program. And I think this is exactly what CARB had anticipated early on when they put these regulations together in 2010. The idea that this, the EV charging and EV drivers and customers are hosts, are participating in the LCFS market is we're really contributing to the California's clean tech economy. And I think that again is a very important achievement.

We have over 14,000 public charging stations in California. And those credits that are being used by ChargePoint provide charging infrastructure as well as educational tools to drivers and station owners.

Really kind of cool, on Earth Day we launched a new tool for drivers where they can calculate their state-specific carbon reductions switching to an EV all over the country. You can check it out on our website.

The other thing that Tim asked me to talk a little bit about is the importance of data. Right now we

have now accumulated over 14 million charging sessions on our network. And there's a lot of important things that have helped -- you know, the data has helped inform a lot obviously that the Commission is using now, really diving deep into data to help target what markets need to grow. And even I remember the original NREL study that you all did with the hypotheticals. That kind of data is really important.

But data has also helped utilization, for example. Data informs our customers of when frankly they need to get more additional charging infrastructure, charging stations. We now are in a position where we have buyers that are constantly upping and upping and upping, because once they put the stations in more people bring the cars in. They need more charging stations.

We've also worked very closely with many research institutions including LBNL, NREL. And there's an increased interest in this data. We are working with Massachusetts' DOER, we're working with many states. NYSERTA, we've worked on the NYSERDA grant in New York to share this data, so again they as well can start leveraging this data to understand better what their needs are going to be, going forward.

And the network is also important for the hosts. We've proven that this network allows them to manage their

own energy; it allows them to understand exactly what's happening on their property. It allows them to authorize people that they want to come on or not come on to use the stations. It's also been great for drivers to be able to schedule-manage their charging.

So I think that network charging and the importance of data is also an important thing that we've all now come to realize.

This is kind of one of those eye-charts. I'm not going to get into the details of it, but this is again the kinds of things that we've learned from our experience in the market that EV charging benefits are not necessarily just getting an asset that brings revenue to the host. Many employers bring EV charging into their workplace because they want to attract really great employees. Many of the commercial establishments want to attract new customers, they stay longer. This is a benefit to them. Many municipalities put it in for reasons to demonstrate that they've got a sustainable attitude about their city.

So there are many, many benefits to EV charging that are not just necessarily charging for power.

The other thing that I think is important, and Leslie mentioned, this is that operations and maintenance is important. Early grants did not fund O&M. The first ARRA grants and the first ones, probably the Phase I out of

the Energy Commission did not fund O&M. Municipal grants did identify O&M as an eligible match. Now the Corridor funding absolutely allows for O&M to be a part, funded.

And early on even the charging infrastructure providers I don't think really realized the importance of O&M. So now all of us have a competitive O&M offering. It is a very, very important and frankly very successful part of our business model. We have something called the Assure Program. And they put the stations under maintenance and they're repaired quickly; maintained to high standards. We repair the stations at our own cost if they are very, very important, you know, in an important location. Many of the early stations that Leslie mentioned did not pay for O&M.

So for example last November -- we just took this stat -- but our stations that enrolled under our Assure O&M program had zero downtime in the month of November. And we track this. I get an email every week how many stations are dark and if they're dark. And we have a less than 3 percent failure rate on our stations. So there's a lot of buzz about these stations are not being maintained. They have to be maintained, they should be maintained, but there is a service that is being offered by most all the competitive providers to offer that kind of maintenance.

I think the other thing that we're learning as

well are issues about pricing. Pricing should not be controlled by regulation. And certainly the Energy Commission, all of the grants that they have provided -- actually, I remember the municipal grant you all asked each one of the municipal applicants to demonstrate or show you what kind of pricing you were going to be looking at. Because even though right now about over 63 percent of our stations and public stations in California are offered for free I think everyone has come to the realization that free does not really encourage the right kind of behavior. It creates a little bit of a sense of entitlement and it can be hard to change later.

What we're finding is that there's different ways people charge for parking. A lot of our hosts want to manage it. This is an asset. The parking lot is an asset to them and they want to manage that asset. That parking lot costs them something and they need to manage it. So usually they will set a price, but then they may escalate a price to get people off the asset.

These are the kinds of behaviors that are very critical and we don't want to discourage that kind of pricing flexibility for the hosts.

The other thing I just wanted to mention that we've grown up too. The association, the EV charging industry has grown up. We now have an association, as I

mentioned.

We've also collectively come together with auto makers as well as with some utilities to create a group called ROEV that is responsible for adopting the interoperability. We'll be working with CARB to also make sure that those standards and interoperability standards are realized in California as they have to be, by law, in SB 454.

So this is a summary of my lessons learned: Importance of skin in the game, don't give it away for free. Match is important. O&M is important. Don't pick winners and losers. We already mentioned the importance of data. Pricing should not be controlled by regulation.

And this market knowledge that we've all come to understand, I think the CEC also has now an institutional understanding of workplace and home. And some challenges as well in the MDU market.

So my recommendation going forward, a couple of things: 1) The Commission has sidelined manufacturing grants for EVs and also EV charging manufacturers. I think that given some of the things I'm going to talk about later there still is a need for new technology in this space. And there's an opportunity to bring these jobs and this manufacturing to California. So I hope that the Commission will go back to providing some funding for manufacturing.

The other thing that I want to recommend is to make sure that the Commission understands the importance of the network. Drivers go between utility districts, so we need to make sure that this is one California represents one network or a series of networks. But access to the inner operability is still important, which we've all recognized.

I think the other thing that again the Commission isn't in front of is interstate corridors between metro centers as well as the regional partnerships that you all have already taken such a leadership role in.

The thing that I would also recommend is that probably the most efficient way to deploy the money is rebates. So in the future rather than giving the funding to the EV charging providers, which in the early days I think made sense, I think probably it's more efficient right directly to the customers.

The other thing that I would like to recommend is that based on everything that I've presented, at least, I would like to see the EV charging industry represented on the AB 118 Advisory Board. Currently there is no representative.

And as I said I think we are sophisticated enough. We're now an industry. We do have an association that could be represented. It doesn't have to be a

company. So I think it would help. It would also help promote some of these future investments and learnings for the Commission.

The other recommendation that I have is that the Commission should lead by example and it always has led by example. But I think most specifically now I'm working on 31 states. We are very active all over the country. I think one of the biggest challenges is that the other ZEV states that are now being guided by NESCAUM have some challenges. And they've put their action plans out, but I think they are still behind, if you will, in really moving some of the initiatives like the Energy Commission has moved and the legislature has moved and the PUC has moved. So to the degree that you are all participating, and I'm sure that you are, but it's very important I think that we have to take this market beyond California to really be successful.

What's next? I just came back from Washington, D.C. and I was part of -- I along with others -- part of a White House -- the White House was putting together a round table discussion. And I'm hopeful that we're going to see some more focus nationally on interstate corridors. Many of you know -- you may or may not know -- but in a provision of the FAST Act they required that EV charging corridors be designated by December of this year.

I had grid meetings at the DOT. And they are going to put out a kind of a solicitation to get input from stakeholders as to what those corridors, what should be the criteria? What kind of technology? What are the costs? Obviously the work that you all have done, and the work that you are doing now and will continue to do, I think will be very important to educate and help educate the DOT. Because I think that is a very, very, very important next step.

The cars, that they've been announced, their batteries are getting bigger. Our goal is to have people not have to have two cars just to have one car. And in order to do that we have got to get these corridors interstate not just inside of California, but we've got to. We've seen what Tesla has been able to do.

We also don't want to have islands of charger. We don't want every auto maker to decide they are going to do a DC fast charging infrastructure that suits their vehicle. Again, this is the kind of thing that government can really help enable. Because it's government that usually brings people and says, "Hey, we want these to be made available to the public, etcetera." So I think we're going to be seeing some action in Washington that I'm very excited about.

The other thing that's next is the whole idea of

community charging. Several states are actively considering utility investments in EV charging infrastructure. We're working with the utilities in the PUC to make sure that customer choice, competition and innovation are a part of that. As I mentioned this is what's going on in the whole United States, very busy.

New York, for example, very exciting, New York finally put in an EV rebate. We worked very hard in Albany to make sure that that was successful, so we got a $2,500 EV rebate in the state of New York. We still have to figure out how much funding is behind it, which you guys know all too well about that kind of thing.

But we're looking at -- New Hampshire is looking at -- you know, California started with AB 631 to exempt EV charging services from public utility regulation. Now over 20 states have done the same thing.

Bill pending today in Connecticut to do that in Connecticut, as well to enable the SB 454 type open access rules in Connecticut.

So the things that we've done here in California are starting to take hold in the rest of the country. And it's very, very exciting, because it's going to be critical.

The only thing I wanted to end with is that this year we were fortunate to end up getting an award from the

United Nations called the "Momentum for Change." And we accompanied Governor Brown along with other clean tech companies to Paris. And I think the important thing there was that again we've talked about the importance to the state, talked a little bit about nationally -- you know, transportation represents 40 percent of the greenhouse gas emissions contributing to global warming. The Governor was extremely proactive in Paris. We participated in many of these discussions.

So I think as we think about what's been achieved here, obviously we want to leverage this good work through the U.S. and also throughout the world. So thank you very much.

COMMISSIONER SCOTT: Great. Thank you so much, Colleen, for that excellent presentation.

I'm going to turn to our reviewers now. Maybe I'll ask if you'd come back to the table. That way they'll be able to kind of look directly at you. And maybe we'll rotate at lunchtime so they can look this way.

But would one of you like to jump in or should I -- go ahead, David.

MR. GREENE: First of all, really impressive accomplishments here. I would like to ask you this gigantic question, which is what is your vision of this self-sustaining industry as it goes forward? Is there a

public role in always subsidizing? Is there a public role in creating policy supports? Or is this something that utilities and EVSA providers can eventually get to self-sustaining without any monetary or indirectly monetary support from the government?

And let me say a related question, just a technical detail. You said you had attach rates. How many chargers will there be per vehicle eventually? One and a half or what?

UNIDENTIFIED SPEAKER: Level (indiscernible).

MS. QUINN: Thanks. So first of all I think levels that -- I think the government will continue to be very critical in policy making: everything from building codes to permitting, facilitating streamlining of permitting to putting the right kinds of open access rules; those kinds of things.

Right now there are very few states that have that kind of baseline policy in place, so I think that is critical.

In terms of we see this as the private investment, yes. So far, a lot of it has to do with the business model and identifying a successful business model. We feel that we have, and so we will continue to. And as I mentioned the market learnings -- the way we're approaching customers and our revenue growth has I think demonstrated

that we expect to be successful.

I think that there is though, a continued role, especially as I'm talking to folks in Washington D.C. I think where we need, where government is really strong, is bringing the potential of the investors as well as the folks that have the benefits from the charging infrastructure together.

So for example, in the corridor charging, the biggest benefit for corridor charging is to the automakers and to the government, because the government obviously wants to enable EVs. Yet oftentimes they don't want to have free riders, they don't want to have -- there are different challenges, if you will, in the business outcomes or the business marketing efforts of the automakers.

So this is a place where the interstate corridor could -- our number is a half a billion dollars to actually deploy the right number of charging stations all across the country. That kind of effort I think is very critical for government to play a role in, because the market will not probably -- the costs are high to deploy fast charging. There are other issues in fast charging.

We were just talking about it, demand charges, and their regulation looking at the rules and the regulations. So those kinds of things yes, I mean I think there will continue to be a role for government because at

this point this still is an emerging market. So we're still learning.

So in terms of the attach rate I would say our kind of best case scenario where people aren't either fighting to get at the station, but it's still an asset that's being utilized properly is about four to one.

MR. GREENE: Four?

MS. QUINN: Four cars to one charging station.

MR. GREENE: Not counting the one at home?

MS. QUINN: No. This is public, yes.

MS. RYAN: And that's fast chargers at Level 2?

MS. QUINN: Not really, Nancy. This is based on our Level 2. I don't think at this point we have put in place the DC fast charger equation.

MR. GREENE: Thanks very much.

COMMISSIONER SCOTT: Go ahead, Josh.

MR. CUNNINGHAM: Just building on David's question, Colleen, and thank you for the presentation.

Clearly the business plan has evolved over the years as the market has expanded. And you've mentioned the O&M services and that that's a growing role in revenue source. So I'm curious on how much of your business model is becoming more self-sufficient, because of the network service capabilities in O&M as compared to the equipment for just installing a level box.

And I remember a couple of years ago the big concerns about the capital equipment costs not coming down fast enough and that that maybe was going to be a part that was not self-sustaining long term. So I'm just interested in diving a little bit more into your business plan.

MS. QUINN: You know, it's revenue, revenue, revenue. What can I say? I mean, wherever it comes from. All three elements of our business model are important.

I will say that early on our main revenue source was California. And what's been really exciting to me is to see that I think the last quarter the East Coast is basically now on par with California. So I can't really get into the detail of exactly what comes from what, but I think all three are important.

And I will say that our Assure Service, which we now have separate, we've got 20 folks that are supporting that service. Also, that's critical. So when we work with, for example, Georgia Power -- we're working with them -- especially utility partnerships going forward, utilities care a lot that obviously that there would be reliable service. So I think these kinds of services are critically important, but they don't just have to be provided by the utility. I mean, this is a competitive service offering, but it is really critical. And it has grown in revenue for us.

MR. DUVALL: I have a question on that.

MS. QUINN: Sure.

MR. DUVALL: So I agree with that completely. You know, dispatching utility staff to fix chargers is sort of like hitting a nail with a 20-pound sledgehammer in many cases. So these guys are obviously, many of them are obviously, exceptionally well-trained for very difficult jobs that don't really include low-voltage equipment that often.

Is Assure a competitive business? In other words, if I have Acme Universal charging stations and I want to hire Assure you'll come work on those too or do you primarily work on ChargePoint equipment?

MS. QUINN: Well, our particular service is for our equipment, but we outsource to ABM and others to work with us on our Assure Program. And others have other programs that they --

MR. DUVALL: So I'm thinking to a future where there are lots of competitive charging providers and as a city or another municipality every time you put out a bid you might get a different winner. And you're integrating them, you're using open software tools to integrate them networking together and you're bidding these things out. So I might have multiple, I might have ten of something and twenty of something over here, but I might want just one

company to work on them and to work with the O&M providers to get obviously the networking data. Do you see that as possible in the future even if it's not happening now?

MS. QUINN: Well, I don't exactly know the answer to that, but you've got ROEV where you're going to have interoperability of the networks. And then if a business is profitable enough I'm sure that more opportunities will -- and more entrants will participate in it.

But I think we've got such a large network that at this point -- and again, we saw this as a priority. We put funding behind it, we put resources behind it. And I think it's important going forward too. I don't know whether, for example, we would bid for a city O&M program. I honestly couldn't tell you that.

MR. DUVALL: That's understandable, thank you. That's helpful, though.

MS. RYAN: Colleen, I want to touch on one of the themes that is kind of a framing theme for how you presented, which is the notion of public-private partnership. And I would expand it to its public and private; it's utility and charging company. You mentioned the OEMs and then of course you talked some about hosts. And it's really that whole ecosystem where there has to be kind of, in my opinion, a web of partnerships. So I guess a few questions for me flow out of that.

The first one is I think it would be helpful for you to elaborate a little bit more on how you see the partnership with the OEMs in forming charging station deployment, underwriting charging station deployment.

And then a second question is I look at it there's only so much public money. There's also only so much utility money. So the rest of the funding is going to have to come from other private sector sources.

And I'm interested in your perspective on is it either whole segments that really will have a stand-alone business model and do not require other utility or public money? Do you want to see those funds -- and I guess, conversely, are there segments really which would should be priorities for public and utility funds or do you want to see those funds kind of peanut-buttered around?

What's your vision there?

MR. QUINN: Peanut butter, hmm. Is it lunchtime?

Okay, so I think you've got a lot of questions in there Nancy. And I think the baseline for our vision, let's say, as it relates to the utility -- and we've been very public about this, and I think in the spirit of collaboration, quite frankly -- we came out in support of a role for the utility to be at the PUC. The utilities have been prohibited from owning EV charging infrastructure. And we were the first industry participant to come out and

actually reverse that position and support a role for the utility.

I think that our vision is collaboration; our vision is based on collaboration. And that I guess the players should do what they do best and participate in the market in that way. So the utilities have a very important role to play, both from the point of view of their understanding of the distribution network, their understanding of the long-term benefits for rate payers, which you've done such great work on just to demonstrate what those benefits are.

The charging infrastructure providers, the competitive industry needs to also participate in that market, and they need to bring their innovation. The market understanding that I've tried to lay out for all of you here today needs to be combined with the utility knowledge and together building the right program designs and the right outcomes.

The automakers as well, I mean I think they've been a little -- my father would call it "reluctant bedfellows" a little bit in terms of putting their own funding into it. I do think though that when it comes to fast charging, well Nissan, for example has stepped up. Obviously they're looking at Tesla. Hello, it obviously wasn't hard to figure out the success of that particular

model and how they've marketed that vehicle. And how, as Leslie said, "Bring it on." They're coming fast.

And I do think that is the role for government. I do think that if government -- and I think it's probably the state -- but I think importantly the federal government to bring all the players together. Usually it helps if there is a carrot. I don't think the autos are really interested in too many more sticks. I think they feel like they know what they have to do with the ZEV rules, etcetera. But I think a carrot, and I do think early on in a market like fast charging where the costs are so high that some kind of a funding incentive to get this collaboration in place, is what's going to be needed.

I have high hopes for it. As I said I was in Washington and I'm hoping that that's going to be something that the administration is going to be targeting and focusing on. And I hope that they're going to bring you guys together to participate in that as well. I mean the Energy Commission.

COMMISSIONER SCOTT: Thanks. Let's do one last question from Jake. And then we will go to our next presenter.

But I'd like to, before you ask your question, welcome Commissioner Peterman. We're so delighted to have you here.

COMMISSIONER PETERMAN: (Indiscernible)

MR. WARD: All right, thank you, Colleen, and a very convenient dovetail mentioning a role for federal dollars, since I'm representing DOE.

MS. QUINN: Oh, good.

MR. WARD: But a question about -- and it builds on some of the questions that were answered before -- but the role for public dollars. So I had a question for you about the operations of the network and the data behind it helping us to use public dollars in the best way possible.

So a question, on the one hand, about operations and maintenance. So I think that anecdotally we understand that having stations up and running is important. I don't know that there has been shared broadly a compelling story using data that'd help us understand what that investment is? What are the dollars associated with operations and maintenance over time? And what portion of different networks does that affect?

But then I also have a question for you about as your revenue stream has moved from grants to organic, as you described, has that changed the way you do your planning? And said another way, is there a way to use public dollars, such that either the level of charging or the location of charging would be prioritized in a different way than the private sector would on its own?

MS. QUINN: Okay, so question one was?

MR. WARD: How much is O&M and (indiscernible) yes.

MS. QUINN: Oh, oh, how much is the -- O&M is, I mean first of all as I mentioned to you I get every week an O&M report. I know exactly how many of our stations are down, so our data absolutely informs O&M. Now if you don't have network stations, frankly, you're not going to know when and if they're down, they're dark, if they do need servicing. And the O&M costs, our offer is a combination of warranty and operation and maintenance.

Look, as Mark mentioned, it's not exactly a truck role, most of the time it's tweaking of the software and/or determining what else might be going on. But we do go to stations when we need to.

So I don't have an exact number for you in terms of what it costs, but I would be more than happy to set you up with our -- we have a whole O&M Department. This Assure Program has a whole team of people -- and the metrics and the economics -- be more than happy. It's just not my number one, but as I wanted to let everyone know it is a priority. And we have less than 3 percent of our stations are down.

And early on the grants did not fund O&M. So many of the station hosts -- and they also, by the way,

didn't continue their network services. So we might not know that they're on the network. And then we might not know if the network needs to be serviced. But early on they also had no cars. There are a lot of things that we now have learned more and are I think more effectively addressing.

MR. WARD: Great. Maybe the second part of that, how has station build-out changed as a function of the shifting in the revenue to organic from grants?

MS. QUINN: Well, we identified early on the importance of workplace charging. And that still is the principle driver for our revenue. But man, we're successful. We've got commercial, we have properties, we have over 600 MDU installations throughout the country.

I think though that there are still challenges in the market. Why in the MDU market? It's not that the technology isn't there, but it's that the cost of installation to a property manager for an EV charging station may be so far down the list that frankly I don't see any attendance or whatever. But we all know we need to lean in on that market, so there I think government can help as the Commission has and as these utility programs are targeting.

The other is low income. I think that actually California is, as usual, on the lead in identifying the

importance; interesting that Leslie noticed that San Joaquin Valley is getting more vehicles, more cars. I think that that also is an important role, because those are markets that we are not as probably visible in. But working with the utility programs, SoCal Edison and SDG&E we will be. We will be.

In fact, for the first time all of our marketing people are coming to me, "Colleen, what are those low income -- how do you find out where those districts are?" We are already proactively now putting marketing plans together, engaging how we're going to address, for example, SCE's program.

So those areas do need, still, some movement, some incentives by the government to address.

COMMISSIONER SCOTT: Great. Thank you so much, Colleen.

And thank you reviewers for your good questions.

I'd like to turn now to Charlie Botsford, who's going to give us a presentation as well. We're just a little bit behind time, so let's do a time check. Let's go, Charlie, until about 5 of 11:00 for your presentation. We'll give the reviewers about 15 minutes or so to ask questions until about 11:10.

Will that -- okay, sounds great. Please take it away.

MR. BOTSFORD: Great, I think I'll try sitting and more of a town hall effect.

Yes, I'm Charlie Botsford with AeroVironment. We were founded in 1971, but we have seven vehicles in the Smithsonian. We started with human power with the Gossamer Condor and the Gossamer Albatross; first human-powered flight. Then we switched to solar power with the Sunraycer, which won the solar race in Australia in 1987.

Then we switched to electric power. We built the Impact for General Motors in 1989. And General Motors then developed that into the EV1 and we were a large part of that development effort. Alec Brooks, who I work with on a daily basis, was the principal engineer for that.

And as part of that development program we developed also test systems for battery packs, a lot of charging systems. In the late '90s, 1999, we worked with UL to develop a DC fast charging listing standard and had the first. It was a 60 kilowatt DC fast charger UL listed in 1999.

More recently, we are in the second incarnation of electric vehicles, we've really focused heavily on OEMs. I would say that's far and away our primary focus is working with OEMs. Our goal in life is to help OEMs be successful in selling EVs.

We do other charging things. We own and operate

the West Coast Electric Highway, which is 56 charging stations in Oregon and Washington. Each station has a 50 kilowatt DC fast charger and s Level 2 unit. And I'm the project manager for that.

We're also working currently on a CEC Program, it's a PON 310 program. It's a V2G Program, which is pretty fun. We're actually a sub to EPRI.

(Off mic comment from audience) (Laughter)

Under that program we'll be working on the transformer problem and also helping solve the duck curve, so it's quite a program, pretty fun.

But what I'm going to talk about today is just one specific program that we worked on. And you can see the stats at a glance on this program. It was a $3.7 million program. Originally we were awarded $2 million and we were under contract. We were supposed to deploy I think 725 stations and this is residential chargers all across California. And then CEC tacked on another $1.7 million. And then so we calculated that would be -- and the contract said something -- I think, around 1,400 or 1,425 stations; something like that.

By the time we were done we had tuned our contractors a little bit and we were able to actually over-deliver. I think that may be the first contract I've seen with AeroVironment where we have over-delivered. Maybe I

shouldn't have said that. (Laughter.) So at the end of the program 17,58 EV charging stations in all across California and residences, 30-amp stations, so 7.2 kilowatts good for Nissan LEAFs with 6.6 kilowatt on-board chargers, that kind of thing.

A big part of this program was to work with dealerships. And again we work with a lot of different OEMs. And Nissan in particular, at the time when we were doing this program, they had a large market share of EVs. But in this program we had EV drivers with Volts, LEAFs, just about everything on the market, even a few Tesla drivers of all things, got chargers. So what this program did was it paid for the charger, it paid for the installation. And then the resident had to foot the bill for the permit, the actual permit itself. But our contractors would go out to the planning agency and go get the permits, but the resident had to pay for the permits.

Local contractors, yeah we had 28 contractors across California and pretty well spread that evenly. Some contractors had 100 installations, some had even more installations. So it was an interesting process, because it was also under prevailing wage. So part of it was under prevailing wage, part of it wasn't.

How we worked that was we had what was called a standard installation -- I'll probably get into that

definition a bit later -- so we calculated 817,000 gallons of gasoline displaced annually; almost 5000 metric tons-per-year carbon reductions, which is pretty good. And then what we did was we had a survey. And as part of the program for the driver to be eligible for the program they had to say that they would take this survey. And we thought, "Well, okay. Maybe we'll get a 30 percent or 20 percent or 30 percent return on the surveys," that you send out, because that's kind of typical for surveys. But I think we actually got somewhere around a 90 percent return on surveys, so we were flabbergasted that we got that kind of return. It was good.

What was probably the most interesting part was that we wanted to really get a gauge of how successful was this program. And we had PHEV drivers and EV drivers. The EV drivers found it more of an enticement, more of a benefit for them. But the overwhelming majority of drivers in any case said that this helped them to make the decision to buy an EV.

And I think the reason for that is you go to the dealership, a lot of the dealerships the sales guys -- and boy, we worked with a lot of different dealerships -- the sales guys don't even know sometimes what an EV is. The EV drivers, the prospective EV drivers, are typically way more sophisticated and know more about the cars that the

salesman isn't trying to sell than what the EV driver wants to buy. So it was interesting. So we worked very closely with the dealerships to try to educate them as to what the process was and how to sign up the drivers.

There's some program goals, but those are typical program goals I think that are far-reaching across all of this particular CEC program.

So here's the distribution of installations. The vast majority was up in the Bay Area, which is again we didn't pick where these went. It went by how the drivers when they bought their cars, were they eligible for the (indiscernible) program? And so that's just how it turned out. And it tracks very closely with where EVs are being bought; statewide, anyway.

So the way the solicitation was set up it was 12 different areas within California. And each application was to be $500,000. And so we put in 12 applications for all the different areas of California. And CEC liked the idea and turned this into a full program, so it actually covered all of California. It's just that in the previous slide you saw how it actually turned out as to where the installations were.

So the process was we worked very closely with the dealerships, again almost 300 dealerships across California. And what would happen would be the EV driver,

when they go into buy the car then if they were eligible they could sign up for the free EV charger and free installation at that time that they bought the car. Not to say that a lot of people tried it differently, gaming the system seems to be a national pastime. And then there was the monthly allocation.

So when we got this program and we were trying to design how to make it work we said, "Okay, we could just put everything out there. And whoever signs up it's first come, first served." But what we were afraid of was that we were going to have people -- we were going to be overwhelmed as far as installations goes and we didn't want that to happen. So we didn't want people waiting six months to get their charger installed.

And in working with OEMs, OEMs don't want that either. Whenever they sell a car they want the driver to have an EV charger installed within a week, maybe even less than that.

So that was probably our overriding principle, was to make this -- what we did was we had a monthly allocation. And that allowed us to stay in front of the installs so that we didn't have a big backlog. And I think the longest anybody waited was on the order of like a couple of weeks. But typically we would try and get a charger installed within a week of when somebody signed up

at a dealership, bought the car, so that they would have a charger within a reasonable timeframe.

Sure, they could have waited months and just used their cord set that comes in the car. But a lot of people, especially if they have a long drive every day that just doesn't work very well.

Oh yeah, so the monthly allocation, it was again a bit tricky. And we had a lot of dealerships this time try to game the system. But we would release the monthly allocation every Tuesday and we started out slowly. The first month it was like 30 installs that we had allocated. And that went within about a week. And then the next month it was maybe 70 or 80. And then each time we released an allocation the first Tuesday of each month the allocation would run out within a week. I think the longest it held for any of the months was maybe 10 days. So it was a very popular program.

And so if you bought a charger at the end of the month you were kind of out of luck. So the dealerships told people -- they used it as a sales technique -- "Look, buy the car at the first of the month. We've got the allocation ready." And we had the monthly allocation posted, how many were left on our website, so people could see, you know, make it transparent.

Oh yeah, we had a portable set up. So we would

verify eligibility. Obviously whoever, to get this free charger and free installation, they had to be a resident of California. They had to buy the car or buy the charger or sign up for the charger when they bought the car. And so then we would install the charger within a week or so. And then the local inspector would come in and sign off. We would take pictures and the resident would sign the order acknowledgement. And that was pretty much the process.

So the standard installation, the only way that we could make this work -- again even at that time we had a lot of experience doing installs for Nissan and many other OEMs. And by that time we had developed this thing called a standard installation, which was a 30-foot conduit run, from the panel into the garage and a few other definitions of standard installation. But that way we could get the contractors to sign up for a fixed price and they would know what they needed to do for a standard installation. And that's what the residents got.

