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CALIFORNIA ENERGY COMMISSION

STAFF WORKSHOP

In the Matter of:	) Docket No.
	) 15-IEPR-05
IEPR Staff Workshop on	)
Plug Load	)
	)

CALIFORNIA ENERGY COMMISSION

1516 NINTH STREET, FIRST FLOOR

ART ROSENFELD HEARING ROOM

SACRAMENTO, CALIFORNIA

THURSDAY, JUNE 18, 2015

1:00 P.M.

Reported By: Peter Petty

APPEARANCES

Commissioners Present

Andrew McAllister, IEPR Lead Commissioner

Staff Present

Heather Raitt, IEPR Program Manager

Ken Rider, CEC Appliances and Existing Buildings Office Efficiency Division

Bradley Meister, CEC Energy Efficiency Research Office Energy Research & Development Division,

Tom Gorin, CEC Energy Assessments Division

Bill Pennington, CEC ED Administration

Martha Brook, Appliances & Existing Buildings Office

Sean Steffensen, CEC Appliances and Existing Buildings Office Efficiency Division

Panel Presenters (* Via telephone and/or WebEx)

Chris Calwell, Ecos Research

Katharine Kaplan, ENERGY STAR

Ken Rider, California Energy Commission

Brad Meister, California Energy Commission

Tom Gorin, California Energy Commission

Vojin Zivojnovic, AGGIOS

Joy Pixley, UC Irvine Plug Load Center

Tony Brunello, Greentech Leadership Group

APPEARANCES (Cont.)

Panel Presenters (Cont.)

Pierre Delforge, NRDC

Rish Ghatikar, Greenlots; LBNL Association

Alan Meier, LBNL

Peter Franzese, California Public Utilities Commission

Kevin Messner, Association of Home Appliance Manufacturers

Julie Colvin, PG&E

*Heather Larson, StopWaste (via WebEx)

I N D E X

I N D E X (Cont.)

P R O C E E D I N G S

JUNE 18, 2015 1:07 P.M.

MS. RAITT: Welcome to today's IEPR Staff Workshop on Plug Load Efficiency. I'm Heather Raitt, the Manager for the IEPR.

I'll go over a few housekeeping items. Restrooms are in the atrium, a snack room is on the second floor. If there's an emergency and we need to evacuate the building please follow staff to Roosevelt Park, which is across the street diagonal to the building.

Today's workshop is being broadcast through our WebEx conferencing system and parties should be aware that you are being recorded. We'll post an audio recording on the Energy Commission's website in a few days and a written transcript in about a month.

At the end of the day there will be an opportunity for public comments. We're asking folks to limit their comments to three minutes.

For those in the room who would like to make comments please fill out a blue card and give it to me. When it's your turn to speak, please come to the center podium and speak into the microphone. It's also helpful if you can give the court reporter your business card.

For WebEx participants you can use our chat function to tell our WebEx Coordinator that you'd like to

make a comment during the public comment period. And we'll either relay your comment or open your line at the appropriate time.

For phone-in only participants we'll open your lines after hearing from the in-person and WebEx comments.

If you haven't already, please go ahead and sign in at the entrance to the hearing room. Materials for the meeting are available on the website and hard copies are on the table at the entrance to the hearing room.

Written comments on today's topics are welcome and due on July 2nd. The workshop notice explains the process for filing comments.

And Commissioner McAllister is on his way, but he sends his regrets. He's a few minutes behind and so we can go ahead and get started.

So our first panel is on Status of Plug Load Efforts and our first speaker is Chris Calwell from Ecos Research.

MR. CALWELL: Hello and thanks for the opportunity to share some thoughts with you today.

I wanted to frame the plug load opportunity, if I could, as very much linked to the climate challenge we all face. And so I'll start here with a chart from the Energy Information Administration. And part of what you see here is that in the last few decades of work on the climate

issue nationally you see absolute emissions of CO2 here and annual percentage change here. The greatest success that's been achieved nationally in reducing greenhouse gas emissions was in the year 2009, when we as a country reduced our emissions by 7 percent. I think the daunting challenge we face is that in order to get to the 80 percent reductions that scientists tell us we need we would have to do that degree reduction 22 years in a row. So this is the opposite of compound growth, these are compound reductions and they're very difficult to achieve.

And so having that challenge squarely in front of us, it's then interesting to look a little more at how you might get there. The U.S. Department of Energy divides the challenge of reducing greenhouse gas emissions into four separate components: population growth, economic output per person, energy intensity per unit of economic output and carbon intensity per unit of energy.

And so what you see here is that in each of the last 12 years or so population growth typically occurs at about 1 percent or more. Economic growth occurs at about 1 to 3 percent per year. And so the other two factors: energy intensity and carbon intensity have to drop by even more than the first two are rising just to break even. And if you want to get significantly below that you need to have dramatic improvements in energy efficiency and in

carbon intensity. And only in a few years have we done so. ZNE of course drives both the energy intensity and carbon intensity issues.

So my own personal response to that challenge was to embark on the design and construction of a ZNE home. This is my house in Durango, Colorado. And it takes a series of fairly radical design steps, as we all know, to get there. the building was very, very carefully designed from an HVAC standpoint, windows, building orientation, PV, all of these measures to try to make the building as efficient as possible.

And similar to what NREL found when they took undertook this exercise in Colorado, it's not hard to bring the energy use of a carefully designed house down by perhaps 50 or 60 or 70 percent and then meet the remainder with PV. The challenge is that putting that much PV on a house is expensive and typically what you do is you get a lot of reduction in water heating, quite a bit in space heating, quite a bit in lighting. But the appliance and plug loads portion, which you see here in blue, often only drops a small amount and then becomes a majority of the rest.

And so I've come to the conclusion in the classes that I teach for California utilities on the subject that ZNE is not really reachable by focusing only on the

building. Plug loads dominate, because the user is the chooser. It sounds glib, but basically the user of the stuff in the building is choosing what to buy, they're choosing which tasks to use those things for, and they're choosing whether or not to operate those devices efficiently.

And I think, ironically, the more sophisticated the energy using technology gets in our homes and businesses, the more the energy consumption of it is driven by occupant behavior. You would think it would be the other way around, but the technology enables the user to use it in so many different ways that it's no longer predictable and it no longer behaves like it did on a government test procedure.

So obviously some things that can help are web-based tools. This is a screenshot of a website called enervee.com. I know PG&E and others have begun using this to help their customers find the most efficient products. And to compare their purchase cost and their energy cost to see which would save them the most money over time.

So then you get to the inside of a house. This is the kitchen of the ZNE house I showed you before. And obviously you can stock it with all the energy efficient appliances you can find. And hopefully, that will bring your energy use down to the point where you can meet the

remainder with solar. What I finally confronted in this process, and I promise this is the only equation I'll show you today, is that there are far too many factors beyond efficiency that govern whether you, in the end, reduce emissions. And so here you have emissions on the left, of greenhouse gas emissions. There's population, which we talked about before. There's the number of devices each person buys.

And I would say the State of California has been largely silent on that question. You can't control acquisitiveness through standards and you really can't control it through incentive programs either, unless you pay an incentive to get people to retire the old device.

There is the level of luxury that each device has. That also we're largely silent on in our programs, but it drives emissions upward. We tend not to do that much about the usage of products per year except with motion sensors and smart plug strips and so forth, but it absolutely drives emissions. The state has been very successful in focusing on carbon intensity.

We do pay attention to the efficiency of products on test procedures, but I would argue that we assume incorrectly that however much energy they use on the test procedure is what they actually use. And they never do. And so we need to make our test procedures as realistic and

representative as possible. And then we have to be prepared to adjust those results with a field adjustment to account for the difference between how they behave in the lab and how they behave in the field. And then lastly, we need to account for the fact that they degrade or improve over time as they age and as they get software updates.

There are a couple of other factors there about the manufacturing and transport end of life emissions and the lifetime of the product, which are also important.

So why do these differences between test procedures and field data arise? There are a variety of reasons here. I won't go through them all, but at least in the kind of plug loads we're dealing with it's not surprising that computers can get extra software and capabilities in the field or be connected to other peripherals. And it's not surprising that TVs will behave differently as the room lighting changes or as the user presses different buttons on the remote to change the mode it's in.

My colleague, Rubin Dumling, found this result from looking at refrigerators in the field. And I think it's instructive. The blue line is what the refrigerators used when they were new in the laboratory. All the green squares tell you what those old fridges used when he went back to a house to measure them. And on average they were

using 23 percent more than they did when they were new. The red triangles tell you how much energy those fridges used when he took them out of the house, took them to a lab and measured them again. Now they were using 42 percent more than they did when they were new, so it's a big deal to account for the difference between lab and field energy use.

This is some work from our colleagues at NRDC and their consultants showing that likewise with computers you can see 13 to 35 percent greater energy use in the real world than would be predicted by test procedures.

I've begun doing some recent research on TVs. The new televisions obviously are extraordinarily compelling and beautiful and I think will draw a lot of new buyers. These OLED TVs in particular are so vivid and realistic that if you didn't see the edges of the screen and the label in the corner you might think you were looking at an actual photo of this item rather than a photo of the item on a TV screen. But we should all be prepared for higher energy use as we start to learn the different things that people can do with TVs that we're not measuring in the lab today.

I wanted to also encourage the state to think about a relatively new idea that Dian Grueneich's highlighted in her recent "Next Level of Efficiency"

Report. It's the notion that products should automatically measure and report their own energy consumption in real time. LBNL has showed some prototypes. There's a California company called Enlighted that has incorporated this kind of technology into their lighting system. And if the device tells you automatically how much energy it was using and therefore how much energy it is saving over time, we could potentially save a decent chunk of the $40 million a year the state now spends to evaluate and measure and verify the energy savings it is getting from utility programs.

I think the final frontier here is power scaling in plug loads and we'd like to get electronic products to do a better job of scaling their power use to how hard they're working. For example, a lot of different products can stream a movie, but they use very different amounts of power to do so. These are some measurements we made in our lab a few years ago and what you see is just to stream the same clip on Netflix products can use anywhere from 94 watts to 1.7 watts just because it's a very different device that's either better or worse at that function.

I wanted to close by sharing a slide that comes from the talks I give to ZNE builders, architects and engineers for the California utilities. And here I was asked to essentially sum up everything we could save. If

you had a traditional house with ENERGY STAR stuff in it, and instead you went to the most efficient set of products in each case, how much of the plug loads could you reduce? I won't go through all the details here, but by these calculations what started out for plug loads and lighting at 6,600 kilowatt hours a year, becomes when you're done optimizing around 2,090. It's a savings of 68 percent, but more importantly it means that 10 to 12 of the solar panels you would have needed for the roof to make the house ZNE are no longer needed. And I can assure you the extra solar panels, racking inverter and labor cost a lot more than the extra cost of the efficiency products.

So there's much we can do to achieve ZNE and I look forward to participating in the process. Thank you.

COMMISSIONER MCALLISTER: Thanks a lot, Chris.

I want to apologize for being late. I've been looking at your slides trying to catch up, but that's a 2kw system. That 2,090, roughly, I mean not even actually, but it depends on where you are I guess.

MR. CALWELL: Yeah. Yeah, it's actually a little less than that.

COMMISSIONER MCALLISTER: Yeah, very cool. Thank you.

So I'll make some opening comments. Just that's a great preamble. And my name's Andrew McAllister, I'm a

Commissioner here over Energy Efficiency. And I want to just thank the staff, certainly the IEPR staff as usual who really does a great job of keeping the trains running and organizing workshop after workshop. So thanks Heather and team on that. And then our staff as well, Ken and the Appliances staff: Kristen, I see Bill and some other staff in the room.

And we are all incredibly interested in this topic, because as Chris just laid out the plug loads are kind of the frontier that we need to unpack and figure out what our policy options are. We've got to make progress on this and it's a diffuse, diverse, large number of items out there that add up to a lot of energy consumption. So it's a very different than HVAC or windows or lighting even. There's so much proliferation of technology that's incredibly compelling and beautiful and makes our lives better, but has a lot of implications for where we're trying to go on the energy front. So we're going to need new program models to get this -- to crack this nut.

I guess I did have a question, was that a retrofit application that you just showed or was that a sort of design from the ground up based on your experience in a new construction environment; that last slide?

MR. CALWELL: Yeah, thank you for the question.

We have taught classes on ZNE for both new

construction and retrofit. And you'll see if you look through the list almost everything on the list is something the user brings with them. So it's arguably slighter harder to do in retrofit, because of the lighting piece. Some of the fixtures, as you know from California Code, are hardwired. But the vast majority of the lighting in a house is from what you screw in or plug in. And all the rest of the things are absolutely brought by the occupant to the house.

COMMISSIONER MCALLISTER: Right, okay.

MR. CALWELL: So the answer is for the most part is it applies to both.

COMMISSIONER MCALLISTER: I had an interesting experience where over the last couple of years I've been retrofitting my house, getting the consumption down. I'm sort of midway between the good house and the very good house that you have in your thing there. And I just got solar and 3kw is it, right? I'm netted out, all the time of use issues notwithstanding, right?

But I had a cable guy at my house and he said -- the third-party contractors -- that set-top box ecosystem with the cable -- the provider and then the equipment kind of come from different sources and the user has very little -- they're very opaque. But the contractor who came to check my line said, "You know, have you thought about going

out and buying your own modem? Because you're paying --" Most people pay the eight bucks or ten bucks a month for the modem, but they actually have better options out there in the marketplace. So if they want to just make a little investment they could actually save a lot of energy doing that too instead of leaving it up to the company to assign you one. So for example, that's an actionable pathway for one of these items on your table. So I just want to invite people to think about those kinds of options going forward.

In any case, this is not my platform. This is the presenters and I want to just make sure that the workshop can move and we can really start talking about solutions. I really invite people to think creatively about this. What the program environment might look like to get at some of these solutions and what the marketplace might do, you know, either with program involvement or just on its own if it were structured right. So let's move forward.

So thanks a lot, Chris. I really appreciate your being here. I know it's not easy to come all the way out here, so appreciate it.

MS. RAITT: Okay. Our next speaker is Katharine Kaplan, but we're having a little trouble getting her on WebEx. So we'll just come back to her and move on to Ken Rider right now, thanks.

MR. RIDER: Great, so I'm going to talk about one of the oldest tools in the box, but a very effective tool in the box and that is Minimum Efficiency Standards for Plug Loads.

So California, its very first standard ever set on appliances, was on a plug load -- was on refrigerators back in 1976. And it was the first appliance efficiency standard in the whole United States. Since then we've continued to set more and more standards with recent examples including televisions and battery charger systems. And we're continuing to work on even further plug load standards. For example, right now we're working on computers and monitors.

And one important thing is these standards have been extremely effective at slowing the growth of plug load use. And so this is a classic graph. Many of you have maybe seen this before. The red line here on the graph is the size of refrigerators over time getting bigger. The blue line is the U.S. average energy use of the refrigerator. It was going up quite a bit in the early '70s and that green line is the price, adjusted price of a refrigerator over time.

And what you can see is that this is the plug load that in the '70s was kind of going out of control. It was really causing a lot of growth in electricity use. And

when California set standards, and then later followed by a slew of federal standards as well, you can see that that consumption really took a nosedive. And so standards were a very effective tool for this particular plug load in driving down energy use. And the great thing is, is not only did it drive down the use, but at the same time the size got bigger and the products got cheaper.

So appliance efficiency standards are very good at achieving market transformation. Mainly because covered products, just simply they must comply with the minimum efficiency levels in order to be sold at all in California. It achieves very close to full market adoption and because as Chris was saying people bring their stuff with them it extends to retrofits just as much as it does new construction. And you get the savings through natural product replacement.

It also yields benefits outside of the state if you're looking at a greenhouse gas perspective. The regulations often tend to change the market and then entire North America and market and sometimes global market.

All right, here's another example of a plug load being regulated, which is televisions. And this you can see, is not just program activity from the Energy Commission, but also program activity from ENERGY STAR on this one and the IOU rebates. And you can see all these

programs, really just tons of different actions being taken over just less than a decade. And really just the television energy consumption similar to what we saw in refrigerators going down quite a bit.

So this is a 50-inch television and you can see back in 2007 they were using over 350 watts while on and today the average one uses a little bit over 50, about 75. So that's a huge reduction and this was another plug load that was kind of growing really fast.

One important thing to realize about standards is that it doesn't create new technologies. Instead it takes advantage of the technologies that are available on the market. Chris's slides showed today what -- if you chose the best things on the market how much less you could use. So there's always a large number of technologies out there that just aren't maybe being used in mainstream. Maybe it's a really slow market, this option curve, but standards take those technologies and make them commonplace, I guess.

Over 40 years we have -- since the first refrigerator standards there's still more opportunities on refrigerators. September of last year, new refrigerator standards came into effect that reduce the consumption even more, so if you think that there's a dead end to these standards there hasn't been. Not even for the very first thing we regulated and I don't know how many standards have

come into effect over that, but many, many standards. New technologies keep coming. They offer new opportunities to reduce the energy consumption of plug loads in refrigerators, even the old classic ones that you would think are pretty stable. And they'll keep coming as long as scientists keep inventing cool new technologies.

This is taken from the EIA and this is residential plug loads. These are what they've identified under miscellaneous loads, kind of the largest ones. The top blue one is televisions. And there's a bunch of different -- there's a lot of different kind of plug loads, but these are the top users according to the Energy Information Administration.

I've color coded the appliances or the plug loads in different colored boxes. The green ones are products that we've already passed some sort of standard on. The yellow ones are ones that we're working on standards on and the red ones are things that we don't currently have in the pipeline to regulate. You can see there's lots of opportunities, we're working on a lot of things. And like I said we can revisit a lot of different standards as well.

But you can see that there's quite a number of them that are growing. For example, set-top boxes is one that's growing quite a bit. Some of them are a little more in control, televisions, for example.

So appliance standards have a lot of advantages over other programs. Relatively high savings with fairly low cost compared to a rebate program when you consider administration and all those other aspects of a rebate program, free ridership. Appliance standards don't suffer from any of those issues. They also can overcome many nontechnical barriers that slow down energy efficiency such as renter-owner split incentives. A very difficult to get with many programs is to get an owner of a rental property to buy, let's say, a better refrigerator. Well, an appliance standard, you just have to buy the better refrigerator. There's not really another option, so it gets through a lot of the barriers that typically hinder an energy efficiency program.

And again, not only does it target new appliances, but also replacement applications. And the savings really begin as soon as a compliant product is purchased without any additional intervention. So no matter how it's used essentially, you're going to save energy over the baseline.

There are also several limitations to appliance standards. We are preempted from adopting standards for many products including the one we originally adopted for refrigerators. That takes a number of opportunities off the table in terms of what we can do as a state. We can't

target installation or application-specific efficiency opportunities, we can only hit really broad technology kind of improvements. We also can't really target heavy users of plug loads, so there's a lot of things that might be cost-effective in a certain instance, because someone uses a product a lot. And we kind of have to cater to the average usage. And we also have to wait five years between revising standards, so we can't update extremely frequently the standards.

I wanted to end my presentation with kind of an order of magnitude of the impact of appliance standards and building standards on commercial and residential electricity consumption, so on the Y axis there is the number of GWh/yr consumed per year. The red box is how much was actually -- or how much is projected, I should say, to be consumed in the year 2015. And then the green box is an estimated appliance standard savings and the blue box is estimated building standard savings. You can see it's quite a significant amount of reduction from just this one program. And it's actually pretty impressive. I mean, it's about a quarter at least here on the residential. So these standards have been extremely effective. This does include more than just plug load, but the majority of the things that we do regulate are plug loads in appliance.

So with that I think that's my last slide. Thank

you.

MS. RAITT: Thanks. So now we'll move on to Brad Meister.

MR. MEISTER: So good afternoon. I'm Bradley Meister, I'm from the Energy Research and Development Division. It's great to see such a wonderful turnout today with all these experts from Plug Load, so thank you very much. I'm going to talk to you a little bit about California's residential and commercial plug loads and our CEC research.

So if we look at energy use, electricity use in California you can see that both residential and commercial buildings are responsible for nearly 70 percent of the electricity consumption. And buildings contain plug loads.

If we look at residential loads we can see that plug-in equipment now contributes a majority of electricity consumption. This shows probably conservatively about 59 percent. You've got appliances, entertainment equipment, pcs and then a variety of miscellaneous equipment, a lot of electronic equipment and other miscellaneous loads. You can electric space heating, electric water heating are relatively small. You've got lighting and then air conditioning and some other areas. but this really frames up the importance of plug loads, especially as we move

toward Zero Net Energy.

Again just to show you some of these loads. You've got appliances, you've got all the entertainment. If you look at the electronics, and this is just a very small list, everything from computer peripherals, laptops, tablets, set-top boxes, and then all the other miscellaneous loads that most of us probably don't even think about: security systems, aquarium equipment, thermostats, displays, so again lots and lots of loads.

If we look at commercial plug-in equipment there's even broader diversity of commercial building of end users resulting in a larger variety of plug-in equipment. So you've got a lot of different types of buildings. You've got everything from large offices and prisons and restaurants. And then many of these building niches have very specific plug loads like in the medical area, there's very specific unique plug loads. So this again just frames up the plug load problem.

