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BEFORE THE CALIFORNIA ENERGY COMMISSION AND

CALIFORNIA PUBLIC UTILITIES COMMISSION

In the Matter of:	)
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2016 Integrated Energy Policy	)
Report Joint Agency Workshop on	)
Energy Demand Forecast and	)
and Doubling of Energy Efficiency	)
- Doubling and Analytical Needs	)
	)

CALIFORNIA ENERGY COMMISSION

FIRST FLOOR

ART ROSENFELD HEARING ROOM

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

MONDAY, JULY 11, 2016

10:00 A.M.

Reported by:

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PUBLIC COMMENT

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P R O C E E D I N G S

10:05 A.M.

SACRAMENTO, CALIFORNIA, MONDAY, JULY 11, 2016

MS. RAITT: So welcome to today's workshop. This is a Joint Agency IEPR Workshop on Energy Demand Forecast and Doubling Energy Efficiency, Data and Analytical Needs. This workshop is part of the 2016 Integrated Policy Report Update process. I'm Heather Raitt, the Project Manager for the IEPR.

I'll quickly go over the usual housekeeping items. Restrooms are out the door in the hall. There's a snack room on the second floor. If there's an emergency and we need to evacuate the building, please follow Staff across the street to Roosevelt Park.

Today's workshop is being broadcast throughout WebEx conferencing system, so parties should be aware you're being recorded. We'll post an audio recording on the Energy Commission's website in a couple of days, and a written transcript in about a month.

I want to thank you, to our presenters, for being here. We're trying to please limit your remarks to the time allotted, and I'll be reminding people about our time constraints as we go along.

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, you can go ahead and fill out a blue card and give it to me. We'll talk your comments first, if you come to the center podium. For the WebEx participants, you can use the chat function to tell our WebEx coordinator that you'd like to make a comment during the public comment period. And then finally, we'll take the phone-in only participants.

If you haven't already, please sign in. They have a sign-in sheet at the entrance to the hearing room. Materials for this meeting are posted on our website. And we welcome public comments. They are due July 25th. And the notice for this workshop provides the process for how to submit written comments.

And with that, I'll turn it over to the Commissioners for opening remarks.

CHAIR WEISENMILLER: I'd like to thank everyone for being here today. This is a pretty good foundational workshop, I was going to say, in terms of trying to -- one of the things that my Adviser Grant Mack is trying to provide a little structure to give people clarity and how implementing AB 802 and 350. And we've had a workshop a couple of weeks ago dealing with demand forecasting, and particularly photovoltaics and load shifting.

But today's workshop is more or less -- one of the issues we're going to confront across the board on 350 and 802 is to determine the right baseline. And with that baseline, and that's today's discussion, particularly very forecasting oriented, very much looking at how we can use data and analytics to get a better sense of the baseline. We'll have another workshop late in August that will deal more with the program side of this. So once you determine a baseline, then the next question is: Well, what are you going to do to meet the goals? And so, again, that's sort of a subsequent phase.

And the next thing, under 802, certainly there will be more workshops on data. I'll let Andrew fill out more of the scope there. But under the IEPR context, we're looking very much at forecasting, per se, so this is a piece of forecasting, per se.

So anyway, again, thanks for being here. We're looking forward for a good day. And certainly, I want to thank all the participants on the dais. Again, I think this is an important topic. And this certainly shows how committed we all are in this activity.

So with that --

COMMISSIONER DOUGLAS: I just have brief opening comments. I want to also join the Chair in thanking everybody for being here today as we move forward to

implement SB 350 and implement the doubling of energy efficiency, and implement 802, as well, certainly data and analytic needs associated with carrying out those responsibilities are going to be increasingly important. And as the Chair said, this workshop is helpful and foundational in the beginning of a process for us of working through that.

So with, again, I welcome all of you here, and thank you for being here.

COMMISSIONER MCALLISTER: Great. I'll also be brief. We have a distinguished group on the panel here -- on the dais here, and also on our panels throughout the day. So I'm really happy that everybody's here. Thank you all for coming, both on the dais and in the audience, and especially the presenters.

So really just briefly, to build a little bit on what the Chair said, you know, overall I just want to exhort everyone who will be submitting comments -- well, everyone to submit comments, and those who do submit, really put your thinking caps on. This is a long-term conversation we're starting in earnest.

If you think about where we are, where we were with informatics and analytics 10 to 15 years ago, we we're on a different planet today, and we're only going to be heading more in that direction. Just, you know, everybody

talks about big data and it's sort of a cliché at this point, but data for better decision making is just part of our lives now in all aspects, every moment. And we're really behind the eight ball on the energy field. I mean, we are just not doing as much as in a lot of other areas. The marketplace is just taking off with the tools and resources to be able to work with information in very sophisticated ways. And we just need to move that forward.

And so our authority rests in forecasting, and much of our activity revolves around forecasting, but we have these carbon goals, and we have energy efficiency goals, as Commissioner Douglas said, and we need to set a baseline so that we know what progress we're making, so that 10 to 15 years from now we have a platform that we can look back on, do longitudinal analysis, and understand where we've been and whether we're meeting our goals. So that is potentially -- we want to do that in every area over -- you know, every jurisdiction. We want to do that at a very granular level to know what is working, what initiatives we have done in either -- in all of our agencies, and out there in the marketplace, what is working, so that we can judicially develop policy to encourage those things.

So I'm very excited about getting this conversation going. We're going to have data coming in, not just for forecasting but for all sorts of different

activities, benchmarking. And, you know, we've got the Prop 39 program. And those are all initiatives that are going to, I think, allow us to step forward and sort of stepwise make this, the development of these tools for forecasting and related activities and analytics, better and build the tools that we need over time.

So again, that's my kind of long-term view of this. I'm very excited about today's sort of jumpstart. And we'll move to whoever is going to be next, I would say President Picker.

PRESIDENT PICKER: Thank you. I'm also greatly honored to be here, and I appreciate everybody who came today. The governor and the legislature have handed us all a fairly significant challenge of reducing greenhouse gas emissions to a level below 1990 levels. And in order to do that, of course, we do have to double the amount of energy efficiency; all the modeling really points to that very clearly. So the challenge of how we measure the progress on energy efficiency to decide what's effective and continue to bear down on that has a great deal to do with whether we actually make those goals.

I hope that we see a rock-solid unassailable consensus emerge from the group here today. It's far better that you do that than leave the decision to us. However, if that should happen we're ready and we embrace the task.

COMMISSIONER PETERMAN: Good morning, everyone. Carla Peterman, Commissioner with the California Public Utilities Commission. As the assigned Commissioner to our energy efficiency proceedings at the CPUC, I'm also honored to be part of this conversation. AB 802, SB 350, and then just our various existing mandates give each of our agencies a critical role in making sure we meet these energy efficiency targets. And specifically I find this legislation significant direction for coordination. And it's coordination that the Energy Commission and the Public Utilities Commission have been doing for years, but I'm glad to see on the dais the Air Resources Board, the Independent System Operator because the set of us need to be coordinating more on these issues now than ever. And particularly, as Commissioner McAllister noted, how do we orient our current energy efficiency work towards supporting the energy efficiency of the greenhouse gas goals that the ARB is working towards, as well as the reliability goals and opportunities that the ISO is working on.

We have already begun our implementation of AB 802 and SB 350. We have some decisions that are coming out in the next few months, a key one coming out this month in terms of further implementing these pieces of legislation. So thank you already for your engagement on these issues. I'm very much interested in today's topic.

And I'll note one of the things that the Energy Commission and the CPUC do at the Staff and Commission level is that we have regular confabs on energy efficiency. And we had one a few weeks ago which lasted all day. And I would say it was the most productive and optimistic confab I've participated between the agencies where we really go to lay out the opportunities, the workload, and the challenges ahead. So at the Staff level there was a lot happening. I look forward to the commissions bringing that information forward.

One of the things worth noting is that we've been both empowered to hire resources to help us with implementation of SB 350 and AB 802. And so if you know talented folks, including yourselves, who are interested in working at the most cutting-edge organizations in the nation, do not hesitate to apply. With budget authorization we will be hiring.

So again, looking forward to today's comments, and for your engagement in the CPUC proceedings over the months to come. Thank you.

MR. GIBBS: Yes, good morning. Michael Gibbs with the California Air Resources Board. Pleased to be here, and thank you all for participating today. I just wanted to emphasize what's been said about the coordination that's taking place among the commissions with the California Air

Resources Board and the Independent System Operator and others to enable us to develop our updated scoping plan for how California can achieve its greenhouse gas emissions reduction targets. And it's through this coordination and collaboration that we are well informed and develop a well-informed plan that reflects the full understanding that comes from the commissions in this work.

So we appreciate all of the coordination and work that goes on these proceedings and are pleased to participate. Thanks.

MR. BERBERICH: Good morning, everyone. I'm Steve Berberich, the CEO of the California Independent System Operator. And I think the fact that we're all gathered here today shows the coordination that we have between the various agencies and groups. And I think we've been coordinating now for some time, particularly around load forecasting and understanding how energy efficiency will play into that.

As we work to decarbonize the grid, energy efficiency is going to play an ever-increasingly important role to do that. I think it's important, though, we do that thoughtfully so that we can reduce peaks and potentially even incentive consumption when we have excess power on the grid. I also think that the electric grid is going to play a critical role in decarbonizing the balance of the economy,

as well, and we need to keep that aspiration in mind as we go about this.

But I also want to make sure that as we think through these things, particularly as we look at the measurements, that the measurements and results meet our aspirational targets, as well, so that we know exactly how well we are tracking on these things. I think that will be a critical attribute of what we come to today.

So, Mr. Chair, I really appreciate the invitation to being here today and look forward to the dialogue.

CHAIR WEISENMILLER: Great. Thank you.

MS. RAITT: So our first panel is on the Current Energy Demand Forecasting Methods and Energy Savings Evaluation Practices. And we have a presentation from the Joint Agency Steering Committee, and so that's from Sylvia Bender from the Energy Commission, Simon Baker from the CPUC, and Delphine Hou from the California Independent System Operation.

MS. BENDER: Good morning, everyone. I'm Sylvia Bender, and I'm here with my three colleagues. Our fourth colleague Karen Magliano from the Air Board, could not be with us this morning. She's been on vacation, so we three will make the presentation this morning on the Joint Agency Steering Committee.

The Joint Agency Steering Committee has its origin

in a January 2013 hearing called by Senators Padilla and Fuller -- and we can move to the next slide -- to examine how energy efficiency investments could most effectively reduce the need for future power plants, and to address concerns raised earlier by the legislative analyst's office that the energy agencies lacked a comprehensive framework for fully coordinating state programs.

On February 5th, 2013 the Public Utilities Commission, the Energy Commission, and the Independent System Operator responded in a joint letter committing to a process in which energy efficiency is properly and consistently accounted for by each of the energy planning agencies, programs are improved to match changing grid requirements, and energy efficiency investments remain cost effective.

An interagency team of senior management representatives known as the Joint Agency Steering Committee has been implementing this process since 2013. The JASC, as we are known, operates under the guidance of the agency decisions makers in the form of an Executive Oversight Committee which sets the vision and direction from the JASC, and selects the single forecast set that we use in our planning processes. The JASC is responsible for establishing an annual joint work plan to coordinate the energy processes impacting the demand forecast and its use

throughout the other processes, interfacing with the staff technical leads, and providing monthly updates to our Oversight Committee.

The key goals that we established for our coordination that we continue with are: Making our forecast more granular -- the more it can be disaggregated by location and specific times of day the more useful it can be for both resource and transmission planning; increasing the level of insurance with and confidence in how estimations of future energy efficiency savings and other preferred resources are made; and finally, providing clear expectations about timing and flows of information, data and study results between our processes and our proceedings.

Next slide.

MS. HOU: Thank you, Sylvia.

This is Delphine Hou with the California Independent System Operator.

And to build upon what Sylvia just said, part of this coordination evolved really from the discussion of energy efficiency, but it has expanded beyond that, and very usefully so between the three agencies. The processes that we coordinate, the main ones, are the CEC's Integrated Energy Policy Report, the CPUC's Long Term Procurement Plan, and the California ISO's Transmission Planning Process.