If somebody had a house with a detached garage and there was a 60-foot conduit run or a 100-foot run or they needed to do trenching or something like that, that was outside the scope. We would still pay for what was called a standard installation, but then for something extra then the resident would contract with our contractor. We would never see that. It did not flow through the CEC

program, but the resident was still able to take advantage of the program even if they had something crazy with three Teslas in a garage or something.

So what our program paid for was under prevailing wage. Outside the program it was just under the contractor; separate contracting between the contractor and the resident. It was not prevailing wage. It was an interesting kind of hybrid mix of program management.

These are some of the pictures. I've got 1,758 of these. Had to submit them all to Aida; Aida Escala, who is our project manager for this. We had quite a package.

So for each package for each house there was a picture, customer acknowledgement, invoices, contractor invoices. I don't know, there was like 5 or 6 pages for each. And we had one month there was like 300, so 300 times 5, it was like 3 reams of paper that I submitted to Aida for one month for an invoice. It was a lot of running through paper.

So CEC asked us -- we had proposed we could supply network chargers or we could supply non-network chargers -- and CEC said, "Well, what's the difference? Could you still get the data even if it's not networked?" We said, "Sure. We'll just do a survey." And they said, "But what are we talking about, the number of chargers?" And we said, "Well, we can do a lot more non-network

chargers than network chargers, just because of the cost." And so that's what we did. CEC said, "Great. Do the survey." And so survey says...

I think all of these survey questions are in the packet, but we had as you can see in the bottom right, PEV ownership. It was like every vehicle that was on the market, so it wasn't just Nissan dealerships it was Chevy dealerships, it was every dealership. Well, except Tesla didn't have dealerships, but we still installed a couple of Teslas.

So one of the questions had to do with -- and this was sort of enlightening to me was, "How many miles do you drive?" And I was thinking, "Okay." At that time, I don't think there were a lot of surveys about how many miles EV drivers actually drove. And we were looking at something on an average of like 11 or 12,000 miles a year for the drivers in this program, which to me seemed like just a huge number. But subsequent surveys since this program kind of give you a flavor that EVs are not just a secondary car. A lot of people use them as primary cars, drive them 10, 11, 15,000 miles a year.

Oh yeah, round-trip commutes, we asked that question to get into the issue about workplace charging. Pretty much everybody charged once a day. That was the most typical one. Percentage of time charging at home,

primarily it was charging at home. And then public -- workplace was the next. And again these survey questions just pretty much bear out what subsequent surveys from a lot of other people have shown.

So if we didn't have PHEV drivers we wouldn't have had to ask the question about gasoline. It turns out that Volt drivers will go to extremes not to go to the gas station and just run on batteries. So we found that even though PHEV drivers were in the program they didn't actually buy a lot of gasoline.

And yes and then the last question was -- and we split this between PHEV drivers and EV drivers, we really wanted to get a feel for "Was this program important for you to make the decision to buy an EV?" And overwhelmingly, "Yes." And even the larger percentage of yes was for full EV drivers.

So recommendations: one of the things that I think this program did is it took away the whole worry about, "What do I do when I buy an EV? Oh my God, now I've got to do research on to a charger. I've got to get an electrician. My head's going to explode." And so this program took that away. And I think it was really valuable to do that.

And it's one of the things when we work with OEMs that they see that all the time. And it's not necessarily

even the EV drivers; it's the sales guys at the dealerships that have trouble. Do they just, "Oh yeah, go to Home Depot and buy a charger." Okay. So there is a big educational program that needs to go on and that we do constantly with dealerships, because they have a lot of turnover with sales guys.

And then I agree with Colleen I think rebate programs are the way to go for EVSEs. Even install programs you need to make sure that the contractors are qualified, but I think that's a good way to go.

And I think that's it. Oh yeah, we had a couple of other projects. Under this same PON a couple of fleet project in conjunction with Car2Go down in San Diego for two apartment buildings and two hotels. Oddly enough, so the program that I just talked about was $3.7 million program and statewide, 1.758 chargers. These two little programs for $75,000 each caused me more headaches by far than the other program. And it's amazing how difficult it is to give away free money when you want to do charging programs.

So I think that's it. Yes.

COMMISSIONER SCOTT: Thank you very much, Charlie.

Go ahead, Josh.

MR. DUVALL: Thank you very much. It's clear you

guys were playing a leadership role in the early days when Nissan and GM were rolling out an EV project.

You know, one of the challenges that the state recognizes for improvement is the experience at the dealership to try and increase sales. And it's both education and awareness of the drivers or the potential drivers when they come, but also the staff and the dealers themselves. You guys clearly have that as part of your business model, at least under the EV program.

So is there anything that you can describe and share in terms of lessons learned? Not so much in terms of how it plays into your business model, but your experience in how you as a partner at the dealership improved the uptake of the purchases of the cars. How did you partner with the auto companies and did they rely on you for information on the floor?

So I'm thinking of the questions that we typically hear are raised. You know, potential buyers wanting to get some comfort level with the network once they buy the car, before they make they the f purchase connecting them to the utilities. They'll ask the question of how to install and get the ton-of-use rates, costs, with the possibility of maybe rolling in the EVSE equipment into a financing of the car.

So if you could just describe some of that, that

would be really helpful.

MR. BOTSFORD: Of all of that it's all about the sales guy at the dealership. And one of the more effective approaches we found is we actually have a rewards program. So think Starbucks or I was going to say United, but I'm not real happy with United anymore. So if you can incentivize the sales guy at the dealership to sell EVSEs then you take that part out of the equation. And so they get more familiar with EVs, it's not a stumbling block.

So that's what happens often is that the sales guy at the dealerships, a driver will come in and they'll say, "I want to by a Nissan LEAF," or "I want to buy a KIA Soul, a Fiat 500e." And the sales guy, "Well, how about this Nissan Sentra?" And it's because they're not familiar or they don't have the last little part. This thing about the charging station just is too much for them. It's hard enough, because they don't really get the idea of how to sell the EV in the first place. And then this last little bit about the EV charging station just is tough.

So this rewards program, that's one way and that's probably the most effective way. It's tough, dealerships are really hard. They're a different animal. And there's such a turnover in sales guys. We were constantly going back to dealerships and doing education. I think we've installed, last I heard, somewhere around

4,000 dealerships, so maybe 10,000 chargers at dealerships; in that neighborhood. So we work a lot with dealerships.

And then that's only one aspect of how we work with OEMs. With Nissan we were under contract, and many other OEMs for that matter too, to do residential installs. So we have a nationwide network of contractors that we've put through this funnel to get them qualified to come into our program. And it's really important for the OEMs to have somebody that they can turn to that knows the business and with certainty doesn't screw up their customer and can take that last little bit out of the picture. So that's another way that we work with OEMs.

Oh, and a third way is we actually supply chargers in trunk to OEMs like Volvo and there's a couple of others we can't announce.

MR. DUVALL: So a great job, but I think one of things is that there aren't -- because the focus has been on shared charging, to me the value of your project is really that you went in and did it. And you have all this great information. And you did exactly what GM and other automakers were talking about in 2008. They said, "What we need is this seamless customer experience." And it turned out that some of the decisions that got made there actually created a barrier as opposed to -- and so I think it was very well planned. Unfortunately, I sort of wish you had

all of the nail-by-nail, screw-by-screw data on all these installations. But of course you used a standard fee, if I'm correct and so you don't.

MR. BOTSFORD: Oh, we have a fair amount of that data.

MR. DUVALL: And I think that would be really valuable. At the end of the day while residential may not be the highest priority focus, as always do we retrofit residential or retrofit type work, whether it's solar or storage or EVs or smart appliances or low income. E is very hard and time consuming and costly and I think that at some point as you get more and more into the mass market the residential problem almost comes back. Like we recognize that it exists in multi-unit dwellings still, but at some point this becomes more and more important as you reach more and more mass market.

So this is great. Thank you very much.

MR. BOTSFORD: Yeah, to that and maybe I'm a little radical, but I halfway consider workplace, MUDs and residential all in the same class. It's all long dwell time EV charging. And so between that and corridor charging I think that's where the future needs to be.

I'm not as much a fan of public charging, actually. Public, Level 2, we operate a network in Quebec for Hydro-Quebec. We're part of the service d'électricité

And the partners there, it's like the Home Depot; it's hardware stores and a lot of different places where the dwell time is really short. And it just doesn't make any sense. The EV driver is supposed to pay $2.50 for a session and he or she is going to be there for an hour or two hours? It just doesn't make a lot of sense.

And especially with the transit Colleen mentioned, longer range, so 150 mile cars, 200 mile cars, 250 mile cars charge at home and if you have to go further do corridor charging. And what more do you need? Maybe a bit here and there. But long dwell time places, hotels, metro stations, stuff like that I get that, I understand that.

Other public stations where they are an hour dwell time, couple-hour dwell time I wouldn't even bother funding anything like that.

MR. DUVALL: I guess what I would say in response to that part is that I do consider it is certainly possible to group share installations together. When the person driving the vehicle isn't the primary or even sole owner of the installation there is certainly a lot of really useful commonalities there to explore.

But really, when we talk about a million-and-a-half vehicles or after that three million vehicles, you know, everything is out to 2050. So at some point they're

into tens of millions of vehicles, maybe. And so at that point then that residential problem becomes real. You want it to be low cost. If you decide that you need networking, if you want load management and all these things you have to go in and you have to effect that in a consistent way. At that point and time you will be able to send people to Home Depot to get a charging station, but not necessarily if you actually want them to come home and automatically be part of a program, a utility program or some kind of load manager program or third-party aggregator or take your pick. In other words, it will take a little bit of extra emphasis to do that.

And I think that what you've done is very informative to that scenario, whether it's tomorrow or 15 years from now. Thank you.

COMMISSIONER SCOTT: Now Jake and then Commissioner Peterman. But Charlie, please feel free to say something to that if you like.

MR. BOTSFORD: Oh, I was just going to add that we're also participating in the CPUC Sub-metering Program, which looks at residential charging from the perspective of metering, utilities as you saw. I think that is a hugely important move in the future.

The other thing about residential and contractors, we have separate contractors for residential

versus commercial because it's a whole different animal, contractor, to do residential than it is to do commercial installs.

MR. WARD: Yes, thanks Charlie. Nice work. And a nice job, nice presentation. I jokingly want to ask you to tell us anecdotes about gaming the system, since you talk about that, but I'll ask a serious question instead.

MR. BOTSFORD: That's beer 30. (Laughter.)

MR. WARD: All right, later on tonight then.

But was I right to understand that folks who participated outside the program, maybe not at prevailing wages, did this program still sponsor their equipment? Or they had to pay for that on their own?

MR. BOTSFORD: So what happened was the CEC program paid for what was called a standard installation. And it roughly was on the order of $2,000 value.

If somebody had a house that would have required $5,000 worth of value they would get the $2000 worth of standard installation, but then anything extra they would just work with our contractor directly and they'd handle that.

MR. WARD: Well, so my real question is the streamlining of the process and the ease with which someone can purchase this vehicle and know they will have the opportunity to charge at home versus the actual funds to

provide the physical hardware, if you were able to run a program recognizing that public funds are limited where you could still make the process easy even if a customer had to pony up is there still an opportunity for impact there?

MR. BOTSFORD: Oh yeah, I think so. I think, for me, anytime I have to do some sort of contracting work at my house my head starts to get bigger and bigger and wanting to explode, because I don't know -- I don't work with contractors all the time. So if there is some like network of contractors that have been vetted that's really valuable. So I think that helps out.

COMMISSIONER SCOTT: Now Commissioner Peterman and then David Greene.

COMMISSIONER PETERMAN: Thank you, Charlie. Thank you for the presentation.

I'm very interested in the kind of longer term impact on dealer sales from a program such as yours. And so do you have any data on EV sales increases for those participating dealership versus not participating? And then when the program ended did you continue to see those dealerships lead in terms of EV sales?

MR. BOTSFORD: Thank you, Commissioner Peterman, great question.

You know, we see this all across the country. There are dealerships that get it and dealerships that

don't. When Georgia had their program, Atlanta was the mecca for EV sales. There were four Nissan dealerships that were the highest dealership sales in the country. And that was because you almost got a Nissan LEAF for free under that program. And so what we found was in California a lot of the dealerships were EV-selling dealerships and a lot of the installs would come from those dealerships before, during, and after the program.

And the program actually helped some of the ones that were on the low side, on the non-EV, normal dealership side kind of get more familiarity with selling EVs. So that's what we came into kind of an understanding.

COMMISSIONER SCOTT: Go ahead, David.

MR. GREENE: So thanks for the presentation, really good work.

I'd like to go to the part you said gave you a headache, which was the multi-unit dwellings and sorry about that. But why didn't that work? I think you said in your report that nobody in the apartments or places owned an EV and is this because you could have a charger in a multi-unit dwelling, but maybe people felt they wouldn't be there that long? Or are they mostly buying used cars and there aren't enough electric used cars yet or I mean, what's going on there; why is that a problem so much?

MR. BOSTFORD: Well, we didn't discriminate. We

picked or anybody who was eligible for the program could get a free charger and free installation. And so this program was open to apartment building dwellers.

MR. GREENE: But part of your project, with the 75K project --

MR. BOSTFORD: Oh, oh, oh that one, yeah. That was just finding that that program had a fair number of constraints. It had to be within the Car2Go service area. And the apartment buildings and the hotels too had to be open parking, because it had to be public parking. It wasn't necessarily the apartment building part of it that was a problem with those projects. It was just all the number of different constraints on the project. Anyway it was just very difficult, those two small projects.

Now as far as the big project in multi-unit dwellings we just didn't see that many apartment building drivers sign into the program. There were a few, but not that many. Overwhelmingly it was single-family resident garages.

MR. GREENE: Thank you.

COMMISSIONER SCOTT: Let me check to see if Nancy Ryan has a question. And if not we'll go to the next one.

MS. RYAN: I'll pass on this round.

COMMISSIONER SCOTT: Okay. Thank you so much reviewers and Charlie.

Let's go next to Mark Triplett. I'm going to let Tim given an introduction, because we did not do that previously.

Just for time, Mark, we've got about 20 minutes for the presentation, so that gives you till about 11:35 and about 20 minutes for the questions.

MR. OLSON: Thank you, Commissioner.

Mark Triplett is the Chief Operating Officer of Green Charge Networks. And he brings a lot of executive experience and utility infrastructure, grid integration. He will present some information on a unique business model using storage technology, so Mark.

MR. TRIPLETT: Thank you very much.

I'm going to spend a little bit of time today talking a little bit about what we do. And it's kind of important in regard to how the program went for us. We have some intricacies about how the electric bill actually works for commercial and industrial customers, so I'm going to take you through a quick example. And then we'll jump into the components of what our storage solution offering is. And then we'll go into the programs. And I'll move through all of that very quickly.

Green Charge Networks was founded in 2009. We're the largest commercial energy storage provider in the country. I'll go into the details of what that means in

just a few slides. We're headquartered in Santa Clara, California. We have offices in New York and in San Diego. As you can see we win a lot of awards related to energy storage.

We have customers that range the gamut. Most of them really education and public, municipal facilities as well as quite a mix of commercial, retail, industrial type of customers. The little orange logo up there is those that have EV charging at their site. And in many cases we were brought in, because they had EV charging at their site or because of this program or they actually implemented storage at the same that we did EV charging.

So I'm just take you through a real quick educational thing that'll take just a couple of minutes. But most people think of their electricity bill and they think about how much energy they consumed and how much they paid at the end of the day. And that's your energy charges. And most people think about, "Well how can I reduce my energy charges as generally energy efficiency on better insulation, better lighting or maybe I'll get solar put on my facility and I'll either generate my own energy or be able to purchase it at a lower cost." That's half the bill.

The other half of the bill that most folks don't know about are the demand charges and that's the highest

15-minute peak usage in any one-month period. It'll sneak up on you. I'll take you through an example.

So this is just a graphic of a day of an average facility. And the energy that they use is depicted in the orange and the gray shade is just the peak time of day and then off-peak time, so you get different rates for different times of the day. But those little spikes that happen -- oftentimes due to EV charging or other spikes like industrial where you have a set of motors kicking off at the same time or a set of air conditioning systems all kicking off the same time -- they'll often make a real sharp spike in how much energy you use for a momentary period of time.

This is really important for the utility, because the utility has to figure out how much electricity you could use at any one point in time. And they have to make sure that you have the infrastructure to be able to get that electricity to your building without short-circuiting the overall greater network. So a majority of your transmission and distribution charges that the utility provide are based on this charge. This charge can get pretty expensive.

It's known as peak demand charge. And the peak demand charge is something that's been quite on the rise in the last decade. If you take a look at San Diego Gas and

Electric the demand charge has tripled in the last decade. So it's gone from about $16.00 a kilowatt up to $45.00, $46.00 a kilowatt. And that's averaged across the different time periods of the day. So if you take that back to the example and you say, "Okay $45.00 times the peak demand charge -- and in this case we have a $500 -- oops, we have 500 kilowatts -- times the 500 kilowatts, which is the peak on the left-hand side that's a $22,000 electricity bill for that month. And every month's different. It can add up quite bit.

I was just at an Air Resources Board meeting a couple of weeks ago, the exact same topic. They have 500-kilowatt-hour DC fast chargers. This is something that's impacting the rollout of electrification of mass transit in the large buses. It's also an impact oftentimes that customers really don't expect when they're installing more residential retail type of DC chargers.

So what can happen here is if you implement energy storage in conjunction with any sort of just commercial/industrial facility or especially one that has an EV type fast charger on it, what we can do is reduce the energy consumption profile so that it looks like the green line that you see here. So we kind of shave the peaks. How that happens is the energy stored on the site, when it notices that the energy usage is spiking we actually push

energy into that local facility and the utility doesn't see that spike. It actually suppresses that spike to what the green line looks like.

And if you take a look at the difference in this example it can take that demand charge cost of $22,000 in a month down into the $5,700 range or saving about $17,000 in a month. So that's the purpose of energy storage, whether it's used for EV charging or just managing a facility's peak demands.

All right, let me tell you a little bit about what energy storage is. It's got three components. I'll go through it pretty quick. The first component, a lithium-ion storage system on the right -- you see a little picture, it's about the size of a refrigerator -- energy storage system, these are small 30-kilowatt-hours systems. We have large ones that are the size of a container that basically take up a parking spot in a garage that are like 250 kilowatt systems.

And the second component is some software. And I'll take you through just a slide and each of the next two, as well. And then some financing, we'll talk a little bit about, which is also important to the program that we deal with the CEC.

So the hardware comes with a ten-year warranty. It can be stored indoors or outdoors. That doesn't make a

difference. It has its own self-cooling. And the ones that we used for this program were 30-kilowatt hour systems. They're lithium-ion systems.

The software is the most important piece. And that's because it's got a learning algorithm in it. It has to figure out when your facility is actually going to use more energy or use less energy, because it has to figure out when to charge and when to discharge.

And you notice the graphic here. The orange peaks that you're seeing are the original energy load or the actual energy load of the site. And the green is the actual energy load that the utility would see on your bill, so it's actually the suppression of the orange spikes. There is no difference. The customer doesn't change their behavior. You just do what you do and let the vehicles charge or run your business the way you run your business. But the storage system is smart enough to know when to charge and discharge and reduce the overall demand charge to the site.

We've got a couple of 100,000 operational hours. We've done site assessments on 12 or 13,000 different sites. The algorithm continues to learn. We continue to present it new use cases and different conditions, different weather and different business types. And it continues to get more and more efficient in its ability to

predict actual usage.

The last piece of it is what we call a power efficiency agreement. And this is what helps actually push energy storage into the marketplace today. Most of our commercial/industrial customers, especially in the public sector have got no idea what energy storage is. They don't understand it, they don't understand the risks behind it, they don't understand the financial savings. They frankly have the budgets to go make a capital investment into this space. It's a little different than a PPA for solar, because it's actually reducing a demand charge. So it's viewed a little bit differently.

And so we put together a no-risk model that just says, "Look, you give us enough space to store this thing in your facility and we'll share in the savings on your electricity bill. And that's all we ask. There's no obligation, there's no lease, there's no capital costs. We just need space." And so that takes the risk out, puts all the risk on the developer, which we are, we're the developer. We also design and engineer the equipment, we do and manage the installations. And so that helps the sales job become a much more efficient process.

The bigger challenge for us is finding facilities where energy storage really works. And financially it works for the customer as well as for us and can actually

pay for the equipment that we're installing.

So let's get into the program. That's the backdrop of kind of what we do. So how do you apply that to electric vehicle infrastructure?

And while the purpose of this program was the same as the purpose of the program that others have talked about, but it's really just demonstrating the feasibility of implementing DC fast chargers in 16 public and private sites in California. Preferably within the Corridor to increase the usage of electric vehicles for longer term transit. And ultimately to reduce greenhouse gases and take fossil fuel vehicles off the road.

The goals of the project were to install these fast chargers with storage to prove out that intelligent storage can actually work with an EV charger and reduce that overall demand charge. And increase the frequency that customers actually travel longer distances by putting this infrastructure in place.

So within that we ended up with the 16 sites. You see the logos on the right there's 4 retail organizations, there's 4 college and universities, there's 3 cities, there's 2 counties and a hospital. Across the 16 sites there's 13 different customers and about 16 different sites. We were awarded the project back in 2013 and did the first installation in 2014.

And how we found these sites was actually a combination of our partners and our sales folks going out and talking to customers about would they be willing to put or do they want to put an electric vehicle charging station at their facility and then alongside of it is energy storage.

We completed the project in January of this year. The project rolled out kind of sequentially as we could get customer sites in place, get the equipment in place, get the installations contracted out and implemented. These were Nissan DC fast charging stations. They were 44 kilowatt fast chargers. The EV infrastructure was energy across 12 of the sites and a charge point across 4 of the sites.

And in Green Charge we were basically the program manager responsible to go recruit the sites, work with the contractors and subcontractor partners to actually implement the EV charging stations, our storage systems, as well as operate the infrastructure and reduce the overall demand charges. And we continue to operate the charging that's inside the infrastructure today.

Let me take you through just a couple of examples. This was Redwood City. They actually have two facilities. This one, we had both a library and a parking garage and so they've got about 84,000 residents. You can

actually see the chart below that shows their energy usage. And the orange pieces are what the energy storage is doing to reduce that overall demand charge. The overall demand charges at this facility we saved over $7,000 a year at just this facility.

Just to give you a couple of visuals without giving you all the stats, this is the City of Santa Clara. It's actually at the Levi Stadium. One of the charging stations you can see kind of a clean line between their energy infrastructure and the peaks that were shaven off with the small battery storage system.

This is a Shore Hotel along the Corridor, as well. And you can see the peaks that were shaven with a 30 kilowatt system here as well.

All right, so findings and lessons learned: It was not too difficult to find customers who wanted DC fast chargers as something they could offer to their customer base, especially schools and cities and counties and some retail, as well. So it wasn't a difficult thing to go, to present the proposition to them.

As I had mentioned, early on and part of the reason I went through that lesson, was frankly none of them had any idea what energy storage was or what part it played. Or what the impact of an EV charging station could have on their electricity bill or how this would work. How

was all this coming together, because they didn't want to take the risk, they didn't want a big financial burden even if we were willing to install and implement this system for free to them. They still really wanted to understand how it all came together. And it's fairly complex. It took a little of bit of time in the sale process to work them through that and get comfortable with it.

The other thing, market saturation is still required. Certainly, we're seeing a larger rollout of EV charging stations. We have more and more customers that we continue to offer it virtually with every deal that we do. We think there is value to the end customer and value to their customers ultimately. And then we have a mitigation solution that we're already implementing that can help overcome any of their EV charging potential increases and demand charge.

All 16 sites actually did reduce demand charges and save the customers money. And the other piece of this was it really was a kickstarter for the company, Green Charge as the developer, relatively new in this business. We really started in New York on a DOE Grant, came to California and got this grant, and really helped get the company started. We learned a lot about our software, about hardware, about integrating with EV charging stations, about the complexity of the implementations

across diverse customer types. I mean, there was really a lot learned. And it allowed us to also help ferret out that business case and transfer the business case from a CEC type funding to an SCHP-type funding, which has been helpful to offset our costs of our current installs.

So the results, you know we put in all 16 DC fast chargers with energy storage, which worked very well. We did offset the demand charge of the EV charging stations in each of the cases, which resulted in over 100,000 kilowatts of energy produced that prevented non-renewable vehicles from being on the road, which equated to about 73 metric tons of Co2 emission that were not emitted as a result of a fossil fuel vehicle being used instead.

And we think we helped open some of the traveling corridor, only 16 sites probably isn't enough to really open up any sort of corridor, but we think we helped a bit in opening up a corridor for accessibility in building out some of the infrastructure that's needed to electrify the transportation infrastructure.

The host customers did save money in every case implementing energy storage alongside with the EV fast chargers. And as a result of this we actually ended up winning an award, which is going to be presented to us at Fullerton in a couple of months as a result of just this effort in working with Fullerton and working with all the

partners as we presented it. And ended up receiving another award that'll go to our war chest, which we're very proud of.

And that's all that I've got for my presentation.

COMMISSIONER SCOTT: Thank you.

Okay, we'll start with Nancy.

MS. RYAN: Yeah, I guess I'm interested in knowing if where you are at looking at the potential to deploy this technology for transit agencies? I mean, obviously the existence of demand charges seems like it's fundamental to your business model. And I know there's a conversation going on about waiving demand charges for transit agencies, at least for some period of time. So where are you on working with transit agencies? And do you have a preferred approach to dealing with their very real challenges on demand charge?

MR. TRIPLETT: Great question. Well, we're really just getting involved in the transit agencies. In general, I think PG&E allows like a two-year demand charge waiver with their program, so they're not seeing it. But some are just rolling off and are seeing it coming. And they're like -- that $17,000 number is actually a very real number for one transit agency and they're trying to figure out "How do we minimize that?"

And so yeah, we're having conversations to help

understand where the problem is. How does energy storage work? What's the business model to make it work with the transit agencies and are really starting to understand it. But they're hit big as this is a big-time impact to the transit agents.

MS. RYAN: And you mentioned SCHP. But does your technology also apply or does the Storage Mandate apply to it? Is it eligible to count towards the Storage Mandate?

MR. TRIPLETT: Are you talking about AB 2514?

MS. RYAN: Yeah.

MR. TRIPLETT: Yes, depending on what the utility is trying to get done. If it's part of the utility program it can apply for part of their 2514 requirements, the 1.3 gigawatt hours, which is really interesting. I mean, when you really take a look at the business model with storage there's multiple layers of potential revenue streams for a developer like us.

So first it's reducing the customer's demand charges and sharing in some of those savings. So at the customer level we can reduce some costs, we can share in some of those costs. There are utility programs that also help the end customer like demand response programs.

So the energy storage that's not being used for those peak charges or during periods when they don't peak charge. We can actually take that energy storage and sell

that capacity or that actual energy back to the utility, providing a distribution relief.

So we are participating with PG&E. They've got a demand site pilot. And they actually even have -- we just started an excess supply pilot that PG&E has rolled out. And that's when they get too much solar radiation they actually want to absorb that and then be able to push it off during the evening periods. And that helps solve the duck curve problem. So we can solve problems for the utilities as well, so there's a revenue stream that comes in at that level.

And there's also a third level, which is the energy market level at the Cal-ISO level. So we're actually participating in a Resource Adequacy Auction as well. And we've been awarded in each of the IOU markets some resource adequacy participation, which makes it even more complex.

And just really to our customer we say, "Don't worry about it. You're going to share in all that. Let us just figure how to optimize revenue stream for you and for the system, because we're going to share in that." And the utilities are aware of that. And the ISO is aware of that. And they're like, "How do we get more of your capacity?" And so it has to be cost-effective. And so we're working with the utility, we're working with the ISO to say, "How

do we appropriately share the benefit of that energy storage resource? And how do we stack those benefits to the benefit across the value stream?"

COMMISSIONER PETERMAN: I have just one tiny plug. Just building off this conversation, just to let everyone know next Tuesday on May 3rd we're actually having a joint workshop between the CPUC and the ISO on this topic of multiple-use applications for energy storage. Which one of the cases that we're looking at is storage that is used behind a meter to manage demand charges and then how that resource also could participate as a utility distribution asset or wholesale market asset.

And then this Friday, April 29th, I think many of you will be attending another workshop we're having where we will be looking at what to direct the utilities to do as a part of their transportation electrification plans that they have to file in response to SB 350.

And one of the main issues that we're interested in is the impact of demand charges and looking at it more holistically, because historically we've dealt with it as a waiver on demand charges. But we're interested in are there other solutions that can help manage demand charges, such as energy storage. And what set of solutions actually makes most sense long-term for the Grid.