I've included one graph here and it shows kind of how the plug load has grown from 2003 to a 2012 study. And in this study it showed as a building becomes more efficient how the plug loads have increased. This shows, you know, almost 50 percent in a high-efficiency building compared to a standard office. And if you go back to 2003 you can see the plug loads weren't that big of a problem.

I want to talk a little bit about our past success supporting Title 20. We've hit, I would say, three really good home runs in supporting Title 20. We did research on the external single volt power supply test procedure, and we tested a number of these power supplies, we wrote a primer and ultimately it was successful in supporting Title 20 Standard that was effective 1/1/2007.

As you can see the linear power supply, the old power supply on the left was very big, wasted a lot of energy, came out in the form of heat. You see the new switching power supply on the right, very successful and I want to credit a number of people. But Chris Caldwell, sitting down, was really instrumental in getting that research completed, so again that was a big hit.

We did a lot of research on TVs. We tested numerous TVs. We contributed to a new test procedure. And that resulted in January of 2011 in a TV Standard.

And lastly, we developed a battery charger test procedure. We did technology assessment. We tested numerous battery chargers and provided that information to Title 20 and that resulted in a successful standard back in February of 2013. You can see on the right if you have a power supply, a charging circuitry, and a battery that comprises a battery charger.

So how much did we save? As you can see we spent a million dollars of state research money on these three projects and it's projected to save 1.2 billion per year. So that's an incredible payback on an investment of $1 million. You see under the CEC Cost what we paid and then the projected savings. Now, of course, it's going to take some time before there's crossover and all these products are out there. But this is what these products will save when they get into the market, so again a good bang for the buck.

We've done a lot of other research. I think to date we've spent about $7.4 million on plug load research. I'll quickly go through these. We influence an 80 Plus Program. And that's a program that really Ecos and EPRI stimulated with the utilities. And right now there are over 5,200 qualified power supplies if you ever Google 80 Plus. But again, that initial research we did with the external single volt power supplies really influenced this program. So we can take some credit for that.

We influenced or revised specification for computers that included a power factor correction that .9 or better. We developed low and ultra-low energy computers. There was a paper we wrote called, "How Low Can You Go." And this research was really important in that it stimulated the manufacturers to build computers that used

less energy, more efficient.

We developed a protocol with LBNL on proxying. And that's a method where a device can enter a low-power state while still maintaining a virtual presence in the network.

We worked on IEEE 802.3AZ, which is the Energy Efficiency Ethernet, which provides for less power consumption during periods of low data activity. It's a little bit like a VFD motor, if you don't need it, slow it down.

We've worked with Calplug down at UC Irvine and developed an efficient set-top box. There was a 5-watt 5-second prototype that was developed, had a 5-watt idle power and could recover in a 5-second period of time.

We developed both a computer survey and a monitoring report at Calplug and these reports were really important in that they helped us better understand computer power enabling rates. And again, that's now an important piece of the rulemaking in Title 20. So again, really important reports.

We also did a piece of research on energy reporting and display. And we looked at self-reporting on power consumption with a focus on computers, so we developed a program to go in and look at the different components in a computer and say how much of these

components we're using at different types of operation.

We developed some efficient kiosks with EPRI and those were 98 percent more efficient than the baseline models we tested.

We did an energy efficient multimedia computer that had twice the performance and was 31 percent savings.

And we also looked at a variety of home audio equipment, sound bars, power speakers and optical displayers. And what we found was that more aggressive strategies for auto power down and idle mode could produce substantial savings.

As far as a vision for the future, this is kind of a snapshot in time. But this certainly is one vision that I think is important. So you want to convert power efficiently with the power supplies. You want to store and retrieve energy efficiently, your battery charging. You want to use features, if you can, of mobile technology to reduce power of mainstream electronics where applicable. You know, the mobile have done a lot and we can really learn a lot from mobile technology. We want to enable true proportionality between the energy consumed and the useful work delivered by devices. And there's a new IEEE Committee, I think it's P2415, that talks to this. We want to auto-power down equipment and put buildings to sleep automatically when not in use. Be shipped with power-

saving features included and clearly communicate the operating state to users.

The last item I want to mention is a very important upcoming solicitation. It's unprecedented in that it'll be about $10 million, which I told you earlier we spent $7.4 million so far. This more than doubles that. We expect the grant funding opportunity to be released in the September timeframe. We're going to develop next-generation plug load devices, technologies and supporting codes and standards. Look at integrated plug load strategies, strategies, control integration and displays, again supporting codes and standards.

And the website doesn't come out real well, but if you go to that website you can review the draft solicitation. And we really want your input. We want you to look at it and provide comments to Felix Villanueva by the second of July. And we want to hear what you have to say. We want to see if we've missed something. So again, it's really important please that you go to this, review it and let us know if we've hit the mark on what we're going to be putting out.

I think that's it. Thank you very much.

COMMISSIONER MCALLISTER: Thanks, Brad. Thanks for all your work on this over time too. Even nurturing the Calplug effort along and getting some good wins there.

And I want to reiterate the last thing Brad said, once that PON comes out it's sort of like all the shutters come down and it's really hard to have a conversation about it, because it's on the street and we have to follow the process. So in order to get your feedback into the process, now is the time. So we really want substantive comments to come forward by that deadline, because as soon as that thing comes out everybody goes on the track of RFP-dom.

MS. RAITT: Great, we were able to Katharine Kaplan on the line.

MS. KAPLAN: Great, hi there everyone.

MS. RAITT: Let me get your presentation up, just one moment.

MS. KAPLAN: Super. First, thanks very much for inviting me to be part of this exciting dialogue and thanks to the IT team for helping me problem solve there.

Can you guys run the slides for me?

MS. RAITT: Yeah, go ahead and just tell me when you'd like to move on to the next slide.

MS. KAPLAN: Okay. I think that this is the last slide.

MS. RAITT: Oh, excuse me. There you go.

MS. KAPLAN: Thank you, very much.

So it's been exciting to hear the last couple of

presentations and to hear the breadth of work that's happening by so many different players. Of course, we're aware of all of the folks who are contributing so significantly through efficiency. And it's neat to think about the interplays of our programs and the way that we can all collectively drive efficiency.

So ENERGY STAR labels products, homes, buildings, I'm going to talk about products. And we've been in the game for more than 20 years and get some good results, so in 2014 prevented -- with the help of many, many partners of course, prevented 300 million metric tons of greenhouse gas emissions. Next slide.

So I wanted to focus today on the multi-pronged approach we're taking to address plug load. It's not just about writing ENERGY STAR specs, we have a number of additional program efforts underway that I just wanted to speak to very, very briefly. We also have our ENERGY STAR Most Efficient Program, our Emerging Tech Award; we have a nascent Retail Products Platform that I'll just give you a little bit on. And then we also been running a couple of campaigns focused on encouraging people to change out their old equipment that I wanted to highlight as well. Next slide.

Great. So this is a visual that I think depicts well the interplay between our different products,

efficiency requirements, efforts versus campaigns. So, you know, it sort of plots them on a continuum. We have in the area of not -- yes commercially available, but not having any traction in the U.S. market. We have our Emerging Tech Program try to pool efficient products, super-efficient technologies, into the U.S. market.

We then have our ENERGY STAR Most Efficient Program, which is for products that are available in the U.S. market, but we want to recognize the best of the best, the most innovative technology within an existing category for us.

And then we have the Base ENERGY STAR Program where products are widely available and we're highlighting the top performers within a category.

And then, of course, after ENERGY STAR we have the great work done by Codes and Standards that Ken, for example, was just talking about. And go the next slide?

Great, so as far as ENERGY STAR specs, 2015 has been another busy year for us. We have 19 spec revisions either underway now or we're still planning to launch them before the end of the calendar year and it's a lot of products: displays, imaging, small network equipment, audio-video, set-top boxes, lamps, light fixtures, room air conditioners. And then so that's on the residential side. Then, of course, commercial as well: servers, UPSes, rack

ovens, you know, on and on.

We have 11 new product categories under development. Connected thermostats, electric vehicle supply equipment, sump pumps and more, large network equipment, medical imaging equipment that was our first foray into the medical category.

And then we have some reviews underway now too, that will help us determine whether we should revise dehumidifiers, ceiling fans, room air cleaners. And then we're always scoping new products as well. Next slide?

I liked Ken's slide better for TVs in what we've seen happen here, but this slide just shows the reduction in energy use of TVs over the last couple of years in the way that ENERGY STAR as well as California and others have helped to drive down the energy use of TVs -- a real success story, next slide?

This is a slide that tracks the reduction and energy use of some major appliances in the home. And this, of course, is the result of combined work of federal and state standards and the ENERGY STAR Program. So I think it shows that we collectively can get some great reductions in energy use. Next slide.

Great, so there's a the base ENERGY STAR Program and then I mentioned that we have also this best of the best of the ENERGY STAR Most Efficient for a subset of our

categories where we're able to differentiate -- there's a large kind of leap to super-efficient products within the data set of ENERGY STAR products. Next slide?

So we piloted the program a few years ago. We formalized it such that we are revising the ENERGY STAR Most Efficient requirements annually. I think we formalized in 2012 and have had renewed requirements every year for the last few years.

This past year in 2014 we felt like we had enough traction, enough interest from some utility partners as well as a very small, but growing consumer awareness. We decided to do some targeted promotions with some of our partners and some really great outcomes from those targeted from those targeted promotions. You can see during the promotion an uptick in the interest in ENERGY STAR Most Efficient, so we intend to ramp up our promotion of these products to raise consumer awareness and commitment to buying the best of ENERGY STAR. Next slide?

Yeah, so it's still such a new program for us compared to the base ENERGY STAR, but we've got some utility partners working with us. And in the survey that the Consortium for Energy Efficiency does for us, we are seeing that there is this slight uptick in the awareness of and commitment to buying an ENERGY STAR product if all else is equal, right? If price is equal, for example.

And with ENERGY STAR most efficient I should just mention we're really targeting a very specific customer and this isn't for the mass market. We are looking to get the attention of very environmentally minded consumers. And we were -- and these consumers are interested in buying a product that is super-efficient even if it costs more. So when we did that I highlighted on the last slide, we targeted those very specific end-customers trying to get their commit. Next slide.

I wanted to talk about the third of these companion programs that we have. This is the Emerging Tech Award, again an extension of the ENERGY STAR brand. We are looking to highlight within an award program, product categories that are a technology that can deliver a tremendous amount of savings, but it hasn't yet had uptake in the U.S. markets.

We have some different principles for emerging tech in that the emerging tech products are not obligated to be cost effective like the ENERGY STAR products. So we can really bring super-efficient products without the cost barrier into the ENERGY STAR fold.

And we pick a new category every year or so and a the award is a one-year award. If you can go to the next slide?

Yes, here are the award selection criteria:

commercially available, maybe in another region of the country, but not widely adopted here in the U.S. More than one supplier, demonstrated savings through a fair and repeatable test, and well-matched with the ENERGY STAR competencies and roles such that we think that we can bring some benefit to the product category. Next slide.

And this is just a little record of just the last -- this is also a new program for us. So the last product category -- the product categories we've focused on in the last few years. We had -- I'll just highlight our 2015 Demand Control Kitchen Ventilation Emerging Tech Award. That was really an idea that came out of our utility partners. But we had four award winners so far, savings up to 60 percents over conventional, so that's a great opportunity.

And then we are looking to secure nominations for 2016. And we will make a decision on the category for the award come September. So if you have ideas I welcome you to -- you can send them to me and I'll route them to my teammate, Peter Banwell, who is leading our Emerging Tech Award. Next slide.

So I wanted to talk with you just a bit about a nascent ENERGY STAR effort that's a retail products platform. It's a nationally-coordinated midstream program that's being developed by a group of utilities with the

EPA/ENERGY STAR's help. The heart of the effort is really to help evolve traditional program design and delivery and evaluation to retail-based efficiency programs. So they reflect the changing nature of the residential product market and capture remaining really hard to reach energy savings through market transformation. So this is a collaborative effort representing a number of different regions in the country. If we can go to the next slide.

So what we're trying to do with the pilot is test a mix of different products, prove a consistent model for midstream intervention, can work and then streamline implementation. And the participants, the utilities with EPA participants have tested a number of different products. You can see them here. These again are difficult products where we're hoping that a collective effort can make a difference. So we can keep everybody in the loop on the outcome of this pilot. Next slide?

So I actually wasn't aware that the CEC cannot set requirements for things like installation, but we did so ourselves in our most recent room air conditioner spec that we just finished a couple of months ago. It'll take effect in the fall of 2015. And this a new thing for us, but the savings offered by better installation of room air conditioners are just -- they are really big, it's a big opportunity for savings and also for consumer comfort.

So this is sort of a starter point for us for installation: requiring that better materials be included in the box including all the weather stripping and gasket materials that a consumer would need to install and also raising the bar of those materials, like the side curtains, setting an R value for those. And then we're in making sure that those who certify products with us also provide good instructions and make recommendations to consumers who are going to leave their units in their window that they get a cover for them.

So we have a lot of interest in these requirements, which is exciting and hope that we can really raise the bar across the board for installation. We usually get a really good uptake on ENERGY STAR for room air conditioners. It's a good way for manufacturers to differentiate themselves, so we're hoping to move the bar here. Okay. Next slide?

Great, and now I'll talk about just a couple of promos that we're running or one we ran and we're going to run again that we hope will help get some old product off the grid and get more new efficient products into people's homes. And one was a "Flip Your Fridge" which has been a lot of fun. We got a lot of great attention from the Ellen Show for example, which was super. And we're working closely with a number of great utility partners to

implement this campaign.

And next slide is a similar approach, looking to get homeowners to replace their old, less efficient water heaters with new much more efficient ENERGY STAR certified water heaters. And water heaters have been a tough sell, mostly because people replace them when they fail and then you get whatever's on the plumber's truck, in their truck. Anyway, the idea here is to help folks replace before failure, so they have the opportunity to make a good choice when it comes to efficiency. Next slide.

Oh, here I already gave you most of this information other than it's going August through October of this year. And we'll move to the next slide.

And that's it. So I hope I've left you with the vision that we're trying to take a really multi-pronged approach to getting at plug load to beyond ENERGY STAR base requirements, which of course we continue to try to revise as quickly as we can.

We're definitely running to keep up, but also looking at a top tier with most efficient, pulling super-efficient products into the market with the emerging tech award. And then trying new things, right? Trying to improve installation, to get collectively with utility partners to get at very hard to reach energy savings through our retail product platform, and then using our

promotions to encourage consumers to have efficiency top of mind and to get rid of old inefficient products and make good choices about the new products they replace them with. Thank you.

MS. RAITT: Thank you.

So our next speaker is Tom Gorin.

MR. GORIN: Thank you. I'm Tom Gorin from the Demand Office and I'm going to attempt to explain the way we treat plug loads in the Residential and Commercial Forecasts. Chris Kavalec was asked to do that, but he's not here this week and he decided to dive into the archive closet to pull me out since I've been involved in the Forecast since about 1978.

I had some qualms about what were plug loads, but we have an Energy Forecast for multiple sectors and residential and commercial buildings are two of those. Residential and commercial buildings are both end use space and Brad Meister had some charts that probably showed it better than I can here. We have 23 end uses for residential buildings, 10 for commercial buildings, most of these are plug loads. These aren't exact classifications, but 15 for residential buildings and 4 for commercial buildings.

The way I grouped our end uses does not include

HVAC, water heating or any lighting integrated or otherwise. I think all the forecasted plug loads should be end uses. I was talking with the commercial modelers and in the miscellaneous sector end use for commercial they noted that things like elevators and escalators and various other miscellaneous equipment may not be plug loads specifically, but that's the way I grouped them.

We have specific end uses that are tracked in both the residential and commercial model. And other plug loads fall under the miscellaneous category in residential and it's called "other" in commercial. But I grouped it as "miscellaneous" in commercial also. So I calculated total plug loads as the specified end use plug loads plus the miscellaneous plug loads. The specified end use plug loads are highlighted in yellow here for residential and miscellaneous is in green. For each planning area there are three housing types.

And there's difference in the backup slides by planning area of percentage of plug load consumption. And in the residential sector that has to do with the difference of saturations of the various end uses and a different mix of housing types. In the commercial sector these are the end uses. What I call plug loads are cooking, office equipment, refrigeration, and miscellaneous in the differences.

In the commercial sector, by planning area, are due to the difference in saturations and differences in makeup of commercial building stock by planning area. So the specific plug loads that we have that are specified end uses in the residential sector are a function of appliance use intensity, appliance saturations, and demographic drivers. And it's a aggregation of the equation probably that was in Chris Calwell's presentation.

And similarly the commercial sector is driven by energy intensity use per square foot. And that's derived mainly from building simulation analysis. And these plug loads in the forecast over the forecast period and through history are tempered by the Building and Appliance Standards over time. And in part of the forecast -- in this 2005 publication has the most detail on how that is derived.

Plug-in lighting is not, as I said before, treated as a plug load. It's defined under lighting as one category.

Then we have the miscellaneous end-use category, which is basically a residual between consumption and between some of the end uses that we have in the forecast and the historic consumption that it is measured against for residential and miscellaneous growth before 1998, so function of price, income, and persons per household. And

after 1998 through the end of the Forecast is forecasted to be a constant growth rate. We're looking currently for better data and growth patterns and partly what this workshop can shed on that information to get more reliable estimates of future forecasts for plug loads.

In the commercial sector it was decided that miscellaneous growth should be similar to the growth rate in office equipment.

These are kind of overall results. Here this is residential energy growth from the residential sector in 2013 and 2026 and here growth in miscellaneous alone accounts for 86 percent of the total growth in the residential sector between those two years. And you'll notice there's a decrease in water heating and lighting and HVAC is relatively constant.

COMMISSIONER MCALLISTER: Hey Tom, can I jump in with a question?

MR. GORIN: Yes, sure.

COMMISSIONER MCALLISTER: So you said a couple slides back that residential computers and equipment are in the miscellaneous category?

MR. GORIN: Yes.

COMMISSIONER MCALLISTER: So when we get through a regulatory proceeding on computers, for example, how will that pan out in the way you do the forecast?

MR. GORIN: That's a good question. There's been a movement, but lack of staff resources essentially to look at residential office equipment as a separate end use. And if we did that we could address the standards, reductions in the standards that way if we had that as a specific end use. Otherwise we'll probably make some post --

COMMISSIONER MCALLISTER: Assumptions or?

MR. GORIN: -- post-reduction based on the estimates from the standard savings.

COMMISSIONER MCALLISTER: Okay. So I mean, this is kind of illustrative of the challenge we have right, which is unpacking that miscellaneous and really trying to put our finger on what's going on in each sliver of the marketplace there. And then the computers isn't actually a sliver, it's a pretty big deal.

MR. GORIN: Yeah, and there's attention between defining each specific end use and the desire to have a more simplified model.

COMMISSIONER MCALLISTER: Yeah.

MR. GORIN: So we have to figure some of that out too.

COMMISSIONER MCALLISTER: Okay. Thanks.

MR. GORIN: And this is residential peak growth and 42 percent is miscellaneous, which is a lot lower than the sales growth, because of residential peak is HVAC.

MR. PENNINGTON: So Commissioner, could I ask question?

COMMISSIONER MCALLISTER: Yeah, please go ahead, Bill. Yeah.

MR. PENNINGTON: So Bill Pennington with Energy Commission staff.

So it's interesting that there's a lot of downward pressure on the energy use of individual plug loads. Chris talked about it, Ken talked about it, you know, the standards and then just general improvement going on in the marketplace, but yet you're showing substantial growth here from 2013 to 20126. So I'm wondering what is driving the growth you're projecting. Is it almost all population growth, is it some sort of indicator of the proliferation of these devices? You know, that's what I'm asking.

MR. GORIN: I was asking the same question when I saw that, because I didn't really look at the results until I printed these out. A lot of it is that in residential miscellaneous is kind of projected as a residual from consumption to growth. And some of it is -- a lot of it's grown by income. And if you look at average income and the projections from Moody's or Global Insight average household income increases at a fairly rapid rate. I would indicate that we might want to look at median household

income, which is a lot flatter rate of growth, but that's something that we're going to have to probably address for future forecasts. And maybe we're going to look at that for the revised forecast.

One of the issues was trying to, from about 1998 to 2013 there's been a lot of gyrations in energy use in the residential sector, because of the energy crisis, the deregulation and the recession. And things that are difficult to model as a forecast, but after they happen you might say that's why consumption's gone one way or the other in the past.

COMMISSIONER MCALLISTER: So Bill, it seems like this problem has really kind of -- it becomes a black box I guess, because what we're hearing is that it's a residual right and sort of falls out of other things. But maybe the idea here who's time is approaching is to actually have a specified model of that miscellaneous category of some sort with its own assumptions, right? So I mean that seems like a pretty tall order, but I guess I'm wondering -- maybe Chris has some ideas about this or somebody else?

MR. CALWELL: Yeah, I'd be happy to chime in real quick on this.