So beginning with these three processes, we've

mapped out timelines where inputs are expected, where we coordinate on vetting that information, as Sylvia said, getting that down to a more granular level so that when it goes into each of our planning processes we ensure that we have reliable granular information that is actionable.

Personally, for the California ISO, what that means is that the energy efficiency that is embedded into the IEPR becomes part of our transmission planning process base case so that that actually displaces the transmission that we may build in absence of that energy efficiency. So again, it is a very important process.

Beyond energy efficiency, we've also begun to discuss other factors that might affect the load, for example, photovoltaics, electric vehicles, other load modifiers such as demand response. So this has become much more comprehensive than just the energy efficiency and has helped all three of our organizations to understand the data that's involved, the analysis that is involved, and we also heavily use what is called the DAWG, the Demand Analysis Working Group, as a technical forum to work not only with our stakeholders but with IOUs and other participants it the industry for feedback.

So that has been an extremely useful process. It's provided a lot of coordination. And for us, at the end of the day it's a way to provide a lot of rigor into the

process so that we can have reliable electric planning.

More recently -- sorry, one thing -- more recently, with SB 350 and AB 802, we've invited the Air Resources Board into the Executive Oversight Committee, as well as the JASC. And we'll be working very closely with them to additionally align their processes. So as mentioned, the scoping update is a very important effort at this point, and we'll be rolling that into the overall JASC process to make sure all four agencies and our stakeholders are aligned.

MR. BAKER: Thank you, Delphine.

Good morning, Commissioners. Pleased to be here. I'm going to speak a little bit about some of the new challenges that the Joint Agency Steering Committee is dealing with.

And as was noted at the outset, the legislature and the governor's office has really given us a big agenda. And so our 2016-2017 Work Plan is largely shaped by implementing these two major pieces of legislation, AB 802 and SB 350. And they really do have some big implications for the single-forecast set approach that has been part of the core commitment of the Joint Agency Steering Committee.

You know, we'll be talking a lot throughout the rest of the day about how these pieces come together, but just speaking, it's important to keep in mind, I think, that

a core focus of the single-forecast set work in the past two planning cycles has been focused on the additional achievable energy efficiency. And within that additional achievable efficiency, really it breaks down into two main buckets of energy savings that we've been looking at historically. We've been looking at investor-owned utility programs, and new Codes and Standards that have yet to be adopted.

As we turn to looking at a doubling of energy efficiency, as required in SB 350, the legislation lays out a number of additional other categories of potential energy savings, including new and incremental savings that could be had from new baseline counting rules pursuant to AB 802, publicly owned utility programs, financing programs such as PACE, fuel switching and substitution and the like. So this really is kind of a whole new ballgame in terms of how we look at what the incremental energy efficiency might be that we would be counting on for grid planning purposes.

The big question for AB 802 really is, with new baseline methods being adopted by the PUC for counting savings from utility programs, the question becomes: How much of those savings really is incremental versus already counted in the Energy Commission's demand forecasting as Codes and Standards savings?

We've done some preliminary analysis at the PUC

with help from Navigant, a technical analysis, to attempt to characterize the magnitude of those potential savings. And there definitely are some savings there, but it doesn't appear to be getting us, in and of itself, to a doubling of energy efficiency.

And turning to SB 350 with a doubling goal, really the key work for us on the Joint Agency Steering Committee is to just facilitate the formation within each of our agencies of perspectives on a phrase within SB 350 that says that these doubling goals shall be adopted to the extent cost effective, feasible, and will not adversely impact public health and safety. And that's really a key question that this workshop is beginning to address and we will continue to be coordinating on as the Joint Agency Steering Committee.

Finally, we're aware that SB 350 is a broad piece of legislation, and it also contains integrated resource planning to reach the broader 2030 GHG goals. And so within that we're mindful that the energy efficiency targets that are set here by the Energy Commission are being done within that broader context.

Thank you very much.

MS. RAITT: Okay. Thank you.

So our next presenter is Chris Kavalec from the Energy Commission.

MR. KAVALEC: Good morning. I'm Chris Kavalec. I serve as Technical Lead for the Energy Demand Forecast. And today I just want to give a real brief overview of our demand forecast and how efficiency gets incorporated in said forecast.

A little bit of background about our forecast. When we forecast we're forecasting annually for electricity consumption and peak and natural gas consumption. We also forecast for self-generation, which means subtracting that from consumption, you get forecasts for sales by planning area. Our forecasts are done by sector, listed here, including transportation, which means electric vehicles. And we forecast for eight different planning areas. For example, PG&E is a planning area. Edison is a planning area. And within those 8 planning areas, 20 forecast zones.

And here's an overview of our forecasting system. To summarize, you have economic and demographic activity rates, et cetera, driving our sector forecasts which are then sent to our summary model where the results are weather normalized and aggregated and adjusted. And from the summary model we send end-use information to our peak model where load shapes are applied, and that gives us a peak demand in each given year.

I should mention, also, that this is our current

system. As we discussed in our workshop back on June 23rd, we're planning to develop the capability to forecast hourly loads for the 2017 forecast.

Okay, turning to efficiency, three main categories for efficiency within the forecast. And I'm breaking this up into two sort of different types. The first type is efficiency that gets incorporated within our baseline IEPR forecast, that is efficiency from initiatives that have already been funded, approved, et cetera, and/or implemented, formally referred to as committed savings. The other type of savings, incremental to that, is what we call additional achievable energy efficiency, which I'll talk about in a minute.

But first of all I'm talking about these committed savings that are in the baseline forecast. First category, implemented or approved building codes and appliance standards. And we track these back, going to 1875 when we had the first building standard. The impacts from these standards are based on analyses done by the Efficiency Division. And standards are incorporated directly in our end-use models for residential and consumption, commercial -- for residential and the commercial sectors through going in and actually changing the consumption at the end-use level for a given end use for the average household in the case of residential, and per square foot in

the case of commercial.

The second major type, utilities that have been approved and funded fall within the baseline IEPR forecast. We're also tracking these all the way back to the '70s. And we use whatever the best information is available at the time, whether it's ex anti-reported savings or ex post-evaluated estimates that come from an EM&V study.

So as an example, during our 2009 forecast, for the 2006 to 2008 IOU Program cycle, we used ex anti-reported savings. By the time we got to our 2011 forecast we had some EM&V results for the 2006 to 2008 program cycle, so we adjusted program savings within our forecast to reflect the EM&V work for that program cycle.

We currently post-process program savings by adjusting the sector results that come from our model. In the future, we want to attempt to incorporate these more closely within our residential sector models, but right now it's a post-processing process.

And the third category naturally occurring, which basically means price effects, as rates increase, customers switch to more efficient appliances or equipment or use less electricity, that impact is captured within our baseline forecast and we refer to it as price effects. And they come from -- they're based on the price elasticities that we estimate for each sector.

Okay, so this gives you a summary of our estimated efficiency savings that falls within our baseline forecast. For the 2015 IEPR forecast mid-case, starting at the bottom are estimates for building standards to the tune of around 19,000 gigawatt hours by 2015. And again, you see in 1990 there you have savings above zero. That's because we're tracking savings all the way back to 1975.

Moving up from there we have appliance standards around 30,000 gigawatt hours estimated for savings in 2015. Program savings, 19,000 in 2015. And you'll notice that program savings begin to fall off during the forecast period. And that's because we're only including programs that have already been implemented and approved. So what remains during the forecast period is the decayed savings which drops from year to year during the forecast period, or the savings that remain after burnout.

And finally, we have naturally occurring savings in yellow there, around 23,000 gigawatt hours estimated in 2015.

Natural gas, building standards around 2,000 million therms in 2015, appliance standards, about the same, a little bit less, program savings, around 900 million therms in 2013, and naturally occurring, around 1,100 million therms in 2015, for a total of around 6,000, I mean, our last baseline forecast. And this compares to total

consumption, at least at the end-use level, for natural gas of around 13,000 million therms in 2015.

Okay, our second type of energy efficiency, additional achievable energy efficiency. And this is defined as savings that are incremental to savings already within the baseline forecast, so these are savings from future programs and Codes and Standards. For the IOUs, this is based on the CPUC's potential goal studies and ensuing goals/directives for the IOUs. And for the POUs, it's also based on the potential studies, as well as utility planning forecasts.

In the 2015 forecast we included LADWP and SMUD, the two biggest POUs. And into the future we'll be including more POUs, but we only had the two biggest ones in the 2015 forecast.

So here in our 2015 forecast the AAEE scenario that was used for the final forecast for planning purposes was what we call the mid-mid scenario, so that means the mid-baseline forecast combined with the mid-AAEE savings, and you see the totals there. If you add these back into the committed savings or the savings in the baseline forecast I showed earlier, you end up with around 140,000 gigawatt hours of efficiency savings predicted by 2026.

The natural gas side, again, programs and standards for additional achievable energy efficiency. And

adding that back into the baseline savings shown earlier, we estimate around 7,400 million therms of natural gas efficiency savings by 2026.

So there are issues we always like to point out when we're measuring and attributing energy efficiency savings, and I'll go through a couple of those here. The baseline savings categories I discussed earlier, these are estimated separately. So there's the potential for double counting and/or overlap when you're measuring these savings. As an example, if you have a rate increase and this rate increase induces participation in a program, it could be that you have savings attributed to both program and price effect categories. And the reason for that is when we estimate price elasticities we're using empirical data, so we're measuring the response and consumption, actual consumption, to changes and rates, regardless of what caused that change in consumption, whether it's less electricity use/conservation, whether it's buying more efficient appliances or equipment outside of a program, or inducement to participate in a program. So that all goes into the price elasticity.

An example of overlap, and this gets to AB 802, our AB 802 discussion, utilities, or at least IOUs, have typically only been given credit for above-code savings. But when your actual equipment is assumed to but does not

actually meet the code, well, then the program savings are not being credited with enough -- or programs aren't being credited with enough savings and standards are being credited with too much. And we can talk about that more later.

And these savings we've been discussing are based on ground-up engineering analyses instead of directly measuring consumption changes. And this means that you could be missing a significant rebound effect. If people are saving all this money on efficiency, well, what are they spending it on? Well, they may be spending it on electricity for other appliances or uses.

We can always use more information on decay rates for program savings, how much savings from a program are going to persist year after year. We could use more information on compliance rates. An we're always scrambling to try and understand and incorporate other changes not directly related to programs and standards. For example, computers have become much more efficient in the last ten years, not only because the given computer, a computer of a given type uses less electricity, but because folks are using a lot more laptops and tablets these days. So overall, computers have become much more efficient. It doesn't really have anything to do with the program or a standard.

And I mentioned market transformation here. It looks like folks are becoming more comfortable with LED lighting, and people are getting used to buying that outside of programs and standards. So that's, to me, an example of market transformation.

Okay, that's my summary, I believe, of where we are currently with regards to the forecast and incorporation of efficiency. Thank you.

COMMISSIONER PETERMAN: May I ask a clarifying question?

CHAIR WEISENMILLER: Sure.

COMMISSIONER PETERMAN: Chris, on slide ten, the natural gas savings, included in future programs, would you include in that programs for end-use electrification, or are any of those savings attributable to fuel switching?

MR. KAVALEC: You got me on that one. We'll have to hear from Navigant on that.

COMMISSIONER PETERMAN: Okay.

MR. KAVALEC: I forget all the details of what went into natural gas.

COMMISSIONER PETERMAN: Thank you. I'd be interested in hearing the answer to that at some point. Thanks.

COMMISSIONER MCALLISTER: Chris, I also want to comment that, you know, market transformation is something

that actually is a little bit of a, you know, buzz word at this point, and now you've defined it somewhat. But I guess, you know, a lot of this is going to happen -- doubling of efficiency is going to have to happen through the marketplace. You know, it's not going to be direct install programs. You know, we want our programs to be as effective as possible. But also, you know, we are going to be relying on the marketplace to carry a lot of the water here.

So could you just characterize how you -- my interest here is building the data resources to understand how the marketplace is evolving, you know, and then sort of secondarily, do all of the things that SB 350 asks us to and parse into the different categories that Simon mentioned.