So please attend those workshops if you're

interested in learning more about these issues.

COMMISSIONER SCOTT: Go to Josh and maybe we can just work our way right down the reviewers, if you like since you're (indiscernible)

MR. CUNNINGHAM: Sure. Thank you for your presentation. It's interesting you have the innovative business model where you're taking the risk off the site host and similar to some of the PV programs.

Can you -- separate from the CEC grant where you were asked to install EV charging onsite with other uses, can you talk a little bit about the conversation you have with site owners when you go in to evaluate a site as to whether EV charging might be something they'd want to consider and bundle into the package, when you're also looking at stationery loads?

And then maybe, because you're shouldering the risk, a little bit of background on how you evaluate whether you want to make that pitch to the site because if that station isn't utilized very often you're going to have capital equipment that you've invested in for the charger. And so do you do some evaluations of employ use in the corridor and that kind of thing?

MR. TRIPLETT: Sure, great question.

When we go in to any customer we generally want to understand where they're at today and kind of where

they're heading. So we want to know if they have solar today or if they're getting solar, because the combination of solar and storage is actually also a really interesting, complementary combination as well. Solar is going to save you part of your bill, but it doesn't help you with that peak demand, because if a cloud rolls over all of a sudden you spike back. So that combination of storage and solar is actually very important as well.

EV charging is another thing that creates those spikes. So we want to understand the spikes that are either happening today or probably going to happen in the future and help size the system based on where they think that they're heading. And so we'll have those conversations with them. And if they say, "Yes, we would be interested in getting charging stations. We've been looking to that, but we just haven't pulled the trigger on it.

We can actually sit with them and show them what the impact of their electricity bill would be. We would show them what the impact of energy storage combined with it would be and what the result would be, so they can make an informed decision on when is the best time to buy in terms of before or after you get energy storage, before or after you get solar or any other combination of energy efficiency. Or even as they're rolling out new equipment

are they expecting to add another facility or another assembly line? Those kinds of things are things that we're interested in. So we'll evaluate those things up front.

We're very transparent with them. We give them lots of information in a simple format to look at to be able to see what the impacts are and the bottom line impacts in their electricity bill as well.

MR. GREENE: Are you a potential buyer of used battery packs from EVs or is this something you can't handle?

MR. TRIPLETT: Yeah, we've actually been working with Nissan for the last two years looking at second-life EV batteries. And we've spent the last two years actually going through the engineering of it. How does that all work? Work with Nissan to say, "How do we take it?"

Essentially we just went live in January at the Nissan Headquarters in Sunnyvale and we literally take the battery packs out of the vehicles. They look like the floorboard of your car. They're three and a half feet wide, about four feet long, about nine inches thick. And they've got all kinds of crazy annotations.

And in any event, so one of the decisions that Nissan needs to make is, "Do we just take them out of the car like that?" There's a couple of places to plug in to them so you can control them and charge them.

And in the case in the Nissan Headquarters what we did we engineered it where the Nissan folks came in, built the battery management systems to work on top of that to manage multiple of these battery packs together as an operating unit. And then their 4R Group, which is one of the joint ventures that actually built the enclosure and did the integration with the inverter, we actually took four of those car batteries, stuck them upright, plugged them in, put a battery management system on top of it, put a traditional PCS or inverter on the side of it. And we used it to actually reduce peak demand charges on the side of their building. So we spent the last two years working through them with that.

Nissan is trying to figure out what's the most economic way to roll these out. Is it just straight out of the pack? Or should we actually take them out of the car, unpack them, stick them in a traditional rack and stick them into a green station like you saw there where it just fits into a rack and stacks up.

So yeah, they continue to be a very close partner. We provide a lot of engineering insight and commercial feedback to them on what they need to do to make this economical. I mean, this is an issue. And it's certainly not just Nissan. All the electric vehicle manufacturers are dealing with this. And are either

becoming primary battery suppliers in the market with brand-new car batteries or secondary, second-life after the end of that useful life.

The interesting thing with Nissan's second life is they come out of the car at about 70 percent retained storage in there. It's just not quite the distance that the customer wants. So it's a really good resource and Nissan stands behind it for ten more years, even as a second-life battery.

So yeah, we work with Nissan. And we've talked to some of the other electric vehicle manufacturers about the same how did we do what we did?

And yes, we would take those batteries at the right price. They definitely will help the marketplace.

COMMISSIONER SCOTT: Any follow-ups, David?

MR. GREENE: That's it. Thank you.

COMMISSIONER SCOTT: Okay, any other questions? Nancy?

MS. RYAN: Yes, I was just going to ask you, so you have a big list of companies you've worked with, some of which have EV charging I'm guessing and some of them just like a few stalls for customers or whatever. So it's probably a small impact in a big building that's got a lot of other things going on.

So taking that into account I mean do you have

installations today and customers today where the system is economical for them without a grant? Or are you still on that sort of pre-commercial stage, kind of across the board?

MR. TRIPLETT: Yes, at this point we're still pre-commercial. I mean, it's either SCHP or it's a grant to make it happen. The closest other thing is in combination with Solar ITC. If you have a tax equity appetite you could potentially make a pencil in that scenario.

COMMISSIONER SCOTT: Great, Mark?

MR. DUVALL: A great presentation and I was at the Tasman Garage ribbon cutting.

So, EPRI and Silicon Valley Power installed 48 charge posts on one side of the garage. You're on the other side of the garage --

MR. TRIPLETT: Are these the 49 for the 49 stations?

MR. DUVALL: So they said 49 and I kept saying, "49, 49, we tried to get to 49 in our grant. We can only get to 48." And I'm thinking, "Where's the 49th coming -- oh right, the fast charger."

Anyway, so first of all it's a parking garage. Before we showed up it had very low, low elevators and lights and so obviously it needed new service, it needed a

lot of new things, that was a lot of the costs. And will continue to be a lot of the costs going forward as long as parking garages aren't set up to do this going forward or a parking facility, so that was an important learning.

You're on one side doing energy management as part of your business model and it sounds really good. We're on the other side doing energy management as part of demonstration of a very large number of charging stations that will get used. They have some events at this thing, I think, on Sundays occasionally that might be big. And as part of also demonstrating the open-charge point protocol.

But we're not talking to each other. And that seems to me like how you show up at a facility and you know, you can probably see some of the things that are going on, but not everything. So what do you do in your software to account for that?

MR. TRIPLETT: Well, our software is only looking at the meter in which we're managing, so the one bill for the one meter that we're managing. So in that case, those other 48 charging stations are going to be off another meter. So we're not going to see that. In our meter we're just going to see the one charging station and the ancillary lighting. And the elevator stuff (indiscernible)

MR. DUVALL: But it's the same customers. Let's say them put them under the same meter, in other words.

MR. TRIPLETT: Well, if they put them under the same meter, yeah. We're in pretty regular communication about any time we see any change, an out-of-statistical-norm change, we always go back to them and say, "What's going on?" And in some cases they say, "Well, I don't know." And we say, "You might want to look around, maybe something happened." Or in another case they will say, "Oh, we just installed 48 extra EV charging stations. That might be the ticket."

At that point and time then we can go back and it's not always just an algorithm change, too. In those cases we might come back and put in -- or in those cases we would probably more likely put in additional energy storage to help compensate for the increase in load.

MR. DUVALL: And I assume "Well, it's a nice, big electrical room, so that's good." And I assume at some point when that does happen you end up overrunning your system's ability to compensate for demand charges on a given month and so you then try to pivot quickly to prevent it from --

MR. TRIPLETT: Correct. Putting a little bit of charging station on a very large load becomes very difficult to predict those little bumps. And there's just not really a great return at that point. So yeah, appropriately sizing the charging station to the facility

and the peaks of that facility is critical to the success in cost reduction.

MR. DUVALL: Great, thank you.

MR. WARD: Yeah, thanks very much, great presentation, very clever. Glad to see the opportunity this opens up.

A similar question, those peaks and how those evolve over time, for some of these charging stations we'll have more people using them over time. That's a good thing. But do you have higher instances where you have that demand required how do you adjust in terms of the energy available to satisfy that or is there may be a theoretical limit where we're just using them often enough that maybe it's not even worth it?

MR. TRIPLETT: So we have a 24-hour network operation center. We monitor every single system. And we're looking for anomalies all the time. We also have a customer service group that's talking with our customer about their bill, their energy usage was changing, and that type of stuff. So we're usually in dialogue with them and kind of anticipate significant changes ahead before they happen.

And then we model those expected behavior changes before they happen. And then we generally will try to implement either additional energy storage if available or

modify the algorithm to anticipate the load change.

MR. WARD: Okay, great and then one other quick one.

The power efficiency agreements, do you tailor those, I guess, per customer or is there kind of a standard? I mean, are they ten years, five years, longer?

MR. TRIPLETT: I mean, we can make some customizations. Some customers have some capital they'd like to deploy and they'd like to save a larger portion of the savings. But it's generally pretty straightforward. The split, the revenue split or savings split, is really based on how much savings is there and what's that return on investment. So in some cases they can get a majority of the savings, in some cases they get a smaller portion, because there's just not enough revenue there to pay it off. Now as we add revenue layers on top of it, DR and other type programs like that, then those things can be adjusted.

We do have customers that want to actually own the systems. And those cases we sell them the system and just operate it for them, but we show them the ROI. And go, "Hey, do you want to own it and capitalize it, depreciate it? Go for it. We'll run and operate it, install it. Turn the key for you, no problem either." Whatever works best for the customers is fine for us.

MR. WARD: Great. Thank you.

COMMISSIONER SCOTT: Any other questions, Commissioner Peterman?

COMMISSIONER PETERMAN: No, thank you.

COMMISSIONER SCOTT: Okay.

All right, thank you so much for the excellent presentation. And great questions from our panelists.

We will now turn to Bill Boyce to give his presentation. Bill, we're at about oh 11:50. So I'll give you till about 12:10 and then we'll have about 20 minutes for questions. Sound good?

MR. BOYCE: The lunch pressure is on. (Laughter.)

All right, just a couple of quick words on SMUD. We've been active with electric vehicles and charging since 1990. We've supported a lot of different parts of the industry. I think kind of more pertinent for this crowd during the late 1990s, early 2000, we were actually hardware distributors for General Motors and also partners with them in getting infrastructure installed across the State of California and Arizona. And a lot of the stuff with regards to Level 2 charging in the downtown parking garages is actually the backbone we put in, in the late 1990s. At which then got upgraded under the ARRA and on the CEC programs to what we have a majority of today.

Okay, kind of my next chart -- there we go, thank

you Tim -- based on the experience we had already had with the Level 2s Downtown we really kind of made the jump to DC fast charging. And in the utility world as well we were probably one of the first half a dozen utilities in the country to really embrace the higher charging power, mainly because of the need of the drivers.

And one of the things I like to think about in the electric transportation world, if you actually go to a utility that has an electric transportation department or people's name on the business card, we really look for solutions for this market to help build it. And that's very unique in the utility world.

So we started our activity back in 2013 really, in response to the fact that we were a desert. CPUC had just kind of come across with the big settlement with NRG. It was only good for investor-owned service territories. And we were actually seeing the fact that we did not have any DC fast charging even targeted for Sacramento, so we invented a program to do that.

The funding for that was actually internally funded. On a utility we had excess AB 32 credits that we auctioned off, got money for those and used that to fund a whole series of things. We actually had internal proposal competitions against each other, so you never escape proposals.

But we also evaluated three different business models at the time. And our President, CEO John Di Stasio, really wanted us to go for a full owner/operator model even though we had identified it as the most expensive model. But he really wanted us to get maximum learning and wanted us to get much more intimate with everything, so we would have more information to base our decision making, going forward.

So when the CEC competition came along we teamed with SACOG to continue a lot of that work. And that all started in 2014. So you'll see what I present is kind of a continuum of what we started on SMUD funding and then have shifted over, as time goes, to the CEC funding.

So this is a map of the Sacramento DC fast charging. You can see there was actually both SMUD, NRG and Tesla is active. We do not try to exclude any sort of third-party arrangement. We actually crafted a policy that allows sale for resale, somewhat similar to some of the stuff that went on at the CPUC, but actually we're supportive of anybody that wants to bring infrastructure. Once again, when your mission is to grow and meet as much of the driver needs we do not see ourselves trying to limit any of this. It's more how can we expedite and help everybody?

So you can see we primarily have this, a lot of

corridor charging. You'll see a little bit in the status right now. You'll only see two red stars up there, but we have essentially four blue-orange stars really active right now. And then you'll see, also, where NRG is active. And we also look at our siting criteria to make sure we get as much coverage as possible and to try to be holistic.

So the most longest lived charger we have is one at our SMUD campus. This one is just a single DC fast charger. There's actually Level 2s right around the corner that get open to the public after hours, but this site we average about eight charges a day. We do have a fee.

A second site over there to the high right is our Citrus Heights; it's at a supermarket. It actually has a Level 2 right next to it. We see about five charges a day on this system.

Down in the bottom left is a picture at the Sacramento International Airport. You can see that that's an active construction site. Right now the charging hardware is being put in place and we anticipate that site will go live in approximately a month.

And then the last one on the SMUD is at the Sacramento Valley Amtrak station. That's kind of a picture of the parking lot territory right behind that little fence that we'll be installing two DC fast chargers. And we've been actively trying to get that for quite a while.

Our standard SMUD design really we worked very early on with Dennis Corelis and the State Department of Architects to really work on the ADA issues. And our stock design really is already sized for two DC fast chargers and one Level 2, but we're only deploying one of the DC fast chargers at our normal design at the get-go.

We have varied that by location depending on the need mentioned at our headquarters. We only have a stand-alone station, but at Sac Valley we anticipate a lot of usage at that station. And kind of in concert with another local stakeholder and state program we will be installing two from the get-go out there.

I already mentioned ADA compliance.

We've also done a lot of work, and I'll have a little bit more on this, about coming up with a flat rate. We just got done talking about demand charges. We actually took a rate and we worked that demand charge back into an energy unit. And we did that also to make it insensitive to time-of-use. In reality, if you think about it for most people using a charger if they happen to be charging during the time period where you went from one cents per kilowatt hour to another, let's say between "shoulder" and "peak," there would be a normal building would get a rate increase. But DC fast charging your gasoline prices don't jump right in the middle of a refueling session, so we wanted this to

be as transparent to gasoline operations as possible.

Another thing we did, teamed with Greenlots for the Back Office Network/Customer Interface. We try to take your money any way we can. If you take a look at it, credit card, RFID, cell phone apps, pay-by-phone. I think we were also one of the very first operations that started using credit card readers. Also, we were using the OCPP protocol and deliberately are trying to integrate multiple types of hardware makes and models onto OCPP for, once again, additional learning. And to prove to ourselves that we're not having such a close relationship that we can only integrate one piece of hardware knowing in time.

One of the other things I'll just kind of say we also -- one of the genesis criteria, when we developed kind of the program principles, is when ECOtality was kind of going through its bankruptcy proceedings. And we wanted to make sure that we were not tied to any individual company or piece of hardware for flexibility.

So, lessons learned and the very first really was how to set up a different business process. And we did outsource our customer service. In the utility world this is a really conscious decision you have to make. I'd already talked about EV flat commercial rate. Even after this program we make that rate available to anyone that really this takes into account some of the demand charge,

if you've got very low utilization. So if you get into demand charge rates -- I also had to speak last week at the Air Resources Board -- there's actually a break-over point. If you've got a lot of utilization on demand chargers it's actually beneficial. But under these types of situations where it's a very low utilization in some scenarios -- and all energy rates actually beneficial, but just to let you know there's actually commercial customers that really make out on that, because they have like a 90 percent utilization rate.

We also had to work out a lot of cash flow and information management. We do our own metering. Then we also do metering and the retail sales through Greenlots, so we have to true those up. And one of the other interesting ones, SMUD is not part of the city government, but yet we have to pay city tax. So we have to determine what the energy is and then break out city tax for that. Actually, where we're at we serve I think five different city municipalities in the county, so we have to apply different tax rates to all of those. Anybody that's kind of operating in that fashion would have to do something similar. If you're just doing normal electricity, that gets picked up by us as part of your normal electricity bill.

Probably one of the number one things we've

learned is upfront land negotiations. These people we've talked about, we find in the average retail strip mall negotiations will take well over a year. Really, the property owners, they're different than the retail business. They're unengaged, disinterested, and there's not a lot of money being made here. If you can't guarantee them some sort of income they typically put you to the very bottom of the pile and you'll hear about that in another situation where after two years of negotiating they just told us "Not interested."

Disability access, there's a lot of stuff. Well, we the utility, we could site these things really cheaply right next to the electrical service panels and the service area. But we're finding we can't take advantage of any of that, because the ADA path of travel that we would have to put across a parking lot is usually more expensive than trenching. Therefore we like to say, "Disability access really trumps utility service proximity."

Hardware selection, we went out of our way to get hardware at the time. There was very few on the market that was rated to 122 degrees Fahrenheit. Most of the hardware available at the time was only good to 104. Our hardware has been very reliable in all the hot climate that we have in the Central Valley.

We've also heard a lot of complaints in drivers

that go to hardware that's not rated that high and essentially get reduced charging performance or no charging on the really hot summer days.

We have had reliability issues. Probably one of the things we found is really credit card readers. Everybody talks about that, but what we found really is we typically get the issues with those after rainy conditions; rain and wind. Typically, we're able to clear the condition just by running a cleaner through them.

And the other thing we really found is our own organization requirements for risk aversion. We have to install security cameras for injury fraud risk, have driven up our costs by about 10 percent.

So I talked about SACOG and the grant. We really work with our local Sacramento Area Council of Governments. They're really the transportation planners for the Sacramento region. One of the things I've learned through the years is we the utilities know utilities really well, but we don't know transportation patterns. We don't know where people necessarily travel. We have our own anecdotal, but the COGs really have this down to a science. This is what they get paid for: road planning, all the different things. So really working together with them for planning these activities is very important.

So we really worked with SACOG. We actually got

them funded as part of one of our ARRA grants with General Motors. They in turn also worked with UC Davis in creating siting. That map, which you can't really see, if you can envision the Sacramento area, really kind of the pink and the red dots are the high likelihoods of where we need to put chargers. If you kind of overlay that with the SMUD map they almost overlay exactly, so we really did that.

SACOG as well brings different community relationships. And brought really with it people that they had talked to that were interested in charging. And so with that we worked with them and those customers really to start transitioning towards getting some of the charging in those. And we were essentially the major sub-recipient to SACOG on that CEC contract getting I think over 80 percent of the funding.

So status: the contract actually was for three new stations. And we've just recently had to truncate that to two. We're in the middle of a scope change for negotiation. The cause of all I just kind of alluded to, the property negotiations with the third site. Really, after two years of negotiating, two years of pain, a design contractor, to try to get something that they liked it didn't come to fruition. We had about three-and-a-half to four months to try to find another site in the general vicinity to meet our contract terms. We evaluated two

other sites and we could not reach adequate design in order to meet the schedule performance.

So the two new sites, Sacramento Food Co-op, you can see that's actually the Level 2s are already installed in a parking garage. A DC fast charger will be at a different part of the facility being installed, planned for this August. The Nugget Market, Elk Grove, contracts have already been signed. The design is going in for permitting. And we're anticipating starting construction in late Q2, probably in June.

So the additional lessons learned that we've had we've been pretty happy with our business process. And the organizational issues mentioned, kind of the rates and taxes, we've been very happy with our hardware. So property negotiations we really believe that we need to get to better screening criteria.

Really like some of the things in strategic agreements with a single entity that owns a lot of property in different locations. Therefore, you could sign kind of a master agreement and not have to go through iterations after iterations after iterations.

Also, taking a look at some of the other things in the industry I think this has really been -- Kansas City Power and Light, I won't go into the details though, but they are trying to deploy 1000 Level 2 chargers, some DC.

But they really have a kind of a take it or leave it. "Hey, here's our terms. If you aren't interested we'll go right across the street to the other strip mall and approach them." So that's really kind of a different tactic.

And also I think we've all talked about business models, but to really approach I think we're going to have to find some revenue streams for the property owners. Most of the time it's the business owners, the retail business, it's not the property owner that's really benefitting from this. And that's really something we have got to look at. So recommendations there, we really need to focus.

One of the things that we've looked at is, "Okay, could we site these on utility parcels where we don't have to go through any property negotiations. How to expedite these? We own lot of property all over the service territory where substations are. And electrical power is pretty close to there." So we actually have been evaluating some of those things.

Also multi-element, we're finding a lot of these types of properties on the smaller side usually have joint property arrangements. There will be one strip mall; there will be five different owners. You've got to get an easement across each and every property owner to get your trench to get from side of the property to the other.

Some of this stuff we're aware of. Some of the larger property ownerships -- and I have Weingarten's and Simon Properties are actually large property owners across the United States -- they have more familiarity with this. Their corporate entities are understanding in really working with folks that are a much broader support, we think are some of the better models.

And then last but not least, if you can ever find it where the property owner actually has the retail business on the site, so they're fully aligned we think that would be the best.

The other thing that we did when we worked with Sac Food Co-op we actually had worked with them upwards of a year and a half before they even started any of their design work; kind of they were interested. We worked with them to get electrical sizing done for the bigger load, so all that's going to lead to lower cost, because they kind of built it with electric vehicle charging in mind. But the schedule still doesn't pan out, because you've got to wait. And you're more dependent on their construction activities. So we're finding it doesn't happen any faster, but there's a lot less headaches because everything is sized accordingly.

So summary, we've supported DC fast charging really going back to 2102. I kind of mentioned this, I

think there was really only about one other utility, and they were up in the Northeast at the time, that really sidled up to this at the time. Really, in my mind we're just now getting to kind of basic fast charging. In about six more months I think we'll be there.

I actually hearken back to some of the presentations we've seen from Nissan and PlugShare, I probably think the minimum that we need in the Sacramento area to get beyond just corridors -- but questions of DC fast charging replacing multifamily dwelling -- I think a minimum of probably about 33 are needed. In a long-term build-out probably something at about 66. To give you a sense, there's 360 gas stations in Sacramento County. So not to say that we ever have to get a one-for-one, but 66 versus 360 in kind of looking at planning level to really address range anxiety according to some of the other data that's out there.

Property negotiations definitely need improvement.

The other one, some the NRG chargers are free on the Nissan charging, but we still see people using and paying upwards of eight charges a day. Some of the interesting things we see out of that we get some people that charge every day, so that tells me they don't have access to residential home charging.

The other one that we see is we see a lot of charging from people not in our service territory potentially either having to top off to get home. Or we take a look at our DC fast charging rate can still be lower than some of PG&Es tier grades, so people taking advantage of the lower rates.

And that's what I have.

COMMISSIONER SCOTT: Thank you very much, Bill.

So let's go the opposite way this time maybe this time, so if Commissioner Peterman has a question we'll start with her and then work our way down towards Josh.

Before she goes if folks are in the audience that have comments for the end of the workshop please make sure that you get one of those blue cards that was out front with the presentations. And be sure to get it to Tim and so that's how we'll know that you have a comment that you'd like to make to when we get to the Public Comment section of the workshop.

But go ahead, Commissioner Peterman.

COMMISSIONER PETERMAN: I don't have any comments or questions. I just want to applaud you Bill for your leadership in this area. And indeed, you were one of the leading utilities to do this work, which is why the IOUs consistently hammered us to let them in the game. So thank you for all your work.

MR. WARD: Thank you, Bill. I'll echo the applause there, really nice job, nice work here.

I wanted to commend you especially for aligning this effort with what SACOG has already done. I think there's probably a lot more coordination among public agencies, but even across folks who are fans of the transitioning that's happening here, to make sure that our efforts are aligned.

I had a question about how that happened. When you went out to say, "Where will we site these?" Did you say, "Oh, SACOG has done the analysis in conjunction with UC Davis" or were you encouraged maybe to use that relationship?

MR. BOYCE: I wouldn't say we're encouraged. What I can tell you, first of all more less or it was my shot call to go get SACOG involved. I had worked with them in some areas with alternative fuel siting.

One of things that you get to is SACOG's mission isn't necessarily refueling. And so they're good transportation planners, but what I had to work with SACOG is, "You need to start thinking about how the transportation modes are going to change." A lot of what their guidance is they're also under requirements laws to try to get VMT down. And so one of the things you kind of run into is they're not necessarily wanting a lot more

refueling for vehicles, because that doesn't necessarily fit. But then they recognize that this is an important part. They're another institution that has to make 30-year plans.

So we, after quite a few meeting and negotiations got, finally, them to recognize that yes, this is very important going forward not only for this, but for other things like hydrogen refueling. And really looking at the different aspects of how we do civic planning going forward. But we actually -- I mean, they weren't part of our original ARRA proposal. We brought them in secondarily after that grant came in.

MR. WARD: Great. Well, I applaud you for doing it and just maybe a nod for Commissioner Scott, but also for Tim and Leslie in updating the Infrastructure Plan for the state. I think more coordination in other parts of the state, too, that's good news.

Thank you.

MR. DUVALL: So Bill, one comment, and then something from outside my area of expertise.

But we did a sort a willingness to pay for fast charging and you're certainly at the low end of that. So in other words, I agree that you have to charge something for these installations. I actually took a colleague by I think it's the Mountain View Tesla facility. And it

happened to be just after lunchtime. It was after the ribbon cutting at the Tasman Garage. And of course it's completely full and it's probably almost every vehicle -- and it's like 16 stalls, probably some that works in that area -- and it's just juicing up for free at lunch. And it certainly looks really good. And yeah I think with education you can even go higher, I think, as people get used to that in terms of it still being economically good for the driver.

The other thing is that was it ever an option to work with SACOG and try to locate? I mean, if you only looked at public property site is what you're trying to do feasible? Because it seems like you would have so much trouble, so much cost and lead time identifying private sites. Is it an option to just look at a map of public sites, not just SMUD property?

MR. BOYCE: The other one that SACOG's really encouraged us and we haven't quite found the money or time really is -- and we'll partner with them on other projects -- but really with regards to multimodal and really trying to get charging light rail stations with Regional Transit.

Now we think that's primarily probably going to be Level 2 charging, because people are there all day and they have plenty of access. But you've got to look at nexus points of where people have land and property. And

once again that's kind of a single property owner that has lots of parcels all over town. And they have the inclination. So SACOG's actually been very interested in that. They think that that's also a way that we could get more ridership on multimodal through light rail, so they've been very encouraging for that.

Going back to the rate the other reason we've kept that rate at like 22, 23 cents really, the source of that funding was AB 32 money from SMUD. So we saw that more as public good that has to be spent on these types of endeavors. So we're not trying to recover the capital costs with that, because effectively using that source of funding for that is all in alignment with that set of policies.

The other one that is kind of specific and this is kind of a little bit strange to think about it, but we also very consciously wanted a "by the kilowatt hour" fee.

And what John Di Stasio was pretty adamant about it is he wanted people to start recalibrating their brain. We know how much we pay for a gallon of gasoline. He wants people to start thinking about kilowatt hours, because going forward that's really going to be the commodity that we have to refuel with.

MR. DUVALL: Yes, there's certainly no reason people can't become as familiar with the kilowatt hour as

they are with the gallon.

MR. BOYCE: Right.

MR. DUVALL: That sounds great, thank you.

MS. RYAN: Hey Bill, great project, great presentation. Thank you.

I just wanted to pick up with kind of what you started to talk about, about what role you may see for SMUD doing Level 2 charging.

MR. BOYCE: Level 2 charging we're actually going to be evaluating a workplace program, going forward. Actually, a lot of the different things we just rolled out -- I'm going to jump back -- but we just rolled out a kind of residential incentive, LCFS based. But we've getting a lot more customer requests lately for workplace charging. We're evaluating a program right now. And the evaluation for that will probably go through June.

We have supported any company or any agency that comes in and asks for just subject matter expert support. We've supported, I can't tell you how many surveys of the state parking garages in support of the state, and some of the infrastructure mandates. I know I've gone on probably half a dozen of those personally. But we do plan on moving that forward, like I said, with planning for a workplace charging program.

Probably it'll be more towards incentives than

anything else and rebates or incentives, which commonly is we're finding seem to be probably the most adaptable.

MS. RYAN: Sorry, rebates or incentives for businesses that put charging in with whoever they work with, so not necessarily like SMUD owned and operated?

MR. BOYCE: Correct.

MS. RYAN: Yeah, okay.

MR. BOYCE: The other one on our subject matter expert support we do have quite a bit of employee charging already at SMUD. We're very unique that way in the fact that it's non-networked. We're trying to keep the cost as bare-bones low as you can get. It's actually administered through payroll deductions of which employees literally just get a rearview mirror hanger that say they are participating in the program. And that allows them to hook up to the non-network chargers. Our security folks will give them a note if they don't have their placard.