I mean, Bill part of why I put that slide in about the equation is to try to urge some more formalization and recognition of the fact that you could --

as we saw in the graph of TVs you could make the average 50-inch TV 300 percent more efficient over a period of time, and not necessarily see a big reduction in the total energy use of California's TVs. Just because there are so many more of them, they are on average getting bigger, they're getting brighter, their resolution is getting higher and people do more things with them. And I think once you have a climate constraint driving your state policy rather than just the average efficiency of the average new product you kind of get a reality check of how much more work there is to do.

It's a really challenging thing to do. And I guess I didn't realize that the California official forecast on plug loads was this aggregated -- you know, this not -- disaggregated if you will. And one thing the Energy Commission might want to do is consult with the folks at the Northwest Power Planning Council, because they have had to build these kind of disaggregated models for the plug loads in their region to do their periodic five-year power plans and forecasts. And there might be some data sharing there that would reduce the burden of creating a similar model here.

MR. PENNINGTON: One observation I would make is that we want to revisit our plug load assumptions for the building standards as we're moving towards ZNE. So it's

really important that we figure this out and all the indications of a sort of per-device way to look at it, look like those loads are going way low. But if there's something else going on that's going to increase those loads, because of more of these devices in the house or whatever that kind of complicates the question for us.

COMMISSIONER MCALLISTER: Thanks.

MR. GORIN: But the one other thing I was thinking about is we put this together for the energy growth, we're basing this on electricity consumption, which is the sum of energy deliveries or retail sales by the utilities. Plus our estimate of PV and there's no -- I guess I would argue there's no accurate measurement of PV. It's not measured with the same accuracy as energy sales are.

COMMISSIONER MCALLISTER: Right. So it’s an estimate of total consumption you're saying?

MR. GORIN: Right.

COMMISSIONER MCALLISTER: Yeah, I've been there.

I guess I had one other observation here too. In categories like computers for example, we're focusing -- we're not actually focusing on global consumption. We're focusing on one piece of the way they're used, which is the standby or the certain power modes. And so I think we're talking about taking a more global view of this to include

all of that other discretionary use, which also presents I think some complications. So, you know, what is the strategy? How much of this can be done within Title 24 effectively and what requires sort of more creative thinking?

It looks like Pierre?

MR. DELFORGE: Can I make just a quick comment? I will speak more about this and this is Pierre Delforge from NRDC.

I will speak a little bit more about this in my talk, but I want to comment that most of the plug loads that we are looking at here are not regulated today. They're not a subjective standard, either federal or state. So I think despite the continued efforts I think we are catching up with -- or we're not even catching up, no we're staying behind the rate of growth in terms of the diversity, and as Chris said, the consumption functionality size of these devices, which is part of the reason why we're seeing the growth despite the efforts that we're making.

COMMISSIONER MCALLISTER: I mean, again I would say there's a policy challenge here. We have more types of devices. They're more complex and there's a certain, if you look at it, it's sort of a fixed cost of doing a regulatory proceeding. You know, you can only kind of get

so many of them done given the amount of resources. So how do we sort of prioritize? And I mean, I think staff is tremendous at getting through them and coming up with a technical underpinning, but that job is getting harder. So I think we need to think about where Title 20 fits in and where sort of maybe the marketplace can be -- can we work more with the marketplace to do things that maybe don't fit into that scheme? Just an abstract idea, but I think it's something that has very practical implications.

MR. GORIN: Okay. These are the same grasp, but for the commercial sector and in the commercial sector miscellaneous growth only grows -- only accounts for 38 percent of the growth between 2013 and 2026 and 26 percent of the peak growth. And I think that's a result of the assumed growth rate there being more like the office equipment growth rate.

So these sort of findings that I've put together: the plug loads are a greater portion of annual energy consumption than peak consumptions dominated by air conditioning. They are a greater portion of residential peak, which I already talked about.

There are -- I put backup slides in there by planning area if anybody has problems getting to sleep at night they can look at those. But they're different, because there's different appliance mixes, different

building types, different commercial building mix as well as different climate mix in the state. And plug loads account for virtually all of the miscellaneous growth. And so these are the differences and this is the sum of -- these are by planning area. You can see the difference of total peak and energy consumption as a percent. This is a percent of the total system peak, not the sum of residential and a commercial. So it's what the percentage of peak and energy that's accounted for out of the total system, peak and energy.

We could use more recent and representative data. There's been talk of using AMI data and some disaggregation algorithms if we can get -- have some of that available to us. The issue sometimes there is getting a representative sample of the state.

Our current analysis relies on the existing commercial and residential surveys, the most recent commercial surveys from 2003-2004. There's an RFP being rewritten for a commercial survey currently and it's hoped that we can get that out by the end of the year.

The most recent RASS survey is from 2008 and we're just in the discussion stages of trying to put another one of those together.

COMMISSIONER MCALLISTER: Hey, Tom do you have -- great, I'll ask a question.

MR. GORIN: Okay. That's it.

COMMISSIONER MCALLISTER: So it strikes me that there are quite a number of activities going on, largely at universities around the state, gathering some of this short-endable data and doing some load shaping and doing really some analysis that's somewhat aggregated, but kind of trying to make sense of the patterns that are out there in the end use. And there are also commercial entities that are working with the utilities and using Green Button and Green Button Connect to kind of do analytics in relatively real time to try to understand the proliferation of different types of loads, maybe not specific loads necessarily, but different types of loads. And miscellaneous loads would be much of that, recurring loads and then also just standby loads and things like that.

I guess have we -- in the forecasting realm, does the Demand Office -- sort of are you tuned into some of those efforts and maybe thinking about how they could be leveraged?

MR. GORIN: Probably not as much as we should be, because we seem to be on a forecast treadmill if you will. I may be a little bit, because I'm kind of removed from that as a retired annuitant.

COMMISSIONER MCALLISTER: Well, no I'm not asking you to put you on the spot really. I'm just sort of trying

to think about how we might leverage some of the thinking and work that's going on out there beyond these walls.

MR. GORIN: Yeah, we were thinking about that in a meeting earlier today. I will say that PG&E informed me a couple of days that 9 percent of my summer energy use was used to cool my house. And I have three ceiling fans and no air conditioning, so my question is how did they arrive at that number?

COMMISSIONER MCALLISTER: You know, I have the same thing going on where I got a whole house fan and my cooling load went up. And that's because I love my whole house fan and I actually use it a lot. I use it relatively more than I ever did my AC, but so I fixed that. But that kind of information drives behavior, it kind of allows you to make better decisions, right?

MR. GORIN: Yeah.

COMMISSIONER MCALLISTER: Yes?

MS. BROOK: Hi, Martha Brook, Energy Commission staff. I just wanted to make a note about the Commercial Forecast, because I think if you just look at it at a surface level you could kind of mischaracterize the miscellaneous plug loads. And I think it's because of what Tom said where they link it to their estimate of the energy used for office equipment. And if you think about how we all work in offices across the state, we bring all of our

plugs or a lot of our plugs from home into the office environment. And I don't think that's getting captured, so to the point where we're trying to focus on what's most important in regards to commercial I think we might be under-representing the low growth in commercial.

COMMISSIONER MCALLISTER: Thanks.

All right, any other observations?

All right, great. Thanks, Tom.

MR. GORIN: Thank you.

MS. RAITT: Great, I'd like to thank the first Panel on the Status of Plug Load Effects and we'll move on to the second Panel.

Oh, I'm sorry. Did you have a comment? Go ahead.

(No audible response.)

So our second Panel on Plug Load Standards Development, and we do have a change to agenda. Peter Franzese -- sorry if I mispronounced your name -- is going to be on the third Panel.

So our second Panel is moderated by Ken Rider. Do you want to go ahead, Ken?

MR. RIDER: Yeah, thanks. You know, in my presentation I kind of went over the baseline of things that we're doing today already. But I think we want to move with this Panel, more into the things that we're not

doing yet, and suggestions for kind of additional activities that we take in standards in other areas. So we've brought together a Panel of people, these four people right here in front of you. We've got Vojin, Joy, Tony and Pierre. And we'll walk through their presentations and then once we're finished with the presentations we'll have a discussion about some of the opportunities.

So with that, I will ask, Vojin, if you could please present.

MR. ZIVOJNOVIC: Thank you, Ken. I'd like to thank the Commission for inviting us to present today. My name is Vojin Zivojnovic and I'm from the company AGGIOS

Just briefly about us, we are a California startup, small business entity, with a focus on research innovation to save energy. Our key technical expertise comes from the very details of plug load, mobile, Internet of things devices. And most of us come from the mobile world where we developed tablets, phones and other devices which are known to consume very little energy. We are an independent and fully employee-owned company.

Our vision from the technology perspective is really the software defined power management and energy management based on industry standards. And I'll try to explain what we mean by that in the upcoming slides.

And here are the three key reason why we are here

since 2013 where we were invited to the CalPlug Workshop, which was a very important recall to evangelize this topic in the wider business community. We started contributing to the Energy Commission's activities.

Our specific angle we are promoting is mobile efficiency. That's where we come from and that's where we'd like to kind of point what advances can be made learning from that very large industry. And in particular, increase the awareness of some of the new standards. We are working on the IEEE P2415, which is the unified hardware abstraction for energy-proportional electronic devices and the CSA standard for unified computing appliances.

I start with a view of where we are as humans versus where is the rest of the nature. And I think we as humans have done a phenomenal job in building our gaming consoles, computers, all these devices for maximum performance. And we are pretty on par with this wonderful animal, the Cheetah chasing its prey, when it comes to the performance, when it comes to the run to the full speed.

We believe still that we have a long way to go to learn how to develop our devices in our system, so that they can equally sleep well and idle when this is not needed and rest enough to be ready for the next step. This slide is contributed by Professor Jan Rabaey, but we think

that that's a very well-known principle.

This principle, which I just have shown in this slide really got materialized in the principle of Energy-Proportional Computing. So a couple of smart people from Google predominantly focused at that time in 2007 -- focused on servers came to some very important conclusions based on their paper, "The Case for Energy-Proportional Computing," where in very simple terms the machines should consume energy in proportion to the amount of the work performed.

The left side shows the LESS energy-proportional device, which already consumes 50 percent of maximum power when utilization is zero. On the right-hand side you see a MORE energy-proportional device, which obviously is delivering something which we would like to have, so that it has a very low power consumption at minimum utilization or when almost no work is done.

This principle is very simple at a first glance, but it involves that all components, which are included in that device follow the same energy-proportional principle. So what we did here as an example of the most recent results from the Appliance Efficiency Pre-Rulemaking where we, in this same room, have presented computers -- one assembled, the other one commercial bought off the shelf -- where we have enabled with software and the changes in the

power supply unit to slash the consumption level in short and long idle by 61 percent for the assembly consumer pc and 54 percent for the commercial pc.

This is fine and good, but this is really when you have one device a server, a laptop, desktop and you would like to optimize it and this what most of the efforts have been so far. What I'd like to present today is an extension of the energy-proportional principle, proportionality principle to a complete ecosystem. So on the right-hand side you see this interaction with the device and its internal components, but equally important for proportionality is what is the environment this device lives in? And the proportionality effectively extends not only to the work performed by a single device, but to the relationship between the invested energy through all these levels from the state, then energy companies, your home, the device itself and the components, back to the useful work. So we believe that at this moment in development it's a perfect time to think about a global principle we will follow when it comes to plug loads. And that we tried to push that principle not only into the chips and the software, but also complete devices as well as the complete ecosystem.

What would that mean? That would mean on the right-hand side that yes, the standard energy-

proportionality is further developed. So that what Chris was talking about, the impact of the software, absolutely we see that growing over time. Hardware, we would say, is going to be more and more convergent and unified. And then on the left side it's not only about how the device controls its components, but also how the device is proportionally controlled by its environment. And that would include, for example, what Chris mentioned -- that the device reports its own consumption.

And these devices are very, very smart. They know that. Internally, they have small AD converters connected to a microcontroller in order for this device not to overheat, which is a very important point for the manufacturers. They have all the preconditions that they can, already today, report their energy consumption. But it needs to be taken up.

This is not only applying to these Apple TVs. It applies to pretty much all devices, because the portion of their smartness, their brain is growing. The fridge has a more capable microcontroller today than it had ten years ago, because this is in the regulation of the motor itself. The pull pumps are the same, not to speak about your desktop, which probably would surpass the most powerful computers from 10, 15 or 20 years ago.

So where are the challenges to have this unified

energy-proportional solution in our lives here and which could impact the energy consumption? We see that in component costs and development time, which really is related to the fact that it's hard to move ecosystems. It's hard to move desktop computer ecosystems, set-top box ecosystems and similar. And whether these are huge manufacturers or small manufacturers they need to be addressed as a unit. And they need also obviously to see certain benefits of these activities.

Currently the energy topic is really attractive only for people who either look for mobility or who have to pay really big bills like the server guys who are entertaining huge farms in order to get all the cloud data in the same place.

The other challenge that we see on a daily basis, is if you have a great student with a lot of knowledge in that space, perfect understanding these guys will tend to join the Apples and the Googles of the world in order to work on the nicest, newest, mobile devices. We need that expertise also on the other side meaning on the plug loads and IOT devices and so on. So here's a solution which I would like to propose is could we weave the energy-proportionality into the unified electronics ecosystem?

And this electronics -- I'm seeing a fridge from five years from now also as electronics, because it will be

very smart, it will be connected to the Internet, and would have plenty of data to report to you. How did it work when it was bought? And what performance it delivers now, because it has all the data, so it's a very smart system at the cost of less than maybe a dollar per unit to implement the microcontroller and the software.

So we would suggest that we work together to expand the mobile efficiency ecosystem. This is a very strong ecosystems, which a lot of money from all of us going in that ecosystem, so why not attach to that ecosystem the plug loads and other devices which are energy sensitive? And try to steer that ecosystem together with a huge benefit that everything that is new that is invented in the mobile technology will, at least after a period of time and after we determine the cost of that, will flow into the ecosystem around plug loads.

So how to do that? One way is to combine carrots and sticks. Technical standards help enormously the business to be more profitable and to produce better devices. That could be one way that we promote technical standards, not only standards of minimum efficiency, but also technical standards. Basically how things are done, how does a device now report out its energy consumption, which we can use for other purposes?

And, of course, I'm not here saying that the

Minimum Efficiency Standards and Regulations are not needed, but they should be also presented in a way, so that they do the possible, so that they motivate investment from outside.

An example, which I already present a couple of times, a thing also included at the Green Tech Leadership Group event in 2013 is the VHDL Standard. The VHDL Standard is a way how to describe and document the behavior of electronic devices. So by 1981, the Department of Defense was overcrowded with tons of new electronic equipment. And they decided to fund the development of a new standard to document the behavior of these devices. It was not a regulation, it was a technical standard aligning the industry to do something together useful. The stick was, of course, included. And that means that DOD from that moment on will only buy equipment, which really has the description of the behavior done under this visual documentation. TI and a couple of other companies were involved in the first ones.

Today the VHDL ecosystem is a $10 billion EDA/IP industry, mainly California based. And effectively every single component of electronics you see on the planet needs either to have a VHDL support or is generated using this standard.

In that regard, what we did as AGGIOS, we worked

on a concept, which is called Unified Hardware Abstraction and it originates from some of my previous research work on languages for instruction set architectures. And approached IEEE two years ago and said we have an idea for this new unified hardware abstractions for energy-proportional electronic devices.

At this moment, after nine months of work, we have 40 plus experts from 25 companies including Broadcom, the key supplier of chips for set-top boxes in the world. We have Cisco, one of the key suppliers of complete devices, Microsoft, Intel, a lot of these companies involved, because they see a benefit for their business. And they all agreed that the unified hardware abstraction for mobile and plug loads based on the energy proportional principle would be very beneficial.

So it is currently one of the most effective and most active IEEE efforts. And I'm very happy to say that SDG&E recently launched a project to explore its use for customer premises IoT devices, because most of these companies were mobile and plug load oriented. Now the IoT, this the Internet of Things, companies are joining more and more.

This is the website. You can see what our details of these activities are and I'm happy to act as a Chair at the moment, of this activity.

The other standard, which also touches I would say very nicely on previous speakers is something which started as a docketed half-baked document of ideas to the Consumer Electronics Rulemaking in 2013, which people from the California Energy Commission took to discuss at the Pacific Coast Collaborative. And effectively, British Columbia Ministry of Energy and Mines, BC Hydro and Canadian Standards Association approved the development of the seed document in which we will address one of the points, which already was mentioned today -- the fact that the computers, media players, gaming consoles, set top boxes all converge in terms of functionality

Here's an example of a 1080p Netflix video. On an Apple TV you will not consumer more than 2 watts if you do absolutely the same work, nothing else, on a gaming console. This console will consume 73 watts and that was already presented in the first presentation.

So what is the goal of this standard? It is to really change the way how we build minimum efficiency standards. On the left-hand side you see this is vertical. It's per device, it's per equipment. On the right-hand side we are saying why don't we unify these devices, which pretty much have the same function. And by the way, 80 plus percent of the power in a gaming console is used to watch video, not to do games. And that was one of the

reports, which was also published.

So our goal here, I think, can help solve the problem of these miscellaneous plug load devices. That we now treat them from the user's perspective and again that will be coming back to what the first speaker spoke, Chris Calwell, software is becoming dominant, because in five or ten years from now pretty much all devices will look very much the same, with the same interconnect, with the same visuals, with the same communication capabilities. The key difference will be the in the software. And interestingly enough, this software will be downloadable and you can change the purpose of your device just by downloading a different software.

So to finish this talk here I would say from our, of course objective perspective, plug loads are quite a low hanging fruit for the Commission as well as for the Department of Energy and can offer quite significant energy savings. Why can I say that? These devices are extremely intelligent, have all information in them, we just need to unleash that and start using it for the energy efficiency purpose. They already do it phenomenally for the gaming, for calculation for your communication, but we need to engage this enormous smartness of these devices to do one small additional job. And this is to optimize energy.

Mobile efficiency is the path to follow. The

money, the interest, the sexiness of that domain is a perfect -- and I would say unique occasion we have now -- to catch up, because we are now in the time where we have quite still stand. (sic) Which means we were totally occupied by mobile devices, it didn't increase massively the energy consumption, and you will now see more and more are coming -- the high-resolution TVs. Which will move us away from the cloud and will bring us back to more information, more devices in our home, because you cannot feed a 4K TV out of your communication channel without massive energy consumption in your home.

So energy efficiency is really possible to be achieved by unified mobile and plug load components, software standards and probably the best way of how to impact the electronics ecosystem.

To conclude I would recommend that the Commission takes sponsorship over key technical standards I presented today and in this way, kind of start helping the whole ecosystem, to move faster in the direction of energy efficiency. Thank you.

MR. RIDER: Thank you, very much, Vojin. And then again we'll take the questions and discussions after the end of the Panel.

Next up we have Joy, if you could present.

MS. PIXLEY: I'd really like to thank the Energy

Commission for inviting us to come talk about the importance of looking at users and user behavior as part of understanding plug load efficiency.

The majority of the work that we've done so far on the standards and codes has focused on the efficiency of the plug load devices as they perform in standardized lab conditions. And in a way that's really much easier for us to get a handle on. It's harder to understand how are we going to pay attention to what happens to those devices after they leave the factory when real users bring them home or bring them into the offices. And what are they doing with them?

And potentially they're doing things that are really reducing the energy efficiency of those devices. So are they effectively installing them? Are they setting them up the way that we expect them to? Are they enabling the energy efficient features, all of the features that we hope that they are? And if they are, what's the persistence level of that? Do they get frustrated and turn them off, do they unplug them? How long are they actually doing what we are expecting they're doing in our idealized scenarios?

And so I love this picture, the idea that we can design the perfect beast and if it's not doing what the user wants it to do we run the risk of them finding a way

of getting around it. So I'm going to talk more conceptually right now, of how can we bring the user behavior into this process.

One of the first things we would like to do is move beyond this monolithic average user, who doesn't really describe any real person out there. So if we look just at, for instance, the number of hours of television per day we've all heard that 5 hours a day -- it's actually 5 hours and 16 minutes to be precise. And if we only look at differences just by age, very simple, we find that that is accurate for people 35 to 44 on average. That's not looking at the people who are 1 hours or 10 hours, but just the average.

But it really underestimates the usage for older people; it over estimates the usage for younger people. And it doesn't say anything about how much each television is being watched, because that television is in a household that probably has multiple people in it. And how often are those multiple people using that television or is one person's five hours spread out over two televisions? We don't know. So having more research into how these devices are actually being used in the home will take us a little farther into figuring out how efficient -- how they're actually affecting the overall efficiency of the household.

This, I think, is the big part. And that is

learning from how the users are actually using the devices in real-life situations. So if we study that we can get two things. First off, we can verify whether or not the energy savings that we're predicting we will find by looking at the laboratory tests are actually being realized in real-life situations.

So we can imagine that a device that performs a little bit better than another one in a lab condition, might work much worse than the other one, in a field condition. There's something that's more complicated about it, the users can't figure out how to use it. And so if you're this person that's great -- if you're the person whose device is doing a little bit better in a field test that's great. If you're the person whose device is doing a little worse, we go on to the next step here, which is that the more we know about why users are not using the energy efficient features or they're misusing them or they're stopping using them, then we can take that information and redesign, rethink our designs. So that whatever it is that the users are trying to do, they can just smoothly automatically do that without having to unplug or disable the energy efficient features.