Certainly market transformation is something that we need to be measuring, whether or not programs are involved. You know, however programs end up being involved, we need to measure sort of where the marketplace is going.

And so I guess I wonder if you could characterize how that is something that you either capture or don't? Is it fully within naturally occurring or is it something that you think about separately from naturally occurring?

MR. KAVALEC: As I mentioned, in practice our naturally occurring is price effects. There are a couple small savings that are incorporated from years ago based on

changes in the industry, but mainly it's price effects.

So when we're talking about market transformation, a good example is the miscellaneous end use. We spend a lot of time looking at the miscellaneous end-use and trying to identify trends, like the one in computers that I just mentioned. So it's basically -- right now it's kind of scattershot, looking at all kinds of different sources, relying on our RASS and Sooth surveys. But certainly the more data we can generate or create at the end-use level the more helpful that's going to be in allowing us to be able to incorporate and properly model market transformation and other naturally occurring changes.

COMMISSIONER MCALLISTER: Okay. Great. So that was just referring to the final portion on your final slide.

MR. KAVALEC: Yeah.

COMMISSIONER MCALLISTER: And I think I totally agree with you, better data, more granularity.

MS. RAITT: Thank you, Chris.

Next is Carmen Best from the California Public Utilities Commission.

MS. BEST: Good morning. Today I am going to be talking a little about our current state of evaluation activities and how we go about capturing the savings and how we use it. Then I'm going to also be talking about some new opportunities that have evolved as a result of the

legislation and regulations that are currently being considered, and some other thoughts about accountability, skills and abilities that will be needed to enable this transition.

I was asked, also, to give kind of an overview of the current state of energy efficiency programs. So in that regard I think it's fairly well known to this audience, perhaps, that we have a funding authorization of about $1 billion a year, and $300 that are going to the Energy Savings Assistance Program funding, which is the low-income focused program funding. The funding actually supports roughly 200 programs that are focused on multiple sectors, including commercial, industrial, agricultural, and residential markets. And they have a wide variety of intervention strategies, like technology rebates, as well as education, training, marketing, and outreach efforts.

In the last two program cycles the average savings have been the equivalent of taking about 800,000 homes off the grid for a year, and the equivalent of three major power plants, so about 1,300 megawatts after about three years of activity. And the estimate of the carbon offsets are around 1 million cars that were taken off the roads. Those are annual consumption metrics, though, not considering the lifecycle of all of these activities, as well.

So the programs are administered by four investor-

owned utilities, one community choice aggregator and two regional energy networks. And they are governed at the CPUC by a rolling portfolio oversight structure which allows ten years of funding authorization for cost-effective portfolios. And that was adopted last year to take out some of the start-stop nature of the energy efficiency activities.

The other component that it added was what we call the bus stop for energy efficiency savings estimations. For example, this year we completed 11 impact evaluations about the savings that were attributable to different technologies, and that's now available for updating the load forecast. And every year whatever is available will be available in time for the next forecast update.

The energy efficiency programs are specifically designed to address specific barriers. And I think it's important to point this out because in this changing landscape the programs will be evolving, as well, to continue to address barriers. They're designed to provide and are evaluated on the basis of their ability to deliver cost-effective energy savings, and also incremental energy savings, their ability to address market barriers and achieve those savings, and then also support market transformation. So there are multiple approaches to meet these different type of barriers.

As Chris pointed out, energy efficiency interventions and strategies are happening out in the market, and there are specific things that we are doing through Codes and Standards to upgrade new construction and other major renovations that appear. Efficient technologies become the norm, like LEDs, as we move through standards and other technological advances. And then we're living in a dynamic of humans and other decisions that people are making around their behaviors and attitudes, the costs, and other regulations that are not even energy-specific that affect adoption.

So all in all there are different applications that are needed to approach these different barriers. And there is no one size that fits all for energy efficiency. Likewise, there's no one-size-fits-all for the measurement strategies that are needed.

I was asked to talk a little bit about how evaluation has changed in the last five years. And I decided to go back ten years, and that's because the one major ship that happened at the CPUC is that they shifted responsibilities of evaluation to Commission staff around 2006. So I wanted to note that during this time some of the accomplishments of this adjustment, as I see it, are that the gap between our reported savings estimates and our evaluated savings estimates closed from about 60 percent in

2008 to a 20 percent different in 2012. Our field evaluations have been able to target some specific technologies that have been the focus of the portfolios, and it allowed us to cover a wider swath of the portfolio which I believe led to a more -- perhaps a more accurate forecast of the savings going forward.

We also simultaneously expanded the public process and access to the data and information that we were gathering, the methods and the outputs. And we did this while we were reviewing roughly 75 percent of the KWH savings, and with a budget cut of about half in 2009.

The energy efficiency evaluation results are a known entity. They are fundamental for portfolio planning at the CPUC. And as we noted, here at the CEC they are a fundamental input for our goals and potential updates, and they are used, as I noted, at the CEC demand forecast.

Right now we are also considering a shift towards program embedded EM&V through improvements in data collection at the point of intervention, enabling more meter-based analyses and performance-oriented program designs which I'll talk a little bit more about later.

I think it's also important to note, though, that all of this happened in the context of not a significant shift in methods, but rather a shift in responsibilities. So these are some of the outcomes of the shift in

responsibilities. Many of the methods state the same. And we're currently considering how some other responsibilities may have to shift as we move away from sample-based review of deemed and calculated savings estimates and into an embedded paradigm of energy savings.

So some of the reasons evaluation and measurement continues to be important is because we do need to continue to have accurate and consistent accountability for measured -- for savings that are measured and achieved to determine avoided costs to ratepayers, and also the dollar savings for participants. We need to know what's working now and what may work next to overcome these specific market barriers to improve deficiency. And then we need to also maintain accountability for getting incremental energy gains and not just ride along with what is already going to be happening in the marketplace.

We use the results from our evaluation measurement verification to continue to adapt to the market by identifying the new potential and tackling it with effective policies and program designs. And I think the EM&V community has been able to do that for the last 30 years and will continue to be an important contributor going forward.

Some of the new legislation and regulatory proceedings that are at play right now really do effect the emphasis on various measurement methods and points of

intervention. As we noted, integrated resource planning is going to be of greater and greater importance, and it creates some shifts in where and how one would be implementing measurement verification. Distribution resource plans offer a wide body of information about locational opportunities. The Integrated Distributed Energy Resources proceeding is also considering how to do consistent means of measurement and strategies for cost effectiveness to kind of enable a procurement strategy that can compare resources more easily.

Senate Bill 350, of course, the topic of today of doubling energy efficiency from a measurement perspective really makes a new consideration of how we would be going about measuring and accounting for energy savings by stating that it would be taking into consideration normalized metered consumption. And that's slightly different from efficiency because it's really getting at this greenhouse gas effect of how has consumption changed, not just our improvements of efficiency over time? And this is an adaptation that's important for both how programs are going to target different barriers and how we do the measurement.

Assembly Bill 802, which is where this really comes to life, had four different pillars that really interact with one another. And we're working through that right now on the staff to staff level at the CEC, and also

through our energy efficiency proceeding, as Commissioner Peterman noted. Benchmarking is an opportunity to really see where we're starting. The baseline activities are a way to understand how we are moving things above and beyond code, and also to code. The behavior, retro-commissioning and operations has noted the opportunities for looking at long-term effects of those sorts of interventions. And then, of course, the normalized metered energy consumption was the subject of our December High Opportunity Program and Projects ruling which really cut new ground for different program designs that could be judged in this new paradigm of normalized metered energy consumption, so really trying to get at the how and the what.

So my final slide is really focused on some of the key opportunities here. I think that the biggest opportunity is to have embedded strategies for assessing program savings and project-level savings. I think this allows us to capture and demonstrate the value of energy efficiency interventions at the time that they happen. It will create a value through the M&V for implementers to sell efficiency and build confidence to gain external financing, not just rely on public funding. It will potentially cut costs through automation and up-front data collection. That's an improvement on our current paradigm. And also offer feedback at the customer level, at the regulatory

level, and at the state policy level.

I think it's important that we continue to create a common understanding of performance. And I think embedded in that is that we not only have to agree to up-front measurement, but we have to allow for measurement from different perspectives because there might be different paradigms that are appropriate for understanding what savings means to different parties and different entities.

I think we need to allow for delayed savings claims or settlement in certain cases to see what materializes in the data and use it to inform future estimates. This was really what I see as the expectation on the behavior, retro-commissioning and operations requirement to have a longer term multi-year savings horizon. And I think it also enables the continuous energy accountability -- excuse me, continuous energy improvements which will create greater accountability for sustaining the savings over time.

My final two points are really around accountability for measured performance. Right now evaluation is too, not only for regulators but also for implementers. And we need to make sure that it is happening at the time of intervention and have those meaningful feedback loops, and that will be accomplished through

building more capacity and training, skills, and partnerships to deploy energy efficiency with measurement and not having measurement as an afterthought.

Thank you. Questions? Comments?

COMMISSIONER MCALLISTER: Thanks a lot for that. Just very quickly, I guess I'm a huge -- this is a great slide because it's got a lot of good stuff for the future on it. And I think, you know, the second bullet there is great. And certainly performance-based evaluation and sort of in-process evaluation, I want to -- those are the future and I think they have to be the future. And we have the analytical tools to do them, so let's figure out how to get the data flowing so that it really is just part of the ether and that we don't have to worry about it.

It's just, you know, I guess my caution is that we really need to put in place the tools, and I think we know this. I just want to make sure that it's sort of an ongoing part of our thinking. The transaction costs have to be super, super low. This overhead has to be in the background. It can't be seen. It has to be automatic and cheap and just pervasive. And so to get information where it needs to go so that we can do this, you know, ongoing evaluation I think is critical to making it all work.

And so, you know, we're working better. I think we're working really well together towards that end, but

it's a big lift. It's a real change of the way we do business, and it requires a lot of investment and it requires a lot of stakeholders. And so I just want to -- I'm super excited about it, but I also want to just make sure that we have that in mind.

And an upside of that is that it helps keep the customer engaged. You know, we often go through all these conversations day after day after day and we never mention the customer. And often the decisions, really, the main decisions we want to happen are the customers' decisions, whether or not it's participating in a program, whether or not, you know, they even know about the details of the technology. So they need to have a palpable sense that this decision they're about to make has consequences.

And so I think this information landscape is really -- getting it right is a key part of it. And we're not going to be the ones in this -- and certainly not at the dais and many of the room, we don't operate in that realm. But the people who out there actually selling stuff, they're the ones who need to kind of be able to put all the pieces together so they can make some money. So this information landscape really does matter. And I think if we keep that long term sort of customer-based and performance-based and local-based viewpoint, then we're going to get it or we stand a much better chance of getting it right. And I'd

really love to see all these initiatives because I think they have a lot of potential to do just that, so thank you.

COMMISSIONER PETERMAN: Hi, Carmen. Thank you very much for the presentation.

Picking up on Commissioner McAllister's point, I think what really stands out to me about your last slide and our conversations has been the potential value of the embedded M&V. And I was wondering if you could just help orient us and provide an example of something that hasn't worked because we haven't had embedded M&V? Like what's a problem absent moving in that direction?

MS. BEST: I think that the majority of the portfolio savings right now are focused on what we call deemed savings estimates which are technology-based interventions for one intervention at a time. And I think there's a space and an important component of that in addressing specific market barriers, but I think it leaves something to be desired in terms of understanding how that is changing consumption over time.

And the -- I'm trying to think of -- a good example of where I think an embedded M&V has been good is in the behavior programs, for example, in which the -- Opower, for example, their program deployment is dependent on an M&V strategy where you get real-time information and feedback on an ongoing basis.

I'm trying to think of some specific programs of which it is not happening right now that it would really shift the paradigm, and I'm drawing a blank right now. But I think there's lots of examples that are coming through the high-opportunity programs. The Residential Pay For Performance Program is an example of that. Every single proposal that we've gotten so far has had an embedded strategy. And I think it strengthens the ability to review and cuts costs definitely on the backend for how much re-review, if you will, has to happen to ensure that those --

COMMISSIONER MCALLISTER: Yeah. I'd actually --

MS. BEST: -- materialize.