The one thing I can say it's a fixed fee. They almost treat it like free charging in the fact that if it's fixed fee they're going to take as much as they can get. But right now we still have enough capacity that it's not oversubscribed.

MR. GREENE: Thanks, Bill. You mentioned in your talk that a lot of other agencies that had benefited from the learning process that you had gone through. And I

think this is true of all the projects here that you're hopefully generating a lot of spillover for others.

Can you say more about how that worked and was that an intentional thing or are these just from participants in the process with you?

MR. BOYCE: I get a lot of phone calls. I get a lot of phone calls from a lot of different utilities across the country. In California, also promote a lot of learning through the California Municipal Utility Association. If you get into CMUA there's a host of smaller utilities. They actually have an Electric Transportation Subcommittee where a lot of the information dissemination goes on. When you get through that organization you've got LADWP and SMUD kind of as the larger and then a lot more smaller utilities.

And Kapil can probably talk to his example, but we work with all questions that come up, we try to support that in like I said the information sharing. Also a lot of different utility forums, we try to support that. We're also very active in codes and standard development, both at EPRI and SAE. And then also have been very active in a lot of the things with regards to Measurement Standards Division going on, giving our experience with per-kilowatt-hour charging and metering.

So I think it's not just general information

requests, it's also being very active in all of the standards development forums, which a lot of that, lessons learned, feed into the standards development to try to get better standards.

MR. GREENE: Thanks.

MR. CUNNINGHAM: Bill, thank you. I'm curious as a utility how you look -- you mentioned the 33 potential sites that you might need to meet SACOG's transportation demand longer term and possibly 66. I'm curious as a utility how do you look at meeting those longer term demands?

And because you've experimented in this case with owning these two sites to get that experience, do you as a utility look at possibly proactively trying to become owners of those future sites to control costs or maybe do energy storage or do it in a way that maximized the grid stability or do you just wait for the private sector market to move into that?

MR. BOYCE: It's kind of two different questions the way I'm reading it.

First, looking at how do you get to 66, you know, that's why I show things like the NRG chargers on that map. We don't anticipate trying to do that on our own. We do not anticipate owning too many chargers, beyond the six that you saw there on the page. So really we did that,

because we were in a desert. As the private sectors started to respond and come in to that arena we would love to see them bring their capital to the game and support that.

With regards to things like structuring we'll partner with anybody. I think in some of the latest competitions we were hit up by three of the service providers. We signed letters of support for all three and also, taking a look at different rates potentially to support that going forward.

What we have done in our demand essentially distributed energy resource planning, so DERs and more on the energy world, less on transportation, is really looking at where all the distributed energy generators or sources will be across our service territory.

And this is stuff where energy storage might be more valuable on different parts of the grid. Or there might be -- the big words -- geo-temporal pricing schemes, where different little islands at different times of the day might have more value. A lot of what we're talking about in the research world, in my group is how can we really look out to real-time pricing schemes to get different energy schemes going?

San Diego -- and I see Matt Zerega in the audience, even though he's not with them anymore -- have

looked at this a lot. But we also really see kind of smart managed charging really helping to send the price signals out there to get good charging behavior.

MR. CUNNINGHAM: So even if you're not going to be the owner of the distribution equipment, the DC fast chargers, you are looking at innovative ways to minimize your costs one those sites go in as the providers of electricity?

MR. BOYCE: Not just minimize our costs, but also like I said if you take a look at some of these other things it's also develop revenue or value pathways that everybody can participate to try to get as much value as you can out of this stuff. Because right now I think everybody pretty much will agree getting the business case to run, you think about, "Hey, I've got to play in three markets in order to get enough money to really split it."

It's also how do we create pricing mechanisms to allow that as well?

COMMISSIONER SCOTT: Terrific. Thank you very much, Bill. And thank you again to our reviewers for their great questions.

I just want to say before we head into to lunch, and I'll turn it over to Tim in case there's any additional logistics, thank you all so very much for coming to talk with us this morning. And let us really kind of shine some

extra light into your projects, to highlight some of the key successes and for us to identify the challenges.

And I really appreciate all of your thoughtful ideas for how we can continue to accelerate charging infrastructure out there and to help support our plug-in electric vehicle market.

I've picked up a ton of insightful nuggets on this morning. I hope you all have as well. I'm very much looking forward to the afternoon.

Let me turn it to Tim and see if we have any remarks before lunch.

MR. OLSON: No, no remarks other than there's an all-electric bus parked in front of the building if people want to take a look at that. It's with a company called Nohm.

And we're ready, we're on schedule, somehow we got on schedule.

COMMISSIONER SCOTT: Excellent.

So please return at 1:30 sharp. We'll get started then.

(Off the record at 12:27 p.m.)

(On the record at 1:33 p.m.)

Okay, Everyone. We're going to go ahead and get going. Welcome back. I'm really excited for our afternoon, very much looking forward to hearing from our

remaining four presenters.

I do want to remind folks in the room that if you'd like to make a public comment, we have the blue cards around that front table. Please be sure to fill one out. Give it to Tim Olson or give it to me and that's how we'll know that you'd like to make a comment and know to call on you. And then of course on the WebEx, there's the hand raiser function that the team is keeping an eye on.

So I'd like to turn it now over to Kitty Adams, from Adopt a Charger and she'll talk us through her project. Welcome Kitty.

MS. ADAMS: Thank you, Commissioner Scott. And I also wanted to just thank all the other panelists. I learned a lot from this morning's presentations. And I was furiously taking notes. So I really appreciate everybody just sharing the knowledge and helping me along the way.

For those of you that are not familiar with Adopt a Charger, we are a non-profit organization that was formed in 2011. And basically, the reason why I decided to form Adopt a Charger as a non-profit was I just did not see the business case for Level 2 charging. I didn't understand how people were going to make money reselling kilowatts. But at the same time I knew that charging infrastructure is the best way to get people in contact with actual owners.

So my approach was to go after highly visible

destination locations that attract people from 30 or 40 miles away that also have dwell time that suites Level 2 EV charging.

My first place, like selfishly I wanted a charger at Leo Carrillo State Beach. So I decided I was going to go after the California state parks. What I realized -- you can go to the next one -- what I realized was that even though the California state parks has the Cool Parks Initiative, they have plans to reduce carbon emissions and also to encourage visitors to the park to do that they didn't have any funding to install EV charging. So that's when I decided I was going to take a different approach and do, like, Adopt a Highway, where I solicit sponsorship, or I help them find grants or funding to enable the installation of EV charging in those parks.

This slide is -- a thank you to everybody on this slide -- there's a lot of logos here and there's probably even a few that I've left off, but Adopt a Charger has worked with utilities, air quality management districts, OEMs, pretty much anybody that's interested in giving me a little bit of money towards these projects.

So I mentioned this nonprofit approach. And the reason I wanted to include this slide, because I think it's really important that we remember that what we're doing in California is helping to percolate this in other areas,

especially non-ZEV states. So Adopt a Charger has been a solution for some other people as well. The Cincinnati Zoo, they worked -- anyone that calls me, "How do I get things going in Ohio?" I say call Clean Fuels Ohio, call your utility, call your air quality management district, so that's what they did. They were successful there.

Louisville Kentucky is a great example of they wanted to get EV charging in. Their plan is for 20 chargers. They recently came back to me, because the local utility wanted to charge $2.85 an hour for Level 2 charging. And I was like "No, stop. That's too much." And what's going to happen is those spaces are going to sit empty. The host site is going to be frustrated because they gave up that prime parking. And the non-EV drivers, it's going to build animosity that these prime parking spots are sitting empty. And for me, I'm going to lose the opportunity for that EV driver to interact with the EV curious and tell them about the ownership experience. So hopefully, they were listening to Bill Boyce this morning.

And there's two other bigger initiatives happening: ChargeStarter.org, in Missouri and also at Pen State University. I gave them my Articles of Incorporation, my F1023, all the information so they can start Adopt a Charger in their community. They can do exactly what I'm doing in these places that maybe are not

as important to OEMs, or don't have a super supportive utility like the ones we have here in California. Next slide please.

As one of my presentation projects, I wanted to present the Getty. This is really -- I was so fortunate to work with them. They upped my game in a very big way and really made me understand a lot of the challenges. This project, I was able to use CEC money, though the LADWP, SoCal EV Readiness Rebate, I think it was called. And AQMD's was another $2,500 per charger. So here I just coupled the two grant opportunities and I made the Getty kick in a little bit of money and we were able to make it happen.

I'm extremely proud of this proud of this project, because when I approached them in early 2015, they had a binder as thick as a phone book full of information about EVSPs, all the charging manufacturers, every plan that was out there, Blink 350, Green, everybody had reached out to them and they said, "Nothing made sense until you came in." And part of the reason why was there's a few things here. The high cost, the differential cost of EVSE. So for a networked charger, a dual-head networked charger, it's going to be about $6,500. For a non-networked dual charger it's going to be $1,500. So how do you overcome that $5,000 right off the bat?

So for the Getty they wanted to install a total of 16 chargers. And it just wasn't penciling out for them. And the other thing that was a big issue for them was the networking fees. So in one year, the usage at these locations for these chargers was just over 37,000 Kilowatt hours, which if you add up the price per kilowatt is about $5,900. For them, just the networking fees, they were quoted $5,000. So you're going to pay $5,000 in addition to the more expensive cost of equipment to try to recoup that 5,900. For them, they said "Oh okay. If you're going to bring all this, we'll pay for the electricity." So the total cost of this project ended up being 75,500.

The other thing that I'm super happy about this project is the results. In March, 2015, they had three employees that drove electric vehicles. One year later, they have 36 employees that drive electric vehicles.

When I initially installed these chargers in 2015, I upsized the transformer and I installed the Level 2 chargers in every other parking space and put 120 volt plugs in between the spaces. I did this for two reasons. I wanted to encourage sharing the chargers, move cords not cars, because often times in these places, there's nowhere to move your car to. So it's great that you know you're charged to full and you're going to get penalized if you stay connected to that chord, but there's nowhere to move

your car to. So that was one challenge that we overcame with that strategy.

But also now, one year later, it's really super easy for me to go back in and add 10 more chargers to this location, because I already had it spaced and kind of the footprint there to add chargers and I upsized the transformers. So really, it's a great example of the highest number of chargers to allow as many of cars as possible to charge.

They've got great utilization there and I'm also increasing zero emission miles here, because in Los Angeles, more people are driving plug-in hybrids. So when that employee's coming from Simi Valley and he's driving 35 miles on his Volt, he can charge at work and drive home without burning gas.

The next project I wanted to talk about was the L.A. Zoo. I could talk really for hours about this one, but really what I wanted to point out about this project -- that was also in conjunction with AQMD and LADWP -- is the whole check-in process. This is something that I've been doing for three years now. We put the Plug Share sticker on all EVSE. And we encourage driver communication and direct observation.

So it's really important because there's no standard on these cars, so that people can just pull up and

tell what their state of charge is. It's blinking lights on some. It's a solid light for others. So this way, people can check in on Plug Share and it's been very successful at Hollywood and Highland, another one of our properties, where they say, "I'll be charging until 2:00 O'clock. Feel free to unplug me."

It's also been really great for places like Cal Poly Pomona where people can come in and say, "Hey, there's a car icing this EV spot. They get notification and they can send parking enforcing right over, so that's really a good use of this check-in process.

And I really wanted to just bring this up, because I hear a lot about free charging. And I know my experience is much different than what I'm hearing in this room, because I know free charging sells cars. I mean Tesla's the perfect example of that and also the No Charge to Charge programs that are out there. People really realize that this perk is helping to get us to the goal of 1.5 million cars on the road by 2025.

And I think also too, because Adopt a Charger is -- people are grateful, so they're coming with a grateful attitude. Whereas maybe with No Charge to Charge it could feel a little bit more an entitlement, because when you bought that car you got this card and they said, "You're going to get two years of free charging or whatever with

that card."

So when people come up to a free charger of Adopt a Charger I think they feel it's more of a community asset. And that's why I think I have that result of people sharing and just calling me and saying, "How do I sponsor a charger in my area?" whereas if you pay for it up front you're frustrated that somebody's on that DC fast charger from 80 percent to 100. It starts to -- or you start to decide, "Who deserves it more: Volt, a LEAF or a Tesla?"

So really just increasing the communication with the drivers and also too for the CEC, when you think about free charging, it's been working. And I don't want to craft policy that's currently benefiting 99 percent of the people for that 1 percent that's complaining.

Yay, state parks, okay I love working with the state parks. And part of is that they really appreciate what I'm doing and part of it is their mission. When I come into the California State Parks, they've got a seventh generation mission statement. So when I'm talking to them about charging needs it's got to be relevant for my grandchildren's grandchildren. So when we're talking about oh, charging and the 200-mile battery and all these different things, for them it really is about a few things.

They want to promote the Cool Parks Initiative. So in this slide, I'm showing you the sign there on the

right. And we want to go beyond charging cars. And educate the public about the benefits of EVs. So here, it's really a demonstration project. We put them by visitor centers. Some docents have worked this into curriculum for some of the schools that they work with. Also too, it's accommodating the California State Parks green fleet as evidenced in Los Angeles. They've been able to add some plug-in cars to their fleet, because when they come to Malibu Creek -- the District Office -- there's chargers there. So they can go round trip in their LEAF.

So really the thing about the State Parks that's so difficult is every single park is different. Sonoma State Park is dramatically different then Old Town San Diego. So the fact that Adopt a Charger comes in without like a one true way to approach that project, I'm better able to custom design the perfect solution for that location.

So for instance -- you can go to the next slide please -- at Kenneth Hahn State Park -- this park is an urban park. It was sponsored by Southern California Edison, so thank you to them again for this. And also AQMD decided to kick in some money here. So when I'm designing this I'm realizing okay, that it's not going to have a high level of utilization, but it's an important place to have charging. So I know that they'll never be able to recoup

cost and generate revenue from that charger, so I had to look at a creative problem solving there.

Also on this slide is Hearst Castle. So when I first started this project I had the Johnny Appleseed approach where I was going to go and sprinkle these chargers everywhere and it was going to just build up consumer awareness and people were going to buy plug-in cars. When I went to Hearst Castle, Tom Kidder said, "You've got to be kidding me. You're going to put four chargers in here? We have 20 Teslas that can come through here in a weekend. If you're only going to put four chargers in here you're going get people frustrated. We're out in the middle of nowhere where there's no other charging opportunities, so let's rethink this."

So I was struggling, because I didn't have the budget to do 20 chargers. So I reached out to Tesla and said, "Hey look, basically these are all Teslas coming in. Is there any way you can participate?" So I'm happy to say, they are sponsoring Hearst Castle. They gave me 16 EV chargers and $25,000 to help augment the installation cost. Here they're giving me eight Clipper Creek j1772 chargers and eight Tesla standard chargers.

I talked to them about cost recovery, because the State Parks is not going to be giving a bunch of electricity away to Tesla drivers. And they said, "Well,

we don't have experience with restricting access. That's just not how we do it." And so I went back to Tom Kidder and I said, "Well, I'm researching these auxiliary payment systems. They're still really expensive. Tesla's not super crazy about that, because they don't feel like it's a super reliable way to approach it."

So he said "Let's do the Iron Ranger concept." So the Iron Ranger concept is what they do at the State Parks when you have to pay for parking or amenities. You take an envelope and you put your few dollars in that envelope and put the coupon on your dash. So when you go to Hearst Castle, there's going to be a little stand there by the chargers where you put your $3 or you know, it's not even going to be a lot.

So that's the way we're approaching it. I feel like maybe the solutions are on the horizon, but I don't want anything to hold me back. Right now, I've just got to get as many chargers in the ground as possible, because that's what sells cars. So I don't want to wait for the solution.

The other thing too is the most expensive part of any project is bringing the power to the curb. So even if whatever you're putting in at the end isn't going to be there for the seventh generation, the conduit and wiring is, so next slide please.

These are some of the other parks I'm working with. And really, I should thank the Kashia Band of Pomo Indians and also the Monterey Bay Unified Air Pollution Control District, because they're the people that provided matched funding to the CEC grant for these parks.

My biggest challenge is ADA right now. It was brought up earlier this morning. For me, I'm not working in newer parking structures with adequate electrical. Everyone's been to the State Parks and we don't want them to look like parking structures, so hardly any of these locations meet the ADA guidelines for the 2 percent slope. They also do not want to give up parking spots, because they already feel like they don't want to restrict access at all to these public places and so if we're removing a parking spot that's one less person that's going to be able to enjoy that park.

So we're really having to look strategically at how we can overcome some of these challenges. For me, it's the cost of the project. This is doubling the cost of every project. And I was lucky and I went back to AQMD and got a little more money for L.A., so that's going to help us out, and Sonoma. But really, I'm having some challenges with that.

I bought up Old Town San Diego, up in the upper left-hand corner there. This is a park that is the most

visited park in the whole system. It's in Downtown Old Town San Diego. Their parking lot is a Metrolink lot. So there I was again really, really concerned about capturing revenue. I was also concerned, because Smart Car is in that neighborhood, using electric vehicles. But when I looked at so many different equipment solutions and none of them made sense. So what we decided to do is we're going to put two dual-mount Clipper Creek HCS-50s and then we're going to just -- I'm giving them $5,000 to just pay the electricity, so we can find out what the next best thing is.

I'm going to just pick it up a little bit here. I wanted to thank PG&E as well. I was also part of a CEC grant from the Golden Gate National Recreation Area to install chargers at Stinson Beach in Fort Mason. And that ribbon cutting will be coming soon. Next slide, please.

Adopt a Charger is EVSE agnostic, so we've used a lot of different kinds of equipment. And I advocate for low-cost simple solutions that can help get the chargers in the ground. Next, please?

Okay. Adopt a Charger really represents the voice of the drivers. I mean we heard from an EVSP, an EV charger manufacturer, we heard from a Utility this morning, an OEM would probably throw in their own take on it. But I always try to represent the EV driver, so I put out an

informal Facebook poll and I got 188 responses. I tried to whittle it down to the five most important things that they said.

Number one, reliability is a top priority. Somebody sent me a picture of this charger that's out of service. I'm losing when that charger is broken, when somebody is coming up, "Hey, how do you like driving your Chevy Spark?" And I'm at a broken EV charger or trying to get the handle out with the wire hanger it's not going to give them a lot of confidence in the infrastructure. So I'm going back to reliability.

People also said DC fast charging along corridors I just said, "Yay, it's coming." Three simple low-cost solutions, a lot of people are talking about Level 1 for workplace and airport. I might make the argument for low-amp Level 2, just to -- going back to again like the complexity adds expense and it also affects the reliability. A lot of times the problem is not with the power being present, but its authenticating it with the network.

Enforcement, this was a big one that people talked about. So signage, getting the laws in place so that people can get tickets, and they can really start to realize like this is like an accessible parking spot. You're not allowed to park there unless this applies to

you.

Solar, I'm bringing this up. I mean really this is more of a CPUC thing, but so many people talked about solar. "Tell them this and tell them that about solar." So in the context of our discussion I just want to bring it up because EVs are a gateway to solar. And 30 percent of the people that get EVs go on to put solar panels on their house.

So when the California Energy Commission is trying to reach the goal of 33 percent of renewables by 2020, I just want to point out that investments in EVs are also investments in alternative energy. And maybe, unlike hydrogen or CNG, investments in that technology still requires us to expand fracking and so that's why I brought that in.

The next slide is just a lot of my other projects. Each one probably has a story so maybe after, since we're running out of time, if there's any questions, I can come back to this.

And then my last slide, in conclusion I just wanted to say what's up next for me personally. Like where do I see the next step for this type of advocacy that I'm doing? And for me, it's about wiring up school districts. My goal is to get LAUSD charged up, because I see all those teachers as really low-hanging fruit. I think about the

Getty where I sold 30 cars in one year; at LAUSD I could probably sell 300 easy.

Another thing is looking at EVs as part of overall mobility. I'm from Los Angeles where we need to get cars off the road. It's great that there are zero emission vehicles, but we just have too many cars on the road. So I want to look at ways that we can use this technology to integrate with other mobility whether its mass transit, bike commuting, car sharing, van pooling.

And micro-grid integration, I also see how important the cars are as storage and modulation of that. So I'm starting to work into that.

In summation I just want to say that I go back to my goal is Governor Brown's goal, CEC's goal, and most everybody in this room. I want to sell 1.5 million cars by 2025. I want to advocate for simple, low-cost solutions. It makes it a whole lot easier for me to do my job when I can present them with low-cost easy options, scalable plans.

And I want to charge as many cars as possible. I want to increase zero emission travel. I want to continue to have these cars plugged in at highly visible destination locations, because a lot of times when you see that car driving down the road you don't realize that it runs on battery. But when you see it plugged in and you get to ask

the people, "What are your rates? And what's the maintenance like?" Then I'm winning.

And actually I added a note in here about maintenance, because I do have maintenance contracts. I handle the maintenance for all of my locations for the first three years. I also have set up a maintenance agreement with the LADOT. And for me, maintenance is really not an issue. It's really about coiling the cord and taking the meter readings, because I'm using unsophisticated simple chargers that are really just glorified electrical outlets. So they're really dependable and I haven't had that many issues. So thank you so much for your time.

COMMISSIONER SCOTT: I like that, glorified electrical outlets. Thank you, Kitty.

We'll start with Joshua this time and we'll work our way down to Commissioner Peterman.

MR. CUNNINGHAM: Thank you for presentation, very interesting. I certainly attend a lot of those parks myself, so I'd look forward to having some of those chargers there.

I do want to touch on the maintenance issue. You showed that picture, which is obviously not what we want to see. And you noted you do have three-year contracts.

I guess a couple of questions, do you get good

support from your partner hosts, so like the State Parks or other organizations that help you implement maintenance and allow partners to come on site to deal with that?

And secondly, what happens after three years? If you've got a contract in place with EVS, EVSP or somebody else to do that what do you project is going to happen after the end of the three years for O&M?

MS. ADAMS: Okay. As far as partnership with the host locations definitely California State Parks are able. They have electricians and especially at these far out locations. And really the only maintenance thing I can think of off the top of my head was a nuisance trip we had at Leo Carrillo State Beach, because when the BMW i3 first came out it was a little glitchey in the communication protocol. And so after plugging in, unplugging, plugging in, unplugging, plugging in, unplugging it tripped the breaker.

So I called the Maintenance Chief, Angel Alba, and said, "Angel, can you go flip the breaker?" And he did and so it was as simple as that. But typically I put that sticker on and I have somebody respond to any problems within 72 hours. And because I'm -- like I said I haven't had the problems, but if I do I'm using low-cost equipment. So if I have to go out and swap out a $500 charger it's pretty simple to do. And then I can always bring that

piece of equipment back, repair it, put it out somewhere else.

MR. GREENE: I think one of the speakers this morning said that -- I'm going to exaggerate what he said -- there's really no place for this kind of charging he said: workplace, home, but this business of parks and so and so forth, he didn't see it. But you seem to have seen real impact of this in terms of those kinds of breaking down the barriers of unfamiliarity and lack of knowledge of vehicles with owners talking to people who are not EV owners.

What sort of even anecdotal or empirical evidence have you got on that score, as to what this accomplishes in that direction?

MS. ADAMS: Well, I agree with you 100 percent that 90 percent of the charging happens at home -- it's not going to change much from that -- 7 percent of the charging happens at the workplace, so we're only dealing with this 3 percent for opportunity charging. And of that 3 percent a lot of what we're talking about: corridor, commercial, that's better suited by DC fast charging. So it's really matching the dwell time with the proper level of charging.

In my particular locations, people are traveling 30 or 40 miles to get to the Getty Museum. Their average length of stay is three hours, so they're there long enough

to get a legitimate charge at Level 2 to get back.

And then also too like you said, the opportunity for people to learn about this technology and one of the greatest stories was when we were at the Muir Woods doing a ribbon cutting with PG&E. A family came from Indiana or something, and were asking us to pose for a picture, because they just don't even see EVs. "Oh, my gosh, a Tesla."

So these are also places where people that -- it's really easy to see somebody driving a plug-in car if you live in Palo Alto. But in some of these other far out remote places, this might be the only opportunity for somebody to see that. So for me it's all about the education and outreach going beyond just charging the cars and getting people to interact with actual owners. Because we've talked a lot about a lot how difficult it can be at the dealer. Where if that person goes to the dealer and they've already talked to somebody at Leo Carrillo State Beach, they're going in a lot more informed to make that choice.

MS. RYAN: Thanks for your presentation.

You may have said this and it just whizzed by me, but how you get -- do your participants come to you or do you kind of decide this seems like a great place to have chargers. I'm going to go persuade them to do it and

figure out a way to make it work?

MS. ADAMS: In the beginning it was really selfishness, where I wanted to charge, where the EV driver community wanted to charge, but I'm inundated every single day with requests for people to help them. I mean it's great that these are highly visible and I'm on KABC News with Mayor Garcetti, but the next day I'll get three emails. "Hey, I'm a city college over here, where does the money come from?"

So really, it's a lot of both and like I said I'm not able to help everybody. So that's when I point them -- I've referred them to NRG, to all these different programs that might benefit them. I also direct them to different rebates and things I know about. I have to say, unfortunately, I'm not seeing the type of -- you know, I got support initially from the OEMs. But now they're kind of taking a different approach, so most of my energy is coming from the utilities and the air quality management districts and the CEC. But these are different --

MS. RYAN: Energy or funding?

MS. ADAMS: Funding, yeah. Both, yeah funding and that part too. But I think also too it's just difficult to commercialize charging at these locations. At Fort Ross I mean we'll be lucky if five people plug in a week. But you really need that charger up there, because

there is nothing else around. And we want to enable people to come from the Bay Area to these state parks and get them to leave their gas-burning car at home.

MR. DUVALL: So David, there's actually another group called Charge Across Town, that are to the vehicles what Kitty is to the infrastructure. And also they run an entire organization almost entirely on volunteers and you can go out and we've used them before, and they come in and they -- anyway, the point is, is that for ten years I've been wondering about whether or not Iron Ranger works for chargers.

So thank you for that. That was worth the drive up.

MS. ADAMS: You're welcome.

MR. DUVALL: I have a couple of questions and I just want to make a statement and I think this was a fantastic presentation. And I would also use your counterpoint to caution everyone in here that says, "The answer is X, or its Y." Because in many cases, we simply can't -- we don't have the data to support a lot of this.

So do signs work? And there's a particular sign, in your opinion -- and you can speculate -- does the sign say that "EV charging park here last". Does that work? In other words, it not a dedicated EV spot --

MS. ADAMS: Yes.

MR. DUVALL: -- but it's a sign urging someone to be a good citizen and park there last.

MS. ADAMS: Yes. I've got a couple different -- I wish I had an hour, really, but at Hollywood and Highland LADOT made -- all the LADOT lots that I did they made special signage that said "These EV chargers are here to share. Please don't unplug anyone that's actively charging." I get so much communication at Hollywood and Highland between drivers. "Here's my cell phone number. It's okay to unplug me at 2:00 O'clock." So I agree that we do need signage and that communication to help people.

I know that at Muir Woods we did that as well, because of the ADA issues. And that one open spot we said, "Please reserve this spot for ADA. Use the other spots first."

And then I love this one, because Will Rogers State Historic Park -- which is in Pacific Palisades, a highly populated area -- every time I go there I see EVs that are not parked at the charger. And it might not seem like a success to everybody, but I love the fact that they're reserving that privilege for somebody who needs it more than they do. And that's this whole culture I'm trying to create. It's community.

So that if you have a No Charge to Charge Card, you're going to be like, "Wait, I'm paying for this. It

was in the price of my car." So you're going to want to plug in every chance you get, but because I think everybody feels ownership around what I'm doing I think it's more conducive to sharing and respect.

MR. DUVALL: The second is so you do still believe in the Johnny Appleseed theory, right?

So I'm sort of thinking I was at a child's birthday party up in Folsom with actually people who worked at car dealerships, a BMW dealership, talking about, "We're getting a lot of people to say they're interested, but they're not ready to make the switch."

And do you believe that there's a compelling interest at least in investigating the idea that if you find every destination like the ones you tend to pay attention to -- and put those two chargers in at an enormous cost, not recoupable, does -- because we're sitting here and most people will probably say, "Workplace charging sells vehicles." You're saying that destination charging at State parks sells vehicles. And I think you still believe that, right?

MS. ADAMS: I do. And I would answer on the Johnny Appleseed yes I'm still Johnny Appleseed-ing, because at Point Reyes, I passed the hat. That was a charger that we put in, in Memorial to Craig Childers, who helped me start Adopt a Charger. So we got a little bit of

money from TAM and a little bit here and we went into a place that didn't have adequate electrical. So what we decided to do with our $15,000 was install low-amp Level 2 in every other space, so that that could serve its purpose and get as many people access to electricity as possible.