And so I'm saying this is a good thing to do, but the flip side to that is if you're telling me I don't know how the users are really using my device once they get them

home, then that's a source of concern about the accuracy of your estimates for how efficient those machines are at home.

So here's some examples. At CalPlug we did a study. We asked 2,000 people if they had changed their power management settings on their computers what were the main reasons for doing that? And 33 percent of people who had office desktops said, "I changed my settings, because the computer has to stay on all the time for automatic updates and backups or for remote access." So they're disabling sleep for this reason. That's telling us something.

And you can say, "Well, why don't they use the wake on LAN or there's software solutions. They can go online. They can solve this problem. They can figure it out." And some of them did talk to me and say, "You know, we tried to do that. We couldn't figure it out." But I think that's kind of a -- it's not a very productive way for us as developers to think about that, because we're asking the user to solve a design problem. And if the user, it's easier for them to solve that problem by turning the efficiency program off or by unplugging the energy efficiency thing that's going to be our problem. So if we can solve that problem to begin with, in the initial design procedure, we're going to be better off.

Another issue, set-top boxes. I think Brad was the one who mentioned earlier the 5 watt, 5 second. Before there was a 5 watt, 5 second there was how many seconds do we need? So with the set-tops like with a lot of other devices you run this problem that on the one hand you want the devices to go as deep into low power states as possible, for as long as possible, but the user wants that to be available immediately as soon as they show up. So how much of a delay can we get away with?

So this is one of the things we tested in the sim labs. We have a simulated living room environment and we're monitoring them on their remote controls. And we're testing how long is it between the time that they click go and the time that they go, "Come on, why isn't it going? Why isn't it going? Why isn't it going?" And that's the frustration threshold and you do not want your device to get to the frustration threshold, because that's where you start risking the person saying, "Whatever it is that's slowing this down I'm to unplug it. I'm going to disable. I'm going to get rid of it. I'm going to go on Amazon and say nasty things about this product."

So what we found for instance, is that 15 seconds you have a lot of people getting very frustrated, 5 seconds was the acceptable time. That's how we ended up with 5 watt, 5 seconds. So that's the kind of thing that we could

do conceptually.

Another part of the design that really needs a lot more attention is the user interface. And the first aspect of that is can the user figure out what they're supposed to be doing? And this is a real problem when we're talking to engineers and computer scientists, because you guys are up to your elbows in this device. It makes perfect sense to you, but we need to go out and talk to the real users and find out do they think the interface is easy to use? Do they understand what the efficiency options are? Do they understand how to activate them? Is it giving them the options that they actually want, because if the answers to any of those questions are no, they're not going to be used.

So here's another example. When we asked people in the survey whether sleep was enabled on their computers said, "Yeah, I think it is." When we did a follow-up study and looked at a subset of office desktops we found that the majority of them, sleep was not in fact enabled. So we're trying to understand what the disparity is here. And what we found is among other things, that the people who were wrong about whether their sleep was enabled they were lower in knowledge about computer power management, they had less control over their settings, they hadn't changed their settings. So we're building this theory that these people

are legitimately confused about whether or not sleep is enabled. They really think it is, and it's not.

Well, how can that be? Well, let's talk about the user interface of Windows 7 for just a moment. Dun-dun-dun. (phonetic) Okay. So Windows 7 was what the majority of the people who were using Windows had in this particular thing. So for instance, if you're trying to figure out how to change my sleep settings or see what they are there's no immediate button, right? So you go to "control panel" and I don't expect you to see all these words, just trust me, there is no work "power" or "energy" or "sleep" anywhere on this page. What do you click? You click "hardware and sound" obviously.

And then you get to the next section, which is a list of power plans and this actually is kind of clever. You have "power saver," "balanced" "high performance." Each one of them has a description. You have an idea that there's a set of settings behind this. And I just want to click on one of them.

The problem is -- so here we have "balanced" and it's checked. So I think that my computer is set in a nice, balanced way. Here's the problem. You see uh oh, somebody has changed it from 30 minutes to sleep, which is the default for this to never sleep. And in fact, this was the majority of what we found. So you can see how it is

that people are again, legitimately confused about what they're settings are and whether they're going to sleep.

Now, the user interface is going to be different for other kinds of devices than for computers. But any kind of device that you have that's attached to your television where you're seeing some sort of user interface on the TV, any time you've got some sort of digital display you're potentially running into a problem where you are not communicating to the user as well as you think how they're supposed to be setting up the device.

The other aspect of user interface is, is the device communicating to the user how much energy is using. And I think Brad also mentioned this earlier. So first off, the power state itself, but also the energy usage itself. So we know this graph over here, that the more information we give people about how much energy they're using in their household, the more of a response we see in terms of them actually changing their behavior and doing something about it. And the most effective type is real time feedback about exactly what's happening right now, broken down by the appliance or the device level.

So that's what we're trying to aim at here is, is there anything about the device that can directly communicate that energy usage, is going to be an advantage to us.

And then the final issue is then, the devices themselves responding to the user behavior. So if we look at this graph here, there's a lot of devices in each person's house. Leaving it up to the user to remember to turn all of those off is just not going to happen. So if the devices can learn, like the Nest Thermostat has, to keep track of what the users are doing, to respond to that, to come up with some sort of automatic settings then that's going to improve the situation.

However, any sort of estimates of savings really should involve these field tests in realistic conditions. Because here you have the ultimate in user behavior problem, you have some people who have very regular schedules where that pattern is going to be very easy for them to find, some people who have normally regular patterns, but maybe it's different on the weekends. And some unknown proportion of people whose schedules are so chaotic that maybe it's not saving any energy at all and how are those people experiencing these devices? Are these actually more problematic than they are helping?

And then a final issue here is when you have these devices that are hooked up with -- what's the word I'm looking for -- sensors, trying to figure out whether anybody's in the room, eventually we're going to get to the point where you have five or six devices in your living

room that all have sensors. And they're all keeping track of whether there's somebody in the room. If we can get devices to play nicely with each other, in some sort of universal way of talking to each other, then this aspect of responding to the user behavior can be coordinated among all these different devices. And we don't have to have all of those monitors be on all the time.

Okay. So to summarize in terms of how can we incorporate the concept of user behavior into these kinds of recommendations for standards? First off, to improve the realized efficiency of the devices much better, by understanding more about how the users are really using the devices. Secondly, to improve our tests and our estimates by doing more tests in real-life situations. How we users again are really using them. And finally, to work more on improving the user behavior itself; I think we can really try to do that with the devices. Not just in terms of doing better with the design, so that the devices do what they want them to do, but also in terms of giving them useful feedback about the energy consumption, which will empower them to make better decisions. Thank you.

MR. RIDER: Thank you, Joy.

Next up we have Tony.

MR. BRUNELLO: All right. Thank you for inviting me today. This is the most presentations I've seen in two

hours in a long time, so apologies. I think I'm also going to blow through. I think a lot of what has been already mentioned has already been stated, I think, really well. And really, there's three points that I'm going to eventually bring up, but more importantly at the beginning is I want to make sure that we're very cognizant I appreciate the invitation to speak today. Commissioner McAllister and staff, you said some very brief comments that I think we would very much align with you on.

Title 20 is tough. It's necessary, but it's tough and I appreciate that you're trying to figure out a way that can rethink how to get all the energy efficiency benefits from consumer electronics. And all the people that I've talked with, that know this topic, they're here, they're in this room. So that's great for the engagement.

Second is incentives, I fully agree and I'll kind of end with that, of some potential opportunities. But it's going to take some work and it's not in front of us, but I think it's really important as we move forward.

And I'm also encouraged by a $10 million research fund. I very much hope that that can hit on some of the topics I know Vojin and Joy have already mentioned, and some of the other folks before.

So Greentech Leadership Group, I'm the Executive Director. One of the things that we focused on in the last

five years has been a Smart Electronic Initiative. It's largely been semiconductor manufacturers or other folks that put a lot of their technology into mobile devices. And so we've been engaging in Title 20 and I'll leave it at that.

Much of the work that we are doing today is what I'll end on, is on the distribution grid. We think that some of the upgrades that the utilities are working on right now with all the energy agencies is really, as we look three or five years down the road, has to be much more linked, which is funny because I think Vojin and I -- I'm finally connecting on the things that he's been presenting, are very much aligned I think where the state is headed.

So just the three points is one, looking at mobile devices and the energy efficiency opportunities. So the devices by themselves, we're seeing massive energy efficiency gains year by year. So we should be figuring out better how can we apply some of the efficiency opportunities in the mobile space to more devices.

Second, really has already been talked about. It's then looking at the network of these electronic devices. There's got to be better communications amongst these devices. And we've got to find that was stated in the overview for today's workshop. How can we start thinking about demand response or some more connected ways

to actually even help for the grid service that the utilities need.

And third is there needs to be some connection between the exciting work that's happening on the Distribution Grid Planning effort with what we're talking about today. They are two different worlds, so I'm not even going to pretend that there's some good linkage right now. But over the coming years I think in the research there's some real opportunities -- that I think that these need to be explored.

One of our companies that we work with quite a bit is ARM Holdings. This isn't meant to be an advertisement for ARM. It's more in the sense that they are in many of the mobile devices that are produced. As you'll see, just last year -- sorry, this got cut off -- but I think it was around 12 billion chips just by themselves. So what they're seeing is that more and more of these chips are going into all different types of products. They have a massive share, over 40 percent of the mobile home market actually has the IP from ARM in them.

What that means for us is that ARM is really focused on energy efficiency. I'll let you look at your slides and go on their website to learn more. Again, I'm not here to promote them, but in the sense that it's a real

opportunity to see where the mobile space is going, some of the trends that are there.

And that with my last slide of thinking about the device, one area where this is happening, is looking at data centers. And in particular as you look at data centers just that middle portion right there, this is one example. This was a partnership between Paypal, HP and Applied Micro using ARM's chip. And we can get you more information on it, but in this one specific category the basic premise is that by using a more energy efficient system you can get almost seven times the energy efficiency gains.

So this is just one product. We think there's many more opportunities.

The second part I think we already have talked about. Really there's so many more devices and more opportunities for devices to speak with each other. Anybody who is connecting their Nest, to try and connect it to their Ecobee or some other device realizes the devices don't speak well with each other. And each of the companies have their own language of how to try and get these devices to speak.

This is obviously a market problem, but it's something that as we look at the state, how can the state actually engage in this process. There's many land mines

in that and I wouldn't pretend that I'm the one that has a solution. But as the trends are looking forward to having more chips that can speak to each other, and with all the efficiency opportunities of organizing these connected devices in a way that I think that Alan Meier might even speak about after this, but that way of actually just having them all communicate to reduce energy use and eventually do it at the right times.

Finally, I just wanted to kill you with my last slide. So anyone who can read this, I will give a dollar to after this. Most important is if you pay attention to where the CEC and the PUC and the ISO are going right now, the bottom line is that they are trying to optimize where distributed energy resources should be placed on the last portion of the grid -- that distribution grid.

So what is required of the utilities right now is to start to begin a system that actually was kind of like what Vojin had set up, of some way to first figure out what is the capacity of the existing grid infrastructure. So just figure out what we have and that's actually pretty hard.

Second, is to talk about where can we identify specific geographic locations that if you looked at all different types of clean technologies and services efficiency is one of those areas that can provide benefits.

But what is an optimal mix of these resources in specific locations?

And then finally, as we're looking to really how do we reach our greenhouse gas goals, this last figure is really there are about 9,000 substations across the state. I should never throw out numbers at the Energy Commission, because this is where they begin. But I know that there's over 9,000 substations that are across the state. And if we had a perfect world over time we're really going to start figuring out what is the optimal mix of these distributed energy resources over time.

And so one opportunity that we're still a ways away from, but I think it's a great research topic -- I think it also is connected at the energy efficiency and integrated demand side management proceedings over at the PUC. But we need to start thinking about what if there was an aggregator of multiple homes that somehow can link up with consumer electronic products that may be able to actually reduce energy use at the appropriate time. I don't think we're there yet, but over time if there is some incentives put in place I really think that there are some opportunities that people need to explore more, that are directly linked to frameworks that the state is engaged with right now. So it's really a top down effort.

And I think through this plug load effort,

thinking about for the efficiency gains, somehow they have to lock up, and again I encourage the CEC to try and do some more work on that. Thank you.

MR. RIDER: Yes, thank you Tony.

Next up is Pierre.

MR. DELFORGE: So Pierre Delforge from NRDC. I would like to thank the Commission for the opportunity to present on this topic today.

So why does NRDC care about plug loads? What I'm going to present is that we believe this is a critical opportunity to achieve the state's goal and the Governor's goal to double efficiency in buildings and to reduce carbon emissions by 40 percent. And that we have a lot of work to make sure that we leverage this opportunity, that -- you know, compared to where we are today.

I think the first challenge that we have is to know actually what are we talking about. I keep hearing different definitions, people thinking of different things dealing with plug loads. So is it just the devices that -- electronics that convert power from AC to DC, is it the miscellaneous, and what is miscellaneous? What I would argue is that we need to think about the plug loads in terms of all the plug-in equipment, so everything that plugs into the wall for two reasons. First, because I think that's the most intuitive definition and also, and

more importantly, because from a policy perspective this is how we can address this opportunity and not miss a major part of it.

Basically plug-in equipment or plug loads as I'm going to use it in this presentation are things which are brought in by the occupants in the building, not by the builder, not by the contractor, they can be installed, they can be changed at any time. And they don't need a permit, so we need to figure out how to get to get to the user in terms of purchase, in terms of use or usage to be able to reduce their consumption.

This is data from the Residential Appliance Saturation Survey 2009, I think it's been presented already, but I'd like to start with this, because it shows that basically we're talking about two-thirds of electricity consumption in the residential sector in California. This is just the residential, it's not commercial, and also we're talking about electricity, not all energy. It doesn't cover -- a lot of HVAC is natural gas in California, not electricity, so there's only a small share for electricity.

But when we're talking about a clean electricity grid this is what we're talking about. About two-thirds on plug loads and if we want to achieve Zero Net Energy in new buildings and increase the efficiency of existing buildings

we can't ignore it, this is a critical issue to address to achieve these goals.

And this is not just an issue, which is -- the data is 2009, it's a little bit old now and outdated, but if you look at this chart that's based on the same data as Tom presented early on, the Demand Forecast, this is actually growing. This is about 70 percent of growth and the rest of consumption and the rest of consumption is pretty flat except maybe for electric vehicles. But most of the growth today is in plug-in and miscellaneous.

And if we try and look at what's in this plug-in and miscellaneous category actually most of the loads are also themselves flat except of the miscellaneous category. So I think we talked about it quite a bit early on, I'm not going to go back into it in terms of what's in it. But clearly I think if we want to fix the growth we need to fix the miscellaneous or the MELs. But if we want to fix the plug loads we want to fix the plug loads, I think we have to look at all the plug loads, because we can't ignore the 38 percent of existing plug loads that are already specified as unspecified.

And now, if we look at where we are today in terms of savings, so this is looking at energy efficiency savings from the utilities, the reported savings to some of the IOUs, reported savings to the PUC. About 11 percent of

reported savings are (indiscernible) codes and standards and that's just my estimate based on half of 22 percent. Maybe it's a little bit higher, because I think in the slide that Ken showed earlier on, appliance standards accounted for more than building codes, but roughly maybe between 11 and 13 or 14 percent. And programs were only about 7.2 percent, so we're talking about 20 percent of savings today come from plug-in equipment compared to about two-thirds, about 60 percent, of demand.

So there's a clear gap and a clear opportunity for us, an untapped opportunity largely, to achieve additional savings. And the question is how do we do that.

So just to think about it, what are we talking about here? What are the plug-in equipment that we need to tackle? So the way I like to think about this is in three major buckets and this is looking at the home, so all the electrical equipment in the home you have the traditional white good appliances that are well understood, we've been working on those for a long time. You have the electronics, which are many of them and we're starting to look into them. We have no first standards on (indiscernible) Energy Commission on the dockets. The ENERGY STAR Program has been working on those for some time already. And then you have the miscellaneous category, which is a free-for-all catchall category, which has a huge

number of devices. Some large users, some small users, some in many homes, some in very few homes and that's the real challenge that we need to better understand today.

And just for completeness I've added another category, which is not strictly plug-in. It's hard-wired, but in terms of -- it also has electric components or electric devices in the homes, and in terms of efficiency opportunities a lot of them are similar in terms of what we can do to achieve savings in these categories -- at least in terms of the electricity consumption of these devices.

One of the reasons, it's not the only one, but one of the major reasons for the high consumption of these devices is what they call the idle load. And just a couple of words, a couple of slides on a recent study that we did on this issue, so the issue of how much energy is consumed by devices when they're not being actively used in homes.

We performed this study based on PG&E data, so thank you for sharing that data, through Stanford University Sustainable Systems Lab and in partnership with Home Energy Analytics. And we surveyed (indiscernible) analyzed 70,000 smart meters and we went into ten homes to do a detailed audit of standby loads or idle loads. And we found on average that 23 percent of all California residential consumption is used by devices that are not actively used. So when people are asleep or away from home

that's about nearly a quarter of their energy consumption.

That cost households anywhere between $200 on average annually up to $400 for people with higher marginal rates, and about $3 billion statewide, and the 6 million tons of CO2. And all this for things, which have not provided significant or any user value. So I think this is right off -- this is one of the reasons why plug loads or miscellaneous is increasing and I think a large opportunity for energy savings.

And if we dive down to one of the homes, just as an example, you can see that concept of the long tail. So we have a lot of devices, an average of 65 -- and this slide's a little bit less -- but which use a small amount of energy. But when you add them up together they're more than half of the energy consumption. And the few that use a lot of energy, they're different in every home, so in aggregate you can't go up to the top one and say, "Hey, I'm going to do this one, I'm going to solve a lot of the problem."

The top offender product that we like to use for many things is not sufficient for this type of problem. We need a horizontal or cross-cutting approach like we've already done with battery chargers and external power supplies where we address many devices at the same time setting standards for standby or to power down and this

type of thing. But I think that's one of the critical solutions that we can address to this particular problem of idle loads.

COMMISSIONER MCALLISTER: Pierre, can I just jump in for clarification here? So in this particular house, I mean it seems like the top offender you could put an LED where the halogen is and you could put the recirc pump on a timer and you'd actually save quite a bit of energy. And those would be by far the top offenders. But you're saying that all the tail we need to kind of attack as well, right?

MR. DELFORGE: Yes, that's right. And also the recirculation pump is the top offender on this one, but you're not going to find it in many of the homes. So if you look at it in aggregate it may not be one of the top offenders. So, you know, yes I think there are a few top offenders like recirc is one good example of something that we should do something about, but if we want to get to a significant portion of the savings on idle load I think we're going to have to do more than just a few top offenders.

Moving on to the commercial sector, I'm not going to spend much time on this, because Brad covered it with the same chart. The only point I want to make is this is even more complex in the commercial sector, because the variety of devices is even bigger. There are a number of

subsectors that have different types of devices, note the devices for restaurant kitchens and medical devices and hospitals and IT equipment and data centers.

These are all different plug loads that need to be addressed differently. And so I think we have a similar problem magnified in the commercial sector. Thankfully we have some of these devices that are fairly common like computers and displays we're going to find in most of the sectors and we can still address through our traditional vertical approaches.

I want to say a quick word on data centers. I think it's an important and sometimes misunderstood or overlooked issue on the commercial side. I think there's often a belief that the problem with data centers are the large data centers, you know, the Googles or the large corporate data centers. If you look at the data the large cloud server farms are only about five percent of energy consumption of data centers in the U.S. And the corporate data centers on which we spend most of our attention through Title 24 and through HVAC measures are only about 20 percent of that pie. Where most of the data center energy consumption is spent is in the small server rooms and closets, embedded into office buildings. And they are a plug load like any other and most of the opportunity there is actually not so much -- I mean, there's some

opportunity in cooling, but a lot of the opportunity is in IT equipment efficiency and in operational efficiency: virtualization, utilization, moving to the cloud. So these are things that are a great and a very important opportunity for energy efficiency programs -- not so much for appliance standards although some of that is needed too.

All right, I covered that. I want to go back to the home picture. And I think the good news here is that a lot of the solutions exist or can be -- are close to being deployed on the market. I'm (indiscernible) more for the record, we don't need to cover this all in the presentation. But I want to mention and go quickly through each of the categories in appliances. Despite the many years of standards and ENERGY STAR programs, there is still a huge amount of opportunity, low-hanging fruit keep growing back.

You know, on refrigerators for example, which have been regulated for nearly 40 years if you look at DOE and NREL's research there's still massive amounts of efficiency opportunities on refrigerators. I think though there's still a large opportunity there mostly through appliance programs, because California is preempted from doing standards, because of the federal standards, but the California Energy Commission can also work with DOE to help

improve the current federal standards.

On electronics, I just want to reinforce what Vojin said in terms of the huge opportunity to bring mobile efficiency on every plug-in device through technology standards, through efficiency standards, through programs. There's, I think, we need a whole suite of tools here and there's a massive amount of savings opportunity.

On miscellaneous there's a number of things we can do. I think standby load, I've mentioned that. Power management controls, energy data analytics to be able to use this modular data, which is a new tool that we have. And give this information that allows us to target which are the homes which have problems or opportunities for savings. And how can we reach out to them directly.