COMMISSIONER MCALLISTER: I would say any whole-house program, for example, it's totally impeded by having some ongoing sort of understanding of what's really going on. I mean, in my own case, and many of you in the room are going to be in the same case where you've got -- you know, we have these great smart meters and we have interval data that can flow, and then maybe a solar system, as well. Well, those data streams aren't integrated, so you can't actually tell where your whole, you know, consumption is. And you can't feed that data to somebody who can help you make better decisions, like sort of on a very -- you know, on a quality but very quick and very sort of pragmatic basis; right?

So I don't know what my net consumption is because -- I mean, I don't know what my total consumption is because all I see is my net consumption. Well, so that's completely useless to me if I want to keep making efficiency investments.

COMMISSIONER PETERMAN: Well, I agree. I just wanted to highlight that point a little bit more in clear English because it sounds like a simple thing, oh, just embed the M&V. But really doing so is going to tackle, I think, some of our concerns at a high level around principles which is how do we know that these programs are working, and the time that is spent after the fact on that? And so having that as a key program criteria up front I think will save us time in the end.

COMMISSIONER MCALLISTER: I totally agree. And then also the macro view of, okay, what is the, you know, energy consumption per square foot in a given sector in a given place? You know, over time, if we know that, then we can triangulate and we can, okay, well, our programs are happening in this environment and we're actually seeing the baseline move. And so therefore we can kind of do some well-informed analysis, have some statistical significance on a macro level to know, hey, our policies are generally working.

And, you know, when we're sitting talking to the

legislature or whomever, you know, and we're on the hook to sort of explain what's happened, I need that. I mean, I would like to have that information, you know, and not have it just be hand-waiving narrative but actually have it be really, you know, grounded in data. So I think we kind of need all of the above to triangulate and really tell a good story over time.

Thanks, Carmen.

MS. RAITT: Thanks, Carmen, and thank you to our first panel.

So moving on to the second panel on New Legislative Requirements and Needs, Improving Energy Demand Forecasts and Energy Saving Evaluation Practices.

Our first speaker is Mike Jaske from the Energy Commission.

MR. JASKE: Good morning, Chair Weisenmiller, President Picker, Commissioner Douglas, other Commissioners and agency executives. For the record, my name is Mike Jaske with the Energy Assessments Division Staff of the Energy Commission.

So unlike the RPS statutory language that SB 350 updated, the energy efficiency text is relatively sparse and it leaves much to be determined. So my presentation today is almost entirely on a list of topics and questions that have to be addressed in order to really understand what

doubling means and who it applies to.

This slide is a list of the things that I'm going to go through in detail in the subsequent slides. And let me say at the outset that my purpose is to raise these design questions, not to answer any of them. I'm sure we're going to get feedback from stakeholders today and in the written comments later this month or early August, whatever that date is that we'll give a lot of input into how these will be resolved.

So first and foremost, who are these targets applicable to? Are they applicable to individual utilities, all utilities, or are they statewide only? A lot of the rhetoric in the -- well, let me use the word wording. A lot of the wording the statute says statewide. How does that translate into something that's operational?

Then there are a series of seeming constraints, like cost effective and feasible. These are not defined. They're evidently left to the Energy Commission to attempt to resolve.

There are some things you might refer to as accounting. Are we only talking about traditional energy efficiency or are we talking about other means by which whatever targets get established can be satisfied. So fuel substitution that leads to a reduction in total BTUs consumed but as the switch between fuels or buildings or

between transportation fuels and electricity, are those to be included within the analysis?

There are a lot of starting point issues. Even though the legislation refers to the 2014 AAEE projections, there are a 2015 version of those which corrected some of the mistakes that were discovered in those 2014 analyses, so is 2015 a better source?

How do we extrapolate to 2030? The legislation clearly understood that the 2014 study only went out to year 2025. It says extrapolate that on an annual average growth rate, but using a growth rate of what? And how do these targets apply to both POUs and IOUs? There is some confusing language within the statute.

So starting off with one of the most important of these questions, are these targets to be utility-specific or statewide only?

Clearly this is a major decision. If they're going to be utility-specific, then utilities will be responsible to achieve goals set out for them. They'll want to assure that those goals are going to be achievable. If they're statewide, does statewide mean adding up analyses from individual utilities so that you form a statewide value or is the analysis only conducted at a statewide level and not at the individual utility level?

So that is among the most important of the framing

issues that has to be resolved.

As I've mentioned, SB 350 clearly requires that the targets be cost effective, but it doesn't define what cost effective means. In practice in the energy efficiency field there are a variety of different interpretations of cost effective. These are three of them. Utility total resource cost test is commonly used to judge cost effectiveness for utility programs. Various kinds of customer pocketbook tests are used, in fact, even mandated for some of the standards that the Energy Commission is responsible to establish.

Or alternatively, is some sort of societal test an appropriate version of cost effectiveness to use? Since we're -- and a societal test commonly brings externalities into the picture and values in some way that is outside the market and can't be expected for individual customers to pay attention to and might well be an interpretation that fits to the GHG goals of which 350 is all about.

And then once a particular one of these is chosen to be the interpretation of cost effectiveness, there is a whole host of numeric and analytic projections for the future that actually go into determining the stream of values that we use to implement the test.

SB 350 includes the requirement that the energy efficiency targets be feasible, but what does feasibility

mean?

It's possible that feasibility could be construed as just a stylistic wording element of the legislation and doesn't have a practical numeric consequence. On the other hand, it could be interpreted to mean that the Energy Commission, with the input of the other agencies, is constrained in the degree to which it can count on emerging technologies through time. Perhaps there has to be some greater scrutiny of emerging technologies than there has been in the past.

It could mean that feasible is a constraint on various kinds of program delivery mechanisms. Perhaps retrofit programs, Codes and Standards within the scope of what is authorized for the Energy Commission to approve or the PUC to approve for IOUs or for the governing boards of POUs to approve is too narrow to actually accomplish a doubling, that you could accomplish a doubling with a broader set of program delivery mechanisms, or perhaps, like Commissioner McAllister said a few moments ago, programmatic activities aren't going to be sufficient, that you have to rely upon market forces which clearly raises issues of estimation and guessing what those market forces are going to accomplish, as opposed to programs that can actually be designed and measured, as Carmen described.

So feasibility is another very important dimension

that needs to be resolved more up front than at the tail end of this process.

Public Resources Code 25310(d), one of the new standalone sections that was established by 350, establishes an illustrative list of compliance mechanisms. As Simon mentioned at the outset, it enumerates a number of tried and familiar approaches, retrofit programs by IOUs and POUs, standards of various kinds, PACE Program. But it also has some very ambiguous language in 25310(d), sub item (10) that could be interpreted to mean that fuel substitution of fuel switching are compliance mechanisms that can count to satisfy the target.

If that is going to be determined to be the case, then that needs to be known up front so that the targets themselves can take that into account, because the possibility of BTU switches from gas to electricity or buildings applications or from fossil fuels to electricity for transportation applications would have huge ramifications for both the size of the targets, as well as then the compliance with those targets.

And as the very last point in the left -- the right-hand column says, if this particular passage is going to be read to include transportation fuel switching, then there may well be a role for ARB in determining some protocol by which the displaced fossil fuel savings

translate into some overall protocol for measuring cost effectiveness and accuracy.

So I've talked about the basic framework and a number of definitional issues that may need to be resolved, should be resolved. You can think of some of them as constraints on the initial set of numbers that are doubled. So one way of looking at 350 is that doubling is the starting point, and then these various constraints of feasibility, cost effectiveness sort of whittle down the level of the savings that does pass muster and finally is established as the target.

If this is the framework from which the analysis proceeds, then 350 clearly says that the 2014 AAEE savings projections should be doubled, and that the POU goals should be included, and that this should all happen by 2030, but how are these numeric analyses actually to be accomplished? How are the existing projections of AAEE or utility goals to be extrapolated, for example? They don't go out to 2030, so there's a host of technical details about how to do that extrapolation and what growth rate is implied by the legislation. Because it doesn't say specifically which is the source of that growth rate, you'll have to resolve those questions.

As I mentioned earlier, are the 2015 IEPR AAEE projections a better starting point than the 2014, given

that we've found some errors and they've been corrected?

Finally, the legislation refers to doubling by 2030. What does that mean? Does that mean only in the year 2030 are savings doubled? Do we achieve doubling at some earlier point than that? If so, how do we ramp up to that earlier point? Or if it's only 2030, how do we ramp up to that point? So there are a host of numeric details of that sort that ultimately will have to be resolved.

That's sort of a top-down way of looking at how to develop the goals. But what's the role of measure-specific energy efficiency analyses?

This is sort of the converse. It's a bottoms-up, you know, looking at hundreds or thousands of efficiency measures and their potential. This is precisely what energy efficiency potential studies have done to first established a technical potential, perhaps using emerging technologies, and then cut that down to something that is economic potential that passes some kind of a customer cost effectiveness test. And then finally, whittle that down one more time by bringing in various market issues so that you actually have a market potential that is, at least hypothetically, achievable through known methods.

Each of the -- well, all of the utilities, let me put it that way, a PUC-funded study for the IOUs and a POU-funded for the POUs are underway. These were planned in

advance of SB 350 being passed by the legislature. It's been unclear, given the many uncertainties I've mentioned earlier, how it is those studies should be modified so their sponsors launch them. The PUC study is due in March. And I need to correct the POU bullet here. Apparently, it's actually scheduled for completion by November of this year, 2016.

So given that these studies were launched with all these details being established, what happens if, as you make decisions about how to frame SB 350 the analytic work there doesn't quite match up? Is there time and resources for further work to sort of correct those studies and make them more directly applicable to the target setting process? Will the sponsors be willing for their contractors to be used to do that or is it some follow-up independent effort? It's not clear.

So far in this presentation I've given you a long list of uncertainties and imponderables that you have to grapple with.

This last slide is my one single recommendation, proposed approach for how to actually work through this overall SB 350 target development effort.

What's shown here on this slide is a multi-phase process. Phase one would established the basic framework for targets and resolve some of these key design elements

that I've described today.

Phase two would then build off of that, taking a very specific course direction that the first phase decision established and actually go out and do the numeric work that would develop proposed targets. That would need to be done by about August of next year.

And then there would be a shorter phase toward the end of the process where that proposed set of numeric targets was reviewed by stakeholders. They'd file comments, and then the final Energy Commission decision would be made by November 2017, as called for in the legislation.

You could play with this. You could divide it into four phases. You could play around with the dates. But I think Staff believes that some basic approach like this is absolutely essential. There are too many uncertainties to carry all of them along until the tail end of the process. Some up-front framing of how the SB 350 target-setting process is going to work and who the targets are applicable to is just fundamental to engaging with stakeholders and making progress.

So I've given you a lot of things to think about, in addition to this specific proposal. Are there any questions?

MR. GIBBS: Yeah. Thank you. This is Michael Gibbs from the Air Board.

I was wondering if we could perhaps return to slide six? I notice on -- and thanks for the presentation, very informative. I notice on this particular slide your identifying a characteristic of efficiency related to greenhouse gas emissions in units, I presume, of emissions in tons of some sort, as contrasted with measuring efficiency in units of energy. I was just wondering if you could expand a little bit about what that means in this context?

MR. JASKE: I'm only going to be able to narrow the uncertainties. But let me start by actually reading the particular 25310(d) subpart (10) language.

"Programs that save energy and final end uses by using cleaner fuels to reduce greenhouse gas emissions as measured on a lifecycle basis from the provision of energy services."

So you have to save energy. You have to use cleaner fuels in doing that. It's on a lifecycle basis. And I'm not quite sure what "the provision of energy services" at the very tail end means.

So the key -- one of the key decisions that will need to be made is does this mean fuel substitution from traditional within building-type end uses, water heaters/space heaters to electricity? And you presumably would be saving energy. In final end uses you'd have to

compare BTUs of gas-fired appliances versus electric ones. But you also then need to compare the direct GHG emissions of that gas use versus the GHG emissions of the electricity that would -- so you have to both save energy and you have to reduce GHG emissions. There's a parallel, you know, set of analyses needed if this is interpreted to mean fossil fuel to electricity for transportation applications.