At Hearst Castle, the reason why it didn't make sense to do Johnny Appleseed is because it's so difficult to work in that way-out remote area. So there I had to kind of future proof it a little bit, you know, figure out what the demand was going to be and accommodate that, because it's hard to go back in there. But for the most part I would tell people to do what I did at The Getty and upsize the transformer, put the wiring in so you can easily go back there and expand. And we're expanding at The Getty. Those 10 additional chargers are only going to cost us about $15,000, because we did so much up front on that.

MR. DUVALL: So my final point, and I apologize for taking so much time, but is that -- I'm giving here her hour, right? Is that I see here a intersection between something -- discrete choice experimentation -- you know, customer surveys aren't going to get us to the answers that you're looking for, that we're all looking for: this free versus not free, this destination versus workplace.

But a combination of something like what UC Davis is doing with household real-time data connection, driving

data. We've also got a similar project in Arizona and discrete choice experimentation around users of electric vehicles and maybe probable adopters, future adopters. There is some sort of intersection around here that I think needs careful consideration, because Kitty makes very good points. There were very good points made this morning. They're in conflict. And there's not enough data out there really to answer it. And I think if we could figure out how to solve this in the public domain? Someone may have the data and the answer that's not in the public domain. I think that would be worth discussing.

MS. ADAMS: I think for me, the answer goes back to my economics class in college, where all I remember is marginal costs have to equal marginal revenue. And right now, that equation isn't working for EV charging, but we can't wait. We've got to find creative solutions right now until the point comes where we can sell it, you know, where everybody can do it for 23 cents per kilowatt hour.

MR. DUVALL: But well it does if you do all of the societal marginal revenue. So if you do a societal cost benefit test on a lot of these things they look really good. They look really good. But it's a societal cost benefit, it's not a --

MS. ADAMS: Right.

MR. DUVALL: That doesn't help you if you're the

guy paying the electricity bill.

MS. ADAMS: Well, and it's interesting that you bring that up, because working with South Coast Air Quality Management District, you know, they're a Health and Human Services agency. So for them their priority is, "We've got to reduce emissions." So they're coming at it from an approach of let's get as many chargers in the ground. Let's get as many people plugged into those chargers. Let's get as many people in zero emission cars."

So it's just kind of also too when you look at all these different business cases everybody's bringing forward a different priority. So I think it's important that you bring that up, because that's very important to me too is that we also add in -- when you add in all the costs of healthcare and cleanup and all these other things, it really does help to bolster the argument for EVs.

MR. DUVALL: Yes.

MR. WARD: Yeah, hi there, Kitty.

MS. ADAMS: Hello.

MR. WARD: Thank you for a very laudable effort, this was great.

One question for you to start off, so when you used the CEC support that you had was that to adopt chargers, or did you use that as program funds in a way to support the rest of the process, or how in particular did

those funds help this Adopt a Charger effort progress?

MS. ADAMS: Well, you reminded me that I wanted to bring up something about this. I've touched on a lot of different CEC funds. It's been like that to get me over the top in a lot of places, combined effort so that I can make some things work. But in the case of the California State Parks, it was not happening. I went to them and they're strapped as far as resources and staff. They don't even have a full-time grant writer. They don't even have anybody on staff that looks solely at this type of thing. So for them, I knew that I needed to go after it in the biggest way that I could.

So that's why I applied for the CEC funding, but also too being able to use that to leverage all these other partnerships. My first round up was the Palma, the Monterey Bay Air Pollution Control District, LADWP, Southern California Edison. And then, now I'm able to still -- because there's traction there and because I had proven results with AQMD -- they came to me like, "Hey, we've got a little extra money. Can you use it at the California State Parks?"

So I think part of it for me was it really gave a lot of attention to the problem and helped to attract people that could be part of the solution.

MR. WARD: Believe it or not, that's exactly what

I was hoping you would say.

MS. ADAMS: Oh, okay. Great.

MR. WARD: So thank you for having an answer keyed up. But I think using public dollars to bring so much private attention and private support to an issue like this, I mean very well done. And take credit for that in your slides.

MS. ADAMS: Okay. I will, thank you.

MR. WARD: So a question about scalability, now that you have traction and you have attention, it sounds like you mentioned very specifically targeting school districts as a pointed way maybe to keep the momentum moving forward. But what does scalability look like? If you continue to build traction, build the attention that you have, how do you keep this from becoming burdensome for your own kind of personal daily agenda and how do you allow this effort to continue to grow over time?

MS. ADAMS: Well, that's a really good question. And right now I go back to I'm retiring when we get to the 1.5 million cars, because it is a lot work for me. And it's just trying to find people like me, that are willing to do this. And I found a lot of kindred spirit with Plug In America, The Electric Auto Association. You know, all those people, I showed in that first slide, those are just individuals like me that drive EVs and they want to see EV

charging in their areas.

What I think would be really effective, and I've told a lot of the utilities this already, is if they had a point person like me. Because a lot of time people are coming in and they represent the "one true way" or a particular business model, so when they're approaching a large corporate campus or these types of organizations, they have one way of doing it.

And if the utilities could just have somebody that gives them information, so they can learn about everything and help them make the choices, that would be really, really helpful to have somebody that's kind of agnostic in this process to just share information and help them come up with -- maybe they want to use Level 1. Maybe it makes total sense there, but if you're a charger salesman and you don't have a Level 1 product, then you're not going to be able to offer that up as a solution.

So I would say having more people to help navigate the process for these large organizations, because often times it's just too much money so they just don't do it when we could maybe offer up a different way. "Just put in some 120 volt plugs," or you know?

MR. WARD: Yeah, so I'm glad to hear you say that too. I think what you've built is probably attractive to a particular kind of person. And I think you have the

personality, but also the traction and the messaging. To hear you use a Facebook poll, for example, I mean that's very bootstrapping. This is an interesting way to get data, right? But at the same time to have people buying into let's have this online community where we contribute information to one another as a function of Adopt a Charger, that's great. And that's something that you can use to continue to build over time.

And I'm curious if the same flexibility and modularity you talked about for how you approach installing an adopted charger for a particular location, if you can describe your process as flexibly and as modularly such that other people you inspire can pick that up. I mean Johnny Appleseed, it took a long time for those trees to grow, but I mean the story's enduring and inspires people even today, right?

MS. ADAMS: Thank you.

MR. WARD: And so I think for you in a position like this, you can use the messaging very differently than other people in this room can. And so I think you should recognize that you're a unique champion in that way, and really take advantage of it.

MS. ADAMS: Thank you. You know you made me remember something that I forgot to mention, that part of the CEC grant for the California State Parks, one of our

other partners is PlugInsights. So what we're going to do is after our six months put out a user survey and just find out what does or does not work for the people that are using those EV chargers and get their feedback and be able to ask them. Then we can start to get ideas about what's the perfect price?

And also with the California State Parks I always wanted to use this as to leverage visitation to the parks. So can we use this to sell the annual pass? Can we use EV charging to build awareness of the State Parks license plate that everybody probably here has on order. You know, just different things to help bolster what they're doing, so yes.

Hi!

MS. PETERMAN: Hi, Kitty. Good to see you and thank you for the presentation.

Two brief questions, so one of the more important things to me than total utilization is predictability of utilization. And so I'm wondering with the chargers that you installed, if in advance of installing them, if you did any forecasting work with the parks or the entity to talk about how much charging to expect? And for example, take your charging case with The Getty, and seeing that their number of PEV drivers jumped from 3 to 36 was that anticipated? So if you could speak to that.

And then number two, do you install as a part of these chargers any educational displays or placards? I would think that the parks would be a great place to do a bit of display on, "This is what EV charging is and why it's good for the earth." So can we heavily maximize the educational opportunity as well?

MS. ADAMS: Okay. I wish I could say I had a sophisticated forecasting method for what goes where. But really most of it's dictated by how money I have to spend. So that's why I had to scramble at Hearst Castle and I still have a $20,000 budget shortfall there that I'm trying to overcome.

But so typically any place I go in I have money to install four chargers. But every other space, I do know that I have to build in that scalability. And a lot of it, I find, is just having that footprint. So getting them to eventually allocate that many spaces, because often times it's more about parking than it is about charging and just those simple low-cost things.

There's a lot of people actually -- Huntington Library, I can't wait to go back there. I still don't have money for it, but when they were doing their parking lot remodel I got to them and said, "Here's how you lay the conduit. Here's what we need." So that when I come back, it's going to be a lot less expensive to do this project.

And with the California State Parks I'm kind of trying to use that same strategy, because ADA is such an issue, and find out where they are doing parking lot resurfacing. Like Henry Cowell, that park will not happen until later this year, because we're waiting for them to update the bathroom. And then at that time it's a whole lot easier when everything's ripped up for me to go ahead and do what I have to do.

So identifying the opportunities way in advance helps that. But a lot of times I'm just reacting to what's available. At Point Reyes National Sea Shore they only have like 80 amps of power, so I have to figure out how can I serve the most amount of people given the resources that are available to me?

And as far as the outreach in education the park signage is one part of what it is with California State Parks. But the bottom line is those rangers need to be unplugging cars, because that's what makes you buy it.

Golden Gate National Recreation area, when we went there, they also got a DOE Clean Cities Grant. So they're driving around electric cars with the arrowhead on it. That's how you sell cars. And the rangers are the best sales people. They will sit there and answer your questions for 45 minutes. At Point Reyes they have a little placard that they hang in the car window, so that

when that car is parked there, people can read about it.

So, yeah just trying to turn those people, rangers, employees, into advocates, so thanks.

COMMISSIONER SCOTT: Thank you so much, Kitty.

Okay, so we will turn now to our next project, which is Matthew Marshall. He's the Executive Director of Redwood Coast Energy Authority.

Just Matthew before you start I'll remind folks if you'd like to make a public comment, please be sure to grab a blue card off of the table up front. Make sure that you can hand it directly to me or give it or give it to Tim Olson. And we'll go from there.

So we're just a little bit behind, Matthew, so I'll give you till quarter till for your presentation and 20 minutes after that for questions. Sound good?

MR. MARSHALL: Sounds good.

COMMISSIONER SCOTT: All right. Thanks.

MR. MARSHALL: Thanks for having me. As mentioned I'm with the Redwood Coast Energy Authority, which is a local government joint powers agency of nine local governments up in Humboldt County. And we primarily work actually on energy efficiency as well as energy programs and are actually in the process of moving towards launching a community choice aggregation program in 2017, which I think is going to give us a lot more room to work

in the EV space as well. And I'll touch on that a little bit at the end. So, the next slide?

And I'm just going to give the punchline first and touch on our progress so far and then touch on the key ingredients of success, some of the lessons learned and challenges and as far as working in a rural community and our experience. And then some thoughts on continuing and replicating the success that we've been able to achieve so far.

So as far as the progress that's Downtown Blue Lake, one of our cities. And so just to kind of capture the fact that we're a very rural community. We've got about 135,000 people in the County total and so that's split up amongst our seven cities and the County. And so it's a different kind of environment that we're working in, but we're really trying to move the dial in our community on EV implementation. And so next slide.

One of the things I wanted to point out is that the CEC support on not just infrastructure, but on the other pieces of the puzzle has been really critical. And so this is the rebates issued in Humboldt County. You'll notice it's kind of a slow trickle and they condensed months worth of zero in the rebate stats, so that's actually a much longer line of a trickle.

And with CEC funding, we actually kind of after

our planning project, at the tail end of our readiness planning project kind of did an initial pilot marketing campaign with a lot of radio interviews and (indiscernible) media and then culminating in kind of a Ride-N-Drive. And you can see the resulting spike in sales, which we confirmed with dealers is not an anomaly that it was really people going to the Ride-N-Drive, then going to the dealership and saying, "Hey, I liked that car." And I think the Toyota guy said yeah, six people that were at that event like the next week came in and bought a plug-in Prius.

So if you look at kind of a trend -- and I need to update this to more modern numbers -- but you can see there's that spike around March 2014. And we've been continuing to see a pretty good trajectory, although we want to figure out how to increase that and make it even a sharper number. But overall the numbers are small, because we've only got 135,000 people. But if you look at the overall percentage of new vehicle sales -- next slide -- you'll see that Humboldt County and the Eureka market is actually number three in the United States, as a percentage of new vehicle sales. So we're seeing a lot of adoption and we want to really kind of keep that progress going, so.

(Applause.)

Hopefully, that will be a continuing trend. So

I'm going to talk about our first our successes, you know, what's been kind of helping on our end move that number as far as selling electric cars, which is what we're trying to do is get people to buy electric cars. And so for us and our efforts, the CEC funding has really been critical and I'll touch on that throughout this presentation.

I think having some local leadership and capacity in our community, as a rural community, I think we had a few pieces in place that maybe other rural communities might not have or might have to figure out how to put that in place. I think the ability to have a robust planning effort. And then having that planning actually followed with comprehensive implementation, not just infrastructure but also kind of a softer side of things, has been a key component for us.

And then again I also just wanted to mention the community values piece, as far as our area has had a lot of solar adoption in the early days of the solar market. And I think the community really having interest, they deserve credit as far as the people that are actually going out and buying the cars and putting their money where their mouth is has been an important factor. And so I think in ways to kind of build that community, you know, is a key strategy as well.

So on the funding capacity piece, on the EV side

of things we've really had three pieces, and that's that comprehensiveness of having the readiness planning to help us figure out really what are the needs in our community? How do we move it forward in our area and then having fall-on funding to actually deploy the infrastructure that we identified as needed, or at least the first phase of that?

And then also, additional implementation funding for things like Ride-N-Drives and working with fleet owners and those other things that are going to help sell cars basically and not counting on the dealers to do that. And I think working with dealers is a key challenge, because they're often not the folks as has been mentioned, that have the best understanding of this. And they're not necessarily trying to sell the cars. And so convincing them to take up that piece is a challenge.

And then I mentioned here the capacity piece. I think there's the fact that we have a joint powers agency, for a community our size, that's focused entirely on energy issues is maybe not the norm. But I think it was a key factor in having these small cities that maybe only have a part-time city manager join together in having that kind of capacity to address energy issues through a joint powers agency, through that kind of a cooperative partnership of local governments, has helped us be a little bit more ambitious than probably our cities would be able to be on

their own.

And then we have the additional benefit of the Schatz Energy Research Center at Humboldt State University. So we've got that kind of technical heavy-lifting capacity, and I can't tell you how many projects that we partner on together; and also working with PG&E to kind of figure out local solutions. And so those, I think, are some elements of our success that I think other rural areas could look to figure out how to get those pieces together as well.

So as far as our planning we started out to say well where do we need infrastructure? And so the folks at Humboldt State put together an agent-based simulation model. And basically they took the Humboldt County Association of Governments transportation planning data and trip data, to figure out where people are driving. And actually combined that with some other data sets like hybrid vehicle registrations, as a sort of a proxy of where we think the EV drivers might end up. And then they also took trip survey data to figure out what kinds of trips people do as far as going to work and going to pick up the kids, or going to soccer practice.

And so they basically built an agent-based model, where they took these transportation zones and the road network in the County and modeled where these EV drivers would be driving. And then where they would be stranded

potentially or where they would need to charge. And I forgot this animation doesn't work on this computer here, from last time, so you just imagine little dots roaming around on those white lines and basically on an hourly basis. And then they'll have charging events. And then there would be times where they might be stranded, because they're waiting for a charger.

And so we used that model and they ran the model to sort of simulate this kind of build out, to figure out where would we need chargers, with the focus being on minimizing delays of full electric drivers.

I think one of the other questions is in our area we actually have more plug-in hybrid drivers. And so there's a second question of how do we maximize their electric miles as sort of a second priority of getting the Prius and the Volt drivers to use as many electric miles as they can. But our effort was really on making sure that a battery electric driver would not get stranded and would be able to complete their daily routines without being constrained by their vehicle.

And so the outcome of that, we were looking a sort of similar planning horizon to what the Energy Commission ended up doing with NREL. And so the numbers were a little bit different based off of the timing, but we basically came up with for about 3,000 drivers in community

-- which is 2percent of vehicles -- we needed about 60 public charging sites.

And again, we were focusing on those public charging needs with the assumption that at least in the early stages people are going to be charging mostly at home. But to fill in that gap as far as connectivity and making sure that people aren't limited in their use, especially in a rural sort of spread out community.

So we were encouraged by that number, because we were expecting -- we didn't know how big it was going to be once we ran this model simulation. And so that it was a manageable number for our community, we were excited to see that.

And then just to touch on this, one of the other things we looked at was actually looking at the potential impact to distribution infrastructure, and so I won't get into the details, but it was basically all the distribution circuits. We worked with PG&E on this and as you can see, the orange charging, that's with that 2 percent kind of build out, it has very minimal impact. And there's no area where the distribution level infrastructure was going to be strained or challenged by even a much greater penetration of electric vehicles.

So the bottom line is there's lots of gray space on those distribution circuits that we can take advantage

of before PG&E is going to start being worried in our community about the number of EVs on the road.

So following on that larger-scale planning effort, we then went in and did what we called a micro-siting analysis where we took those zones like Downtown Eureka, or Downtown Arcata, and then went down to actually finding specific parking lots and sites. And we had a kind of a matrix of evaluation criteria. And went through and figured out okay, "Well, okay. Within this area where we know we need three chargers in Downtown Eureka, where can we actually site those that's going have adequate lighting? You're taking into consideration ADA requirements. How far is it from the panel? Are we going to have to cut through an entire parking lot? What are the security issues? What are the amenities that are in the area that are going to cause somebody to be parked there for multiple hours?"

And for us, in a rural area, a lot of our public parking is also workplace charging. We don't have corporate campuses. We don't have any parking garages in the County. And so a lot of these smaller government lots are both serving the customers and businesses, as well as people that work in those areas. So it's really workplace and public in most cases, kind of a hybrid for us. They're not really distinguishable.

And so for each of those sites to we identified

and narrowed down, for the first phases of it we did fairly detailed preliminary plans and engineering cost estimates to really be as shovel-ready as possible to figure out what's going to be the actual cost of this? How are we going to meet the ADA requirements and really plan out those sites for installation and get to that level of detail as far as our planning effort? The next slide?

And then the way we kind of decided to move forward, and this came out of the process as well, is we actually have a publicly-owned network. So the Energy Authority owns and operates the charging stations we're putting in. And so we have Memorandums of Understanding with the site hosts. And then the reasons for that were one, a lot of these small communities didn't want to take it on. So the City of Trinidad is like, "We'd love to have charging in our public city lot. We don't want to have anything to do with it. Can you guys figure this out for us?"

And really even with the businesses, it was something that people were exciting about the opportunity, but didn't want to be responsible for when somebody calls and says, "Hey, this isn't working. Or we've got to update the software." They didn't want to be involved at that level. And so, we came up with this model where we would be the operator and then just have agreements with the site

hosts.

And then again the focus was putting chargers in places where we're enabling the vehicle use, reducing range anxiety, and not just focused on revenue generation. Because there are certainly some of the sites that are going to be highly used because they're in the middle of Arcata and people are going to the Farmers Market and the university. There's going to be other ones that are maybe important for somebody not getting stranded out in the boondocks, but isn't going to be used that much.

And so by having a whole network that's within our portfolio, we can spread those costs around. It's still going to be a loss leader for quite some time, but at least its less of a one by having that network approach. And then it gives us an economy of scale of on the operations, the maintenance and administrative costs. Again, so looking at trying to say we want to make sure that if there's one out here in the middle of nowhere let's get that in and fold it into the network, so that it doesn't become a site that nobody wants to develop because there's just not a business case for it.

And so we started out with actually five sites. All but one of those five was funded with other Energy Commission funding, and then next slide. With this last round of infrastructure grant funding we are putting in

another nine sites across the County and actually having a ribbon cutting later this week for that.

And then we're in the process of planning additional sites, again with additional follow-on readiness plan implementation funding, to be able to do that kind of detailed site design work for the next round of sites. That need to go in towards that total of 60 for this first phase that we're trying to pursue to get up to that 2 to 3 percent penetration level.

As far as lessons learned in challenges, the coverage-based build-out in a low-density area that increases costs is a big factor of just having this big geography with not a lot of population density. Rural infrastructure challenges have been another thing that we've had to try to overcome. And then the high costs and low usage in this early stage really is not a great business case if you're going to try to make money at this and not do it for other public benefits. Next slide?

And I think there's some text that'll appear on there. That's one of our charging stations that's at the Bigfoot Museum out in Willow Creek. And so if you look at that, it's really important. Those were one of the modeling works that nobody's going to be able to get to this half of the County unless there's some charging out there. But it's something that when you look at ADA

requirements, you look at the costs that you can't overcome that aren't spread out, when you're not putting in a bank of 20 chargers in one location, you kind of have a lot higher incremental costs for each one of those distributed sites? And so to be able to provide that kind of coverage instead of just saying, "Let's just put all 10 in this most busy area," it jacks up the costs significantly. And so the per charging location cost is much higher trying to provide that kind of coverage in a rural area. Next slide.

And in particular, the accessibility requirements for small sites, is a challenging hurtle again when you're only putting in a couple of spaces and one of them has got to be ADA accessible. And so we actually put together a guide for our own use, although we're happy to share it when working with the folks at the state, to have for site host guidance on how to make sure that you're meeting the ADA requirements. So that we're not putting an infrastructure that we're going to be challenged to show is complying with the law down the road. Next slide.

Rural infrastructure challenges, we've got out dated parking areas that sometimes need to be upgraded. Maybe they don't even have ADA compliant spaces as it is, so we've got to make that upgrade. We've had issues of copper theft of people cutting the cords and stealing them. And then especially if you've got to replace the whole

charging core along with cord that becomes a pretty big cost. And so that's been a challenge.

In some areas the cellular network for networked stations of not actually having quite a good enough signal to get the data transfer can be a challenge in rural areas.

And then actually just the panel capacity on older structures, so I mentioned the distribution level, we're okay. But this trench here is going to the panel at the Blue Lake City Hall, so that town we saw at the beginning. We were just putting in one j1772 Level 2 charger at that site. And it turned out that the panel didn't have capacity.

And then it turned out to upgrade the panel we had to update the service from PG&E and that the power line was not actually in conduit. So we had to trench it, put in conduit, upgrade the panel all the way back to PG&E's pole. And so again this is like the city hall/police department/library complex and they just didn't have even the capacity for one Level 2 charger. And so with older structures, in rural areas, this is something.

And also on the residential side, and I think in particular talking about future residential challenges, I think rural communities are going to see a similar situation where the incremental cost of just putting in one port can be pretty substantial. And if we don't have even

the size of a parking lot to put in ten it doesn't make sense. So I think that's a barrier for rural communities.

And so ultimately, the high cost and in the early days, lower usage for a rural area versus the Silicon Valley means that the business case for this, if we were trying to be profitable, is really pretty shaky. And that's where again I'll just reiterate that the Energy Commission's support to not have this chicken and egg scenario -- of like well we don't have the customer base, how do we build out the infrastructure? And being able to let us start pushing that infrastructure out and give people that confidence to buy vehicles in our community, has been really critical for us as a rural area.

And then as far as continuing, hopefully the success we've been seeing, I think EVs are a key sustainable transpiration strategy for rural communities. And I think there's a lot of opportunity as we've seen by the excitement in our community and we just need to help catalyze that. Next slide.

So one thing that is mentioned, 40 percent of emissions are being from transportation in rural communities like ours. And if you look at our region it's actually a much greater share comes from transportation. It's more like 60 percent or above is transportation, passenger vehicles, really. And so it's a key part of

reducing our communities greenhouse gas emissions.

And electric vehicles are really critical in the sense that when you look at other transportation strategies, EVs are hard in rural areas, but everything else is even harder as far as public transportation. We just don't have the density for putting in a light rail line or having every 15-minute bus service. We're working on bike infrastructure and trails in our community, but you've got longer distances.

And so really it's a lot harder to get out of your single passenger vehicles in a rural community. Not that those strategies are not being pursued, but it's really important to say, "Okay. We've got to get people a more sustainable approach to choose their transportation options."

And that's where as a community I think we really do look at the public infrastructure piece almost as a loss leader. Again it's going to be 5 or 10 percent of that charging demand maybe, but it's a key piece to make people feel comfortable.

And we have pursued the networked pay to charge model. I think there are two reasons why that was critical for us. One, we wanted to get the data, because we wanted to use at least this first round of infrastructure that we're putting in to inform the next round. And so being

able to line up the actual usage data with our modeled predictions, and be able to refine our modeling and refine our planning based off of real world numbers. And so having that more granular data, while we might not need it in the long run, is valuable at this stage.

And then the other thing is we have a lot of public sites that are publicly owned. And there's a question of gift of public funds. Are we giving away charging?

For us, I think we like to plan for success, and it's like, "Well, hopefully before I've got gray hair there's going to be a large number of EVs on the road in our community. Let's say 10 percent even." And if you look at the state's goals it's going to be 20, 30, 40 percent sooner rather than later. And even in 5 percent of that charging, if we're looking at public infrastructure, that starts to be millions if not tens of millions of dollars of fuel being dispensed at those public sites.

And so ultimately, we felt like in the long run, not there isn't space for other models, but we wanted to pursue it in an approach that our local governments are not going to be giving away tens of millions of dollars of fuel in the long run. And so we wanted to build towards a model where we did have that cost recovery with the understanding that we're trying to get people to buy a car, charge at

home, and this isn't a business venture for us as a local government at this stage in the game.

So this is back to Blue Lake. That's at the Blue Lake Rancheria, so the tribe is another one of our partners. And they're right next to the City. And as you can see three of the four spaces are in use when we took this picture. And that's some folks that work there, so again it's the workplace/public charging in a lot of these situations.

But we're excited to continue to work with the CEC to move all this forward. Thanks.

COMMISSIONER SCOTT: Great. Thank you so much, Matthew, excellent presentation.

Let's start with Commissioner Peterman this time and we'll work our way to Joshua.

COMMISSIONER PETERMAN: All right, very interesting, thank you very much. So March of 2014 that was pretty amazing when you quadrupled the number of vehicles sold, so you mentioned the outreach of that. Are there other incentives that apply to purchasers, or potential purchasers in your area? I presume HOV lanes aren't a big deal there.

MR. MARSHALL: HOV lanes are not an incentive although people still like it, because we do come down to the Southern part of California, down here in the Bay Area.

We consider San Francisco, Southern California. (Laughter.) And so people do care about that, but for the most part I would say we don't have a lot of even paid parking lots. I mean, there's a few meters in Eureka. And so there aren't necessary a lot of financial incentives the local governments have at their disposal. So I would say a lot of folks it's their environmental values combined with their -- a lot of folks actually crunching the numbers on the cost side of it.

And I think it's been also a good experience as far as it's a small community and so people talk to each other. And I think the performance aspect of it is one that more people are starting to realize as far as electric cars are just better cars and they're more fun do drive. They've got better acceleration and they're quiet. And so I think that's not to be undervalued as far as people want a nice car if they're like, "Oh, this is actually better than a gas car." That's a message that I think maybe doesn't get told quite as much as should.

(Announcement from WebEx.)

There is one factor that I think we've also seen that we have an underground economy in the agriculture sector, and there's a sliver of the population that is buying plug-in vehicles because then they can get on the EV rate. And so if you're illegally growing indoors, you can

-- so talking about gaming the system? We've talked to a couple of dealers who said, "Oh, we've had a couple people come in and say I don't really care what it is as long as it's got a plug in the car." (Laughter.) I would say that's not the majority of them, because I pay close extension.

And not to profile people, but in our community you can usually kind tell. Like if somebody has got gray hair and they're wearing a flannel shirt and their khakis they're probably not one of those folks. And so I wouldn't say the majority of the drivers we've encountered at events even fall into that category. But it is something that we're aware of.

COMMISSIONER SCOTT: Let's get the WebEx going again, so that the folks who were listening on the WebEx can hear the rest.

MR. MARSHALL: They missed some good comments here.

COMMISSIONER SCOTT: They did.

(Colloquy while WebEx is fixed.)

MS. PETERMAN: You just mentioned the EV rate. I was just wondering how do you work with PG&E, for example, in terms of making sure that your community is aware of the different rate structures available to them?

MR. MARSHALL: You know, that's something that --

COMMISSIONER SCOTT: Do you mind repeating the question just so the WebEx can hear since they're back online?

MS. PETERMAN: I just wanted to see if PG&E, the utility that you're working with, is actively engaged in your Ride-N-Drives, your outreach events, to make sure that customers are aware of so many electric rates available to them?

MR. MARSHALL: Yes. That's something that I think we're hoping to do more of. And so we work quite closely with PG&E on both on the efficiency side, but across the board. And they're a partner in our planning project. And I think they certainly have information and they participated in, and we work with them to get that out. I think again that dealers can sometimes be, I won't say the weakest link, but the least informed link sometimes.

(WebEx automated announcements continue.)