Energy reporting, Chris mentioned that and Vojin as well, and I think that this is a very important -- you know, we think a great opportunity. User behavior, Joy talked about that and a lot of that can be applied to the hardwired devices as well.

I want to finish my presentation more on the solution side. On a "what can we do to achieve this?" Obviously, the challenge that we have with plug loads is that we have a huge variety of plug loads, some of them are small, many of them are small energy uses, but in aggregate they're huge. And the market in some -- for some plug

loads the market evolves very rapidly, so it's kind of difficult. You know, we have to be very quick in terms of both programs and standards.

But I believe that the tools that we have, the framework we have with R&D programs and standards, can work if we apply it a little bit differently to what we've done. First, I think we need to focus on the market transformation using all the tools together, so that -- you know, we need standards, but we need programs to compliment the standards to both -- you know, before we implement standards for code readiness. And then after that to compliment standards and get ready for the next cycle we need to do them quickly, we need to do them in a horizontal manner whenever possible.

And so in a more strategic level I think we need to set targets. You know, the analogy of a road trip, if we are going on a road trip and we have the car we know roughly which direction to go. But if we don't know where to go exactly and we don't know when we need to get there we are unlikely to get there on time.

So I think we need to set ourselves a real goal, adjust our resources, our resource levels, based on this goal. And do some planning and adjust our priorities to get to where we need to get to achieve and to help achieve the state's energy and carbon reduction goals.

The second strategy I think, is we need to ensure that our regulations, and that's mostly for the CPUC, are unleash the power of the utilities to do market transformation in terms of how to credit them and how to encourage them. And, you know, I think we're not there yet and I think there's a lot of work to do in this area, so that programs can really be put to bear on this issue.

And the last one is I think clearly we need to have the resource level that we need to address this magnitude of opportunity. And I think, you know, you mentioned Commissioner McAllister, the lack of resources or no, the limitations of resources to address so many opportunities. I think clearly this needs to be a priority if we want to address this issue. Thank you.

MR. RIDER: Thank you, Pierre.

Did you have any questions, Commissioner McAllister, for any of the panelists?

COMMISSIONER MCALLISTER: I just wanted to make a comment and maybe see if folks had any additional ideas in keying off of something that Tony said. It was a theme -- I was over this morning at the Statewide Energy Efficiency Forum that is mostly local governments. And some of these issues came up, not in the context of plug loads, but really just the grid of the future, the distribution grid of the future.

And, you know, I agree there's incredible technology out here and we've thought -- in the confines of Title 20 we thought, "Okay, well how do we get grid responsiveness to (indiscernible) responsive capability, those sort of additional functionalities, into plug loads?" Can we use a regulations vehicle for that or what's the best way to do that?

And similarly, in the distribution grid all that functionality for management, active management of the distribution grid, that you've been doing really great work on -- and I really like what the more than smart effort has turned into over the PUC.

You know, so there are all these technologies available that can help us manage energy, but how do we drive those into the marketplace in a way that creates value that's monetizable, right? That's really kind of what it's all about, because like you said we have kind of one -- we have a hammer, but not everything is a nail. And the marketplace could be more -- could act in a more subtle way and could kind of move forward, hopefully without a whole lot of regulation.

So, you know, what is the structure, the regulatory or statutory legal whatever structure that will allow or drive those sorts of changes? Like Vojin was talking about that not just on efficiency per se, but on

this grid responsiveness. It's got to create value somewhere otherwise we can't justify that it's cost effective and the marketplace isn't going to adopt it, because it doesn't create value for customers. So like what is the special sauce to link the individual device up to the through-rates to some kind of aggregation or some kind of a monetize-able value, you know? Thanks.

I'm all for having a discussion, I just am not clear that it's actually at this Commission -- you know, where does that conversation need to take place in your sort of view in how things operate in Sacramento say, just to be perfectly blunt.

MR. BRUNELLO: Yeah, no my quick response is just factually what's happening at the PUC right now is there is no clear discussion of devices to grid services yet. And I think in one way it's on purpose, so at the PUC they're looking at what are the grid services that potentially markets can be developed around? So that's where they're looking at voltage resiliency reliability. So you'll see over the next year I'd say that there may be new markets. If you go at 30,000 feet of the services that are needed to keep the lights on and hopefully use the existing grid infrastructure.

The next step is once those are defined is figuring out how do you meet those services. And so that

was that horrible graph at the end. That there needs to be both a mix of what DER services can help meet that with what tools. And so if you talk about efficiency, everybody in my world on the political side, is talking about performance-based efficiency. Period. And I have no idea what that means in terms of I saw the solicitation that was put out by SEE last December; that's about as far as people go.

It's not the panacea, but something's in that, that as utilities are looking to procure more services to meet their needs -- and they may move to more of a wires company -- that's where I think what's interesting over time is that there's got to be some smart companies that are out there already. We work a lot with the energy data companies through our mission data effort, but there's got to be more efforts when they see an incentive to aggregate more at the home or business level. You know, being able to reduce the energy use and get paid for it at the appropriate time.

So that's kind of a pathway of -- I think we're still a couple of years out, but I think at least what people are excited about, that's it. If that makes sense.

COMMISSIONER MCALLISTER: Yeah, that does. I mean, a corollary is back in the day we had -- there was a market incentive to become lighter as we were -- you know,

ten years ago when everything was moving mobile. Now we're kind of here and we forget what it was like back then, but everybody was lugging around these big heavy laptops, because they were incredible. They got hurt, they burned your legs, you know? And like they crapped out on you all the time and they weighed ten pounds and they were an incredible piece of technology, right?

But they had a really clear incentive to make batteries better, to make low power electronics, and make the power supplies sort of small and portable. And so all that stuff sort of drove the marketplace in a way that regulation in that category wasn't needed, but today how do we -- what is the market imperative, right? What is that incentive that sort of we can leverage to get the technology developed and into the --

So I guess my point on that was industry, all the players got together: the Compaq, HP, Dell, all of those companies got together and decided on some standards around batteries and how they would be treated and how they interacted with the device. And sort of what that little ecosystem looked like for energy efficiency and performance.

And they had a clear incentive to do across the industries. And so is there -- in terms of grid responsiveness and the electronics that are necessary to

enable that kind of communication, communication protocols themselves, and all that like how can we as a state facilitate, but not own that? Because I think if we own it, it's a done deal. If we facilitate it, it could be really great, so that's a corollary to that monetizing the benefits.

But it's also there's also got to be some standardization the industry probably has to drive, so what does that look like? I mean, I know Chris has thought about this a lot more than I have and some of the others here on the Panel. I don't know if I ended up with an actual question there.

MR. CALWELL: Yeah, this is Chris Calwell from Ecos Research.

I guess I was gratified and sort of encouraged to hear a lot of people mentioning energy reporting by various terms, because if the distribution of plug loads in the house follows that sort of long tail pattern that you saw in Pierre's slides, you're not going to be equally effective at reducing the energy use of all those devices. But you don't need to be either. You can get most of the savings from some of them if you know which ones are the worst.

And I appreciated Pierre saying that you can't just decide, for example, that recirculation pumps are the

problem and go attack that, because it's only true in some houses as would be the case with TVs in other houses, set-top boxes in other houses, network equipment in other houses. And so why not use California's regulatory power, not just to specify that products get more efficient over time, but that they tell us what they're doing. And that you then can act on that information to decide if your utility incentive program was cost effective. And to decide if you need to target new products in the future with your standards, because all of a sudden they're telling you from the field that they're using more energy than you think they are.

We also have a system both here in California, and at ENERGY STAR where both agencies need to do a request for data to industry, which is time-consuming and often yields data that are already too old to act on by the time your specification might take effect a year or two in the future. Why not have the products continually telling you themselves how much energy they use in the field and then specify on that basis?

COMMISSIONER MCALLISTER: Are you aware of any regulatory proceeding anywhere that is working through that issue? Or a communication, you know, self-reporting and communication? You know, you mentioned Diane's report, how like in Europe or is there anywhere where they're having

this sort of conversation, sort of trying to put standards for that kind of communication and reporting in place?

MR. CALWELL: I was going to ask any of the other panelists if any of the IEEE processes might touch that. I mean, I guess Commissioner, I'm inviting you to be that one.

COMMISSIONER MCALLISTER: I hear you, but I want to build on somebody else's work, if possible, as well.

MR. CALWELL: Well, in my travels people frequently say, "Well, once California does it, we'll do it too." And so it is a circle.

Anybody else know about standardization efforts in that regard?

MR. ZIVOJNOVIC: So, if I might comment? This is a very good point. I really hoped we will be having this discussion.

There is an IEEE 2030.5, which basically establishes the full communication between all devices and custom (indiscernible) side. And the key motivation is really demand response, but demand response really cannot work properly if you don't know what this device is doing.

Now, it's going to be hard to get it going on some of the, say older, devices we have. But for example, car chargers is a phenomenal opportunity to unleash that potential, because this is what you already have. You have

for your Tesla or whatever, a bold car, you mostly have a kind of app (indiscernible) that. So the full infrastructure is there. Once it's in the -- Tesla has an NVIDIA Panel, so like a NVIDIA table, it's just integrated into the car, software is there, hardware is there.

The next step is really to standardize that under the 2030.5. I think EPRI is very involved in that and basically enabled that across all the devices. So we can then, what we just here discussed, have this information available and then yes there will be a privacy concern. But we're already giving so much of our privacy from these devices, so I think in the proper legal conditions that could be presented anonymously to the users of that information.

COMMISSIONER MCALLISTER: Thanks, Vojin.

Kevin Messner.

MR. MESSNER: Kevin Messner, on behalf of the Association of Home Appliance Manufacturers.

So NIST, well it's not NIST now, SGIP is the clearinghouse for trying to get this smart grid in our interoperability panel. So it was at NIST, now it's spun off, so they're looking at all these communication things and protocols in trying to get a consistent basis through their (indiscernible)

COMMISSIONER MCALLISTER: What's it called again?

MR. MESSNER: It's SGIP, it's a Smart Grid Interoperability Panel -- Protocol -- or whatever the P stands for. But it was at NIST and then they kind of got it through its nascencey and now it's its own standard kind of development protocol. But it's a clearinghouse where all the protocols were WiFi, Xbee, you get updates and Green Plug and everything is done and it's all cleared. The ENERGY STAR for the Smart Connected relies on that SGIP to get everybody talking the same language.

But we asked NIST back four years ago if they would pick a standard, because we're not going to pick one. Nobody wants to pick one, because you're going to have winners and losers. NIST wasn't going to pick one, so nobody's going to pick one. And so you have SGIP to try to (indiscernible) be in that Beta/VHS kind of mode for awhile.

COMMISSIONER MCALLISTER: Okay. So that's not an unfamiliar problem, but at some level somebody's got to pick. You know, we've got to standardize or we're just imposing a whole bunch of additional costs on everybody.

MR. MESSNER: Yeah, but if somebody picks it's -- nobody will pick -- maybe CEC will, but nobody will pick. So the market will flush it out eventually. The thought is that the market will flush it out and then there's a question of well you have the USB ports, how do those

become standard by everybody doing it. And then there's the -- so but right now it'll -- like BETA/VHS. We pick the market -- ended up picking.

COMMISSIONER MCALLISTER: Thanks.

MR. GHATIKAR: Real quick, not meaning to take too much time, Rish Ghatikar from Greenlots.

I worked on this problem of standardization at Lawrence Berkeley National Lab for almost eight to nine years, part of the DRC.

I think to your question, there are two parts to it. One is standardizing the energy reporting information itself and making sure that the energy reporting information is done by everybody that implements those standardizations.

I think going back to the standardization itself, there is the Green Button data that is mandated. A lot of utilities like PG&E and vendors like Honeywell are implementing it. So Green Button is one I would suggest where -- it's primarily for commercial buildings. It hasn't been applied on the plug loads in appliances yet, but it could be, because the energy usage information is going to be very similar.

So standardization will help quite a bit in developing third-party applications in businesses for energy efficiency and (indiscernible) response.

COMMISSIONER MCALLISTER: Can I just ask quickly, so I'm familiar with Green Button sort of at the whole building or the meter level. I guess you're saying it's capable of reaching into a building and sort of having multiple devices transmitted through that?

MR. GHATIKAR: It has the potential to be expanded to that. There is also an initiative by NIST for a Facility Smart Grid Information Model, FSGIM, which also is important. It goes into the device level to get information from HVAC systems or lighting control systems. You can think about that similarly in the plug loads also. I'm not aware of any requirements where everybody has to report it to some entity whether it's a public entity or utility or some entity. But I think that's where the CEC can make sure that any devices that are plugged into our network and connected have the ability to report the energy usage information if needed to. Thank you.

COMMISSIONER MCALLISTER: Go ahead, Alan.

MR. MEIER: I'm Alan Meier, Lawrence Berkeley Lab.

I just wanted to address your question about what should the state be doing? And I think what we saw actually is that the best investment can make is as far upstream as possible in ensuring that the technical standards are designed and allow for energy efficient

operation. And this is an area where the technical standards, to put it crudely, are owned often by the manufacturers. And there's nobody there saying, "Hey, what about energy efficiency?"

And I'm glad you're nodding, because I think that's what you were really saying too. And I believe that this is the best investment that the Commission could implement are long-term commitments with the technical experts, some of whom are in this room, to be on those committees. And, you know, there's a saying that the devil hides in the details. Well, there are so many devils in the technical standards areas and in those committees. And yet, we need somebody to expose those and bring those out into the public, so we can reduce energy (indiscernible)

COMMISSIONER MCALLISTER: To exorcize those, is that what you're telling me?

MR. MEIER: Yeah, we need some exorcizing. Thank you.

COMMISSIONER MCALLISTER: Thanks. Ken, do you want to --

MR. RIDER: Yeah, well I do have a few questions. So that I mean -- and this (indiscernible) which is I was going to ask what are the first steps? And then I think what you were -- what translated in what you were saying is, is how do we ask for what we want from the community in

a way that we're going to get it? We have the hammer, we can say, "You have to do it." And then they have to go off and figure out how to do it and that's the Title 20 way. But is there another way to ask? So I won't re-ask that question.

On the power management -- so you identified an opportunity in the power management of Windows 7, same kind of idea, what would you see is a first step to trying to solve -- this is a little bit different problem. It's not a standards problem, so much as an interface problem. What would you suggest for a first step to try to tackle that?

MS. PIXLEY: The user interface problem -- well, it's clear that people are having a hard time just finding where the settings are. So I have some ideas on how we would change the user interface. I'm not a user interface expert by any means, but there could be say an icon on the bottom of your screen that tells you whether your computer is set to go to sleep. There could be -- for instance, your computer is constantly reminding you, hey you don't have backups set up. Hey your antivirus needs to be updated. Is there any reason why it couldn't say hey, you're computer isn't set to go to sleep?

Now, the potential there is that that would annoy the users, but we haven't tested that. So the question is would it save more energy than it would annoy the users?

And that's the kind of thing that we would set out to say well, here's a couple of different levels of different ways of using the user interface. And how can we test that in real-life situations and see whether or not that's leading to a better result. And I would definitely get away with de-customizing the profiles.

MR. RIDER: So let me sharpen the question a little bit more. How would you -- so how could the Commission get to getting to the answer to all of this stuff? Because obviously we're not going to sit in a room and figure out where the icons go and things like that, so...

MS. PIXLEY: You're not?

MR. RIDER: No, well I don't think so. If I'm told to I will, but --

MS. PIXLEY: That is a harder question, you're absolutely right.

MR. RIDER: I mean, do we need to do research? How do we ask for that? Do we just ask Microsoft, "Hey, can you?" How do we do it?

MS. PIXLEY: I'm not sure how you could ask Microsoft. I think the idea is that we're holding people responsible for the energy efficiency of the devices that they are selling, if part of that energy efficiency is because of the software that's going on there then whoever

is selling that device needs to somehow negotiate that with the people who are putting the software on it or come up with some other sort of software solution.

So again, the idea is that if we're testing what's happening in the field, and then bringing that back to be a realistic portrayal of the energy efficiency at the point of purchase -- so does that answer your question?

MR. RIDER: Yes, thank you.

MS. PIXLEY: Yeah.

MR. RIDER: Vojin, I had a question for you on 2415, the Standard, so what is that going to enable us to leverage here? I understood that you were working on a standard, but it wasn't as clear what are we going to be able to get out of this. And then as a follow-up to that, how can the Energy Commission take advantage of that standard.

MR. ZIVOJNOVIC: So IEEE 2415 is a formal description of a device, which can be used for different purposes: for integrating IP components, for verification, for synthesis of the software and so on.

One of the key, for example, activities of the moment is the unification of the power states of the devices, so that we have a clear definition of what is "asleep," what is an "idle?" And we will not call it sleep idle, it will be identified through some quantification.

Very often it's latency, power consumption, terminal characteristics in that state, necessary readiness elements and so on.

So I can tell you what is currently in it for the electronics industry. It is the ability to prototype and develop most efficient devices in the shortest period of time, so that they can say I need a Fie, (phonetic) which is like an Ethernet enabling component in a device whether it's a phone or something else, a USB controller, DVR controller, the memory controller, the processor chip. And then off-chip devices, SoC, is fully integrated on the board. You have different devices, which they combine DOCSIS for set-top boxes, Mocha interfaces, they combine that in the full board. Now, this procedure is inefficient for them. And there we often speak about low-power states, but it's not formalized, so it means different for me and for them. So that's what is in there for them.

Now, once this infrastructure is formalized it's easy to add the communication of that information to the outside. Currently, it's used inside to keep the mobile phone running for 36 hours when you just listen to audio, like your iPhone does. This information can -- about the states, about the current state it is in, like an identity card, energy identity card of the device. Plus the real-time reporting, which we discuss here is a simple add-on to

that feature. And we are happy to have this (indiscernible) who is through Internet of Things going to bring forward that point.

How the Commission can help, these people I listed there, are competitors. And they definitely only come together if they have proven financial benefit. And one of the elements, which could be attractive is what I think Alan mentioned, is the upstream incentives for that. Because that could enable some components, which are inefficient, which are more costly, maybe 50 cents more costly, consume 5 watts more to maybe save a place by a more efficient component. That will be a more specific contribution of not the Commission itself, but maybe of the energy companies around it.

There is this notion, which I mention of the Department of Defense, which made a very simple step. Put the federal seal on that. It raised the awareness in the industry, newspapers talking about it, media started talking about that and so on. So suddenly by initially an investment was paying TI and Intermetrics (phonetic) in '81, maybe $300,000. And it generated an avalanche of activities, literally $10 billion if not a larger industry at the moment. And the DOD didn't follow that to every step, didn't go into detail. It just said, "This is what we think is beneficial." And then we said, "Yes, this is

beneficial to us, let's move together." I think the Commission has, especially in California, most tech companies are coming from here -- has this opportunity to set that sequence of events in motion without having to overspend.

MR. RIDER: Thank you.

MR. ZIVOJNOVIC: If I may just comment on the software side: very, very excited about the fact that more and more people are mentioning software and yes it's not only Microsoft, it's the Linux community. All the servers we have, you have, Google has are Linux based. All networking devices, if you have a router at home it's Linux based. So there are not too many, there are three chunks of software companies which need to be brought to the table. It's the Windows ecosystem, the Linux ecosystems and then the Artos ecosystem for the smaller devices like fridges and similar.

And these people will be very good if they start listening about energy efficiency from that perspective like we have now, an occasion that the Intels and Dells and HPs, have the contact with the Energy Commission.

MR. RIDER: Okay. And then Pierre, on your presentation there, you have a big long tail of products. And we talked about how maybe knowing what the products you're using is useful, can really target the big ones, but

what do we do about this? I mean, you've got this huge tail. I don't think user behavior -- I wouldn't spend the time to save a tenth of a kilowatt hour honestly, and I'm pretty conscious about this stuff. What do we do about this? How do we get this tail?

MR. DELFORGE: A couple of thoughts. First, I think the reporting will tell you which parts of the tail, which aggregations of the tail are significant and better understand it and able to prioritize and focus on parts of it.

I think horizontal approaches, you know, horizontal standards for standby can address a lot of the tail, maybe not all of it, but a significant portion. And some control approaches like whole house control, you know, smart power strips. So there's a number of things that could be done to address multiple of them, so I think there's no silver bullet. But I think there's a number of combination of tools that might be able to significantly reduce the tail.

MR. RIDER: Yeah, and then you were talking on the commercial side, it being very difficult. And then Joy was saying -- or I don't know if it was Joy -- someone was saying that there are people with just really chaotic schedules, but businesses for the most part are the most rigid. At least here at the Energy Commission, "We come up

at this time and we leave at this time." There's no whistle that blows, but it's pretty much what happens. And so then the building is empty. Is there a different strategy made for tails in commercial buildings where you have a more regular schedule?

MR. DELFORGE: So I think that's true in office buildings and maybe in some other sectors, not necessarily in all sectors. That lends itself well to control and energy management. My comment was more in terms of the diversity of end users and the fact we're going to -- the variety issue in the residential sector is compounded on the commercial sector, which makes a stronger case for horizontal approaches that can cut across many of these sectors.