This is probably one of the thornier things that needs to be decided because it has the potential for greatly enlarging the scope of this from electricity or natural gas efficiency to energy efficiency on an all fuels kind of basis.

MR. GIBBS: Yeah. Thanks. Just a short follow up.

So within the context of the language that you read, then the greenhouse gas emissions impact is a characteristic of the outcome but not necessarily a measure of the extent of efficiency achieved? Is that one way to think of it?

MR. JASKE: The way I read it there's a two-part test. You have to both be energy efficiency and you have to have GHG emission reduction. So a fossil-oriented electricity resource plan wouldn't fare as well as renewable-oriented electric resource plan. So we'd have to project forward in time how the resource plan will evolve.

And, of course, independently in 350 we have the RPS mandate moved up to 50 percent by 2030. We might need to consider how to extrapolate that further out into the future because it talks about a lifecycle basis. So if you're in 2028 still short of 2030, you do -- you need projections out to 2040, say, in order to understand investments being made in 2028.

MR. GIBBS: Great. Thanks.

MR. JASKE: You're welcome.

COMMISSIONER MCALLISTER: I think this, I mean, we're going to rely on, I think, ARB and stakeholders to sort of, you know, talk about the possibility, you know, the transportation possibility, and certainly the implications of what that decision would look like and, frankly, the intent of, you know, what was meant by -- in the legislative discussion with SB 350.

CHAIR WEISENMILLER: I think we're also, probably more in the JASC context, trying to go through, looking at the ARB as we try to sort out what, you know, what are the baseline utility GHG numbers before we get to the step of saying, okay, what do we do to reduce them, but we have to have a pretty well agreed upon set of metrics there that have to be developed in a comparable fashion for IOUs and POUs both.

MR. GIBBS: Yes, I think that's correct. The

characteristics of the fuels of which we can now talk about electricity in that context and the characteristics of the greenhouse gas emissions associated with the use of that electricity when it substitutes for the other fuels. And so we have to make sure that we're comparing properly.

And so I was thinking in the context of comparing the emissions attributes as one component. But then when we're trying to assess the role of fuel switching and achieving the doubling of energy efficiency, you also have to account for it in energy units in some way, as well.

So I was trying to get to both of those with the question before in that the greenhouse gas emissions may be a necessary outcome, but the counting toward the goals of energy efficiency would be in energy units.

COMMISSIONER MCALLISTER: And so I think --

MR. GIBBS: And then we also have to decide what energy we're counting.

COMMISSIONER MCALLISTER: Historically, it was really all about the energy and it wasn't about the carbon. So I think the migration really has to be to do both, and I think you're totally right. But, yeah, how we do that is not a trivial question.

MR. GIBBS: Yeah.

COMMISSIONER MCALLISTER: Okay. Great.

Anybody else for Mike?

Thanks, Mike.

MR. JASKE: You're welcome.

MS. RAITT: All right. Next is Gary Cullen from Navigant.

MR. CULLEN: Hello. My name is Gary Cullen. I am a director with Navigant, and I'm located in the Portland/Vancouver, Oregon/Washington area, in that office. I'm going to be talking about the POU potential modeling. Greg Wikler who will be right after me will be talking about the IOU potential modeling.

Now the potential modeling for the POUs -- keep up with this stuff -- we began the project about two months ago, in May. And we are planning to complete it by the end of the year, November timeframe, December timeframe. Doing a potential study for the POUs is a challenging situation. We have 37 members of the CMUA participating in the project. We've creating 37 different potential models for all these utilities within this timeframe.

And the size of the utilities varies dramatically. We go from the big ones like SMUD and LAWP, then we go all the way down to these really tiny ones like Biggs and Banning, and we have to come up with a consistent methodology amongst all of them, but then also recognize that each of them have a different political climate, a different budgeting schedule, a different staffing. And

Biggs can't necessarily do what a SMUD can do, not at all, in fact. But we need to take that all into consideration when we're developing their targets.

However, the measures that we start with in doing the analysis is the same portfolio of measures. And we start with that portfolio from what is being done with the -- can you hear me? -- with the PGT study, the IOU study. It has a database of 200 measures approximately. It is multiple sectors, we do the same. However, we have modified that to a degree.

And first off -- I hope I'm following my slides because I kind of get carried away sometimes -- we modify that because the CMUA just got done doing a technical resource manual for themselves because they didn't necessarily all the results out of the DEER database. And so we have -- start with the PGT dataset, then we look at the TRM from the POUs and see if we need to modify for our client. And then we went through all the measures that the various POUs offer and we found that there were a subset of measures that aren't covered by either the TRM of the PGT dataset, and so we've been adding those back into the dataset.

We want to have the ability for each utility to consider what measures they want to have in their portfolios, how they want to implement the programs, and how

much money they want to spend on their own. There's always an emphasis when we work with the POUs that they want to have control of their own utilities, because they have to respond to their city councils and to their own ratepayers. And so they're very careful about making sure that they have this autonomy, so to speak, in the planning process. But they do recognize the need to achieve these higher goals.

The general scope, we're using each utilities A3 submittals to the CEC as a starting point for calibration in terms of what their programs are doing to date. We're doing the calibration, not only at the program level but we're actually doing it within the end-use category within each program to get more granularity into the results.

We are starting with the measures that they currently have in their portfolio, because we can't do calibration properly if we're looking at all of the measures that are available. We have to look at what has been offered, and then we can calibrate and then we can look forward and see what's happening with the measures that are in the dataset right now in their portfolios, as well as new measures that are in the database that they could consider in the future. And we call those new measures, and we have an ability to turn those on or off within the portfolio.

The recent history of POU potential studies, this is the third set that I've been involved with. I've been

the project manager for the one back in 2009, and the one also in 2012, and this current one, so I have a long history with the POUs in doing this work.

Most of the utilities -- not all of the utilities participate in the CMUA study. We have 37. I can't remember exactly what the total number is, but I know there's some utilities that participated last time that are not participating this time and vice versa.

The model that we use is similar to the one that's used by IOUs. It is bottoms-up stock accounting methods. As I said, we have over 200 technologies characterized by sector, building type and climate zone. We arrange all the datasets by climate zone, and then we start applying the building-type characteristics that are unique for each utility into each of the individual utility models. The sales data that we use as our point of differentiation is the QFER data that we get from the -- that's the supplied by all the utilities in California to the CEC. And that provides data by NAICS code. We then use the NAPI (phonetic) and the NAICS into building types to come up with energy use levels by building type, and then we use the CBEC (phonetic), the federal standards, to then come up with building stock estimates. So these are all very unique to each of the individual utilities.

Back there.

With the measured impact and cost status, we do rely on the PGT study. The TRM that the POUs have created does not have any cost information, it just has energy savings information.

We also had to rely on the PGT study to get our basic information on building stocks in terms of saturations of efficient versus baseline technologies. And so we utilize that same kind of information at the climate-zone level that the IOUs use.

All the measures within the database are in terms of annual savings. We do have the capability if the POUs wanted to in the future to potentially have an output that is terms of hourly shapes, hourly loads. We do that by -- we'd categorize all the energy savings into end-use categories by sector level, and then we'd try to associate an 8769 load profile to each of those end-use categories. And if we went that extra step we could create 8760 load shapes of the end-use savings potential. Currently the demand savings are based on what the (indiscernible) definition is.

These are the types of energy efficiency potential that our models project. And you can see the technical potential, you can see the economic potential, and they keep getting smaller. Maximum market potential is a subset of economic potential generally limited by our estimate of

consumer awareness of energy efficiency and, if they are aware, their willingness to even implement the measure, and that actually is allowed to vary over time.

So that comes into market potential which takes into consideration the historical achievements done by the utilities which comes up with an elasticity rate by various measures that then moves forward and tries to project what the future market potential is up to 2030.

Now in terms of the (indiscernible) methodology, the baseline results that we start off with are what's going to happen in the future if you just kept your measures -- your portfolio exactly the same. But then we want to have the ability to create a lot of scenarios for the utilities to consider.

We have the ability to change program design such as considering early retirements, which is changing the baseline. And, of course, if we do that then we have to worry about what happens at the end of the remaining useful life to the baseline technology, and so we need to incorporate that.

We had the additional measures that I talked about beyond what their current portfolio is and if they wanted to add or subtract -- add them into their portfolio or not.

We had the additional of behavioral programs if the utilities don't have them. Some utilities have Opower-

type programs right now, but not very many of them. And none of them have a commercial or industrial behavioral-type program. And so we have the (indiscernible) capability to do those.

And then we have the ability to adjust the incentive level to take advantage of the elasticity rate for program participation, as well as the administrative incentive which we take as a proxy towards increasing advertising for the program, increasing awareness for the program.

And here's some of the switches that we're incorporating into the model. And so we've only been working on this model for the last two months, but we're getting close to having a working model that we can play with to get the bugs worked out. So like with new measures beyond the current portfolio, we break it down by sector, we break it down to yes or no, you want to include those new measures, and what starting area you want those new measures to start coming into your portfolio. So there's a lot of flexibility here.

Similarly for early retirement programs, if a measure has the ability to become and early retirement program only then we look at, again by sector, do you want to modify your program design to go to early retirement or not? And if you do, what year do you want that to start in?

This is our general behavioral program input sheet. And again, it is what percentage of the population you think will be participating, and then also the starting area you want the program to begin? And then our incentive multipliers and our administrative cost multipliers for increasing or decreasing responsiveness to the program through incentives or increasing or decreasing responsiveness through increasing or decreasing advertising of the program.

And that's my brief overview of the POU effort. Any questions?

CHAIR WEISENMILLER: Yeah, a couple.

You mentioned you have 37 participants. I think the number of POUs, I'm trying to remember, is 43 or 44 depending upon whether the ski lift is regulated by Picker or myself. And a subset of those are caught up in the IRP issue. So I'm trying to at least get -- it would be good to get a submittal from you that just details who's in this so we can try to figure out if at least all the IRP POUs are participants. Good. Okay. But anyway, if we can get the list, that would be good.

The other thing is when you have your figure five methodology, do you differentiate -- go back one more, that one -- do you differentiate there between owner-occupied and rented space?

MR. CULLEN: Not --

CHAIR WEISENMILLER: Where does that come into the potential estimates?

MR. CULLEN: The owner-occupied, it does not come into a separation within a segment. Such like in the residential sector, we generally thing of the single-family as being owner-occupied and we think of the multi-family as being a rental situation, and we do have those separately modeled.

CHAIR WEISENMILLER: Okay.

MR. CULLEN: But with commercial buildings, we do not have that distinction.

CHAIR WEISENMILLER: Okay. And in terms of emerging technology, how does that play into this?

MR. CULLEN: We allow the emerging technologies to go into the database. And they have a first year of availability index number within the dataset. And so when that timeframe comes up, and it will be identified as a new measure for that new measure scenario, but when the time comes up and when it becomes available, then it can be added to the mix.

CHAIR WEISENMILLER: And do you have a sense of what the major differences are between your technology reference manual and the PUC's database?

MR. CULLEN: Well, actually, because we just got

done reviewing that, and we actually found that the differences were not very large. And sometimes we had to go like to the IOU work papers themselves to finally define which was the better number. And so I would say we're probably 95 percent in agreement with the PGT numbers.

COMMISSIONER MCALLISTER: Yeah. I guess, you know, a lot of our problematic here to get to a doubling is to really affect these concentric circles, right, so get out more towards -- harvest more towards technical potential to hopefully make technical potential more economic and, you know, sort of essentially expand the inner circles out to get to the technical potential.

I guess do you have the capacity to sort of, you know, produce specific -- so like this is a stylized kind of, you know, representation of all this. But I think, you know, can we put some numbers to that, say by service territory or just by, you know, as a group?

MR. CULLEN: By doing the scenario runs with all those different switches that I could push, could pull, we actually could have a market potential that could be, well, here's your standard market potential, here's what happens when you do this, here's what happens when you do that, and see how it expands into these areas.

COMMISSIONER MCALLISTER: I mean, I think that would be helpful for the discussion, for sure, and help

people think more concretely.