MR. MARSHALL: And especially for us with them that on the used car side of things that we're more of a used car market than a new vehicle market. And now it's getting to the point where there's actually an abundance of used vehicles available. And I think especially having gone in and talked to some of those guys, it's like they don't have the spiel quite down. They sort of know what

some of the talking points are, but I think there's a lot of education on that dealer side of it, because if they're not participating you can't really sneak yourself in there without their at least cooperation.

MR. WARD: And do those preferential rates, do they extend even beyond plugging in the vehicle? It's kind of a binary on/off if you have the plug-in vehicle, you can have a preferential rates?

MR. MARSHALL: Yeah, so the EV.

MR. WARD: It is?

MR. MARSHALL: Yeah, so it's basically the whole house. I mean, in some areas you can do a separate meter for the EV in the home, but actually our county doesn't allow second meters because they want to prevent illegal second dwelling units that were separately metered. And so there's actually a county-level rule against that. So it does -- again, that's where somebody could game the system a little bit if they've got something going on in their garage that uses a lot of electricity and they want to --

MR. WARD: And so when you had the outreach event, when you calculate the bottom line to them, is it beyond just how much can you save in gas. Its here's your total home and gas bill. Look how much you can save?

MR. MARSHALL: Yeah, I mean and the value proposition is pretty compelling. Gas prices are very low

right now, so it's a little bit less of a delta but saying, "Hey, if you're charging at home off-peak you're talking a dollar to two dollars of gas equivalent." We also have the highest gas prices, I think, in the lower 48 states and definitely the highest in California as a market in Humboldt. And so when people are paying $4 a gallon or 3.90 and you say, "Hey, this is going to be south of 2.00" that's compelling. I wouldn't say that's necessarily what gets people lined up to say, "Oh, I'm here to save some money on my bills." I think it has some other values associated with it.

MR. WARD: Great, and then just two comments for you. One, I wonder if you can tease out the relationship you have with Humboldt State, which sounds like a great one. I'm glad to see you work with them and that agent-based model I think was a good one, especially since it's home-grown.

No pun intended based on your earlier comments. (Laughter.)

But to look at talking to them about the neighborhood effect, if people are talking and that's what's helped maintained sustained growth? Because it looks like after you had that kink in May 2014 you did have continued high sales. But then also your coverage build approach I think is really interesting, making sure that

the folks can get where they need to go within the counties. And I think you could use that agent-based model to test model to test okay, if they didn't have that opportunity to recharge there, is that suboptimal for how we as owners of the infrastructure would plan?

And it'd be interesting if you would touch base with areas outside of California that are also relatively rural, that are also very proactive -- Vermont for example -- but really nice job. Thanks.

MR. DUVALL: Other than at one point, I was asked by some utilities in Oregon to write a transportation/electrification piece in Oregon in 2009. A lot of the rural concepts, you've actually followed them through, so good job on that. I thought that was very effective.

MS. RYAN: Yeah, thank you for your talk, a very interesting project.

Just quickly you mentioned you were doing some data collection, I think. I'm curious, I mean are you collecting data that is going to let you go back and validate the agent-based model you used for siting?

MR. MARSHALL: Yes. That's the hope is so we've been looking at a couple of different factors. And it's interesting, because the markets are rapidly changing. And so last like last summer's results don't necessarily play

to this summer. But one of the things is it's letting us help dial in kind of the costing piece of it of like okay if we're setting a price and we want to try to recover costs, I think that's in particular a challenge as far as far as network fees, because there's a fixed cost there of a monthly or annual fee. And if you're having substations that really aren't going to use that much, you're not spreading that across a bigger customer base.

And then also looking at the nature of the charging is another thing we started to analyze. Like are people plugging in for just a shorter period of time? How long are they there? How much are they actually drawing?

And again looking at that plug-in we've got Teslas, but we've also -- like I think the Prius is the most popular vehicle in our community. And so looking at what are the charge times? How are people using the infrastructure?

And then now that we've got a more robust build out to really line up the actual usage with the modeled usage. And start to see like, "Oh, okay. This one up in Trinidad we thought was going to be used this often and its being used much greater. Can we look at is that because there's more travel to the area?"

And also we're looking at doing some surveying as well to query drivers. Again it's a small community, so we

can catch people fairly easily and say, "Where are you charging? How often do you use the public infrastructure?" So that we can refine the modeling and hopefully use that to re-inform the next round and make adjustments as are appropriate.

MR. GREENE: So I think this was very interesting perspective from the rural areas where coverage and the cost effectiveness of it are a problem. This is not a new characteristic of networks. This is the way networks are, that the low-density areas where there is natural gas or electricity or telephones, old land-line telephones.

And so Kitty Adams had a really interesting solution, which I would characterize as monetizing the PR and public goods benefits, through sort voluntary cooperation. And so you decided to make this a publicly-owned infrastructure to solve that same kind of problem of serving low-density areas that it's hard to make money from. And those low-density areas give benefits to the rest of the network, because people can now go to Humboldt County in their electric vehicles.

Where do you see this going in the future? Is it going to be always a publicly-owned infrastructure, or is it going to have to be regulated, or what's the future of this kind of low-density network?

MR. MARSHALL: You know, that's something that I

think we ask ourselves often. And I think part of the answer is well we shouldn't try to guess at it too much and we should let it sort of evolve. And, you know, again it's still pretty early in the stages of this market. And so I think we saw this as the fastest way to get movement and implementation going. If we become obsolete as a network, that's fine. We're in this for the public good.

That said I would say a big factor for us as far as where we see it going, if I had to pick a route is, we're looking at like I said community choice aggregation. Which if you're not familiar with that, it's a hybrid between a municipal utility and an investor utility, where they still own and maintain the infrastructure, but we're responsible for the actual power procurement side of things.

And again talking about it, as a loss leader, if we're operating a community choice program the bigger impact in market share from greenhouse gas reductions, and also from a cost standpoint, is getting somebody to switch from fueling up at a gas station to fueling up in their garage. And so if we are losing some money on this public infrastructure to push people towards that predominantly home charging, but being a customer of our utility services, that's where the greenhouse gas benefit comes from.

And that's where there's business case as well as far as a public entity. You know, that that's where the -- the revenue is going to be from selling them electricity in their garage, not from the public infrastructure. And so if I had to predict for us, that's a key piece of it.

MR. GREENE: Thanks.

MR. CUNNINGHAM: Thank you for your presentation. I worked a number of years ago on some of the early efforts in California to get the readiness plans off the ground from DOE and with CEC.

One of the things that we learned clearly is that even if you can get local readiness plans put together at a county or a multi-county regional level, there's a huge challenge in capacity in ensuring that you get those best practices or templates or training for city officials for every single city within the county and that you implement those kinds of things.

So my question is, how has it worked in your county? What's the model that you've used to maximize the planning capacity within all the cities? And how do you ensure that that is robust? And the local officials know how to go out and inspect consistently the homes and the regional public planning siting, because I recognize how challenging that is.

MR. MARSHALL: Yeah, so as far as the information

piece of it, I think it's fortunate because we have a joint powers agency that's working with all these local jurisdictions to kind of engage them. And say we had meetings with planning folks and can answer questions when they have a question. They kind of know, "Oh, let's call the energy guys up and get some more info," if something arises. So being that kind point of contact.

You know, again I don't want to beat a dead horse, but the fact that the Energy Commission also gave us some funding to support continuing that effort. And to working our local government fleet operators, to working with our planning officials, to continue to provide them with that support, I think is a really good investment of funds. In the sense that a few hundred thousand dollars in the grand scheme of things isn't gigantic, but it makes a world of difference in the area that we're working in to be able provide that support. So that it doesn't slip through the cracks or it doesn't fall off the priority list.

COMMISSIONER SCOTT: Okay. Thank you very much.

All right, let us go on to our next project presentation, which is from Kapil Kulkarni who is the Marketing Associate at Burbank Water and Power.

And because Matthew talks just as fast as I do, we're actually back on track. So we've got about 3:20 or so for your presentation and then we'll leave about 20

minutes for your questions.

MR. KULKARNI: Okay. Thank you.

Hi, my name is Kapil Kulkarni with Burbank Water and Power, a department of the City of Burbank in Southern California.

And I wanted to thank the Energy Commission, Commissioner Scott, Commissioner Peterman, Commission staff for being here, for inviting me to present on behalf of our project and also for providing the funding that lead to me being here. So thank you, next?

A little about Burbank, we're a city of 105,000 people in Southern California about 10 miles northwest of Downtown Los Angeles. We're in 17 square miles. We have about 43,000 households and about 500 electric vehicles currently registered in the city, so about a 1 percent penetration rate per household.

We're the media capital of the world, self-proclaimed. But we also have in addition to those 500 EVs registered in the city we have a daily influx of studio employees, people who work at Warner Brothers, Disney and other studios, who come in from out of the city and want a place to be able to charge their car either at say workplace charging or public charging. Next?

And so our curbside program, which received the grant from the Energy Commission, is part of our overall EV

charging program. We're a utility that provides electric, water and fiber services, so the ability to offer electric vehicle charging, which is an extension of our existing electrical service made sense. And it makes sense because it's cost-effective through grants and service revenue and also in the way that we approach the whole program.

So my predecessor, Bruce Hamer, he's the one who applied for the grant and did all the hard work to actually get it. I just came in and took all the credit for it. When he retired he was in the engineering group. And the function for this program went from engineering to marketing and customer service, because we realize that the strength of the engineering group is to design and build these EV chargers and to install them.

The strength of the marketing group and customer service is to make sure that the chargers are available and customers know where they are. And that we're promoting the use of them as a way to get more EV drivers on the road and convince non-EV drivers to take up electric vehicles. And to use these chargers in the same way that my -- the other part of my job is to convince customers to take up energy efficiency and water conservation measures.

So it seemed very natural to move some of the functions to marketing and customer service, but still have engineering focus on their key role.

In terms of Grid impacts it makes pretty good sense, as most of you probably know, that for utilities to provide electric vehicle charging services as a way to balance the Grid and encourage off-peak charging. And also reduce greenhouse gas emissions in their territory and air pollution impacts.

So within the utility, we haven't had as much of an impact on the Grid as we might have 5 or 10 years from now. But one option we've considered with the whole Alliso Canyon situation is potentially shutting off these public chargers as a way to kind of reduce peak demand when there may be possible summer outages. So it's something that we haven't really discussed in terms of how these chargers might work for demand response. But we may find that out sooner rather than later.

And then I'll get to the environmental and policy impacts.

And so this slide provides an overall view of our charging program of which curbside is a big part. For residents we offer rebates of up to $500 for Level 2 equipment, not covering installation costs. And if they get a rebate from us they also have to go on time-of-use pricing. And we have a really good time-of-use rate to where yes you will pay 24 cents per kilowatt hour during summer peak times, between 4:00 and 7:00, but you will pay

8 cents per kilowatt hour after 11:00 p.m., which is of course the optimal time to charge, and on weekends as well. So when you compare that 8 cents per kilowatt hour to $4 for gas, which is the long term price of gas, it really is a good deal for customers to be on this rate whether they receive a rebate or not.

Same thing with commercial, they can receive up to $1,000 for Level 2 equipment making up for the fact that commercial and multifamily dwellings may want network chargers, which are more expensive. So that's why they receive a little bit higher rebate. And within Burbank, most of our commercial customers are either already on time-of-use rates or will be at the beginning of next year. And most of our residents will be on time-of-use rates in the next I'd say two to three years, similar to what SMUD is doing.

And so the curbside is part of our public charging. Initially, we put in 11 chargers at 6 different locations through Charge America and ChargePoint in 2011. And we've added these 16 curbside connectors at 8 different locations. And I'll get into the charging rates as well, but we do have time-of-use rates for these public chargers.

So going back to our initial foray into electric vehicle charging, this curbside project, which I'll discuss could not have been possible without the lessons learned

from this program. It was DOE-grandfathered. And then we also used experimental pricing to figure out kind of what market there was for EV charging.

So for the first six months from end of 2011 to mid-2012 we had a free-charging holiday. So it was a way to get mostly LEAF users and early Volt users, get them used to the stations, get them used to the technology, with the idea that we would eventually charge for charging.

That went to $2 per hours for about two years, which was a great way to get people to move their cars after they had been charged, or after they had been there long enough. But it wasn't a way for plug-in vehicles to use them widely, so if you had a Volt and it was going to take you three or four hours to plug completely it didn't make any sense to pay $8 in total when they could easily charge it at home or at their workplace.

So that led us to adopt a flat kilowatt hour rate in 2014. And in 2015, we adopted that peak-period pricing. We kind of reduced the overall charging rate and then added the peak rate of 31 cents. So from that initial charging program, we found that the market was definitely there to support additional efforts by Burbank Water and Power, by usage of the chargers doubled every year. This was hopefully in addition to customers charging at home or at their workplace.

And also an economic development issue. If they live in Burbank, but they worked in Glendale or Los Angeles, we didn't necessarily want them charging in those cities. We wanted them to charge in Burbank. So they could charge at home, they could charge at these public chargers. And so we're thinking that there wasn't enough of a market to have public chargers available whether they were charging at home or not.

And then we also got a lot of feedback from customers through surveys and through other online materials we submitted. Customers wanted more chargers, so there were 11 throughout the City of 17 square miles. But that wasn't enough. If usage is doubling every year, than at some point, that's going to stop or level off. So we wanted to make sure that we can address not only the market increasing and new drivers coming into the City, but then handle chargers in different locations.

So the initial 11 chargers were located mostly in Downtown Burbank, as Johnny Carson used to talk about, but we wanted to make sure that we had other parts of the city covered. And we also wanted to make sure that the chargers were accessible to multi-unit dwellings.

So the initial chargers are mostly in Downtown Burbank, which is a commercial area. There are some multifamily buildings around there. But there was a lot

more potential for getting these multi-unit dwelling users throughout the rest of the city.

And also convenience, we wanted to make sure that customers could use these stations as easily as they could use a gas station. Equitable pricing: going from free to just $2 per hour, to a flat-rate, to the time-of-use rate.

And then also more enforcement, so everyone's kind of talked about making sure that gas cars aren't taking up these spots. And as we're seeing now a secondary issue related to that is electric vehicles parking in those spots, but not charging or being fully charged and not moving their car. So we ought to make sure that we would be able to address having more turnover, and more people being able to use those stations.

And based on all those finding is how we developed Charge N Go. The planning started in 2014 and we applied for, and received the Energy Commission grant that year and then installed the chargers in 2015, in the summer. We like to think of it as the first curbside project in the country. I'll debate anyone if they want to make that claim before us, but I haven't seen -- I guess there have been other curbside chargers, but not to the extent that we put them in Burbank.

So there are 8 dual Level 2 chargers at different locations throughout the City, so there's 16 total

connections at 8 locations. And probably the most interesting part of this, especially to people who may be in the utility space or public agency space, but not in the charging space, that they're curbside. So it's the same as any parking lot charger, but it's just located at a different part of public infrastructure. So it's on a sidewalk. A car can just pull into a public parking spot and charge and go.

And two-thirds of the cost is paid by the CEC. The remaining cost was paid for by our Electric Division. And we think that based on kind of conservative estimates we'll achieve a payback of five to ten years. So there are different issues about the role of public chargers and I'll get into that later, but I wanted to get into additional details and lessons learned from this part of the project. Next slide.

So as everyone else has talked about, there are a lot of details that go into where these chargers are located and how they're installed. Kitty talked about how each park is kind of different. And Matthew talked about how you might have challenges in rural areas. In this case, there are different challenges associated with curbside.

So based on the feedback we received from our first effort at this we wanted to make sure that these were

dual chargers to maximize the conduit, trenching and digging that went into it, in terms of those costs to minimize those. And also put in retractable cords to make sure that the cords weren't a tripping hazard when going from the street to the sidewalk. And just make it easier for the customers, so that they didn't have to wind up the cord or walk back to the unit once they were done.

And also, I think the initial charging program, from 2011 laid the groundwork for internal outreach with other city departments including public works and police and traffic, which are very vital to having a curbside charging program.

So within Burbank we got a lot of support from our General Manager Ron Davis, who is now the Acting City Manager for the City of Burbank. And also from Jorge Somoana, who's our Acting General Manager, who was in charge of electrical distribution. So they've worked with our City Council and the Burbank Water and Power board to make them comfortable with overall EV charging and expand that to curbside chargers.

And we also began discussions two years ago with our Public Works Department since it's their property in the sidewalk that we're installing this equipment and making sure the permits and ADA access is satisfied.

And then also working with police and traffic to

develop an ordinance that would allow us to do a couple things: one is to limit parking at those curbside chargers to two hours in order to encourage turnover and make it no different from other public parking spaces in Burbank.

We also put in an ordinance allowing for even private charging networks or private market entrants to come into the market and be able to use our electricity to resell for charging purposes. So we don't consider that reselling, but they do have to comply with our ordinance and fee schedule that mentions maximum charging rates or charging rates must be set at this level or cannot exceed this level for Level 2 and DC fast charging.

So we did that not only to kind of set the market for what these costs should be, but also to make sure that customers weren't inconvenienced by high prices.

So if they saw that charging rates were a couple dollars per hour or say a dollar per kilowatt hour, it would discourage them from using not only those private charging networks, but also potentially from using our DWP public infrastructure.

And also, probably the biggest headache -- I think someone else talked about headaches with these projects -- my biggest headache was outreach to businesses who complained about the City taking away their public parking spaces. The ones that their patrons had been using

for a long time, had become expected to use or kind of accustomed to using, where they could just pull in for five-ten minutes, drop off something, say at a drycleaner or pick up something at a liquor store and then move on. And by reusing these parking spots from general use to electric vehicle charging only, we weren't necessarily taking then away, we were just making sure that EV drivers had the same chance to use them where the infrastructure was.

And so that's been the biggest challenge. I guess there's never enough outreach you can do to make sure that you're putting the chargers in a location that's somewhere between too popular and not very popular. So we want to make sure that the chargers are in a location that isn't hidden away or doesn't adequate street lighting, but that also will be used throughout the day and throughout the night.

So curbside is also a way to address all the different charging scenarios from destination to corridor to workplace and even multifamily dwellings to where if they're located and sited correctly they can be used by workplace chargers and by destination chargers during the daytime; and then by corridor and multifamily dwellings users at night.

And other big parts of this project were just

local and regional media. So local media, having news media at the dedication event that Commissioner Scott and others attended in August, was a good way to get the public interested in curbside charging, but then we also have to do mass market promotions of these chargers to let customers know who otherwise wouldn't necessarily attend an event or care about an event. But let them know that if they do decide to -- king of get it in their head that there are resources for electric vehicle adoption that the utility can provide and that manufacturers and dealers can provide as well.

And another big part of the project is data collection and analysis. So Greenlots has been a big partner in this in not only addressing a lot of the needs that we have from our initial project, but also making sure that customers were getting satisfaction and getting good customer service, so putting in the retractable cord, the credit card reader that allowed for the third-payment option beyond a smart phone and the RFID card.

And just all the data collections we're able to get from Greenlots through their dashboard and website, which I can access. Right now, if I wanted to I can access it at home, figure out which stations are down, and then put in a call to our DWP electricians to make sure that they can go out and visit a site in case the charger is

down.

And also a big part of this was the UCLA Luskin Center for Innovation, which developed the SoCal EV Readiness Plan, and has been a partner of ours throughout this project from initial selection of the sites, final validation of the sites through a travel model they developed, and then also analysis of the usage over the first six months of the charging program.

So I wanted to include a few pictures of the curbside chargers. As you can see, they're just like some of the chargers we've seen earlier in presentations. And I think once we are able to put some additional branding and stickers on this -- we definitely need to put PlugShare stickers on there. It's a little bit more inviting than the other infrastructure you see in the picture.

So the meter cabinet you see behind it, the water meter cabinet in front of it. So we like to think that this is part of the City's infrastructure and we want to make sure that customers are aware of it whether they are driving by or walking by. And this charger is located near a library in the center of Burbank and also next to a park. And you can see multifamily buildings behind it. And I'll get into how we know that those residents are using the chargers. So this has been one of our most popular locations.

Another one, in northern Burbank, it's near a Starbucks, so we know we're going to get pretty good usage out of that. I don't know if you can see in the last picture, but in this picture, you can see parking T's, which are just little T-shaped signs in the road showing where the EV could park. Most of Burbank does not have those, so we're able to make this a little more innovative by putting in those where the chargers are located.

This one is near Downtown, but in a pretty busy commercial area. And it's always nice to see the "Golden Arches" in the background. So you can park your car there, run across the street, get some food and then run back to burn off those calories that you consumed at McDonalds.

And then this one is in front or the SoCal AAA Auto Club, their office in Burbank. So Southern California residents can come to this location, pick up maps or whatever else they do at AAA, and charge their car there if they need to. So AAA has done some pretty good work in outlining the case for EVs in previous marketing they've done. We had to make sure that this station was visible to those users and those drivers.

And it also happens to be across from the Starbucks. So we figured that we can piggyback on their efforts. They must know a lot about where they put their coffee shops, so we want to make sure that we're putting

our chargers nearby.

This is a map of the eight curbside locations. It might be a little hard to see, but you can see the pink dots in the yellow area, yeah right a round there. Those are the initial chargers that we put in through ChargePoint and the grant we received in 2011. As you can see, that is mostly in a commercial area Downtown off the 5 Freeway. There is some multifamily, which is dark green around there, but those chargers weren't really covering use by other residents or other locations throughout the city.

So we scrubbed it up pretty well and as you can see the 537 South Glenoaks, to the southeast of Downtown, that is very surrounded by multifamily dwellings and multifamily units. And we know, based on the data we've collected from Greenlots that those chargers are being used by multifamily residents who come home in the evening, around 6 or 7:00 o'clock and are charging until 11:00 o'clock or even charging in the middle of the night.

Other locations, we've got 2034 N. Hollywood Way, which is located near the airport, which is where we plan to put in additional charging. And then just to show the different land uses, light green is single family. We know most of them are going to put in Level 2 or have access to Level 1 charging. And we wanted to make sure that we're reaching other land use types.

The schools and churches and hospitals are in red, so I think that's another area that we target. There's always more multifamily targeting that we can do. But we want to make sure that we can address other land use sites as well. Next?

And the last map was generated by UCLA. This chart was also generated by them. As you can see, the chargers went online the first week of August. And it took about four weeks for the use to get up to a level that we consider normal.

You can also see that charging dips at the end of November and into December. As the holiday season approaches and people spend more time at home or less time out and about. But then usage has really picked up to the first week of January and just the cumulative usage over time increasing. So that's through January.

The next slide will show even since then, which is kind of surprising as well that, you know February has less days than January but there was more usage. And it's really jumped, almost doubling from December through March.

And so that's the kilowatt hours on the left hand side up from about 3,500 to nearly 7,000 kilowatt hours, just from these curbside stations, not counting the other public chargers. And revenue that's surpassing $1,000 per month. So we think that there is a case for municipal

utilities to provide public infrastructure for charging, based on the fact that the service revenue and the charging rates can be used to reduce the payback for this equipment and help generate funds for new chargers. Next?

This is an interesting graph that UCLA also helped us with just showing the share of charging sessions by time of day and in terms of the hour that they start. So you see like a twin peaks effect to where like most people, especially government workers, we get lunch from 12:00 to 1:00. And that's when we go start charging our cars as that's when we go out for lunch and are able to use these public chargers. So that's the peak for both curbside and parking lot chargers.

And then, during the middle of the day, which is when you see most destination charging whether its people going to a retail store, or going to a park or library, or going to a school, you'll see that parking lot chargers, which were mostly in the Downtown area exceeds use by curbside.

But then later on in the evening, as people come home from work and there's a charger in their neighborhood that they're able to use, whether it's a multifamily resident who has no other option or a single family, or even someone going to a coffee shop in the evening, you'll see that curbside use exceeds parking lot use both between

7:00 and 8:00, and also a little bit in the hours after that. And then another thing you see is early morning charging by curbside between 5:00 and 7:00 a.m. exceeds similar usage in parking lots.

So we don't know exactly who's using these stations, but we know from some matching of date between customers who live in Burbank, who live in multifamily residences, who leave feedback, either through Greenlots or through PlugShare, or even just contact us directly, that they're very thankful to have these chargers there. And it's something that would not have been possible with parking lot chargers or a different type of project.

We also did a survey in March and early April of this year both of the 200 or so users of the Greenlots app, whose email addresses we had, who had been using the curbside stations, as well as a few thousand other Burbank residents whose email addresses we had and just contacted them to get information on what non-EV drivers think.

So the actual scores are probably not as important as the relative scores. And you can see the thing that's lacking in customer satisfaction is availability. So that goes back to enforcement.

It's pretty similar for curbside and parking lot, but we want to make sure that the users of these stations are able to use them when they need to. And that whether

they're charging between peak hours or off-peak hours, that they're paying a fair price for them, so they may not like the pricing -- as you can see that score is a little bit lower -- but I think they're thankful to have multiple payment options to pay for the service.

So I think what we found is that we will continue to do monitoring of charger status and usage. And I think Mark had mentioned earlier that trying to service these units is like playing Whack-a-Mole.

And what we did was, when we first installed the chargers with ChargePoint in 2011, we had ChargePoint handle the maintenance. Over time we realize that we wanted to experiment and see if Burbank Water and Power could do all the maintenance, because we had electricians on staff and we thought that with these chargers that it may not be too difficult. And we can experiment to see if we can achieve better satisfaction with the utility handling the maintenance as well as the ownership and operation rather than say ChargePoint or Greenlots.

So I think we're still in the experimentation phase. There have been some issues with reliability of, I don't think it's the equipment. I don't think it's the utility. It may have to do with the customer trying to pull out the retractable cord before they've actually authorized the payment.

But we've had a lot of success working with Greenlots and their contractors to make sure that they can fix any resulting equipment issues since the units are still under warranty. And over time the maintenance issues may subside as customers get more used to different types of chargers and the way that they're supposed to use them.

So I would think that where now the City has 28 chargers in the area, in the city, if we get to a level of 50 or 100 it may make more sense to where the utility can't handle that. And we'd go back to having ChargePoint or Greenlots or a third-party do the maintenance. But at this point we're still evaluating the work load of the utility handling the maintenance, but we want to make sure that we leave all our options open and involve the market when we need to.

I think we've increased customer satisfaction not only by putting in more chargers, but then making them more easy to use. But we still have to address the residents time, enforcements. And make sure that customers, if they want to pay through their utility bill if they live in Burbank and work in Burbank and just like to go out and use these chargers, that it's easier for them if they want it on their utility bill.

And then the thing that probably is not only a citywide focus, but a statewide focus, is just expansion of

the network and then also accessibility for a multiunit dwelling residents and making sure that they aren't left behind by a focus on other types of public charging.

So I wanted to thank the California Energy Commission, Greenlots has been a great partner in terms of the equipment and just strategizing for our charging program, Dynalectric which did a lot of the trenching and digging to make sure that the chargers could be connected to Burbank Water and Power service, the UCLA Luskin Center for Innovation, which is doing a lot of analysis as to the effectiveness of our program. And then Cherry Laysig (phonetic) of Silver Consulting (phonetic) for grant administration, who helped write the proposal. And is working on our final report to the CEC, which is due on Friday.

So thank you for your time and I welcome lots of questions.

(Applause.)

COMMISSIONER SCOTT: That's a nice preview of the report I guess that we will get on Friday. I just also wanted to say that it was a lot of fun to be able to go in and due the ribbon cutting at those curbside chargers. That was neat. Thank you for inviting me to that.

MR. KULKARNI: I wish we'd had had the electric bus. I spent weeks calling around to see if we could have

an electric bus ferry everyone around and we could not find one, but now we do, so for the next one.

COMMISSIONER SCOTT: Excellent. So let's start with Joshua this time and we'll work our way down to Jake.

MR. CUNNINGHAM: Thank you for your presentation. You're doing some I think interesting experiments with the public charging pricing. We need to see more of that throughout the state, kind of going from a free then to a flat fee per hour, to pricing per kilowatt hour. So it's good to see some experimentation. Hopefully, you're learning what is working and what's not working to get the right amount of usage.

I guess my question is on the residential side. You talked mostly about your curbside, but you do mention on the residential side in order to get the $500 rebate, you require the households to do time-of-use rates.

Did you or the utility work with the households to get a sense of what the impacts on the bill were going to be when they factor in the whole house loads and everything else. Because there's always an education process there to make sure that they're thinking about, "Do I want to take that rebate?" knowing that the rest of the bill on the house might get changed.

MR. KULKARNI: Right. Yeah, good question. I guess we benefit by the fact that Burbank Water and Power

put in smart meters at all or our residences and businesses around 2011. And so the option for our customers to have garage only time-of-use pricing is not there, so as you said there is going to be an impact if they switch from the tiered rate to a time-of-use rate.