But, you know, to your point -- and I think there's some of it in Title 24 already -- is looking at controls strategies to try and minimize plug loads in these type of buildings.

MR. RIDER: Thanks.

All right, I think we've used up the Panel time on this one. I want to thank the panelists for coming here today and providing their insight into how we might address this plug load issue. And we'll move on to the next Panel, which I believe is moderated by Sean Steffensen here.

COMMISSIONER MCALLISTER: Thanks a lot, everyone.

MR. RIDER: I'll hand it off.

MS. RAITT: If I could ask the panelists to go ahead and take seats in the audience and we can get our next Panel up. Thank you very much, everybody.

MR. STEFFENSEN: Hi, I'm Sean Steffensen with the Efficiency Division. I work with Ken and I will moderate the next Panel.

While California continues to have significant opportunities to reduce plug loads through standards development there are several appliances for which we are unable to improve standards due to thorough preemption. For these appliances California will need to consider other strategies and tools to achieve the necessary reductions in plug load efficiency.

The next Panel will discuss some of the strategies and tools currently underway or make recommendations about such tools to reach these types of appliances. So again, there'll be six speakers today. There'll be Q&A at the end, so I would ask to hold comments and questions until the end. And if we're ready to begin, I see people are still settling in just a little bit, but Rish will be the first one up. Thank you.

MR. GHATIKAR: Thank you for the introduction. It's a pleasure to be here and thank you for the

invitation, especially to David Hungerford and then Charles Smith for having me here.

So today there were a lot of good questions. I am glad to have a lead to some of the things I'm going to be talking about today on the appliances side and the equipment. I'm not going to be focusing on the plug loads per se, but some of the work we've been doing for quite some time. At least I've been working on understanding the demand response automation in appliances and to recommend.

Until last month I was at Lawrence Berkeley National Lab for 13 years leading some of the grid integration research. And just this month I worked for another interesting startup that is focusing on electric vehicle charging and standardization interoperability of vehicle charging and smart networks.

So in terms of my talk today I'll be talking a little bit about demand response context in automation, what we've been doing in demand response. Because plug loads are pretty new in demand response, not many plug loads are out there. Through demand response we will have a knowledge of what could be done for demand response including some of the R&D findings primarily done through the Demand Response Research Center, which was a peer-funded research center for the last ten plus years at Lawrence Berkeley National Laboratory.

And then what's the path followed, what's the CEC role and what were some of the key recommendations we would like to move forward.

So if you're looking for the context for demand response automation primarily a lot of standardized standards and regulations in California, including those by the California Energy Commission, have focused on energy efficiency. They haven't focused much on demand response.

If you look at the potential for energy efficiency it's quite significant. A lot of people are aware of what the potential savings of Title 24 Building Code has been on energy efficiency. But also the first time in 2008 there was an effort made by the California Energy Commission to include Demand Response Standards in the Title 24. And the idea there was it was expected to deliver a savings up to 132 megawatts each year of demand response savings.

And for those who are not well versed with demand response or a difference between energy efficiency and demand response, demand response is all about when you save energy and not all the time. Energy efficiency is all about using the least amount of energy to provide you the maximum services. So the demand savings are quite significant, because the ripple effect goes up all the way from the distribution system to the transmission systems

and all the way to generations.

Another important thing about this fact is that similar to energy savings, demand savings also accumulate every year. So there is a huge potential for leveraging the cost effectiveness, both from the consumer perspective, from the utility perspective, from the rate (indiscernible) perspective.

The significant change that happened in the standardization effort for demand response was in 2013, Title 24, which required automation. While demand response can happen without automation -- you know, people can turn off their lights or manually change their temperature set points in the thermostat -- automation is a very key enabler, because you don't need a human in the loop. It's much more reliable. Research has shown it's around 8 to 9 percent more reliable than manual demand response. And it's also a very key element if you want to have a quick response, especially for wholesale DR market or ancillary services.

And as we see the future grid is moving into more renewable and the grid is becoming more variable. Flexible loads will play a very key role and automation will play a very key role, so the idea there was to move these building systems -- Title 24, which is most focused on the commercial side -- to have native capability and

enablement to provide demand response resources.

So I think there are a lot of lessons here taking from Title 24 and moving them into Title 20 potentially in the future. And that's where CEC can play a role.

I don't have too many details on this one I'll go over, due to the constraint of time, but I have added a lot of references and publications we have published in the past. So anybody who wants to get into more detail, they can refer to those publications.

So what is the road map of what Title 24 came through demand response? As you all know the name of the (indiscernible) standards, the Warren Alquist in the early '70s. That was a key game-changer in enforcing energy efficiency and why California is a leader in energy efficiency, in the entire country, maybe in the entire world. So there were a lot of steps that happened whether it was three-year rule period -- the biggest change was in 2008 and 2013 where I mention.

But another thing I also should mention, there was mandatory demand response standards requirements that were explicitly defined. Whether they were defined in the right way or not, there is a paper that we have, and there is a potential to improve those languages. But that was a significant step. I have no knowledge of any building code in the world that has a requirement of mandatory demand

response standards and implementation, you know, in any building codes. So I think it's a key step that we can learn lessons from.

Again, there is an immediate need to allow such electricity equipment whether it's appliances, white goods, or I was very happy to see somebody talk about electric chargers, EV supply equipment. Also be able to leverage looking into the future, what could be done. And those are very key to meet the goals of California, especially with the 33 percent renewable by 2020 and addressing having more flexible loads.

So what are some of the lessons that we have learned through our experiences? Again, this information I have here is based on two major studies. One is on the what we call Demand to Grid Lab that we had set up at Lawrence Berkeley National Laboratory when I was working there. It was part of the Demand Response Research Center Initiative funded by the Energy Commission. And the second one was in the Title 24 support itself, in enabling automated demand response and standardization natively in commercial buildings.

So one of the things we looked into on the appliances side, as part of the research, is looking into different types of equipment whether it's a washer, dryer, a refrigerator or water heater, a thermostat which is also

used in commercial, not just residential and how the displays, gateways and meters play a role.

But it's important to understand the fundamental difference between why metering and these gateways is needed, because technically you don't need them for demand response. But for establishing automated demand response and getting data and to be able to establish a measurement verification and change their energy usage pattern, you need some kind of communication and a network to be established. So that's where these play very key role in enabling automated demand response and for the future electric grid.

We looked at different DR modes as well, what we call function in what can these appliances do when they receive a signal. And how much energy or demand savings they can provide over what period. How much can they share, how long can they do it, and how often they can do it.

We also looked at different protocols that exist out there, because there are a plethora of communication technologies and protocols whether it's a Xbee or Wifi Internet, a smart energy profile, and SGIP was mentioned, so there's some standardization happening in there. And also Open ADR, which came out again of the lab research I led for the last ten years. It's a national standard, part

of the NIST activity and SGIP activity for demand response and press communication. So there is some standardization happening in the demand response in the Green Button, for example, on the energy reporting information. But there is no standardization of that need that these standards should be implemented in any appliances or equipment. And that's where I think CEC can play a role in influencing that.

The second one was natively enabling what can you do in these appliances, because while consumers are smart at the same time they do not have enough time to really go ahead and program them for every event that they might receive from the utility. So there is an inherent need to have some native capabilities of what could be done. There is an example of the laptop or, you know, smart charging infrastructure or what you could do in a laptop.

Similarly, what can be done in a thermostat? What can be done in a washer? What can be done in a refrigerator? So these are some of the things that also can be taken a look at and then those could be required, so that when appliances are purchased by the consumers they're natively capable. And they can, with some minor customization or some selections they can be ready to participate in a demand response program.

So another thing is also how much can they save through these strategies? We looked at three appliances:

washer, a dryer and a refrigerator. We looked at different rates, you know? One of the ways to enable demand response is to provide a time differentiated rate, what we call dynamic rates. At critical peak pricing, for example, that Southern California offers or peak day pricing that PG&E offers are some examples of dynamic rates. That's when the grid is highly unstable and demand is very high, the prices are high. How do you communicate that to the customers and how the customers can take some actions to reduce the load? We saw that at high-rate level and critical-rate level, which could be an emergency right, what can we do?

We saw a significant potential for load reduction with these individual appliance even at the high-rate level, which is older than this. We saw like 39 to 40 percent demand savings potential in appliances and again, you don't do it all the time. You just do it in currently the critical peak pricing, looking at 60 to 70 hours a year. So, you know, out of a four or five-hours event, you're looking at twelve to thirteen events in a year, that's it. So there is something that you can do in appliances and in the cumulative effect and an aggregated effect could be very significant.

So if we look at how do you enable these devices, again the important thing is the language that was part of the Title 24, the Joint Appendix 5. For the first time in

the OCST or what we call programmable communicating thermostat or the language for occupant controlled smart thermostat, is basically defining a standards based messaging protocol. Because all of a sudden now you're communicating with the grid to receive this price information or demand response information. And you need a way to standardize that, because all appliances cannot be customized for individual utility programs. You need to have some standardization just like you plug in your WiFi network to your computer and the WiFi is standardized, so you can use that anywhere in the world. And then you can communicate to the Internet.

Similarly, can I purchase a thermostat in Home Depot and not worry about whether it's in the Southern California Edison territory or PG&E territory. I can easily participate in their programs. The answer is you can do that now, it's not a technical challenge.

It's a program challenge, because you're utility may not require it, thankfully. All three (indiscernible) western utilities have standardized similarly with Open ADR requirement for DR demand response. So you can say anybody if implementing Open ADR in that thermostat, are capable to receive and communicate with the utility pricing information for demand response.

So there are certain things one can do, certain

things CEC can do and certain things CEC cannot do. Markets drive them, so the appliance manufacturers and the consumers drive them. Certain things like internal protocols and protocol translation you cannot change. You know, I'll be happy to use WiFi, somebody will be happy to use Xbee. You cannot say "everybody use WiFi."

But there are certain things which could be standardized, which is the Open Standard Protocol on the right side which communicates to the grid through your smart meters or your gateway or cloud application or any other devices. And those communications are very critical, because this lesson I think is important to not reinvent the wheel, even while federal regulations, federal appliance standards, don't have the requirement for demand response. They are very aggressive in energy efficiency, but the ENERGY STAR is the first time it's not mandatory. But ENERGY STAR requires or at least recommends what could be done. And this is the best one I have ever found in terms of separating the Open Standard Protocol that communicates with the grid and linking them to the requirements that consumers and manufacturers can choose to deploy with their products. And that is where you are separating.

And the important glue between these two is a Protocol Translation. So any communication that comes from

the grid and the communication that internal advices use, they need to understand the language. And that's where the key aspect, whether it's the home energy management systems or gateway systems. Or some kind of a logic that could be built into these appliances very cost effectively, because appliances are capable and sophisticated enough now, it's a small task to do. But if regulations do not require it the appliances are not going to be doing it. So this where I think there would be a key element to implement such requirements.

Again, cost is an important factor, I'm not denying that. But that kind of cost benefit analysis could be done very easily to really see that the scale through which this could be deployed in many different appliances, the cost would be very minimal.

So if you start looking at this as an example and start linking it to the distribution grid, in the future the utilities whether ISO for wholesale market or utilities in California for retail market, there is also an important thing is that you can communicate directly with the utilities. That's the secure standards communication that the utilities in California have over 250 megawatts and they have deployed over 1,500 facilities, mostly commercial and industrial, for using the standardization. And they directly communicate to a facility where there's a logic.

And that makes sense in commercial and industrial, because most of these buildings have building energy management systems, they are more sophisticated than you would have in appliances or homes. But that same concept could be applied in a home where you might have a third party, because the loads that you can get from homes are very small. And aggregation can play a very key role in bringing in smaller loads from hundreds of millions of homes and devices and providing those resources to the grid.

So this is what we had proposed as part of our study for Title 24 is to use some of the experiences that we have had in California for commercial buildings and what ENERGY STAR had been recommending for its appliances, particularly in refrigerators and freezers. And have those demand responsive controls, what we call, within these appliances as a native capability with some pre-program strategies of what they could do when such information is received.

It's totally up to the consumers to decide whether they would like to enroll into a program and enable such devices to participate in demand response, but the capability does exist. So it becomes a very cost-effective strategy and easy to participate. And then you can have a logical interface that takes this information from external

signals and can communicate to any of the other third-party service providers to the utilities or ISOs directly to provide demand response.

I think the standardization is very important, because that allows us to reuse our assets. The (indiscernible) terms of standards assets is very important, because you don't want to use an asset and know that the particular utility doesn't offer the program or at least doesn't communicate in a way that these device understands. And the asset becomes stranded and then you need to spend more money to either change an asset or reprogram the asset. So that is very important for ubiquitous adoption of the technology in allowing the technology to be able to participate in either retail or wholesale DR markets, especially in California.

So if you look at that analogy since I'm now very much engaged in looking at this problem in the future of California with all of the government and state goals of 1 million electric vehicles by 2020. Is there is a huge analogy in terms of what we have learned in commercial buildings and what we are learning in appliances and other equipment, into electric vehicle charging.

So there are basically two huge levels standardization requirements. One is in how the electric vehicles charge from the charging stations. There are many

different charging standards out there: SAE, Tesla has its own, Shadowmo (phonetic) different standards. Just imagine you have a car where you don't know which particular pump offers you a kind of hose that allows you to put gas in your car. So that is a huge barrier in terms of what you could do. It's a similar problem with electric vehicles right now. It's a huge problem in terms of adoption of electric vehicles. Luckily we are in the very early stages of that and we have the potential to change that.

And the second standardization is in the networking itself, because most of these are down (phonetic) charging stations called EVSEs or EV supply equipment. They don't have the ability to communicate and neither do they have the ability to provide information that can provide grid services in the future. So understanding how much energy they themselves use to keep them awake is one part of the problem.

And the second problem is what kind of information that can be enabled, and control that can be enabled to provide grid services through the electric vehicles, which also have storage by the way, in them, is a very big area that California can leap frog in the future.

And I also think there's a third area, which we can learn and apply the same lessons in enabling demand response in price communications through the commercial

building. You don't need to build a new standard. The DR Programs can be the same. The communication infrastructure could be the same, but how you respond and what kind of device uses that to respond could be different.

So I think the lesson there is taking those could be applied to a network-based solution whether it's your charging or your network or grid participation, into a much bigger skill. And the idea there is how do you enable or defer the charges that might be necessary in order for the future grid, you know? Sometimes a transformer may be over-congested or the grid may have enough supply, but localized problems might be very big. And demand chargers are a big part of California consumers, commercial and industrial consumers electricity bills.

And it could be a big part of the EVSE owners in the future as well. So you could have some kind of controls that allow people to save money by more regulated or managed charging or smart charging as we call it. So I think that integrated development and demonstration is absolutely necessary, because we are moving into a new paradigm for large-scale deployments of EVs -- and also to lower their cost and enable them for greater participation.

So lastly, what did we learn from all these things? Without too many things of eight or nine-years research I think there is a huge potential to improve Title

24 Building Code, especially looking at the thermostats in small commercial buildings and building control systems. I think that similar guidelines, terms and accepted testing requirements, which California Title 24 requires -- without developing the standards, but using the standards in creating guidelines -- can be applied with Title 24 appliances or equipment as well. So there is a huge lesson that we could learn and use those.

The second one is interoperable demand response controls in appliance equipment that can automatically respond to an external DR signal and that can provide customers the choice, so command and control paradigm is gone. You know, customers are smart. They would like to have their own choice. They'd like to decide when they would like to participate and how they would like to participate in a Demand Response Program. Choice becomes very critical.

And the third one is how can the results be added to the home automation network of consumers, utilities, generators and regulators. So taking those lessons and applying them into other different areas, I think, would be very useful.

Finally, the path forward. You know, we think that these standards could be made accepting and acceptance testing requirements can be made more clear. CEC may not

develop its own standards, but they can define the acceptance requirements and the consumers in the market can decide what kind of standards can be meeting those requirements. They cannot be one or they cannot be ten, but they could be two that can meet those requirements.

And the second I think is extremely critical, because I have spent at Lawrence Berkeley 13 years of my life since I was an intern there and now on the private sector side, so I'm trying to see it from the other side. And even at Lawrence Berkeley we did applied research working with industry very, very closely. So anything that you're going to develop, industry stakeholder engagement is going to be extremely critical in accelerating that option of such standards for appliances or equipment to participate in demand response and see that the consumers can benefit eventually.

Then finally is education and training. I don't want to say that the -- you know, everybody knows what we are trying to do and so utilities and other key entities can play a very key role. And what CEC can do is foster programs and funding that allows that kind of education and training and tools that allows -- before you purchase an appliance or before you build a building, you can do a code compliance check and see how well such a program can provide cost-effective savings whether it's a Demand

Response Program in the California territory, in PG&E or at Southern California Edison. So I think those three would be extremely critical if we want to look at what could be the path forward in enabling such infrastructure for appliances or EV chargers.

Okay. Thank you.

MR. STEFFENSEN: Thank you.

Next up will be Alan Meier.

MR. MEIER: Thank you very much, my name is Alan Meier from Lawrence Berkeley National Laboratory. And I think I'm going to go backwards in my slides and start at the end, because I want to get to solutions.

I don't claim to have all the answers, but I think you've heard a lot of recommendations here and I'm going to repeat a few of them. But then I think I have a few unique ones and actually I disagree in a couple of cases, which I was surprised, because I thought I was going to be agreeing with everybody. And I mostly am, so there are a couple of small observations I want that might give a different slant, if not disagree.

So the first is, I think there's a way that we want to limit the amount of loads that are installed by builders. We need to think of a way to do that and it might be part of the Title 20/24 approach. I don't know all the solutions, but I think there's a way and path

forward there.

You've heard several people use the words "power scaling, proportional energy, proportional power use." I completely subscribe to that. We need to get involved in that. We need to figure out ways in which that can be implemented and that needs to be done way again upstream. That needs to be done with the test procedures and the technical standards. It's not easy, I don't know all the details of it, but this is where in small investments done today by thoughtful people, we'll be able to make a huge difference. And I think that is and will become a research problem, which I will get to in a moment.

Finally, we need to think -- or not finally, but third -- we need to consider ways of using Title 20, Title 24 combinations to deal with perhaps other reasons why people might want to have special energy features in their buildings. And I'm thinking about energy security, energy for health reasons and maybe more reliability. There may be a variety of reasons, which they may want to pursue a different path. And the Energy Commission has already started that, but we may want to emphasize that in the future.

I think there's still a tremendous amount of research in the area to understand and then reduce plug load energy use. And partly because you've see that we

just don't know very much about it. And so some of the research areas are like I've already said, greater power scaling, nobody has talked about the potential here for DC grids in the home and how that might be used to reduce energy consumption. Not only because it can reduce energy consumption, but if done correctly it can provide communication among the devices in a very efficient manner. And that will give us additional energy savings opportunities.

Naturally, we want to improve the efficiency of the individual products. I have some data that suggests that in many cases, some of these things that we think are insignificant actually have large ranges of energy consumption, and we could further reduce them. We haven't -- we're now at the level though that some are so low that we can consider things like energy scavenging and small onboard storage if you wish, batteries or super-capacitors, in order to free them up and further reduce the energy consumption.

Energy reporting has been discussed many times here and I subscribe to that. But what exactly is energy reporting, how that information is going to be reported, what are the protocols to deliver that, and how do we get around are what are becoming closed gardens of information exchanges is going to be a real challenge. And I think we

need public entities to get in there and to play a role. Again, it's upstream and it's excruciatingly boring to be on these technical committees, but that's where the action is. And will make the long-term decisions.

We already heard a little bit about user interfaces and I subscribe to that. I was shocked a few years ago when I started studying thermostat interfaces. There is no standardized procedure to quantify the usability of user interfaces, so how can you expect manufacturers to make good interfaces, because they don't have a scale on which to measure their success. Well, we've worked a little bit on that, but there's still a lot work to be done that.

And usability does have an important role in this. Along with energy reporting we also need to have an interoperability of products. And again, that's allowing them to communicate key information, not only energy information, but status information, identity information, all that needs to be able to be communicated. And right now we're beginning to live in a land of walled gardens. It's going to be the GAFA, Google, Amazon App, Facebook and Apple. These are the walled gardens that we're beginning to see.

Finally, we shouldn't deny the fact that there may be social science solutions that are much, much cheaper

than other ways of saving energy. And I'm not going to try to list them or I'm not trying to force people to do something. But behavior is extremely pliable and changes over time and sometimes we aren't even aware of how much our behavior and our attitudes towards certain things have changed. And we need to recognize that sufficiently, so that we can take advantage of it when possible.

Now, those are my solutions and so now I'm going to go back and mention a couple of things that I wanted to make sure that everybody got.

I think this has been covered by Pierre and other people. Once again, there's no single solution. We need to have a diverse collection of strategies to deal with plug loads. And so I am going to skip that and go to this slide, because this is one of the rare cases where I disagree with Pierre. Pierre, are you still here? Yes, he's still there.

I've actually had a student measuring what I called the builder installed loads where we try to find houses before -- just when the builder has finished it, but before anybody's moved in, and there's a smart meter attached, so we can look at the power consumption. And so this is the energy consumption that becomes a mortgage on the home. For the life of the home that energy is built in, baked in, built in, I don't know what you want to call

it, into that home for 100 years.