MR. CULLEN: We're not to that point of ability yet --

COMMISSIONER MCALLISTER: Yeah.

MR. CULLEN: -- but we're getting there.

COMMISSIONER MCALLISTER: Yeah.

MR. CULLEN: Anything else? Thanks.

COMMISSIONER MCALLISTER: Okay. Great. Thanks.

MS. RAITT: Thanks. Next is Greg Wikler, also from Navigant.

MR. BERBERICH: Mr. Chairman, not directly related to the next speaker or the previous one, but I think it is important to note that a significant percentage of the energy use in California is in water movement. And I think that last number was 18 percent or thereabouts. And I think that certainly needs to be an area of focus as we move forward on what opportunities exist there for energy efficiency, too, so that's from the center.

MR. WIKLER: Good morning, Commissioners and leaders. My name is Greg Wikler. I'm with Navigant, as well. And today I'll be talking about the IOU potential study, as Gary referenced, the PGT study potential goals and target, for those of you that are annoyed by acronyms. And what I'll do is give you an overview of the PGT results historically, and then talk about the future and provide

some insights as we start thinking about how to incorporate the doubling provisions of SB 350, and also thinking about AB 802 and how that incorporates into the potential estimates for the future.

So just as a brief overview of what has been done in the past on the IOU potential study, the model that we use is also very much a granular bottom-up type of forecasting assessment of energy efficiency potential for the four IOU service territories.

As Gary referenced, we use more than 200 energy efficiency measures or technologies across six sectors. We also look at 16 climate zones in the state that are linked to the CEC climate zone definitions. And we look at multiple building types within each of the sectors. We also incorporate the effects of Codes and Standards, but also behavior programs and financing, as well. And our results are calibrated to historic EE adoption rates.

And it's important, what we use in our look forward is a basis by which to look forward is to say, okay, what are the policies that are in place as we know them today and how they would translate into the future? So in a sense our market potential is essentially a policy-driven potential based on the current policies.

The history of our studies, we've been at this for a while. We started the cycle back in 2011 when Navigant

was first brought on to assist the CPUC in doing IOU goals and potential, updated in 2013, and then updated again last year.

Earlier this year we completed the AB 802 technical assessment that Simon had referenced. And I'll speak a bit about the results there, as well.

In terms of our data sources, you can see here just a variety of different notes of information. Certainly our assessment is extremely granular from the perspective that we look at all data sources that are potentially applicably, including what the CEC uses in their demand forecast, but also the EM&V studies that Carmen had referenced, IOU program plans, as well as work papers, and the database for energy efficiency resources or DEER that Gary referenced, we rely on that very extensively, as well as a few other sources.

I should note that the data is based on existing -- what data are out there and available. So to that end, our potential study is very much integrated into the existing stream of data that supports this. We're not actually out in the field collecting new data. We're using existing data that has been really valuable for this study effort.

Just in terms of results, there's a lot of information going on in this slide. I just wanted to

highlight a few things.

You'll note the percentages that I've included at the top of the orange bar there, or orange line. Those are the percent reductions incrementally for those snapshot years. So in 2016 the percent reduction, 1.6 percent of the base usage or in this case the base consumption, over time that incrementally goes down as we see incorporation of different Codes and Standards, and so it levels out at about one percent per year out in the outer years. The 2024 is our forecast.

A few points also to make here. Forty percent of the savings, and that's the big orange wedge there, are the result of IOU claimable savings that comes from Codes and Standards. So those are the code advocacy efforts that IOUs are able to claim as part of their savings efforts. We include that in our analysis of potential going forward. The second point, and I'll come back to this because it's an important point, these savings do represent the policies that are in place currently, so the policies and the rules and procedures that essentially are governed to the IOUs in terms of what they can do for energy efficiency program implementation. So very much, this market potential is a reflection of the policies as we know them today going forward.

Now it's important to note, and for the benefit of

Commissioner Peterman's question earlier, we do, also, a separate forecast of gas potential. One of the things that we do not incorporate into our analysis, and it might be some subject for discussions with the CPUC, is to look at cross fuel, fuel substitution impacts on the potentials. So that's an area that we don't currently look at. We look at savings from electric to electric and gas to gas. But that could change over the future, it's just not a part of our analysis framework right now.

In terms of the potential study forecasts as reflected in the demand forecast, you can see these lines here boil down to a couple of major wedges. That first wedge I have highlighted in the purple bubble, those are the energy efficiency savings over time identified from the 2015 potential study. So those are the accumulation of savings and what their effect would be on the demand forecast.

If we were to then look at the effect of AB 802, which is what we did in our analysis earlier this year, you could see that additional savings wedge in the red arrow and bubble that I have below there. I think Simon had pointed out earlier that what we found, and this confirms what he was saying, is that, you know, we don't see doubling coming from AB 802 effects directly. So, you know, we have to think a bit more about where we're going to find those additional savings in this next round of analysis.

I wanted to point out that that red savings or that red wedge, the incremental savings from AB 802, also does include the risk of possible double counting. And it's something that needs to be considered, this double counting issue with regard to what are existing codes that might be adopted and included in the demand forecast that Chris Kavalec had identified earlier.

One of the things that I was also asked to do was to look at energy efficiency potential estimates across the United States. And I've been involved in potential studies for a long time around the U.S., and also have done a number of studies in countries abroad. So I thought this was an interesting compilation. This is a recent DOE assessment of a whole host of energy efficiency potential studies dating back to 2006 and trying to get a sense as to where they stand relative to the baseline, so what percentage reduction are they expected to see across different states around the U.S. And what the results of that assessment indicate are that about one-and-a-half percent savings per years is generally looked at the energy efficiency potential when you look at all the studies across the U.S.

What that also reflects is a lot of states, a lot of areas around the country where there's traditional energy efficiency programs being implemented. There's lots of untapped potential, so that's certainly a point to keep in

mind.

We also see energy efficiency ramped up and in place in a lot of the wholesale markets, PJM, New England, and Texas. So there's a lot of energy efficiency potential in those areas where there's wholesale market activities, as well.

And I also wanted to just point out that there's increased emphasis on integrating energy efficiency into other distributed energy resources. And we're seeing, in addition to here in California, we're seeing a lot of emphasis on integrating with DEERs in New York State, Hawaii, and Arizona. Those are just a few examples. There are other states and other pockets around the country where that's happening a lot.

And then finally, there is an emphasis on market transformation activities, and particularly in the Pacific Northwest where we're seeing a lot of interest in market transformation as a basis by which to design programs and really achieve a higher degree of savings.

And that leads me to my final slide which is where we see the path going forward and what we're starting to talk with the CPUC about in terms of scoping out and assessing where we think the analysis needs to go for this next round of potentials. So I wanted to offer just sort of two factors, and some of those factors are, you know,

leading to the increase, you know, kind of getting us, what we think, toward the doubling of efficiency. But there are other factors that might be pulling that down.

On the upside or the increase side, we're starting to look at more advanced technologies and really incorporating what we think are a lot of opportunities and potential from emerging technologies in the electric space in particular, where those technologies have been ramped up faster on the commercialization scale. Certainly the AB 802 assessment that we had done earlier this year in terms of below-code stranded potential, as well as operational efficiency and behavior initiatives. And then the new energy efficiency program delivery strategies and ideas that I talked about, market transformation, an example, Pacific Northwest where we're seeing this concept called momentum savings. And that's another area that we're wanting to try and look at, but also financing programs. And we think that financing might be another way to really ramp up participation in energy efficiency efforts.

We also have to think about some of the pressures on energy efficiency. Cost effectiveness, we're heard a bit about that today. I think with, you know, the recent revelation of lower avoided costs in the IDSR proceeding, that also opens the question of whether we are looking at the right cost effectiveness paradigm, so we have to think

about that.

Certainly the zero-carbon policies might actually be a counter to achieving higher levels of savings because there are certainly tradeoffs. I think that, you know, the issue of measurement within the household that Commissioner McAllister identified is an issue that we have to get our heads around in terms of whether we can really understand what savings are really happening at the home with all these other resources that are also competing potentially.

This whole issue of distributed energy resources brings up the question of incrementality that we've heard about.

And then finally, electric vehicles have been referenced here today. Certainly the market uptake projections that we're seeing has to play a factor in overall how we look at the energy efficiency resource.

So with that I'll take a few questions.

CHAIR WEISENMILLER: Okay. A couple. First, in your modeling, how do you distinguish between IOUs customers and CCA or direct-access customers?

MR. WIKLER: So in our modeling we look at the four IOU service territories as the basis by which we conduct our assessment of where the population lies. Within that population are CCAs and rens, and those we would consider to be delivery approaches but they happen in the

IOU service territories. So our counting or consideration of the potentials is inclusive of those activities.

CHAIR WEISENMILLER: And back to the basic question of how do you distinguish between -- how much segregation do you have about owner-occupied versus rented space --

MR. WIKLER: Well --

CHAIR WEISENMILLER: -- either residential or commercial?

MR. WIKLER: Similar to the way Gary had described it in the POU context, we look at, on the residential side, single-family versus multi-family, so to the extent that those variations are addressed on the res side.

On the commercial side it's something that we've thought about in the past, about ways to distinguish between tenant versus owner-occupied in the commercial sector. And we started to look at that in the AB 802 technical analysis. We looked at, for example, tenant-based engagement efforts on the commercial side with regard to operational efficiency.

So it's beginning to become -- it's beginning to be more of a consideration in our analysis going forward.

CHAIR WEISENMILLER: And in general, what would you say are the top three or four differences, if any, between your analysis for the IOUs and the other Navigant

analysis for the POUs?

MR. WIKLER: So the biggest difference, as Gary mentioned, 37 individual utility potential studies, whereas we're conducting one potential study and representing the potential across the four IOU territories. We have one model that drives the analysis across the state.

We have one regulatory body that defines the policies versus the POUs that have essentially 37 utility commissions, in a way.

COMMISSIONER MCALLISTER: I want to follow up on the Chair's first question.

So I think I understood that the CCAs and direct access people are like imbedded in the IOU territories; right? So what would you have to do to break out metrics for those entities directly?

MR. WIKLER: So I think the way to break it out is to essentially identify or carve out what portions of the service territories are essentially covered by the CCAs and rens. And, you know, to do that we'd say, well, who is -- you know, a whole host of questions and issues. Who's the administrator? Who's the implementer? If we were to separate out what the IOUs and their implementer agents implement in their service territories that don't involve rens versus what are inclusive of rens, we might be able to then assess some unique characteristics that are only

pertinent in one context versus the other. But right now we don't have that breakout, but it's possible to do it in the future.

Because I think what you're getting at is that there may be different delivery approaches, different engagement strategies that might be present in those REN and CCA approaches that --

COMMISSIONER MCALLISTER: And different outcomes that we want to know about, or that would be relevant at least.

And I guess maybe I would ask you and others to think about the data challenges there in terms of, you know, those customers are interspersed. You know, they're not going to correspond with circuits necessarily, and I think there are some potential challenges there. I kind of want to understand how big they are for doing that kind of analysis.

And then, you know, market transformation again keeps coming up. And I guess I'm wondering how you quantify it for -- this is a bottom-up analysis. But in terms of your scenarios, how do you approach it and then how do you sort of calibrate going backwards, okay, it did or didn't happen and here was the impact?

MR. WIKLER: So I think you're suggesting that our calibration is an ex-post function sometime down the road,

but we don't do that. We look forward.

COMMISSIONER MCALLISTER: Okay.

MR. WIKLER: So in the context of how we would look at market transformation, we'd have to see, what are the program delivery strategies that essentially lead to greater levels of participation. And so our adjustments in our scenarios are to say, well, let's not base our participation off of the standards parameters that we've used in the past which are gaged to past delivery approaches, but look at some of these other initiatives, like momentum savings, and how those approaches would essentially be factored into a look forward on customer adoption and customer uptake rates. That's, I think, where we have to look at it particularly.

COMMISSIONER MCALLISTER: Okay. So in a fast-moving area, say like LEDs, you know, there was a certain point where nobody would have anticipated how -- you know, sort of their trajectory, and so you would have made a forecast. And then maybe the next time you update it you have to say, oh, well, here's what happened. I guess how does that -- so that basically -- if you're trying to project, it creates a huge range of possibility.