Unfortunately, we don't have as many tools as we would like just because there aren't as many EV drivers out there that are considering the switch. So we think there's a market currently of say 500 EV drivers and there would be a few hundred that may want to consider it in the near term. And we found that any sort of software to handle it on a larger scale would be tens of thousands of dollars. So we didn't think it was a good investment at the time.

A lot of times it's just me and a spread sheet. And if I've developed a good rapport with a customer -- and I get probably one or two of these inquires a week -- I can do the analysis for them based on an example summer month and an example winter month.

We found that if they're able to manage their usage, which most EV drivers are, just by the fact that they know to charge after 11:00 p.m., that a lot of them do end up saving I'd say $5 or $10 a month or even 20 bucks a month. And I try and tell them that the utility is going to switch to time-of-use pricing for all residents in a couple of years. So you're going to have to go down that

path anyway, so you might as well try and get the rebate now while they're available.

And even if they're not better off currently, there are better ways that you can reduce your usage through other energy efficiency programs and still come out ahead by on this time-of-use rate.

MR. GREENE: Thanks for the presentation.

I made a note, and I guess I got this from one of your reports that the charging revenues became sustainable. I could have gotten that wrong, so correct me if I made a mistake there. But you showed, I think, five to ten-year payback, something like that. Could elaborate on that?

MR. KULKARNI: Right.

MR. GREENE: And you also showed revenues, which if my math is right or my arithmetic rather, it came out to -- the total revenues and maybe I'm interpreting that wrong -- were $1,500 per charger per year for this 8-charger Charge-N-Go complex?

MR. KULKARNI: I think it was about 1,200 per, for the last month, for March of 2016, for those eight dual chargers. So over the course of the year as the usage increases, that may go up to say $10,000 per year.

I think what we found from the initial installation was I think we received about 50,000 in revenue over the last five years from the parking lot

chargers. And our net cost of that, minus the grant, was right around that amount. So we've already paid back that project.

And a lot of it did have to do with the price when we put it into effect. With two bucks an hour we may not have made it as fast, so initially when we put that in place the revenue dropped, because it became a little bit more expensive for some users. But over time, because of usage doubling the revenues have continued to increase. So we've pretty much paid off the parking lot chargers, minus the cost of the grant.

And we think that if we continue to apply for grants and have those available, as well as use other funding sources such as the Low Carbon Fuel Standard Program, which we opted into at the end of last year. And we can make this sustainable.

So I think sustainability can mean a few different things. The main thing is that we are able to show that we can generate revenue from these stations. And continue to not affect non-participants and make sure that only participants are paying for the service. So if we did it for free, like a lot of agencies and cities are doing, and everyone else is just paying for it. So we wanted to avoid that approach.

MR. GREENE: But the revenue is the gross revenue

from that?

MR. KULKARNI: Yes.

MS. GREENE: Okay, thanks.

MS. RYAN: I'll pass. Thank you, good presentation.

MR. DUVALL: So, I've always thought about curbside parking in the city right-of-way for a long time, so almost as long as Iron Ranger. So thank you.

And because I thought your presentation is so good I'm not going to mention a certain curbside installation that is outside Duke Energy Headquarters in Charlotte, North Carolina, that's about three years old. And because I don't think it's exactly the same, but it has been tried.

MR. KULKARNI: What? (Laughter.)

MR. DUVALL: No, this is better. And so now I'm going to my question. So I couldn't tell from the pictures. These locations are served, and I'm just talking about your curbside, a combination of underground and overhead distribution?

MR. KULKARNI: Yes.

MR. DUVALL: Okay. With the underground distribution I take it you've installed a separate meter. You've gone from your vault to a separate meter; is that correct?

MR. KULKARNI: Actually, I think there is underground work that was done, but all the service connections are from the pole.

MR. DUVALL: Okay.

MR. KULKARNI: So I guess the only underground work was to get it from the pole to the charger and to the meter cabinet.

MR. DUVALL: Okay. You're only at low voltage when you're coming to the meter cabinet?

MR. KULKARNI: Right.

MR. DUVALL: Okay. Did you ever -- I think there's an NYSERDA project in New York where they're actually strapping, they actually affixed the EVSEs to the utility pole; did you consider that at all?

MR. KULKARNI: I think LADWP is also considering that. And we're hoping piggy back on their efforts and have them do it first.

We didn't consider it just because I think when this project was first conceived two years ago, I don't think there were that many options back then. But we thought this would be a better solution just to be able to have them more visible and put them in public locations whereas with a pole, it may not be as convenient for the user.

MR. DUVALL: Okay. As we know, the OEM is

standardized on a number of things. Two things they did not standardize were DC charging and where to put the port on the vehicle. So if you're dealing with like Chevy and Ford where it's in the driver's side versus Nissan where it's in the front, or some of the other ones where its back passenger side, do you notice a difference in users, just casually? Have you noticed a difference, because some vehicles it's a lot easier to do curbside, because you don't have to stretch it over the hood of the vehicle or stop short or things like that.

MR. KULKARNI: Right. That's a great question that we actually talked about internally at our utility for a long time. And there were a few different viewpoints. One was that J.R. DeShazo out of UCLA told us, "Well, you know, 90 percent of cars are on the right side of the car, in the front, so don't worry about it." Whereas my boss who is the marketing and customer service manager, she's like, "Well, you still have to worry about those 10 percent of people, because they're going to be the ones that complain."

So there is the customer service aspect to everything we do, to where we can reach 99 percent of the market, but there's still going to be that 1 percent who are frustrated by the inability to use the charger.

So we worked with Greenlots to put in an option

to make sure the cord is long enough. And we actually measured just in our own utility parking lot -- put two cars side-by-side next to two chargers that weren't really optimized for curbside -- but just kind of guessed to see how far they could reach. And I think the 20-foot cord was able to reach around to the other side to get to the Tesla or to get to the Volt. So it was something that we thought about.

And we haven't heard any complaints about users trying to use them since them, so maybe it was kind of academic argument. But UCLA has found that there's one station where one charger is used three or four times as much as the other one, so there are maybe the same driver or a similar car pulling into these station using the same charging spot. And if they use it enough maybe they someone knows that, "Oh that guy is going to take that spot, so I'll park behind him."

And there may be some kind of community aspect to it to where people able to know each other's patterns and when they're using the spots and keep them unoccupied.

MR. DUVALL: The difference between your gross revenue and your -- what is the difference between your gross revenue and your net revenue; is it about 30 percent?

MR. KULKARNI: For the grant or for the charging fee stations?

MR. DUVALL: The charging stations themselves on a session-by-session per basis in terms of the amount of revenue that goes toward the operating the financial?

MR. KULKARNI: It's about 10 percent.

MR. DUVALL: Oh 10 percent, okay. That's really good.

Okay great, so ten years from now every PEV's got a DC charging port, charge times are as low as 12 minutes. And yes we'll all be hearing more about this in the coming months. Do you see yourself taking this neighborhood concept even farther where you stop and 10, 20 minutes, and you're done and you drive off?

MR. KULKARNI: I guess we want to make sure that whatever type of charger is located everywhere, so we are planning to install our first DC fast charger. But it's in a parking lot location, so we want to make sure that our customers are able to use them. But that that's also for range anxiety and not necessarily for daily everyday charging. And so it's important to have that type of station in the community as well.

MR. DUVALL: There's a station set up in Atlanta, and it's not exactly curbside like you've done, but you really can pull off the street and there's maybe seven or eight parking spaces. And there's a mix of Level 2 and there's a DC charger there. And that would be very

interesting to see somebody to true curbside with DC in a really high-traffic area. It could be very interesting, because its one spot. And you could serve a lot of cars, because chances are it would be empty when you came up to is, because you would have a very short dwell time.

MR. KULKARNI: Yes.

MR. DUVALL: All right, great. Nice job, thank you.

MR. WARD: Yeah, a great presentation. Thank you very much.

And thanks for sharing the data comparing the curbside with the parking lot by percentage of time of day, for example. Did you see a difference in the total usage by parking lot or curbside; was one used more frequently or a greater number of incidents than the other?

MR. KULKARNI: Sure, yeah. It's kind of complicated just because the parking lot chargers have been in place longer, so they are being used more. But I think the curbside usage is catching up.

So when you look at current situation, the parking lot chargers are being used maybe six times per day. The curbside ones are being used three to four times per day and that's up from one or two times per day when they first were installed. But then also, the curbside usage was much greater than the parking usage in the first

six months.

So it's a combination the market being a lot bigger now to where you would expect that. But then also if you're going to Downtown Burbank for lunch and you need to charge, you're not going to try and use the curbside stations unless its nearby. So some of its based on location, some of its based on drivers using the same ones all the time and adjusting their habits to what they already know is in the community.

But over time, because we have at each of these six parking lot locations there are pretty much two chargers at each one. So it provides a good comparison of per port, per location, in being able to compare them over time. To where potentially we could see maybe more development or just more even differentiated pricing to get people to use the curbside ones if we find that there's more space availability or if the Downtown ones are always occupied.

MR. WARD: Okay, thanks. And then I really liked Mark's last question about where this goes. I think he shot for the long term and maybe I'll rein it in just a little bit --

MR. DUVALL: Ten years is not long term.

MR. WARD: Well, okay.

MR. DUVALL: I mean, it's just around the corner.

MR. WARD: Well, okay.

So how do you plan between now and ten years? So you speculated about the 50 to 100 that might be part of the portfolio some day. How do you balance across this curbside concept with garage concepts with potential other concepts that were mentioned by the payoff?

MR. DUVALL: Fair enough.

MR. KULKARNI: Yeah, I think we're open to all different scenarios. And I think we'll hopefully be able to rely on UCLA and SKAG to help us with that as well as see if what our other neighbors are doing.

So I don't think we have a plan as of yet, because I think the emphasis is still on residential and workplace charging. And that's addressing what others have talked about in terms of providing rebates for that and not just bearing all the cost ourselves.

So we want to make sure that the number of EVs goes from 500 to 1,000, to 1,500 or 2,000 that residents are incentivized to charge at home either through time-of-use rate or through installing Level 2 chargers.

So I think these are mostly for range anxiety, and also as Kitty said, to make sure that chargers are available. So that you're actually going out and -- I go to Will Rogers State Park, I go to The Getty, I go to The Getty Villa. But I mostly go in my minivan, because

sometimes it's easier to know that I have that option available. But if I know that there are chargers at these destinations and locations I can replace the minivan that gets 20 miles per gallon with my Nissan LEAF. So I think it's important to have not only public chargers, but also destination chargers.

MR. WARD: Well, next year you can get a plug in minivan so you can just replace it with a plug-in minivan every (indiscernible)

MS. RYAN: All right. I thought of a question, so I'll give you the full gamut.

MR. DUVALL: I think Jake and I used your time, Nancy.

MS. RYAN: Well, I didn't see -- yeah, I want to fight that. (Laughter)

No, I think also looking long term I'm curious what the utility's perspective is about its role relative to the role of other third-party charging party charging companies? You see like particular segments of a market that utility would focus on serving versus these other players and maybe you're already seeing that now.

MR. KULKARNI: Yeah. I think, based on the interest I've received from other public utilities in Southern California -- and Bill talked about this -- we have an EV working group through SCPPA, the Southern

California Public Power Authority. And I think based on what L.A. has done, and what we have done with curbside, there is more interest in utilities such as Riverside, Anaheim, Colton. In their cities they all participated in a grant, also through the Energy Commission, through SCPPA, for DC fast charging for a corridor project. And I think they are also seeing the benefits of not just installing corridor charging, but also public Level 2 charging.

So I think there is a role to play for public utilities. And I want to make sure that we're able to continue with that role in terms of providing public chargers. And then also being able to own and operate the stations with support from players like Greenlots and ChargePoint.

And I think the model we have in place is working pretty well to where we own and operate them. And we're able to utilize them for the back office support, which the utility would not be able to build on our own. We're able to have billing systems for electric usage that's stationary, but not necessarily for mobile. So we want to make that Greenlots and ChargePoint and other market players continue with that role and then using them for maintenance as we expand the network.

And at some point reach a place where there are hundreds of chargers throughout the City. Or even if

someone installs a ChargePoint charger that they were able to get service through ChargePoint or through the utility rather than through a third-party if they prefer, instead of through an electrician. Or if they know that they can rely on a utility to service that equipment that is also giving them rebates and time-of-use rates that they can rely on that.

MR. DUVALL: One thing, and it will be very interesting to see how your maintenance experience turns out. At the very least I think it'll be a lot of really great operating experience that will -- even if you decided that you did want to outsource or you did want to do something different you'd be much better position having experienced it yourself.

The second thing is you've hit on a question that several other people have touched on, which is sort of like what makes used and useful?

And I think part of it is visibility and ease access. I mean some of these charge stations where they are, they're calling to like a plate of free cookies. You know, you just drive by and I think this is the magic of workplace. Your workplace charging is familiar to you. You drive by it every day. You're familiar with the company's parking lot.

The same thing with these things versus some of

the places where we have to drive into the bowels of a parking garage and you have to go in a certain direction or you'll never get to it. And this is I think a very important question when you start making additional investments in this area regardless of where it is. Is what leads to be frequently used?

And sure there are good apps and other things that assist with this process, but really it doesn't seem like -- it does seem like there's a certain magnetic appeal to a really good location that becomes very familiar quickly to someone just driving through in an area. Thank you.

COMMISSIONER SCOTT: Great. Another set of excellent questions and excellent presentation. Thank you.

We will go now last, but certainly not least, to Matt Henigan, who is the Deputy Secretary for Sustainability at California Government Operations Agency.

So welcome Matt.

MR. HENIGAN: All right, thank you Commissioner Scott, and to the Panel.

Yes, I'm happy to share with you some of the successes and lessons learned from DGS's Electric Vehicle Infrastructure Program. So, next slide.

So we'll be discussing a particular grant that was received by the Department of General Service that was

focused initially on fleet vehicles, but has been extended to include workplace charging, as well.

So we were asked how would we characterize and quantify the success of the program and how we've fostered commercialization of electric vehicle infrastructure. So one thing I'd like to highlight is that the grant paid for installation of infrastructure. But it also prompted a great deal of policy making and planning that was not necessarily anticipated. So DGS has written a EVSE guidance document for use for other state departments, so that guidance document is available online. And it hopes to convey some of the lessons that DGS has learned to other state departments that are embarking down this path.

We've also been experimenting with parking policies, cost recovery structures. And all of that policy making and planning has contributed to not just DGS's rollout, but the rollout in other state departments as well. All right, next slide please.

DGS has set a goal for providing 5e percent of all parking spaces at state facilities with some type of electrification, whether that's Level 1 or Level 2. So far the Level 2 program has installed 23 chargers. Those are all here in the Sacramento area. But the others are coming fast and furious, 19 more to be installed in April. And 60 more in design, with another 800 Level 1 chargers in the

design phase throughout -- these the are the 56 DGS-owned and operated building -- throughout the state.

DGS has also created statewide contracts for purchasing of EVSE equipment that charges themselves. And so those contracts are available to all state departments and indeed local governments and local governmental authorities, so that cities, counties don't need to do their own procurement process for EVSE. So that's one way that DGS has helped smooth the paths for other departments as well as for local governments.

So for this particular program we are looking at 23 EVSE, Level 2, installed in Sacramento. Those are up and running -- and hopefully you're charging at one right now -- 11 in San Francisco and 8 more in Oakland, 42 in four locations in San Diego and another 18 in four locations in L.A., Orange County. Again, these are all DGS office buildings.

So we were asked, "What are some of the key ingredients to the project's success?" And we'll go into some of that now. Well, we assigned senior project directors. This is a new frontier for DGS, so we assigned some excellent staff: project directors and architects, engineers to really shepherd this program through. DGS also relied upon top executive and agency support in order to get that accomplished. So having that executive level

buy in, director level commitment to EV charging has really paid dividends.

We've also identified a range of funding sources, not just the ARFVTP, but also encouraged departments to submit budget change proposals using DGS's building maintenance accounts, building rental account, operating funds and kind of guided other departments to kind of shortcuts and ways they can use operating funds to install EVSE.

In prioritizing where we should begin the rollout, it was analyzed. Obviously, adoption rates are higher in the Bay area and Los Angeles and San Diego. But it was decided that Sacramento should be the first area where these are rolled out to build legitimacy and momentum for the program. We've got legislative staff plugging into our chargers, we've got department directors, Governor's Office staff using our chargers. And I think that was a wise decision, to make this more real and foster political support for EV charging at state facilities.

So the milestones, right? So this is the process that DGS goes through to install these chargers and it's quite extensive, so we'll go through it quickly. So there's an initial site visit where we're cataloging data about number of parking spaces and bundling those buildings into groups for bidding, right? So the Bay Area all goes

out together or high priorities groups are bid first.

Next, we're looking to see which facilities have a lot of early adopters, which have even the parking capacity. Which are going to run into really tangled ADA compliance issues or which might have easier utility access and so these assessments develop a rough cost estimate in a preliminary design.

Then we're working with the facilities managers. We're getting more detailed now to analyze ADA path of travel and review any kind of project-specific issues with the site or with the users. There may be particular user groups that have particular needs. Every site is special and so it's important to get that on-the-ground feedback.

All right, we're getting kind of into the weeds here, but the idea is we're balancing this goal for 5 percent electrification with the constraints on the site, right? So if we can get to four percent and that last percent requires major infrastructure from the utility upgrades and things like that, we're trying to gather the data to make those decision points. That's the idea.

Then we're circulating the data needed to make those decisions. And figuring out where the money is going to come from. The plans are then drawn up, submitted to the Division of the State Architect for ADA compliance and the State Fire Marshall. Then the easy part: bid, award

and construction, right? Even though we know that's not exactly easy. There's a lot of run-up to these projects.

All right, we were also asked to talk about the pitfalls. So I apologize if this section gets a little negative, but we were asked and we're here to share lessons learned.

The first is make sure that the entire organization is behind the program. You don't want to find internal resistance, so that high-level buy-in is important and getting written policies into place, like the Executive Order. Executive Order B-18-12 calls on all state facilities to install workplace charging, so that's been very useful as we talk about the need for this rollout.

Also, pay close attention to parking policies, cost recovery fees, whether these spaces will be dedicated for EVs or whether there'll be time limits. All that dictates and plays into utilization, you could easily run into a situation where they're over-utilized and people will no longer have confidence that there will be a free EV charger when they need one. Conversely, you could set the pricing too high and no one could use them. And we don't want that situation either.

The goal, when we put these policies together, is to have N+1. We always want one charger available for that next car to show up and use.

It's important to determine early on if the focus of this rollout is workplace charging or fleet charging. Initially, the focus was on fleet. We have B-16-12, Executive Order B-16-12 that mandates a 10 percent of all new fleet purchases are zero emission vehicles. And finding a place to plug these in has prompted this project, to begin with.

As we were working through this we realized that the infrastructure upgrades, the trenching, the changes to the parking lot are the same for workplace or fleet. And it makes sense to plan for both at the same time. So we hit a bit of a hiccup when we shifted directions to look closer at workplace. So the lesson learned is evaluate all of your needs. Not just for this year and next year, but for say 10 years in the future. And do that project at once, with one mobilization and one building permit and one project if you're at all able to, all right?

We talked about the importance of having buy-in from all stakeholders, down to the building manager down to the tenants. Every building is special and has their own constituencies.

And use those location assessments, those initial site visits when you're first looking at the panel and first scoping out the parking lot. Make sure you have a detailed list of what data you're trying to gather: ADA

issues, utility service capacity, parking disputes or challenges at the facility as well as ADA issues.

And don't be surprised when you get some pushback, right? So be prepared to go to the Director or go to a higher authority to get these things done.

We found that many facilities are oversubscribed for parking and it can be a challenge. Even though hopefully these "EV only" spaces are used as parking stalls, it can be difficult politically to get folks to restrict access to certain parking spaces. So that is a lesson learned.

And due to the high profile of the program expect getting decisions overridden by executive management. Apologize to staff for that one, but yeah this gets a lot of attention. And everybody's got an opinion, especially if executive folks are driving cars themselves and don't like a particular time limit or charging policy, it can be distracting and slow projects down.

Don't always chase a newer or better idea. I think I'm also guilty of suggesting new project delivery models that while maybe valid, could have gotten in the way of rolling this out under the existing process.

Involve the local utilities very early on. You don't want to be surprised by costly utility upgrades. That's a lesson learned.

Keep up to date with code changes, right? A lot of these ADA changes happened in the midst of our project, so fortunately Building Standards Commission and the Division of the State Architect are parts of DGS, so we have a direct line to these policy makers. But for folks out there doing these projects these code changes could surprise them, so it's important to stay on top of that.

And we already talked about designing for a future capacity, right? So don't design for the EV drivers you have today, but look into the future. DGS has chosen one charger to hang on the wall in all of our installations that simplified reporting and management and maintenance.

And also be prepared for maintenance, vandalism, enforcing time limits. There is definitely a staff-time component to managing a EV charger network.

And we talked about some of the benefits of outsourcing that are contracting for that. DGS owns and operates its chargers and that does take staff time.

Stay aware of any other programs that are going to be happening at these sites. So be aware if this building is up for renovation or demolition or if there is a solar canopy going on and you can piggy-back on some of the trenching that's going to be going on. A lot of these things happen over different timelines, different timeframes and different staff groups, so we don't want to

upgrade a parking lot that is soon thereafter demolished.

Consider the impact on the facilities demand-response commitments. That's something that I don't have a great answer to. There are some technological solutions that we found, but you may have to rework your demand-response commitments in response to the chargers that you've installed.

All right, that's enough pitfalls.

How has your project contributed to achieving further successes and replications in electric vehicle charging technology?

Well, we have been experimenting with parking policy. And I think DGS's experiments in the realm of parking policy can help inform decisions at other state departments, and indeed, other companies and governmental entities. So there has been a $40 a month discount at DGS facilities, which in some places is half; it's a 55 percent savings on the parking rate. So that, in and of itself, has encouraged EV adoption. And we've seen growing number of employees at DGS parking facilities registering for this discount -- $40 a month, that's something you can include in your lease decision. When you're in the dealership and you're thinking, "Can I afford that lease?" Well, that lease is actually $40 cheaper if you know your employer is offering that discount.

Next, we've also been experimenting with cost recovery rates. Initially we had established $1.15 an hour flat rate. And we received some feedback that that's not reflecting the fact that some cars are charging at twice or even faster than the rate of other cars. So this new rate that DGS came up with is a hybrid. So there are certain fees that DGS encourages every day that that charger is on the wall: the networking fees, the maintenance, dealing with vandalism and repairs. And so that's where this 31 cents per hour service fee comes in. The idea there is to recuperate those ongoing fees for operating and staff. The 12 cent per kilowatt hour rate is purely to pay for the electricity. So that ends up being miraculously close to a $1.15 an hour, so for those 6.6 kilowatt charging vehicles, it's $1.13 an hour. Apparently our chargers max out at 7kW, so even if your car is capable of faster than that the most you're going to pay is $1.18 an hour.

But for the Chevy Volts or the plug-in hybrids that are only charging at 3.3 kilowatt hours, or kW, it's only 74 cents an hour, which we think is more equitable.

We've also been providing good data to the CEC on usage, providing policy templates for other departments, and putting procurement contracts in place for the EVSE, and helping to evaluate the design of installations at DGS and also other department facilities.

We're interested in the advent of battery storage. And having this program in place allows us to devote time to investigating those avenues. And we think it's been an important step in addressing range anxiety to have these chargers in place for employee as well as fleet use.

All right, so how does your project help contribute to achieving public policy goals?

Well, we all know what some of those are. We've got EOB-16-12, (phonetic) which is the 10 percent EV purchasing requirement. So we're finding that departments that have not necessarily planned for EV charging are parking their vehicles at DGS facilities. At least until they are able to get a construction project underway to install their own EV chargers. So this grant in particular and DGS's program has been very helpful in rolling out B-16-12.

We also know the 1.5 million vehicle goal by 2025 workplace charging opens up EV ownership to multifamily dwellers who would not necessarily be comfortable owning an EV otherwise.

And I think this experimenting with Level 1 workplace charging is interesting. What we've found is there was a strong resistance to the four-hour time limits we were putting on Level 2 chargers. Folks in some of

these places, especially around Sacramento are very busy. They are not willing to come back and move their car. But we essentially stranded assets, where this car would fill up during the first four hours. And then that space is unusable.

So rather than remove the time limits or simply add additional Level 2 chargers we made Level 1 outlets available. This was not done through the grant. This is the type of thing that can be done on existing operations, maintenance funds, but we saw immediate adoption. People immediately shifted to using the Level 1s. We see a lot more availability of those Level 2s again for the visitor who is spending a short amount of time there or maybe only parking before lunch, after lunch.

And given the commute distances that we see, I think that Level 1 could be a way to maximize the investment in the Level 2 charging. Like we said if every charger is consistently full that does not give that multifamily dweller confidence to go out and buy that vehicle.

All right, thank you for your time. I'm happy to take questions from the Panel.

Thank you, Commissioner Scott.

COMMISSIONER SCOTT: Terrific. Thank you very much, Matt.

I actually forgot. Am I starting with Jake and going to Joshua this time?

MR. OLSON: Yeah.

COMMISSIONER SCOTT: Yes. Okay, excellent.

MR. WARD: All right, thank you. As someone who faces similar challenges in D.C., it's refreshing to see that other people have to fight these fights, too.

How do you find -- and maybe it works differently out here in California -- but when you don't have alignment across agency leadership or even the legislation that allows the agency to take action what are the most effective methods at the top of convening the right stakeholders? And making sure that you have a clear roadmap from the top down? And then maybe I'll take that back and we can do it.

MR. HENIGAN: Right.

MR. WARD: (Indiscernible)

(Laughter.)

MR. HENIGAN: Well, we have a pretty robust infrastructure of sustainability, working groups, task forces, roadmap making and planning. So this is wrapped up in a number of the fleet managers, the statewide Equipment Council; so these are the fleet managers. That's a different side of the house than the Facilities folks, who tend to attend our Green Buildings meetings. But there is

certainly no lack of coordination. And having the emphasis on zero emission transportation coming from the top of our organization, coming from the Governor's Office, I don't think there's anybody who is unconvinced of the necessity of moving forward. It may be a question of resources or expertise. But we are able to successfully communicate those priorities to the decision makers in all of the departments.

MR. WARD: Okay. That was a great answer.

Do you find once you communicate that -- so if there are metrics, say, that preexist -- a direction for zero emission vehicles, zero emission vehicle direction is shared and you're encouraged to make those changes, do metrics at the working level then fall in line? Does that alignment automatically happen or what does that process look like to make sure that even the working level the folks making the purchasing decision make the right decision?

MR. HENIGAN: Well, we are fortunate in that we do have some strong leverage over the vehicle procurement, because DGS runs the procurement for the entire state government. And DGS will not approve a fleet acquisition plan that does not include 10 percent zero emission vehicles.

So we lack a similar control over ensuring that

infrastructure is in place, but we do a large amount of outreach. And there is a process in place over at DGS when a Fleet Acquisition Plan containing zero emission vehicles comes in, the EV charging experts who have worked on the installations funded by this grant reach out and say, "What are your plans? Did you know it may take a year to get these things installed? Can we walk you through the process and hold your hand a little bit?" So those processes are in place.

MR. WARD: Okay. And then just one more comment and question, maybe. You mentioned a couple of times in going through the slides, "Okay, we're in the weeds now." Yes, but thank you for having spent the time for developing a policy that goes into the weeds. So when someone has to reference a policy the policy is in place.

Can you talk about flexibilities in that policy? As technology has evolved over time how does the policy evolve in conjunction with technologies or market offerings?

MR. HENIGAN: Well, that's interesting. I mean, the parking policy and the cost recovery policy, those are living documents. They have been changed in the past and can be changed again. The vehicle procurement is set in an executive order, which may require a larger act to modify.

But what I've been telling the departments and

advocating at DGS is, "Use the technology at hand, right? The vehicles are available, the charging technology is available, let's roll this out." It's a matter of adoption. I don't want waiting for the "perfect" to be the enemy of the "good" as we roll this out.

MR. DUVALL: So love the mixed Level 1, Level 2. A few years ago we used to talk a lot about benefits testing. You know, obviously if it`s free and it`s right there, there`s a huge demand. And if you apply even what we could call a slight cost to the user and that could be you make them walk from the other side of the parking lot. Or you make them break out their Level 1 cord set and sometimes coil it back up in the rain, etcetera, that that could be way of at least as overflow or at least as extra, as a complementary system. That was really good.

The one question I had, and I don`t know if you know this offhand, but how many parking facilities do you think that are impacted by DGS, or under your purview, are either built or refurbished over like a ten-year period?

MR. HENIGAN: Not a lot.

MR. DUVALL: Not a lot.

MR. HENIGAN: There's obviously maintenance going on. And there's probably a handful that go through a refurbishment, but the building stock is fairly set. We're not building a lot of new ones.