Well, these are the power consumption of ten homes or something like that, that we measured by literally just looking at the smart meter. And we think that there was nothing else -- everything was switched off in these homes. And just to give you a sense of 100 watts corresponds to roughly 900 or 1,000 kilowatt hours a year, somewhere around there. So you're seeing that before anybody has moved into those homes they're using 1,000 kilowatt hours a year and they're going to continue using 1,000 kilowatt hours before anything else happens.

Now, we don't know exactly what all that's made out of. We've got some ideas of what the components are, but this seems to me something that is important to address. And it also seems to be addressable, because there is a person who is responsible for it. There is a builder who is responsible for this home. And there may be ways in which we can figure out that we can reduce this load.

But as Chris Calwell had mentioned before, this is something that basically translates into an extra selector on the roof. And that's very expensive, but we need to figure out ways of reducing this. In many cases these are required by other codes such as Safety, because these are hardwired smoke alarms. These are GFCIs. These

are arc fault interrupts. These are security systems. There's a whole -- these are ventilation systems. We need to talk to the code officials and figure out ways in which we can assure safety, but maybe reduce energy consumption at the same time.

Again, I want to give a plug, so to speak, about the need to have proportional or power scaling of devices. These are very poor graphics, I apologize, but on the left-hand side you'll see a network switch going from 367 watts. So there's a huge amount of power consumption that's not shown on this graph, 367 watts when it's just sitting there idle. And then when it's being utilized at 100 percent of capacity, it goes up to a whopping 376 watts, so it's increased maybe 10 percent from 0 percent to 100 percent of utilization. That means it's not being at all flexible. There's no power scaling occurring.

And then we need to ask, well how often does it actually get to 10 watts or even 50 watts? And so this is a few -- the right-hand graph shows crudely, on several days, how much of the capacity of utilization actually occurred. And most of the time it was below 1 percent. Well, we don't even deal in most of the test procedures and so on with products operating at 1 percent. But in fact, many, many electronic products have a 1 percent utilization and so do elevators and a few other things like that, that

are in the same boat. And we need to deal with this whole concept of being able to ensure that products operate proportionally to -- they consume power proportionally to their power consumption.

One other point just to keep in mind, and to kind of repeat what Pierre described, this is a poor graph which actually has a mistake in it. But look at the red, because that shows the distribution of the minimum power consumption in existing homes for 20,000 homes. And actually the blue line is a little wrong; it should go over to that black line. If you look at the -- 50 percent -- you'll see that about the median home in California or this group is at the lowest possible power consumption it ever reaches over the year. It's using actually about .25 kilowatts, which is still somewhere around 2,000 kilowatt hours per year.

And we've got to figure out a way, so that when a house is absolutely at its minimum power consumption it's got to be close to -- well I'm not asking for zero, but it should be really low, because more than likely nobody's in that house. Nobody's using any services. Why isn't much, much lower? I don't know.

Well, we need to understand that and we need to figure out how to design appliances in the whole building, so as somebody else said here, the building goes to sleep

when the people go to sleep. Or when the people are on vacation the building should be going much closer to off.

So I'm going to stop there. Thank you.

MR. STEFFENSEN: Thank you, Alan.

Next up will be Peter.

MR. FRANZESE: Hi everyone, my name is Peter Franzese. I apologize in advance -- you've all been very good with not having animation and I might be the guy that you go home and say, "Wow, this one guy had a lot of animation on his slide. It was really annoying."

I work at the CPUC. I'm the Residential State-Wide Program and Evaluation Lead. And I was asked by CEC staff to present just sort of a snapshot on where the IOUs Rebate Programs are that address plug loads. So I'll jump right in.

In 2010-2012 there were two large statewide programs that addressed plug loads. The first one was "Home Energy Efficiency Rebates," which provided down-stream rebates to customers who purchase new appliances, plug-load equipment.

So here you get a sense of how much each utility spent and at an IOU level, what the cost-effectiveness was, for these programs. Just Southern California Edison's Home Energy Efficiency Program was cost effective. Overall, we spent $115 million on this rebate program and it had a

combined TRC of just .69. So we don't want to get into the debate here, I think, about TRC, but we have the TRC, not the TRC we wish we had. And 91 million of that 115 million was spent on programs at the IOU level that were not cost-effective.

I looked at the top five measures. There were 21 total measures offered in the '10-'12 year program. These are the top five by expenditures and -- I'm sorry, the top six -- and savings. So you've got clothes washers, refrigerators, roof insulation which made its way in there -- not a plug-in device -- but the HVAC, furnace, dishwashers and pool pumps. You can see the average cost effectiveness for each of them. And then there's a range by IOU, so the measures perform differently, depending on the service territory. Sixty-five million of the expenditures were spent on non-cost effective measures.

The next program was Appliance Recycling, providing customers with incentives to get rid of an old inefficient refrigerator. Freezers were in there too, but they didn't make up a very big portion of the savings or the expenditures. It primarily targeted refrigerators.

You can see the spending levels varied as did the cost effectiveness. Just Southern California Edison's program was cost effective. And overall, the IOU spent $54 million dollars and the roll of that cost-effectiveness was

.82. Like I said, refrigerators, they were 92 percent of expenditures and their cost effectiveness was a bit lower than the total program average.

At a sector level and a portfolio level, the HEER Program accounted for -- sorry if this slide's not readable -- it was 63 gigawatt hours for the three-year cycle. That was 1 percent of the portfolio, 2 percent of the residential sector if you include lighting, and 13 percent without lighting.

For the ARP the savings were 103 gigawatt hours. That was approximately 2 percent of the total portfolio savings. In the residential sector, if you include lighting, those savings were 4 percent. If you exclude lighting ARP savings were 21 percent.

And I do note that under the current framework, only the IOUs portfolios have to be cost effective; neither sectors, programs or measure groups or measures need to be cost effective.

In 2013-2014 the HEWR Program and the AR Program were rolled up into a larger umbrella effort called the Plug Load and Appliances.

Again, you can see there's a wide variety of spending depending on utility size, but PG&E and Edison were pretty much in the same ball park. The TRCs were still varied, but none of the IOU Plug Load and Appliances

Programs were cost effective. $102 million were spent with a total TRC of .66.

The top plug load measures by budget and TRC -- appliance recycling is rolled up in there, clothes washers, refrigerators, pool pumps and TVs. Again, you can see there's a range of cost effectiveness depending on the IOUs, but only pool pumps for San Diego Gas and Electric, among these five were cost effective. Consequently, 81 percent of the expenditures were spend on non-cost effective measures.

And in terms of the plug load and appliances savings, as a percentage of the portfolio in the sector, PLA -- and that's a rollup of essentially home energy efficiency rebates and the Appliance Recycling Program. It's not a direct comparison to '10-'12, but they're pretty close: 95 gigawatt hours, which is 3 percent of the portfolio, 9 percent of the sector if you include lighting and 20 percent of the sector excluding lighting.

Marketing, Julie's here from PG&E, she might correct some of what I say, but I think it's fairly accurate. The IOUs have, I would say three sort of at the residential level, complementary marketing efforts. The Home Energy Efficiency Survey otherwise known as The Energy Advisor. A customer fills out a survey either online or via the mail option -- I think just Edison is relying on

mail surveys until they get their website up and running -- based on the results of that survey the IOU then sends recommendations on low-cost and no-cost actions to save energy.

Sorry this doesn't show up, but this was the screen I was presented with after I completed the survey. And it breaks down your energy use into five different sort of larger end uses. Within these recommendations there's low-cost no-cost actions such as line drying your clothes, looking into purchasing a new TV, pursuing new insulation for your house. So there's no discrete messaging that targets plug loads exclusively.

You have the Home Energy Reports, which I think most everyone is familiar with. They use comparative usage to give you information on your energy usage compared to neighbors in similar homes, along with some tips on how to save energy. Again -- terrible resolution, but this is not my report, it’s a general image online -- but you do tend to get -- the three gray columns are the recommendations based on your energy usage. They're not specifically again tied to the plug load usage that's happening in your house.

The broader EE marketing includes a combination of efforts. There's email, direct mail and bill inserts. And while plug load messaging is part of that effort, there

isn't any specific marketing targeting the broader use, I think, of plug loads that we're talking about here today.

Future efforts in 2013-2014, both PG&E and Southern California Edison explored pilots that addressed plug load devices beyond the traditional white goods. These include a downstream program that targeted set-top boxes. That was Southern California Edison pilot. Julie's going to talk later about the retail plug load portfolio, which is a midstream pilot offering incentives to retailers to stock a greater portion of energy efficient plug-in devices. And PG&E had a proposed game console effort with a manufacturer.

Each of these revealed fairly significant challenges in terms of I think the downstream was what type of rebate do you offer? Should it even stay as a downstream program? Does it need to be a midstream program working with the cable provider or the manufacturer of the set-top box? RPP, Julie will talk about that, but there were some challenges in those results.

And gaming consoles shows that there are some pretty big challenges. A lot of people here have been talking today about working with manufactures. And I think that Julie can speak that working with game console manufactures will be very challenging. They do what they do and they like the way that they do it. So figuring that

one out is going to be tough.

I think one thing that hasn't been mentioned here today is in the last year or so, there have been two separate bills, neither of which has been passed. But they are targeting plug-in equipment, so we may soon have a legislative mandate to go after this group of products.

And Paula, are you on the line?

MALE VOICE: We don't have her.

MR. FRANZESE: Oh, we don't? Okay.

I can't really speak to this, but Paula Gruendling is the CPUC Lead for Codes and Standards and she had some -- what did she put here? I'm sorry, I didn't read this slide. So this is what she basically is describing as what would be needed in support of standards from the IOU programs -- primarily data, you can see -- and how incentive programs can complement those standards efforts, which I think has been talked about here today as well.

So thank you very much.

MR. STEFFENSEN: Thank you, Peter. Next up will be Kevin to speak.

COMMISSIONER MCALLISTER: I want to reiterate. Thanks, Peter, for being here. We really appreciate our sister agency coming over and helping us build the record and educate ourselves about what you guys are doing over

there. So thanks.

MR. MESSNER: Kevin Messner with PolitacaLogic. I represent the Association of Home Appliance Manufacturers.

Commissioner McAllister, thank you for the day. I mean, from the appliance manufacturers perspective my head's kind of swirling right now from hearing everything. And I'm not sure really where to focus.

COMMISSIONER MCALLISTER: Like a blind dog in a meat house as the saying goes.

MR. MESSNER: So, I'm going to try to go through this quickly. And if people are interested in things, they can ask me.

But I want to do -- first on Rish's presentation -- it was kind of music to my ears on the ENERGY STAR and the smart. That was back in 2009 fighting claw and tooth and nail trying to get that HUD protocol, get ENERGY STAR, get everyone agreeing took years. And so it's good to see, we are six years later, and specifications intact it's going forward there. It's an incentive for manufacturers for 5 percent energy. It's going to go on to others. We're doing test procedures for clothes washers; it's going to roll out. And we just really need to see if consumers will buy these things now.

The real problem there, from our perspective, is

we need real-time rates. You need real-time rates to really incentivize the consumer to do more than the automatic delay loads and things. These are good, but you can really just ramp it up of they had real time.

So anyways, what I want to talk about today is harmonization and then an early replacement program to really kind of really get up the next wave of energy efficiency.

So harmonization globally, AHAM represents global manufacturers from LG, Samsung in Asia, Haier in China, Bosch, Electrolux Europe, Whirlpool, GE, Sub Zero, so we're a global membership. We love to see global harmonization and everything the same -- it's not happening. There's energy labels in India, China, everyone's different.

So let's drill down to U.S., Canada -- a little more realistic -- U.S. and Canada energy standards are harmonized. Canada, there's a lag and so there's issues there, but you have all the provinces in CEC.

And just within the federal level, you have so many different "hands in the pot." You've got DOE with the Standards. You've got ENERGY STAR at EPA. You've got Energy Guide, which is over at FTC. In Canada you've got NRCan and ENERGY STAR and EnerGuide. And the provinces have a lot more authority in Canada as well, so it's far from perfect for harmonization.

I just want to come up with some examples of the disharmony. These are just some specific examples to show the issues that are out there. And I'll go through each one of them fairly quickly, but focus mostly on the database.

Portable air conditions: talk about test procedures. Yes, those meetings are -- it takes a certain personality to sit through those. And there are -- for portable air conditioners this is a case in point -- you have a marketing test procedure that's used. You have AHAM test procedure. You have another ASHRAE test procedure. You got Canada potentially looking at one.

But they're defined differently. CEC's defined spot air-conditioners, which is not a portable air conditioner in our opinion, but CEC says they are. And then you have DOE working on it and says that they're single-duct, dual-duct and then spot coolers, so everyone's defining things differently, there's different test procedures.

And the consumer -- there's one side story. Mexico did an energy label and they said, "Well you just need to put a label on and it has to be backed by a test procedure. Use whatever test procedure you want and for every product." So you could have a blender. You could run it with a watt meter for five minutes and put water in

it. You could put sand in it. And so it's meaningless to the consumer.

So having different test procedures and labels and everything all over the map is just not helpful for anybody. And that gets into the databases and the Energy Guide, which I'll get to next.

So the Energy Guide, Energy Guide is U.S., EnerGuide Canada. Many times you'll -- and this is not on every product -- it's FTC regulated. And a lot of times you'll see a manufacturer with Energy Guide on one side and EnerGuide on the other side, because we like to sell the appliances up through North -- well, the U.S. and Canada, the North America portion.

Well, Energy Guide, we have a new standard, a new test procedure. The new test procedure is modernized and a little more consistent with IEC in Europe. It includes additional energy. So a more efficient refrigerator with the new test procedure will potentially show more kilowatt hours than an older refrigerator with old test procedure. And so there was this overlap, so in order to make sure the consumer didn't buy the less efficient refrigerator, we have all these black lines and ways to try to hope the consumer will choose the right one even though they'll see a different amount.

But people understand dollars. Not everybody

knows what a kilowatt hour is. Everybody in this room seems like it's a no-brainer, but not everybody knows what a kilowatt hour is so they use dollars. EnerGuide used kilowatt hours, so again the consumers -- different test procedures. Canada couldn't change the test procedure, so they're using a factor to try to estimate it, so the numbers are different. It's just a mess.

We're part of it. We had a hand in this mess. We negotiated this with the advocates before we had a test procedure. And so this not entirely not of our own doing, but we're trying to make it work.

Databases -- there are databases -- everybody wants data. Everybody would like to have better data. Everybody wants good data. Well, that would be great. DOE has a database. FTC has a database with different definitions. ENERGY STAR has their qualified product listing. NRCan has their database. CEC has their database. AM has its verified database. The definitions of each of the databases in the fields are all different. DOE and FTC have different definitions of what you put in there.

So we did an exercise where we took all the data from the different databases, pulled it together, merged it together, analyzed it. I mean, it'll drive you bonkers.

This is some database categories looking at DOE,

ENERGY STAR and FTC how there's just no overlap. DOE has three uniques. That means unique fields where only DOE asks for it. ENERGY STAR has 12 fields. CEC has 9 fields. And every field could be defined differently. So manufacturers are trying to send data in for each of these and they're all different. And they're not. It's a nightmare.

And what's worse is then if the consumer every went to use these and they compare -- they go to an ENERGY STAR web product list and they go to DOE and then CEC -- they're going to potentially see different things in there, so they're going to probably just say this is meaningless. So harmonizing the database would be a great thing.

And I know CEC is actually interested in this and that's great. We don't always agree with CEC on everything, but this is great to hear. I mean, ideally we would like to have one database and it makes most sense to us at DOE. It's a federally -- and we can kind of co-opt in -- Canada and NRCan. We're not hopeful that CEC is going to say "Yeah, great. We're going to get rid of our database and go to DOE." That would be fantastic. We never give up and hope, but at least the CEC and DOE could somehow harmonize with definitions and maybe pull from data, so that it's in the same format. And there could be some cooperation.

And we'd be certainly willing to help with DOE on that as well and could even bring NRCan and Canada too. It would be a great, great way to give people that actually need the data real confidence that the data that they're having is good and accurate and consistent and defined in the same way.

I want to move over now to the next thing is early replacement of older appliances. So I'll get into this a little bit more, but we're not real excited at some of the things CPUC has been doing on rebate programs. We think the evaluations are really killing rebates. They have a DEER Database that has as 11-year or 12-year useful life for refrigerator and that's just not accurate. We have plenty of data that shows that refrigerators are 20, 25, 30 years. And so that kills these TRC and modeling numbers. And then they're capped at 20 years.

Then they just announced a policy on DEER Action for Disposals that's just going to destroy the disposal rebates. And they take all kinds of triple redundant -- Peter can -- we haven't discussed it at length, but this is kind of a new thing. And they take like triple reductions that are just going to kill the disposal program, which is a huge, huge deal. And they're assuming that nobody fixes or refurbishes a ten-year refrigerator.

And it's these kind of things that are -- because

of these evaluations the efficiency programs could be more impactful than they are. So I think we're missing a lot of energy savings because the evaluations are really screwed up.

(Colloquy off mic.)

MR. MESSNER: Yes, in fact we appreciate it. Like I say, this is new. I'm frustrated and that kind of thing. And they have not had a chance to clarify where I'm wrong, if I'm wrong, and help me with that. So I'm in my frustrated mode right now with that. So let me get back then to the early replacement.

So what we've talked about and everybody knows -- here's the chart -- the utilities could justify a dollar amount with the kilowatt hours. This is one just one kind of basic example. A refrigerator, ENERGY STAR was 20 percent; 20 percent of 500 kilowatt hours is a 100 kilowatt hours. Now you have about a 100 kilowatt hour new-to-new, non-ENERGY STAR to ENERGY STAR, to work with to justify a dollar amount. Now we're at a 60 percent drop. Refrigerator's down to about 400 kilowatt hour. ENERGY STAR is 10 percent, so now you're at 40 kilowatt hours to try to justify the same amount of rebate. That's not a trend of sustainability and future possibilities of great energy efficiency areas.

So what we're saying is let's -- and I've heard a

lot today -- everyone's talking about new. How do we get the new-to-new? It's always the traditional old-school thought of let's compare new to new or new to the next new. And we feel its missing the efficiencies that can be obtained by looking at new to the old. Get the old one off the grid and get a new one.

For appliances, the efficiency gains are so dramatic, 70 percent for clothes washers, 50 percent refrigerators. It's the percentages are dwindling -- the kilowatt hours are dwindling down -- but it's new to old. So we have purchase rebates. We have disposal rebates. They're siloed. They're separate.

And as part of that there's inefficiencies with the disposal rebates. You have to pay for a truck to go to a home, which is very, very expensive. If you link them together, buy something and you have to get rid of the old one, the truck is at the home to deliver the new one. It's in an empty truck. You pick up the old one and then you get it off the grid.

Right now we did a look across the country from what we could do, best case is pretty much nobody's linking the two together -- .2 to .4 percent of U.S. households have a purchase disposal linked. Now PG&E is now working pretty close with a retail partner to try to link them at the point of purchase and that's great. But it's very few

have access to a linked program. So what we're pushing here is you link the two together and you'll get some really dramatic savings. That's by increased participation and increasing behavioral change.

Alan mentioned social science and behavioral change. If you have a $25 purchase rebate for an ENERGY STAR refrigerator and $50 for a disposal the consumer is kind of, "$25 rebate or $50 rebate? That's not really moving me a lot." Maybe somebody in the store might influence a decision, maybe not, $50 disposal, maybe not. You've got to get over the magic three-digit $100 to really get a consumer to say, "I'm going to really have an impact on this."

So to get it $100 if you look at a $50 purchase rebate, $50 disposal rebate, there's $70 that you have to go to subsidize an empty truck going to the home. But if you join them all together -- $170, $150 rebate -- now you're really changing a consumer's behavior. You're not focused on somebody who's in the store trying to figure out, "Oh, I'm going to buy an ENERGY STAR that's 40 kilowatts more, but the refrigerator costs $400 more. And my payback's 20 years." You're getting after somebody who's not in the store and trying to get them off the couch and get them into the store and to replace their unit -- somebody who's not planning on doing that. That's where

you really get your savings and increased participation.

There's some California-specific numbers on this. These are estimates based on national numbers, but we did it very detailed. We did the DOE. We did the whole webinar with DOE and opened it up for criticism if people have it. And hopefully we'll have a DOE stakeholder on this, but we're looking at California to have 5.6 gigawatt hours if you link these two together. And you really get after the broad-based participation and looking at getting the old ones off the grid and getting the new one in the house.

One last thing is the consumer research. Just so folks know about it, we do this every five years, a very robust consumer research program to get after things on saturation and a lot of different areas. Where efficiency is on the list of purchasing decisions, is it number one, is it number 10, do they even consider it?

Some of the things just to share is this came out and this isn't public yet, but it's that many times appliances are refurbished and repaired. And they're older than 10years old. And there's a lot of money in it. And the disposal rebates are competing with Craigslist now. And you can go on Craigslist and Google how much an old refrigerator or dishwasher is and you can see people selling it for a few hundred, a couple hundred dollars.

That's hard to compete with a utility rebate.