And I guess I'm wondering how you go about trying to anticipate those sorts of development that are kind of, by their nature, less predictable?

MR. WIKLER: So we have a lot of sources that -- you know, historically, we have been constrained to use certain data sources that are based on the past performance, the EM&V studies, the various data sources that essentially would inform what might happen in the future. In that context we're looking at, you know, we need to look broader. We need to say, okay, we might not have the same information here in California, that we might want to rely on secondary sources. What's happening in the Northwest? What's happening in other parts of the country where market transformation initiatives have yielded greater levels of acceptance, and use some of that information in making assessments about our going forward viewpoint.

COMMISSIONER MCALLISTER: Okay. Okay, thanks.

Anything else? No? Okay. Thanks.

MR. WIKLER: Thank you.

COMMISSIONER MCALLISTER: Thanks.

MS. RAITT: Thank you. Our next speaker is Hillard Huntington from Stanford and a member of the Energy Demand Forecast Independent Expert Panel.

MR. HUNTINGTON: I'll just make a few comments here. Good morning. I'm really excited about being here, and give you a comments about -- to both the Commissioners and the executives about evaluating and monitoring energy efficiency programs. And I'm going to emphasize the role

that new data sources provide, and maybe we can discuss that for a few minutes.

Although I Chair the Demand Analysis Expert Panel, I think you ought to view my comments as being more personal than a formal vetting by the expert panels, because this is an issue that we haven't really addressed in particular for the individual programs, although, as you'll see, we have talked quite a bit about these views in general. And in preparing these comments I talked with some of the Panel members, and I think they would generally agree with kind of the gist of my comments.

As you should know, the panel is really geared towards helping improving the IEPR forecast, which you heard a very good presentation by Chris on what they try to do which is to look at the energy demand and the peak loads demand, project over ten years' time period and try to come up with the best estimate that they can.

And in that light, we've done a number of different things that I won't go into detail here, but these are thinks like opening up the process to make sure we get the utility folks involved, which was a process they already began with, looking at new data and new statistics, and also looking at uncertainty which is a big issue I won't go into today, uncertainty and the projections. And then, also, just looking at energy efficiency, and particularly, energy

efficiency, it's so critical to get this right because your projection of energy demand is going to be very, very critical on that.

But today what I want to do is talk a little bit about thinking about how to measure energy efficiency, either at the aggregate level, but also at the more detailed level, some of the programs that you've been looking at. And I think this is going to be a very interesting development as we go ahead.

And in fact, I would say that it's really a very exciting time for evaluating and thinking about these issues. We are really at the cusp of what I would consider, and I think many people would agree, truly informative data about how people use the energy and when they use it, and that's going to be very, very important. And it really gives us an opportunity to merge behavior with the engineering processes and all of the things we traditionally think about. I mean, this is what people keep talking about and this is what this data has the potential, although there are some limitations as I go through this.

So we have energy -- and in particular what I want to talk about is the advanced metering information data or other data that we get from smart meters, and also the power of data analytics which is just beginning to really hold its roots and people are coming up with very innovative ways of

thinking about this issue.

Before you had AMI just think about what we had. We had energy consumption which was often measured at aggregate levels, whether it's by a region or sector or time period. But at the same time we had efficiency policies which were operating on a very granular basis and really depended on where and when you would use the energy. So this discrepancy between the measurement of energy consumption and the policies for energy efficiencies really led to this confusing debate that people have talked about, about the top-down versus bottom-up, and everybody gets rather confused by the whole thing.

But now what we're talking about is instead of measuring energy consumption through what many of the EMNR (phonetic) studies look at, they look at measured equipment and efficiency changes going on, and then they have to apply assumptions about how consumers are actually using this equipment.

Now we have the chance of measuring energy consumption directly. And this really -- and I'm going to give you a few examples of why I think this might be key. And so we can actually replace the assumptions in the EMNR studies with actual metered consumption data.

So how would you really do this merging? And let me give you a few examples of why I think this would happen.

Well, first of all, let me just tell you broadly, some of you are familiar with the CPUC estimates that's often called the macro consumption approach, which is you develop estimates, economic and demographic and a number of other variables that will explain consumption, electricity consumption, electricity use. And then you put in additional variables for the energy efficiency programs. It could be projected savings that the people expect. It could be investments in these programs.

So you're putting both of those factors -- you're putting in those energy efficiency program factors in with these other drivers of energy consumption, and you're allowing the statistics to try to sort through the different effects. You're also allowing the statistics to give you kind of a true-up on what the -- I mean, everything has got to add up to consumption eventually, so it's either being saved by market transformation factors or it's being saved by some of these programs. And that's kind of one of the attractions of this approach.

The problem has always been that even that data has been fairly aggregate, and that was one of the big stumbling blocks in trying to pull this stuff together.

Well, now what we have is this data from the automatic -- the advanced metering information data which really goes down and provides household-level data for

various times of the day. And so let me give you a couple of examples where I think it may be actually kind of interesting.

One is you can actually sort out what is being generated by things like normal market transformation issues and those that are due to your programs. And you know that you're not going to be -- well, you don't know for sure, but you have a better idea as to what's being generated by efficiency programs and what's being generated by market transformation. And you're not doing a lot of double counting, which I think was an issue that I think Chris maybe had brought up earlier.

Another issue the people are very keenly interested in is the rebound effect. People actually change their behaviors if you put them in a new building or give them some new equipment. This will also allow you an opportunity to try to get an estimate of the rebound effect, and also an estimate of what you really can achieve with energy efficiency. So that's a second issue.

Another issue is just thinks about systems' effects in a building. If you meter it at a building level you can pick up the opportunities to save energy through recovery of lost heat and other things. And so I think that's -- the opportunity is to pick up these system-wide effects that can be measured directly by looking at this

detailed consumption data.

And then I guess finally what I would say is we talked quite a bit about the energy substitution issues. And really, you really want to -- I mean, I think in this day and age what we really want, we want energy efficiency because it will save on greenhouse gas emissions. I mean, I think that's the reason. So you want to make sure you're picking up energy efficiency that is bringing about that change in greenhouse gas emissions. And that's what we're interested in.

I think if you get better measures of the consumption, of what's really happening, and things like trying to promote people to use vehicles, electric vehicles, you really want a net savings there, a net savings ultimately in the greenhouse gas emissions there. But you get that through a better measure of the energy that they're consuming. Or if you're looking at different wastes, water heaters or just other kinds of equipment, you want to get better measures and more consistent measures across these fuels. And again, this source of data, I think, will really provide this opportunity.

So let me just kind of make a few comments on where I think -- a couple of limitations.

Number one is the data, as I understand it, is we're just starting to collect it. It is covering just a

few years. And that doesn't give you the power yet to really make robust conclusions about different things that could happen, you know, your economy, different states that you're economy is in, different population movements and so forth, so we're not getting quite the -- we want data to cover more kinds of situations in order to develop robust conclusions.

But the good news is that we're starting to collect that data. And within a short period of time I think we should be able to actually get quite a bit of power out of looking at this data.

The other thing I would say is the other issue is the data accessibility issue. I know it's a tricky issue. I know people don't like it. There's been a lot of issue about trying to get a hold of this AMI data. I know if I asked for the data, I would not get it. But I think if we can continue to push for this data, I think we can overcome a lot of the issues. But I will point out, I recognize that people are worried about grid security, they're worried about customer privacy, they're worried about fair competition for people providing electric services and so forth, but I think we're making this effort to really get beyond this issue.

And so I guess one of the things I would say from a state point of view, the more openness we can have on this

dataset, I think the better we will be for all Californians. And I think even the utilities that provide the data will also get enormous benefits out of having this data used more intently in the public policy-making. Because ultimately better information is going to improve the decisions. But I have to warn you, this I not an easy task. I mean, it's much easier to talk about it than it is to implement it.

And so I think that I'll just say thanks for listening to me, and I'll certainly take any questions that may come up.

COMMISSIONER MCALLISTER: Thanks for that. And I would just point out, I think we're going to depend on a broader ecosystem than we traditionally have to do this kind of analysis and come up with the right kind of answers to inform policy as we really, you know, have to get more assertive and aggressive with policy to reach this doubling goal and to reach our carbon goals. And universities, I think, in the state will be essentially, including Stanford. I know you guys are doing a lot of leading stuff on this, as are, you know, a number of UC campuses and others.

So there's a lot going on that's really positive in the state. So certainly looking forward to having a lot of very knowledgeable input from the universities and the state, so thank you for being here.

CHAIR WEISENMILLER: No, I thought it was a good

segue to what will be the afternoon topics on how to better integrate some of the AMI data into the forecasting and EM&V stuff.

I think with that, let's take a break for lunch. Let's try to be back at 1:00. We're running a little bit late. We'll squeeze lunch a little bit and try to get back on schedule, so thanks.

(Off the record at 12:20 p.m.)

(On the record at 1:05 p.m.)

MS. RAITT: Welcome back to the Joint Agency IEPR Workshop on Energy Efficiency.

CHAIR WEISENMILLER: Yeah. Let's start.

MS. RAITT: Okay.

CHAIR WEISENMILLER: Everyone sit down. We're going to start now.

MS. RAITT: We want to get started. Let's get started.

COMMISSIONER MCALLISTER: We're really glad that the people in the room are so plugged in and relevant, you know, and the networking is good. You know, we all are about social interaction and networking, but we do have a workshop we have to get on with. So we'll take it away with Heather and Cary.

MS. RAITT: Okay. So our panel this afternoon is on Perspective on Establishing Energy Efficiency Targets and

Evaluating Energy Savings. And Cary Garcia is our moderator.

MR. GARCIA: All right. Good afternoon. I'm glad we're full of energy today because we have a lot to discuss I think here.

So I'll just introduce myself. I'm Cary Garcia. I'll be the Chief Forecaster for the next IEPR forecasts. Hopefully I can keep it together.

But I guess real quickly, Heather already kind of explained and we got a good little intro or segue into this by -- I forgot your name -- Hillard. And I think that actually summed up everything, that we are ready to go. So we have a lot of new data that is going to be available, hopefully. And I think we're kind of chomping at the bit to use all that and apply new methodologies, new analyses in the future. And I think we're right there, we're ready to do it.

So let's just do quick introductions and some opening words from our guests here.

Let's start off with Luke Nickerman from PG&E.

MR. NICKERMAN: Thank you, Cary, and thank you, Commissioners for having me here today.

I'd like to start by just noting that PG&E is a strong supporter of the SB 350 goals, and we're really looking forward to working with many of the people in the

room on outlining what the plan is for meeting those goals.

There's a number of points that I'd like to make in my opening remarks. And the first one is on the issue of cost effectiveness and what it costs.

Someone earlier mentioned that as part of the Integrated Distributed Energy Resources, IDER, proceeding the avoided costs are currently in the process of being updated, and we are seeing a decrease in what it costs. I would say maybe that's the bad news.

I think the good news, though, is that a number of the underlying pieces of that update are very relevant for how energy efficiency will be interacting with the grid. And the primary one is the change in the peak hours. The old set avoided costs had peak hours in the timeframe of like 2:00 to 3:00 p.m. The updated avoided costs are looking at a timeframe of say 6:00 to 8:00. And so we do see that as an important update for realizing energy efficiency potential for things like distributed -- excuse me, the DRPE and the IDER proceedings, as well as other areas where you would be interacting with the grid.

As a follow onto that, though, I think there are a number of things where we are seeing, you know, potential uplift in energy efficiency. The first one I'd mention which I wasn't -- I had discussed this morning is the provision in SB 350 that calls for an integrated resource

planning process, and IRP, and with the objective that IRPE being to meet GHG reduction goals and outlining a process to do that.

So I think while -- when you look at the, say the updated set of avoided costs which are really based on current market conditions, those avoided costs don't have the overlay of policy considerations, like reaching GHG goals. I think what we might see in the process of moving through that IRP process is that energy efficiency still is one of the lowest cost resources for meeting those additional goals relative to what the alternatives are. And so in that framework -- so I think it's important that we keep that in mind and work closely with Staff and others working in that proceeding as we're outlining what those SB 350 goals look like.