MR. DUVALL: I mean, because in 2050 every state vehicle is going to be electrified, virtually everyone. And I'm sort of wondering in my head is, "Do you build this out piecemeal? Do you do what many people have advocated today, which is build for your foreseeable capacity?" In other words, "We're putting in 8, but we can really 16 in the future."

Or at some point do you just say, "Look, it's a brand-new garage. It's got to have conduit the length of it." In other words, it's got to have at least the basics. It's got an electrical room that's big enough to hold the service expansions when they come." This is an important question is that at some point, and when you put up a new facility, well let's see 30 years from now, 2046, look at COP21. Look at all these -- virtually everything is electrified.

So then you come out to where, "Well, it's maybe not every space." Because obviously you would have vehicles, you wouldn't -- not everyone needs a charger every time they stop the car and plug in. But whatever you decide your maximum is, and those are calculable based on today's travel patterns, at what point do you say, "Well this is a new facility. We've got to have that?"

MR. HENIGAN: You know that's an excellent question. You're right in that yes, there will be a future

when virtually all the vehicles on the road are zero emission vehicles of some kind, right? Many will be hydrogen. And not every single one will choose to plug in. Even our $1.15 an hour is more expensive than charging at home. So it's an open question, right? What percentage of vehicles in our garages will be plug-ins? And what percentage will demand infrastructure?

In state operations sustainability we try to walk the walk and take our cues from the policy experts. And I haven't seen great guidance that a best practice for existing garages, retrofitting for ZEV readiness means X percent. I know that the Building Standards Commission adopted a standard for new buildings that was proposed by their Resources Board. I believe that was 6 percent of spaces in garages. And I think that's intended to be at least evaluated for ramping that up over time. But 5 percent is as good a number as any.

And you're right, what's the time horizon? Are we planning for the next 10 years? That sounds like a long time. Or are we planning for the next 40 years, which is also within the lifetime of these buildings. It comes down to cost effectiveness. When you get to high levels of electrification, the panel upgrades and utility upgrades are going to become a matter of course. And maybe that's not the best way to spend your EV dollar this year. So

there, some compromise has to be made.

It's an excellent question. We could use some guidance.

MS. RYAN: So looking further down the road, well in tandem with more electrification, we'll also see more and more renewable energy on the Grid. In California that increasingly means solar energy. We've all heard lots and lots about the duck curve over the years or over the last few years. Workplace charging is, I think, is most widely considered to be the locale where there's some flexibility in charging to use to kind of manage against the duck curve.

I don't think I heard you say anything about incorporating smart charging or managed charging into your program. I may have just missed that, but --

MR. HENIGAN: Yeah, you know it's something we're interested in. I haven't seen -- it hasn't been part of our program to date, but it's definitely something that's on the horizon. And it's something we need to plan for when we think about this percentage of spaces that need to be electrified, because if we're living in a world with V2G maybe we want every electric vehicle plugged in all the time. Even if they don't necessarily need to charge, maybe they're driving to work in order to serve a Grid support capacity and make a few bucks. So do we really need every

space and not just be planning for the folks who need a charge to get home?

That's again, I wish I had a crystal ball in order to plan for that.

MS. RYAN: Do you have the ability to kind of do pilots in different buildings to just explore like a wire-up of one building more, so that more the cars are plugged in all the time? And then experiment with that building and test the willingness of people to participate in that kind of charging, vary the prices and so on? I mean, do you have that kind of flexibility?

MR. HENIGAN: I'm sure we could. Right, we're trying to get minimal charging available to the workers in the DGS facilities.

MS. RYAN: Right, but that's Phase II.

MR. HENIGAN: That's Phase II. That's Phase II, but I love the idea. Thank you.

MR. GREENE: So I think your emphasis on Level 1 here, and I think Kitty also was talking about Level 1, is really appropriate. And it seems to me logic tells you that very few people actually will arrive at work with an empty battery. And most of them would rather plug in and go to work and not think about it again.

And for PHEV owners also, the same thing, they don't need a full battery charge. I mean, their batteries

are smaller.

MR. HENIGAN: Right.

MR. GREENFADER: So why do we not see more of this, I think. How will you find out what the right balance is?

MR. HENIGAN: Well, if we can serve as an experimenting ground, as a proving ground, I hope the DGS can do that. Figuring out that right proportion is going to be a challenge.

MR. GREENE: I think the fact that you said that it was just taken like that once you've provided it is pretty telling.

MR. HENIGAN: Right. And we may see different adoption patterns. That was a small sample size of one parking facility, but you're right, the (indiscernible)

MR. GREENE: Is this a common theme in other areas in this kind of research that Level 1 is something that a lot of people think is good enough for them?

MR. HENIGAN: Yeah, I mean I also hear people saying that batteries are getting bigger, Level 1 is not sufficient. But I think for me the limiting factor is commute times. There's a bell curve of how far your employees are coming from. And for those folks who are driving extreme distances and very high-mileage EVs, Level 2 is available. That's great. But I think even as the

batteries get larger the commute distances aren't necessarily getting larger.

MR. DUVALL: Clarification, you did outlets though, right?

MR. HENIGAN: That's true.

MR. DUVALL: So there is a difference. If you do permanently installed Level 1 infrastructure the costs are really basically about the same as Level 2. It's if you throw the outlets out there and you have no cost of equipment and it's on the employees, then that's what they did. And that saves you some capital cost.

MR. HENIGAN: I'd also mention that the conduit is sized and the system is designed to be upgraded to a Level 2 should that become necessary.

MR. DUVALL: Thin wires, that's right.

MR. HENIGAN: So it gives us the ability to -- right, a 208 instead of 240, but it's pretty good.

MR. GREENE: Right, but I'm thinking of the low-cost option, really. And it does seem that this is good enough for a lot of people.

MR. HENIGAN: That's right. And it allows us to get more charge points on a panel before major electrical upgrades. It allows us to stretch that electrical capacity to more users.

MR. GREENE: Thank you.

MR. CUNNINGHAM: I've got an acquaintance that works with a sister state agency here in Sacramento who was one of the early drivers of the LEAF to his agency building and hit some of the earlier -- this was before 2012 when we passed the Executive Order on the Buildings Charging For Workplace -- and hit resistance with upper management not wanting him to charge at his state building, because of the local resistance from other employees, free benefits to some employees, not to others. Or the local building fleet manager didn't want to see the cord to cross the sidewalk. I'm not sure what it was. So I guess my question is obviously with the Executive Order you have the authority to go and kind of work with upper management.

You mentioned it multiple times, working from the top down helped. So as DGS how have you staffed up and developed the capacity to work with all the other agencies? I mean, that's got to be some permanent staffing and workload and best practices and tools that you or your team has to put together. So this is a new work area for you, isn't it, as an agency?

MR. HENIGAN: Yeah. That is true, but DGS is in the construction business. Most state agencies do not have their own independent construction authority. They go to DGS for if you need a loading dock added to the back of your building you're calling DGS, with the exception of the

really large organizations like CalTrans and Department of Water Resources. So it's a well-trod path to have DGS do construction management for other departments.

That said we've been surprised that there has not been a larger volume of requests for DGS construction assistance, so stay tuned. I think a lot of people are going to realize that they need chargers very quickly when they start getting more and more of these vehicles in their fleet. We may have had a few low-hanging fruit. They buy vehicles in places where there's already outlets in the parking lot or they're able to use an electrician to do one or two installations. But as the number of fleet vehicles increases I think we're going to see a lot more requests at DGS. And yes, that requires staff. You're absolutely right.

But DGS is also a fee-for-service organization, so they're recouping those staff costs in the project costs. So ultimately it's a funding issue to those departments requesting the construction.

MR. DUVALL: One great thing you can do, because you have these CWs (phonetic) mixed fleet workplace installations --

COMMISSIONER SCOTT: Hey, Mark? Just make sure you're talking into the microphone, so that WebEx can hear.

MR. DUVALL: I'm sorry.

Is that you can set it up, and you're right the electrical capacity, in some ways that's really the cost is what does it take to expand a service or utilize the existing service? And one of the interesting things about fleet plus workplace is you can always steal from workplace, steal capacity from workplace to charge fleet, so fleet demand is high, because say a lot of vehicles come back at any given time. You can always shift that capacity over.

It's a really interesting problem. And I think you really have the ability to be more flexible than a fleet-only installation and a workplace-only installation for each one, because you can blend both of them.

MR. HENIGAN: That's an excellent point. And they're not necessarily charging at the same time, right? The fleet is charging overnight when the workers have gone home. So as long as that transition from the vehicles coming in, plugging in and their operators getting in their private vehicles and leaving, as long as that transition could be managed the same charge points can be used for both conceivably.

Thank you, excellent questions.

COMMISSIONER SCOTT: Yeah, any other questions from the Review Panel? David.

MR. GREENE: Since this is near the end I mean I

just have a comment, which is how impressed I am by the quality of all of the presentations, by the ingenuity and the innovativeness of the people here. And what they've been able to accomplish with relatively small amounts of money by being creative.

So just very impressive, thank you.

COMMISSIONER SCOTT: Thank you for that.

Okay, so now we are ready to turn to the Public Comment portion. So I'll just remind folks if you'd like to make a public comment please make sure you fill out a blue card. You can hand it directly to me or hand it to Tim. He'll bring it to me.

Before we go there I did just want to highlight some things for you all that I heard throughout the day, in no particular order. And the panelists, I invite you to do the same, too, if there is a great observation that you want to share with everyone as we are wrapping up.

As you all know, we put this Merit Review together. I call it the "Mini Merit Review," because we were modeling it after what DOE does with their annual merit review. Of course I can't do every single project that the Energy Commission has funded in the Convention Center over the period of a week and a half or so. But we really wanted to take a chance to dig in to some of the projects that the Energy Commission has funded.

And we did ask the questions -- thanks, Matt for kind of going through each one of those questions -- to try to get a good sense of how we're spending our dollars. Are we spending them well? What are the lessons that are learned that we can take and apply across the industry to really help accelerate the infrastructure out into this space? Are there challenges that we've solved that we can then again take and make sure that everyone knows about the solutions that are in place?

So I think that this has been a terrific set of project panelists. And I really appreciate the detailed review. You might see this binder I have here. We sent this to all of our reviewers and said, "Please read through this, so you can ask great questions of our panelists." And you can tell from their terrific questions that they did.

So a few things that we've heard, I really appreciate the practical perspectives that we heard about today. And the kind of a day-to-day work in implementing the charging infrastructure and what it really takes. We had, I think, a really nice mix between kind of home charging, public charging, corridors and destination charging, workplace charging. So we heard a little bit about that throughout the panelists today.

We had a chance to kind of look at rural charging

and what some of the challenges and successes are there versus in the big cities and curbside charging.

We heard a whole bunch of different ways for how to get the chargers out there. We learned that although that there is a lot of great data we're still in the early stages and we need a lot more data.

I think we heard from all of the projects how we're leveraging the dollars, which makes me really excited because we have about $17 million in this space at the Energy Commission. And it's a lot of money. It's a lot more money than a lot of other states have. But this is also, as you all know, a huge state. And the magnitude of the change that we're trying to effect on the timeline that we're trying to effect it in order to meet our climate change goals and our clean air standards really does require us to jump in, leverage, accelerate in all of the places that we can.

We heard a little bit about parking as real estate and really thinking about it seriously in that way. And not just, "Oh, you can just add a charger in any parking space." And how do we expand the benefits of the electric charging to all of the businesses and the folks that are associated either with those parking lots or the businesses out in front of a curbside charger?

We learned about energy storage, upsizing the

transformers and other actions that allow us to be prepared as we go to the 1.5 million vehicles, 3 million vehicles and beyond. So we heard some really neat ways to kind of bridge us from where we are today into the future.

And so those are kind of my high level observations from the day.

I did want to highlight for you all that we have had all day a representative from both the Governor's Office and from GO-Biz, which is Tyson Eckerle and Taylor Jones, that are back there behind you. So the lessons we learned, the great information we heard today has kind of carried across the state agencies.

We had Commissioner Peterman here. And I was so delighted that she could spend a good portion of her day. We had the Air Resources Board, so the state is coordinating working really well with each other in this space.

I want to highlight tomorrow there is the workshop at UC Davis. I see that Paul has left, but we can get you information if you're interested in that workshop. That's going to be an opportunity to take some of the lessons that we've learned from shining a spotlight on these eight projects that we heard about today. And really dig in more to some of the challenges and how do we solve them. And make sure people know what the solutions are.

And then once we have those solutions in place how do we replicate those and really get those widely known.

We'll talk about critical topics that the agencies need to consider as we work together on SB 350 and the continued deployment of electric vehicle infrastructure.

And we're going to spend a little time on the medium-duty, heavy-duty space as well at the workshop tomorrow. We didn't do that here today, because to date the Energy Commission's funded projects have all gone into the passenger vehicle space.

And last but certainly not least I want to thank very much our panelists for their fantastic presentations and their great projects. The work that you guys do each and every day to stand up this infrastructure.

I want to thank our reviewers. I really appreciate the time that you took to dig in to the projects and ask these guys tough questions, so thank you for reviewing those and sharing your thoughts with us and your expertise.

I mentioned my thanks to Commissioner Peterman. I'll be sure to pass that along when I next see her.

I'd love for the Energy Commission staff to just give a wave to folks, because they work really hard each and every day to get these projects going. Go ahead, don't

be shy. I'll make you stand up if you don't wave. So thank you guys for your good work there.

And I really want to say thank you to Matthew Ong and Tim Olson, because I went to Tim and I said, "I want to do a Mini-Merit Review." And he put this together and he pulled this off in just a fantastic way. I learned a ton today. I'm really excited. I hope that you all did too. So thank you, Tim.

I will ask around the table, "Are there any burning things that you just want to make sure everyone knows before we head to public comment?"

(No audible response.)

Okay, great. So I'm going to turn to Public Comment. We've got three minutes per person. And the first blue card that I have in my hand is Dan Davids from Plug In America.

And I'd like to ask of you guys -- and he's doing exactly that -- go right to the table here and then when you're finished with your public comment if you'll give a business card to our court reporter, so he gets your name right that would be terrific.

Go ahead, Dan.

MR. DAVIDS: Great. Thanks, Janea.

Dan from Plug In America.

I just wanted to second Mr. Greene's comments

about the level of discourse today was just -- if you think about where we were ten years ago, the fluency around all these issues today is just unbelievably better. So again, hats off the everybody on that.

I wanted to bring up one issue that I don't think really was touched on much today, which is signage. And I think it's really, really important. Right up there with the emphasis that we did hear a lot about maintenance and management plan for stations when they're put in. And this has been kind of a problem that I see across the country. It continues.

There are really good examples right here in Sacramento of signage done right. And I want to again point out SMUD. I think anyone here who hasn't been out to the SMUD facility and seen what they've done, they've got it just about as close to right as you can get it.

Even the Sacramento Airport has directional signage in their parking structure. But there are an awful lot of installations for public charging where your app may get you within a block or two of where the station is. And then you're in a dense urban area. And there are young people and bicycles crossing the street and jaywalking at warp speed. And you do not need your attention looking at the screen in your car or your PDA or whatever. So it's really a safety issue at that point.

And I've experienced more times than I care to admit, kind of what Mark was alluding to when you go into a parking garage, multi-story, and make the wrong turn there's no signs whatsoever. You cannot find the stations.

And so I guess my bottom line is just like operations and maintenance and management the installation isn't done until the signs are done and "signs," plural. So the advisory sign that identifies the space and spaces and the regulatory signs that allow if you want to enforce things. If you don't have the proper municipally compliant signs the ticket that's written isn't worth the paper it's written on.

So all of these signs have been developed. They've been adopted first in Washington and Oregon, Hawaii; now California. CalTrans, they're all in the manual uniform traffic control devices. There's no need to reinvent the wheel.

I just want to put a major shout-out to make whoever is in charge of installations -- and that's part of the difficulty here, is the electrician isn't going to think about this -- frequently the hardware manufacturer isn't going to think about these things. The champion or the project manager for the job has to make sure that it gets done.

And I would just try, in future grants from CEC

and that sort of thing, if you've included OEM try to include the signage part of it as well. Thanks.

COMMISSIONER SCOTT: Thank you very much.

I have next Lisa McGhee. And Lisa will be followed by David Greenfader.

MS. MCGHEE: Hello, my name is Lisa and I'm from San Diego. I'm kind of losing my voice, but I am actually the only ZEV fleet operator in San Diego in an urban dense-populated area. So I do run a fleet. And I want to thank Tim Olson and the staff here today. This is really encouraging to see the efforts that you guys are making to make a change, because I heard a lot of talk about demand for the first time. And I can tell you I'm 11 months into a fleet and it's a tough battle to think that I could possibly be hitting demand rates of $22 per kilowatt and $19 per kilowatt just because I plug in two vehicles at one time, any time of the day. And it's an issue.

And I'm running 20,000 miles per month. That's equivalent to 18 household vehicles per year. If we focus on low-carbon credit scores we're talking about a big difference for. I'm a super-small operator, I'm only five buses. And I'm trying to find a way.

It's not about technology, it's not about the vehicles it's ending up being about the rates, because when I do drive we have three shifts, 24 hours a day. I do 125

miles in my first shift. That vehicle has a 100mile range. They end at 1:00 o'clock in the afternoon. They have to plug in, plug in, plug in, fourteen trips, ten minutes plug-in every single time you're back at base.

They'll wind up with 126 minutes of plug-in time. That gives them 55 miles X range. That gives them an extra 25 miles. They end with 30 miles positive. That's start of the second shift at one o'clock in the afternoon, that's peak time.

I go into my second demand rate at $19.00 per kilowatt in summer. And we're talking about some huge costs and it's only a spike. So I'm wondering what is that then, whether I plug in for 15 minutes or plug in for 10 hours?

I'm so encouraged by what DGS is doing. And Bill, I applaud you to my heart. What you're doing is going to make a difference. And I'm encouraged to know what tomorrow is going to bring.

So it's really about a comment, but I would like to know what we're going to do about accelerating for the 10 percent infrastructure for ZEVs and renewable infrastructure?

We've got Envision Solar, who does solar trees and arcs. Level 1, Level 2 and fast charging, you don't pay a dollar per kilowatt and it's a free electric bill.

That would be my comments.

And the question is what we're doing about accelerating infrastructure for other uses of renewable energy?

COMMISSIONER SCOTT: Excellent, we'll take your question offline, but thank you for your comment.

MS. MCGHEE: Okay.

COMMISSIONER SCOTT: And then I have David Greenfader next. And he's followed back by Matt Zerega.

Oh yes, thank you for bringing your card for the court reporter, so that he can get everyone's name correctly. Oh, he's right there with the white hair.

MR. GREENFADER: Thank you very much for inviting me here today, what a great venue.

And thanks for the plug, Lisa. That was really nice.

One of the things that I did not hear today and I'd like to have heard is about energy security. Surprisingly we're all talking about grid-tied charging infrastructure and no one has really mentioned off-grid charging or distributed generation.

We are growing our commitment to grid-connected electricity, which is a concern when you look at blackouts and brownouts and potential disasters or terrorist activities that could knock out substations. Battery

storage and solar is the most reliable source of energy that we have. As long as you look up we're going to have a sun for at least another five billion years.

So it's important that we think a little bit outside the box and maybe outside the generator or the coal-burning fire plant or gas-burning fire plant down the street.

Envision Solar, my company we're working with, is a company that's recently gained some traction with the state of California through the Department of General Services and CalTrans. We're deploying the world's first transportable solar electric vehicle charging station off-grid system that can do all the charging you need via sunlight and batteries. No need for grid ties, no need for civil engineering, no need for site acquisition. Literally drag, drop and you have yourself a charging infrastructure in a matter of 20 minutes.

This station can track the sun. And it becomes very important, not only for providing clean off-grid charging infrastructure, but also in a way of educating the market, inspiring people to adopt electric vehicles. And also ways of providing other opportunities for hosts for creating revenue generating opportunities, such as advertising, branding, parking metering, added security and other things like that.

So we're thinking outside the box and saying, "Why wait for critical mass of EVs to be adopted before the common person in the parking lot allows his parking lot to be ripped up for EV charging infrastructure to be deployed? Why wait? Why not create a value proposition that will literally put the cart before the horse and get people excited about EV charging like nothing else?"

And that's what I think we're doing with the State of California and CalTrans. And we're very grateful to be working with you guys. Thank you.

COMMISSIONER SCOTT: Thank you very much.

I have Matt Zerega, followed by Marc Geller.

MR. ZEREGA: Hi, Matt Zerega again. And I want to echo that the presentations today were outstanding. And this is great, great conversation for the purposes of getting everybody more aware of the immense complexity here. And so to get to hear about it in the context of real projects is just great.

One of the things we heard about today was -- and I'm going to look at my notes here, I'm not texting -- was with regard to price. And we heard it should be free. And then we heard it shouldn't be free. And we know that today at $3.00 of gasoline's 20 to 25 cents a kilowatt hour is gasoline equivalent. And I think price does matter to drivers when they look at the pricing of fuel, especially

if they're driving a plug-in hybrid. And I think we also heard a comment that said we shouldn't regulate price. So we heard free, not free, shouldn't regulate.

I think the point I want to make, and I won't use the whole three minutes, is that we need to decide who is going to decide on the price. And in conjunction with that we need to be thinking about what are the parameters of anything that should be used to decide on price. And maybe most importantly, and it's hard to ignore the passion we heard out of our San Diego fleet operator over there, we need some consistency and some predictability. And I think once we have that and we are thinking about comparative fuel prices and that goes into the decision making about price, that we'll have a more happy plug-in vehicle drivers.

So that's it.

COMMISSIONER SCOTT: Thank you.

I have Marc Geller followed by Richard Schorske.

MR. GELLER: Hi, I want to thank everyone for their presentations, really great presentations, but I feel the need to really highlight the fact that Level 1 received a certain amount of discussion that it usually does not, particularly regarding DGS. I can't tell you how happy your plan made me feel to do masses of Level 1.

The reasons for doing lots of Level 1, there are

numerous reasons, but as Mark pointed out before sometimes the cost of the conduit, etcetera, can be the same. But one must realize that the benefits of doing Level 1 extend beyond the fact that the infrastructure happened to cost relatively similar amounts to put in. And it has to do with leaving work to move your car in order to not have to build out more infrastructure, etcetera.

So I just really celebrate what you've done. I'm going to get in touch with you to have a further conversation about it. And particularly the notion that perhaps there is a role to be played at the workplace with paid Level 2, some amount, and free Level 1 might well be the soft spot, the special point where you get folks. You do what free charging does. Human psychology is at play here. Free charging attracts people to get plug-in cars. And we really shouldn't forget that the prime objective here is to get people into the cars.

And so the simplest way to get people into the cars is often to offer them some free stuff. For all of the nay-saying around that Nissan does it. Tesla has proven that it matters. And I think that we ought to not just sort of throw out the baby of free Level 1, because I think it will do what, in fact, is the main mission here, which is to get people into plug-in cars.

I had a question for Charles, because I'm curious

who's gone and whether or not they've had any traction getting their Level 1, Level 2 turbocharger into the OEMs when they sell their car, because it would do what in fact, what Tesla does, which is offer various levels of charging right out the gate with the car.

And again, whatever will simplify it for the consumer, make it more likely for them to buy the car with less expense after the fact is it seems to me a win-win.

Thank you.

MR. DUVALL: Commissioner?

COMMISSIONER SCOTT: Thank you.

Yes, go ahead.

MR. DUVALL: So in 2011, 2012 American Electric Power had an Employee Demonstration Program. And that was you could pick for Level 2 or you could get free Level 1 with your own cord set and it worked fine.

And there outside the climate zone then I would say Level 1 is a no-brainer, because certainly when you heat a car in Ohio and when you heat a car on Level 1 you do actually discharge the battery doing it, but it was very popular.

MR. GELLER: I'm very happy to hear that. If I could ask you one last question, which was, "Would I have gotten into trouble had I plugged in my car at Lot -- I think I was in Lot 14 where I found some outlets and just

wasn't sure if I would be able to do it, because there was obviously no signage. And no one there knew the answer to that question. But I would have most preferred to just plug the car in to that Level 1 outlet.

MR. HENIGAN: So you'd probably be fine. We've had to repeatedly clarify, that our attorneys have found that this is not a gift of public funds, because it is in furtherance of a policy priority. But that doesn't mean that message gets out to everybody. And so as a one-time user I think you'd be fine. But your building manager might ask questions over time.

But you do bring up a good point. We do have outlets that are there for maintenance purposes and other reasons that could be a really cheap and simple though incomplete solution for some plug-in charging.

MR. GELLER: Yes. And clearly in lots of state locations there have been people who have been refused access to a Level 1. I mean, I know someone who falls into that. In Vacaville Prison where they just wanted to plug in to existing outlets outside, but then their superiors thought they might get into trouble. And so if a clear policy came down from on high that this is kosher it would probably go a long way actually to getting people into cars.

And to relieving the possible need to putting in

Level 2 infrastructure, which you might then find out you don't need as much of.

MR. HENIGAN: That's an excellent suggestion. Thank you.

COMMISSIONER SCOTT: I have Richard Schorske. And this is the last blue card I have in the room, if there's anyone else who would like to make a comment please be sure to let us know. And then we'll turn to the WebEx and see if we have comments there. Richard, welcome.

MR. SCHORSKE: Hi, thanks so much, again great presentations. I really appreciate this opportunity. I just wanted to go back to something that was touched on a couple of times. And it has to do with the tradeoff between prepping for capacity upgrades now versus putting money into charging infrastructure right now in the form of the stations themselves.

And I feel like the Commission has an opportunity to create a little more flexibility for particularly larger institutions to make those decisions and present a plan for funding.

I work with a lot of cities and also organizations like universities and such, who are really scraping to figure out how to do capacity upgrades, because they get a standard allocation from grants that might be $5,000 or $6,000 per Level 2. And they come to a point in

a given garage or other facility where they just hit the wall. And it's $50,000 for the 5th charger or the 4th charger or what have you.

And there's nothing to be done except for them to stop and wait for something they don't even know what they're going to do. And yet that is by far the best location, maybe the only location. They can't do curb-side, they can't do this and that. They simply have to bust through that cost barrier at some point.

So anything that the Commission can do to create a flexible pot that is a larger pot for larger public or private institutions including fleet folks to simply lay out a long-term plan. And maybe the number is a few hundred thousand dollars per institution as opposed to X thousands for per charger.

And that would also then optimally open things up for Level 1, 2 or 3.

And I've seen incredibly creative approaches to Level 1 that were done with no state money, because there is no state program that allows it. So UC Santa Barbara has a huge deployment of Level 1. They use a permit and they just say, "If you want to plug in here's the coupon that you have to have a sticker you have to have on your car," just like another type of monthly parking sticker, but a different color, so very simple, very effective. And

they've dealt with the cord issue somehow, enough to where there's satisfaction for their risk management, so that one.

And then lastly the flexibility could and I think should extend to battery storage, again for these larger entities. Because they know what their demand charge situation is. It's totally unique to every circumstance. And in some places they simply can't go forward without the storage.

Oh and finally, I want to cite Alan Romero's work at the Monterey Bay Unified Air Pollution Control District, who just put out a great RFP -- it's available for everybody to look at -- where he basically said, "We want these corridors addressed. You all come to me with an idea about how to do it in terms of the number of types of charging through investment and capacity versus actual chargers."

Level 3, he said, "Let's have encouraged multiple Level 3 installations, fast charge installations, rather than 1 or 2 that we've seen with the state-funded programs to date, which have the obvious limitation compared to the Tesla network of just if there is a car there you have to wait another hour." So if there's two cars there and so forth.

So he's saying, "Let's do this more like the

super-charger network and giving providers the flexibility to propose the most rational approach." So I just want to encourage again the Commission to look into those more flexible strategies.

Thank you very much.

COMMISSIONER SCOTT: Thank you.

Any other comment here in the room? Now is your chance. Okay, do we have any comment on the WebEx? Any hand raisers?

MR. OLSON: No comment on the WebEx or phone.

COMMISSIONER SCOTT: All right.

UNIDENTIFIED SPEAKER: I have this quick announcement. There's an amazing electric bus right out here in front that people should check out from a company called, Nohm. And I think that the rest are over there.

COMMISSIONER SCOTT: Very nice. There is an amazing bus out front, so folks should check that out. That's what was just said.

Well, so with no other further public comment our workshop is adjourned. Thanks again everyone for your time today, I appreciate it.

(Whereupon, at 4:53 p.m., the workshop was adjourned)

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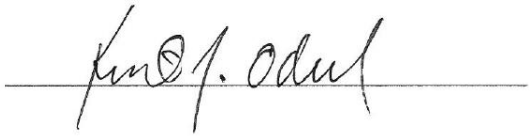

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