Now whether somebody wants to deal with Craigslist and that hassle, you have that advantage. But coincidentally it also said that rebates do impact consumers' disposal decisions. So you're competing with Craigslist, but they do have an impact. So if you find the right sweet spot, you can have an impact.

So here's just an example of one of the results of that survey. There's a lot of that kind of information here. But the big thing is that 22 percent buy used refrigerators -- 22 percent. And we have other data that show 20 percent of the units that recyclers pick up are resold. Most of the time talking about refrigerators, there's a really an inexpensive part that needs to be replaced. And a lot of times these are picked up and there's a big, big market on that. And so you've really got to get these off the grid and you'll get a lot of savings.

I think I'll just stop there because it's been a long day. And I hope to answer any questions when that time's there. Thank you.

MR. STEFFENSEN: Thank you Kevin.

Julie, from PG&E will be up next.

MS. COLVIN: Thank you so much for having me. I know we are very close to the end of the day and we're

losing folks left and right here. But my name is Julie Colvin. I lead the Plug Load and Appliances Programs at PG&E.

And a number folks have alluded to the midstream model that PG&E has run a pilot in 2014. And we're looking to develop a more scaled pilot in 2016 and beyond. So the goal is really to have simple, scaled and synchronized approaches to transform markets.

So where are we today? Essentially, low-hanging fruit is getting harder to reach in the energy efficiency space. As we've all seen, you know, plug load is growing and the appliance standards have really increased. But here we really need to have innovative approaches to how we influence energy efficiency.

But how do we really face the dilemmas of innovation? We need to take risks. We need to change the status quo. We need to accept some uncertainty, disrupt the market and act fast. So instead of really running -- instead of sprinting we need to start running marathons and looking toward long-term approaches to transforming markets. And that's really the goal of the retail products portfolio.

So we also need to synchronize our approaches and collaborate. We need to build scale and -- sorry I'm so nervous. Utilities need to synchronize our approaches and

collaborate and also really keep it simple. By keeping it simple we'll get retailers to participate and we'll also save costs and administration and evaluation.

So what have been our challenges? What are the programs goals? What's the unique approach and what are the opportunities? So we have three really big challenges that we're trying to face. We've all mention this today: growing plug load use. We have increased appliance standards, our decreased ability to claim savings in the utility space.

There's low incremental savings now associated, but we can't have downstream rebates to influence customer's decisions. And it's all in a setting today where we're hearing that we need to have big bold energy efficiency strategies. And we also need to reduce plug load by 40 percent in 2020 according to the Strategic Plan.

The biggest challenge too, is that our customers fact too many decisions. When you're in the retail space there's too many choices when you're looking to buy a refrigerator. You don't want to think about energy efficiency, so our goal is to remove that barrier and make the efficient choice default. So there's too many choices when you're looking for a refrigerator. You don't to think about energy efficiency when you're trying to decide where the ice maker goes or what configuration you need. So how

do we really remove that customer choice and make it easy by default?

The other challenging space is the retail market. We have 10 big-box retailers that essentially cover 80 percent of the market share for both consumer electrics and appliances. They really are challenged to participate in utility programs, because we're seeing lower rebates available to these retailers. Lighting rebates are diminishing. Appliance rebates are going away. So how do we maintain the relationship with the retailers? And they're indicating that they really need scaled support to change their buying decisions, so how can we change their buying decisions? We need to do that through simple, scaled coordinated approaches across the utilities.

So what's RPP? At the high level the goal is to transform the market. Through a combination of incentives and engagement we can motivate retailers to promote, stock, sort and demand efficient models where they wouldn't have done this absent the program, so there's short, medium and long-term objectives. This can be over a ten-year program.

In the short term retailers can sell more efficient products. We want them to promote these products. In the medium term they can stock and demand these products. And in the long-term, over five-to-ten years we can induce sustained structural changes in the

market for targeted products to really accelerate and increase adoption for both participating and non-participating retailers.

So I think as we've seen this from Katharine Kaplan, from the EPA, this essentially is a bit of overview -- our goal in market transformation. How do we accelerate adoption and increase adoption of these more efficient products.

And what's this unique approach? We want to basically influence just a hand full of retailers that can sell to thousands of stores and impact millions of customers. And eventually the goal is to actually influence the manufacturers as far as what they're demanding. And so that's the goal of market transformation.

What does this look like in retail? It essentially takes away this downstream rebate, move that midstream rebate to the retailer and makes the most efficient product default to the customer -- taking away that choice and making these most efficient products more available. This could be a refrigerator. These could be electronics. This could be a platform for all products in retail, but what we really need is sort of an approval of this approach, to make sure that we can scale collectively as utilities. And utilize this as a platform in the future

moving forward.

So we had a pilot last year that was a 14-month pilot with one retailer. The goal was essentially to prove the operations, determine how we can evaluate such type of a program, and validate the performance. We really wanted to know how the process works and demonstrate if there's potential via one retailer.

So with the findings we only saw sort of limited net effects of the program, just an influence of 5 percent of the change in stock -- sorry an influence of 5 percent of a lift in sales. And this is really one year. And our goal is to look at something more scaled and more long term. They didn't necessarily have time to change what their stocking, but they're shifting most efficient products to be sold in our territory for the pilot.

We found that what we need to do is accelerate the specification with ENERGY STAR, so that we're incenting above ENERGY STAR and routinely track key performance indicators. So right now we're developing key performance indicators to make sure if we're running a long-term program that's five-to ten-years how do we make sure we're on track? And what are these key performance indicators to make incremental program changes and ensure the retailers are implementing as they indicated they would.

But what's most important is that the retailers

really need certainty that these programs will exist and that they will make these changes in their stocking if they know those incentives will be there.

So what's been proposed for a 2016 trial is a more scaled approach, like I mentioned, is with four retailers and five products. There's electronics and small appliances and even dryers, freezers as well. But basically because those incremental savings are so small, how can we try to accelerate the sale, the proportion of the sale of the most efficient products, and reduce the less efficient products that they're selling? We're asking retailers to basically develop an implementation plan and ensure that they're meeting the short term objectives and promoting the programs that increasing the sale. And eventually seeing a shift in what they're stocking and selling.

And we're also coordinating on a scaled data service provider. Retailers really need this to be an easy approach. And when they have 400 utilities with thousands of programs, how do we get their attention? It's through our collaboration where we have brought partners on that are working towards approval for our program launch where we see about a 15 percent of the market share through this participation of these partners.

One of the hardest things that we are faced with

is agreement on what products we select and how do we complement existing downstream programs where other utilities don't face the same challenges that we have in California.

So where's the opportunity, and what do we need? I think a lot of us have said this here, we need to -- given this as a core to the market transformation theory we are looking at a long term approach. We are looking to influence both participating stores and eventually the non-participating stores. If we can provide incentives to the large retailers they will eventually influence the manufacturers to reduce the cost and make these products more available to customers.

But how do we change our traditional evaluation approaches that essentially count the number of rebates that customers have applied for and look at more of a theory-driven approach for market transformation effects. How have we influenced the market? How have we accelerated codes and standards? How have we accelerated the adoption of these products? The devil's in the details, always. How do we look at calculating our savings?

We actually have been working with the Cal TF, California Technical Forum, over the past nine months to basically gain their insight and approval of how we should be claiming savings. You know, looking at the unit energy

savings and unit energy consumption for these products. So what are some learnings, that we've had for the trial, for how do we appropriately set an evaluation approach for a long-term market transformation program.

So in summary basically the goal is that utilities through scaled incentives and streamlined retailer engagement will see more efficient products on the store shelves. More customers will choose that efficient option by default. We'll drive energy savings and see market impacts.

That's it. Thank you.

MR. STEFFENSEN: Thank you Julie.

Last up will be Heather Larson, from StopWaste.

MS. RAITT: And she'll be joining us by Webex.

MS. LARSON: Hi, can you hear me on the line?

MS. RAITT: Yes, and I'll get your presentation just one moment.

MS. LARSON: Great. All right, well in the interest of time I will start talking. Thanks for including the local government program implementer prospective on the Panel.

MS. RAITT: Just let me know when you want me to change slides.

MS. LARSON: Okay. And my slides are good. Advance to the next slide.

So StopWaste, as I mentioned, we are local government agency in Alameda County. We have a number of projects that touch on appliances and plug loads. And one I'm not going to go into, but I will mention is that we are trying to lead by example in this area with our lead existing building operations and maintenance certification. We received an innovation point for implementing a plug load pilot in our own office building, which includes on-going monitoring or our own office spaces, which we're reporting and it's fed into a number of other studies including one we did a while back where a building was contributing to some data around office plug load use. But go ahead and go into the next slide.

So I'll just dive right in here. Quantity Quotes is a project that we are sort of -- sort of an incubating-type project that we essentially took over from the Department of Energy. So back during the Stimulus period DOE was pretty heavily promoting their Quantity Quotes platform, which is an online marketplace for the bulk purchase of resource-efficient products.

And after the Stimulus the site had gone dark, partly due to some funding constraints. But at the time DOE had recently signed an MOU with HUD, Housing Urban Development -- who we do a lot of work with for our multifamily program -- for use of the tool. And HUD had

also just recently negotiated some confirmations essentially that the tool could fulfill some of the public purchasing requirements to get multiple bids. And they thought this was for public housing. And so they thought this would be a great opportunity for getting reduced rates for appliance purchases for their public housing.

So through our work with HUD we ended up kind of getting in contact with DOE, and essentially taking the tool over, and DOE contributed their consultants' time, Energetics, to help us sort of revamp the site, get it back up and running, and add WaterSense products to the site. So go ahead, next slide.

And the basic concept -- you know, you don't get a guaranteed percent reduction in the cost of any particular product on the site. Basically any purchaser can go on -- it's completely free both for purchasers and vendor suppliers -- go on and say, "I need 1,000 CFLs." In fact, a lot of the original users of the tool were utilities in some of their CFL programs.

And so you can go on and say you want a large purchase. And then the vendors on the other side, assuming that they want your business, will respond and give you an estimate for this request. And you can put in a lot of details, again specify delivery over time, and you can specify different types of pretty detailed information

about the products that you're looking for. And then the suppliers or vendors follow up directly with the purchaser, so they make the transaction directly. That's the basic idea. Next slide.

And so as I mentioned, so this tool was basically revamped once we took it over from DOE. And we only about a month-and-a-half ago added the WaterSense products to it and it's live.

There have been over -- I was told there have been over a million items requested through the tool that we know of. Because other purchases have happened offline, we don't know all of the purchases that have happened, we know over a half a million items have been purchased and by 3,000 purchasers at over 190 product providers. So it has gotten some volume. So we're hoping that now it's revised with some new and improved content and additional products we do hope that we'll see some use of the tool again.

We are interested for vendors, to add vendors, in particular California-based vendors or national.

And a couple of things -- and, you know, a couple of things -- we just got it up and running and we do know the only promotion we're really doing with the tool is mostly through the building community. And through some of the programs that we run, which are really focused on property owners and building sector. And that's not always

-- maybe not the market that's always going to be purchasing online, at least maybe not yet. Right now they still have different types of vendor agreements and relationships. So we know that's something that we're going to have to get over.

Another thing we already know about sort of the future of this tool is that, you know, for public agencies, even though there's a concept of getting multiple bids in one step should be attractive there are other requirements for purchasing in most public agency procurement processes, especially things like local hiring or using women or minority businesses that this tool doesn't satisfy. And so for an entity like a school or local government, who may want to use this, they may resort back to their standard RFP pre-qualified vendor process, because of those specific local requirements.

So those are things we already know that are going to be barriers. But the site is up and running and you can go to QuantityQuotes.net yourself and see the product categories that are on there.

So moving right along to the next project that touches on appliances that we've been working on -- the Home Energy Analyzer was a pilot that we launched sort of when we were in the throes of doing outreach marketing program implementation for Energy Upgrade California for

the single-family market. Most people that had anything to do with that program know that home upgrades are a really tough sell. You know, it's a big ask to get home owners to kind of say, "Hey, do you know about energy efficiency? Now, don't you want to spend thousands of dollars to tear apart your home and hire a contractor and give him this big project?"

And so there's a number of people who quickly realized there could be sort of an onramp to engage people in these more behavioral type pilots. Some of them mentioned such as the old Power Type Tool (phonetic) or CSA recently hired PlanetEcoystems for a state-wide behavioral pilot.

But in our experience when we did this -- and it was back in 2013 -- we did an RFP for some of these different software. And there's a bunch of them out there, the two I mentioned the two I mentioned, plus a handful of others. And most of them do peer-to-peer comparisons. But what we were interested in was APA at the time, was because it does energy induced disaggregation. So if I had more time and slides I'd show you all the nice graphs of how they get to the induced disaggregation that basically breaks it down to base load, recurring load, variable load and heating and cooling. And then you can kind of see where the high and low-energy end users are. You can go to

the next slide.

So we were really interested in this end use disaggregation, because we saw it as a way to essentially kind of classify the single-family home marked into those that may be good candidates for Energy Upgrade California. And we have some great data about the high-quality leads that were fed into the program and the high-conversion rates of the projects that came in through here, had this prescreening. You know, their highest loads were in the heating and cooling areas. They would be good referrals for Energy Upgrade California.

But the ones who were sort if identified as high base-load users we did one-on-one phone engagement with them to talk about how they could affect their plug loads. And next slide.

And basically out of the 198 users that got in the tool over a one-year period 160 households -- and this is just within Alameda County where we ran this pilot -- it was kind of combined with Energy Upgrade California and Alameda County implementation of it. We had 948 users in the tool, 160 households were identified as high plug load users from the peer-to-peer comparison analysis. And of those, these were the actions that were recommended to those high plug load users that you see on the screen here.

So these were things that, you know, on these

phone consultations we could talk with people about, "You were identified as a high plug load user. It doesn't look like it would make sense for you to do a whole building upgrade since you're not using heating or cooling or whatever, but here's what you can do in your plug loads."

And we also had the data, because this connects directly to PG&E data. They do have to go through that process, but we did see over a year on overage, the users were saving $140 on their utility bills, of these users. So we did see some actions taken on these recommendations and some specific savings on the user. So we got some great data out of the tool. Next slide?

And lastly, sorry, this is a compilation of some different projects we've been working on in this space. But we run some multifamily programs. We have a long history, since the 1990s we've been doing work in the multifamily space. And what this sort of end diagram is meant to point out is there is a little bit of different sort of entity who may be purchasing appliances in the multifamily as compared to the single-family residential space.

So in multifamily, particularly renter which is kind of the biggest portion of the multifamily market, the appliances are often supplied by the owner and the management. And then the consumer electronics are often

tenant-supplied. And so whereas in single-family it's more common for the homeowners themselves to purchase the appliances. So there is kind of a big opportunity with the sort of development, and with the programs, and with the property owners to at least get the appliances into their programs with multi-family. And next slide.

We have most of the Energy Upgrade California multifamily programs throughout the state are including some appliances within their programs. Some treat them differently, some have sort of individual incentives for them, and some model as a whole building approach. But in our case so we're running an approximately a $10 million, this year, incentive program; it's been a very successful multifamily program. And last year we closed out this placement of 8,500 units within the Bay Area.

And the way that we're handling appliances in here is that it's basically bundled within sort of the package of required improvements as a whole building approach. And so some of the appliances that they can use are clothes washers, dish washers and refrigerators and it's part of that overall percent improvement that they have to meet. We have approximately about around 10 percent of the projects are using appliances as part of their mix.

And this is one of those things with multifamily

where they need a lot of flexibility, because in some cases they may be able to get into the units and install upgrades and in other cases they may not. And so but when there are opportunities they want to do it where they're doing other work in the units. And so it's been effective to include appliances as part of this overall (indiscernible).

And so we're not paying extra incentives per piece of equipment. It's a flat per-dwelling unit incentive for bidding the whole building approach and then we get the appliances within that package.

Another thing to note about the way that we're doing this, the program had developed -- it was actually partly with Stimulus funding and then later on was a program from the Bay Area Regional Energy Network. This Energy Pro Lite software is a version of Energy Pro that's specifically piloted through our program, because some key components to it -- we went through a stakeholder process to develop it with the IOUs and the CPUC and CEC staff and InEvaluation (phonetic) staff.

And one of the key things that came out of the development of the software was it is basically not using the HERS II engine, which does include appliances and lighting in the calculations. But it really relies on a non-res compliance module, which is essentially (indiscernible) II. And there were a number of reasons for

this, but one of them was because it had the ability to enter custom calculations into the model. And so it enabled us to basically take a look at sort of what were the defaults in the information that was coming out of HERS II assumptions for appliances as compared to some other methodologies for estimating savings on appliances. So then we can kind of take a look at different ways to input savings into that whole building approach.

So lastly, I'll just -- on our multifamily note, another thing for this particular market sector is that we see in the whole building approach an opportunity to get the appliances in there, but it's not going to always work. And we do see anecdotally, particularly actually on the water fixture side we see a lot of times where owners are doing appliance upgrades at the time of the unit turnover, so they may -- we go into a building and they say, "Oh, well half the building has high-efficiency toilets or has a new refrigerator and half doesn't." And it's because each time Joe Hurley and his Dalmatian or Grandma Sue go out then it's the time to go in and replace the carpet and refrigerator and toilet.

And so we do see these upgrades over time in the units from another strategy that is different from this whole building approach. So that's sort of another angle we've taken in working with property management as a unit-

by-unit appliance turnover approach.

So I'm going to leave it at that, but I'd be happy to follow up with more detail on any of these projects. Thank you.

MR. STEFFENSEN: Okay. Thank you, Heather.

That concludes the Panel. I would like to ask the Commissioner if he would like to ask the Panel any questions?

COMMISSIONER MCALLISTER: Well, we were pretty far overtime here, so I don't want to keep people too long.

I guess, Heather, I was interested in your characterization or your description of some of the potentials, but also the limitations of bulk procurement approaches. And that's something obviously that we mention in the AB 758 Action Plan as a potential strategy. And I certainly value your insight there on the turnover strategy as well, sort of complimenting that.

I guess, I'm wondering if you've had any interaction with -- you know, you mentioned some of the procurement difficulties. But for example, DGS is a place where for the state -- I don't know if you've talked with them at all about the potential for state buildings. I don't know that you work with them directly, but I'm kind of thinking that that's one area where they do a lot of procurement. And potentially having large numbers would

give them some market power.

And then you mentioned multifamily, but I think in HUD -- it's great that you're working with them -- I'm wondering if you have talked with CSD and I imagine also the utilities you've talked to, about potentials for bulk procurement in terms of the LIEE Program and some of the low-income initiatives and whether there might be an opportunity there to standardize on highly, highly efficient appliances?

MS. LARSON: Uh-huh. You know, we haven't and we really just kind of took this over and got this (indiscernible). We haven't gone on a road show promoting it yet, so we -- this is a good opportunity to let people know it's out there. And we're kind of formulating a plan to try and get this out there.

It's kind of one of our little incubator projects and we were hoping that just through the relationship with HUD that it would kind of pick up and they would have some interest in it. And so working with DGS and CSD are good suggestions.

You know, I do know that there's other folks at our office here who work more with like the local sort of DGS equivalent where they're doing environment preferable purchasing. And if you wanted to get more into like sort of breaking down the nuts and bolts of some of the barriers

to those purchasing, because a lot of the locals are doing simple purchasing, those folks might have a lot more insight on that. That we could rope into the conversation. I'm kind of the messenger here today.

But I do think there's folks with a lot more experiences of how those purchasing agreements are already made and how we could get in and standardize them a little bit more.

COMMISSIONER MCALLISTER: Yeah, I guess to ask right now is we should engage with you, our staff on the AB 758 -- should engage with you and try to tighten up that part of the Action Plan to get it to a final version of that section. I think that could be very fruitful. So thanks very much. Thanks for taking that on. I mean, it's really tremendous. It gives you kind of a natural national reach as well, because that's a national tool, right?

MS. LARSON: Yeah, it is a national tool. And yeah, I believe -- you know, we took it on. And really the only sort of -- DOE essentially handed it over and handed over some resources with their consultants. But other than that it's kind of our own initiative. And so it'd be great to get some life into it in terms of getting it out there and promoting all of that, because we're only just kind of mentioning it word of mouth through our other programs. So we don't have like a full-blown campaign behind it right

now, so if others are interested it could use some life in that regard.

COMMISSIONER MCALLISTER: Very well. Well, thanks a lot for being here.

I don't have another other specific questions. I want to respect everyone's time and we're already over 5:00 here. But your presentations have been a lot of fodder for us to think about, I think. And, you know, certainly I saw Alan Meier just leave, but his recommendations were great and we'll sort of mull those over. And hopefully have some further interaction in the future.

Thanks to everybody for being here, I really appreciate it. I don't know, Sean, do you have any other questions for the Panel?

MR. STEFFENSEN: Yeah, it's somewhat late. So I think I'll hold it anyway.

COMMISSIONER MCALLISTER: Okay, the Last Panel Syndrome, sorry about that.

But really thanks to everybody for your participation. It's been terrific and I'm really, really glad we were able to pack a lot of substance into half a day. So thanks for being here.

(Whereupon, at 5:23 p.m., the workshop was adjourned)

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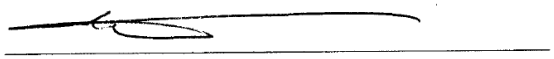

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