Another thing I'd like to mention is the gross versus net framework. As many of you know, our energy efficiency goals for the IOUs are defined on a gross basis. But for forecasting purposes, they're on a net basis; right? So the forecasts that we saw this morning are using net goals. The difference right now that we're seeing is about 60 to 70 percent. So right off the top, about 30 to 40 percent of the savings that we're seeing on a gross basis is removed from the forecast in terms of the energy efficiency accounting.

One thing we've done at PG&E is look at, you know, what are some of the best practices in other states, and in particular the leading states in terms of energy efficiency. So a lot of the ones that you see at the top of say the ACEEE scorecard. And in most of those states we're seeing a much narrower gap between gross and net savings. And one of the reasons is there's been a more concerted effort to quantify spillover in those states than we've had here in California. A lot of attention has been paid to free ridership. And so I think as we're moving forward we may want to think about how can we do additional research and investigate that question further?

Another thing I wanted to mention is market transformation. PG&E and over the years has supported many market transformation efforts. But these are difficult programs to run in the context of this net-versus-gross dynamic that I just mentioned. Typically, you know, at some point a lot of savings is identified as free ridership-type savings, and we see that as a good thing. It means that the market is being transformed and we're actually reaching the goals that we have outlined.

But on the other hand, the utilities are penalized to a certain extent for them pursuing those programs because the actual ratios end up being so much lower in many of those programs. So I think we should also keep that in mind

about how do we incorporate those and change the framework to help support those programs going forward?

I think tied to that is naturally occurring. And Chris in one of his earlier presentations talked about naturally occurring and how it's currently estimated in the forecast. And I think this is an area where additional attention could be sued. A lot of attention has been paid to how do we quantify IOU programs and Codes and Standards, but for the naturally occurring piece it's a relatively simply adjustment, it's a price elasticity adjustment based on changes in rates. To a certain extent that might capture some of the energy efficiency that's happening outside of the programs in Codes and Standards, but in many cases it might not. And so I think this is an area where we could use additional attention.

AB 802, of course, is going to be very important for quantifying and appropriately treating in the forecast going forward. We're well on our way to moving towards a framework. The Energy Division has outlined in a white paper, and Navigant supported in their AB 802 technical analysis, some initial thoughts. And we're looking forward to working with everyone in this room to move that forward.

I also wanted to mention, I think that one of the benefits of the SB 350 framework that hasn't been talked about so much is the fact that the language identifies some

of this broader set of energy efficiency policies and measures and programs that haven't been captured before. I think a couple good examples would be the Prop 39 efforts and some of the ARB Investment Plan programs that specifically target energy efficiency in existing buildings. And so right now I think a lot of those efforts have not been incorporated, and so we should be kind of paying attention to that going forward.

Just an aside on that point, I think one of the things that we kind of uncovered at PG&E about a year-and-a-half ago in looking at the ACEEE state scorecard was that a lot of other states are incorporating that full extent of energy efficiency, and that's something that we're not doing. So I'm looking forward to the SB 350 goals' framework supporting that fuller accounting.

Lastly, I'll just mention some supporting research that we think is really important to getting this right, and in particular that would be the end-use studies, so CEUS on the commercial side, RASS on the residential side. These are important studies for understanding how energy is being used at the end-use level. And then on top of that, what portion of that usage is inefficient versus efficient? So it's important not only for things like potential studies, but also quantifying how those changes are taking place over time.

And I'll just mention, I think recently the CEC signed a contract for an updated CEUS, so we're really happy to see that and we're looking to working with you on that issue. RASS, I think it was -- 2009 was the last update, so, you know, looking to an update there, as well. And I think on the CPUC side there has been some progress. I think there was an EM&V (indiscernible) recently that outlined the process for updating these on a regular basis. Who exactly would be doing that I think still needs to be worked out, but there is some practicing activity there.

So thank you for your time, and then I'll take any comments.

MR. GARCIA: I think we'll just actually, we'll move on to Lisa Alexander, and then we'll bring back around for discussion at the end, once we do these quick intros.

Go ahead, Lisa.

MS. ALEXANDER: Good afternoon. My name is Lisa Alexander. I'm Vice President of Customer Solutions for SoCalGas.

First and foremost, I'd like to start by noting that SoCalGas's is upmost committed to delivering safe and reliable energy to our over 20 million residential and business customers in Southern and Central California. And as part of that, energy efficiency is an integral energy research as we plan and manage our system. So we're very

proud to steward 80 gas energy efficiency programs. And over the last five years we've delivered over half a billion dollars in avoided costs, we're contributed nearly $200 million in annual bill savings for our customers, and reduced GHGs by over 800,000 tons, and that's about 30,000 cars a year. And we're also proud to have supported SB 350, as well as AB 802, and to have participated in this current IEPR process from the beginning.

So I'd like to focus my comments today on the customer. So Commissioner McAllister this morning noted that the voice of the customer isn't very strong in a lot of the forecasting work that's done. So I'd like to spend a couple minutes just talking about what we see in the market as we work with our customers, our municipal partners, CBOs and others to advance energy efficiency.

So first, transparency and certainty. So in order to adopt, whether it's passive or direct adoption of energy efficiency measures, customers want clear understanding of the incentive. They want to understand how the measure is going to be delivered. And they want pretty quick payback, a short timeframe between when the commit to the incentive -- or commit to the measure and get paid back out on it. So the certainty is a really important part of that, so understanding what the incentive is, particularly for our larger commercial/industrial customers where there is still

room to grow energy efficiency.

Related customers want a streamlined process. So shortened cycle times, but also, again, an understanding of what happens next, and for administrators to be quick in following through.

And finally, customers want flexibility, meaning it's not one-size-fits-all across the state. So there are variations in customer needs across sectors, across geographies, in the residential market across income levels. Today we have many programs that are customized to these various segments. We think it's important to preserve the local nature of energy efficiency and to work closely with community and other partners at the local level to advance that.

So that's really what customers have told us that they've needed over the years. As we think about what that means for the purpose of this workshop the first is embedded EM&V. So I so appreciate the presenter earlier this morning who brought that up. We also support that concept and believe that by embedding the EM&V, that we can help support that idea of certainty and also transparency on delivering on the incentives that are contemplated for a specific measure.

The second thing is that we wholeheartedly support further use of smart meter data, advanced meter data. At

SDG&E, our sister utility, they completed a number of years ago their smart meter implementation, have a robust dataset that they're starting to mine. At SoCalGas we anticipate being completed with our implementation of advanced metering by the end of the year. And I can tell you that we're already starting to take advantage of the data. We're working with Opower on a conservation pilot. San Diego Gas and Electric has similar programs. But we're really starting to, at SoCal, look at trying to tease out through the low profiles different end uses. So we're able to look at the data and start understanding the water heating load as compared to the space heating load as compared to maybe a pool pump by the different load profiles.

So we're excited by what that's starting to tell us from a program targeting new program development perspective. But we're also inspired by what can be possible in terms of using that data to support that imbedded EM&V.

We recently made a significant capital investment in an integrated customer data analytics tool which is bringing us more into that new big data space. And that is a commitment that SoCalGas has, as well as San Diego, to continue to mine big data, bring in the talent and technologies required to make the most of the data that we have for the purpose of energy efficiency.

The last thing that I'll note is that we are committed to determining the true cost savings of energy efficiency. So different speakers throughout the morning have talked about that, that as we have a deemed measure it might actually be masked, you know, we don't know what the real outcome is. So we're very pleased that having the advanced meter data, or smart meter data in the case of SDG&E, can really help us tease out what those benefits are and allow us all to start migrating towards more of a true energy efficiency outcome approach.

So those three things, again, embedded EM&V, reliance on advanced meter data, and big data analytics, as well as a focus on determining and managing to true energy savings are the three things that we'd encourage the Joint Agencies to focus on. We're here to support that.

I think the last thing I'd note before passing it on is that in our service territory more than a third of our customer base are low income. So this is a very important and special sector that has its own needs and own set of programs. So as we think about programs and cost effectiveness, and as we move towards doubling the energy efficiency, we suspect that there is going to need to be a set of complimentary programs that helps eliminate some barriers related to tenant-landlord disincentives, old construction where there might be a lot of asbestos and

other things that are barriers to energy efficiency retrofits, et cetera.

So that's kind of the last area that we're starting to look at, is to take away -- or to create programs that aren't directly energy efficiency programs but that could create a path towards energy efficiency by addressing some of those issues that tend to be more specific to low-income communities.

So we thank you for your consideration.

And pass.

MR. GARCIA: All right. Thank you very much, Lisa.

Next up we have Rachel Huang from -- the Director of Distributed Energy Strategy at SMUD.

MS. HUANG: Good afternoon. My name is Rachel Huang and I'm the Director of Distributed Energy Strategy at the Sacramento Municipal Utility District. I want to thank all of you for having me today to share SMUD's thoughts and approach regarding energy efficiency targets and evaluating energy savings, and how we're approaching the SB 350 doubling of energy efficiency goals.

In recognition of statewide and SMUD Board-adopted greenhouse goal -- emissions reduction goals, coupled with the changing electricity landscape, SMUD has really been working on, in the past year, developing its enterprise

strategy as it relates to distributed energy resources and energy efficiency's role as part of that. SMUD is taking an integrated approach to its DERs, considering both the need for integrated approaches to accomplish its corporate grid and greenhouse gas emissions goals, as well as meeting customers' needs in their interest in the various DERs and ensuring value streams to both the utility and the customer.

With the availability of AMI data and utilizing advanced analytics, we're working to pinpoint the places where strategic location of DERs provide utility value and where they dovetail with customers' interest and proclivity to adopt those DERs and how we can deliver up on those different value streams.

Specifically for energy efficiency, how SMUD has been looking at and developing its strategy as it relates to increased goals within SB 350, SMUD is first focused on optimizing program delivery costs and energy savings through improved targeting with analytics. We really believe that with the analytics available today that we can identify those customers that can best benefit from energy efficiency and really be able to pinpoint and target the dollars investments in those customers, as well as broaden the participation of energy efficiency. We have a group of customers that tend to participate in every program that we have at SMUD. And so wanting -- in order to be able to get

those doubled energy efficiency savings, we're really having to expand the pool of customers that participate, as well as ensuring customers, like our low-income community can participate, as well.

The second piece is increasing the value of energy efficiency as a resource by improving the confidence in energy efficiency savings. We've obviously been talking about, under AB 802, the EE metering. How can we really leverage EE as a resource? We're also taking and promoting comprehensive approaches for deeper energy efficiency savings as this continues on to investments that we've made during the ARRA funding to do more comprehensive approaches.

In order to deliver upon the doubling of energy efficiency goals, SMUD is looking at leveraging data analytics to better target those customers, as well as utilized pay-for-performance approaches. We started investigating the different tools that are currently in the marketplace as we look at analytics approaches to EE metering.

We're also looking at electrifying commercial and residential gas end uses. I know there was some discussion about transportation electrification this morning, but we're also looking at building electrification.

Bundling energy efficiency with other distributed energy resources for comprehensive packages for our

customers.

And then continuing our research and development demonstration efforts to integrate continual emerging technologies into our program offerings.

So as we begin to establish the frameworks and definitions for the energy efficiency goals under SB 350 and AB 802, there are a number of considerations that SMUD would like to posit.

First, with the rapid transition to decarbonized electricity and decarbonization with EE, it will be important in achieving that goal to ensure that the efficiency is focused on those end uses that occur during the times that we expect to be utilizing, not renewables but gas-powered generation. Already we are starting to see some limited instances where we have to actually curtail excess generation of solar. And so it's important that we focus our dollars in aligning those efficiency, considering how the power mix is going to change as it relates to the RPS goals under SB 350.

In conjunction with this, if we can deploy efficient flexible electric end uses, including things like key pump water heaters and air source heat pumps for space heating, we can make greater use of excess renewables while mostly avoiding using electricity while natural gas is on the margin. This should be a priority for efficiency

standards to drive these technologies as a way of laying the foundation for meeting our long-term carbon goals.

And then finally as a publicly owned utility, the ability to serve our customers and tailor our offerings based upon our service territories' needs I fundamental to our business model and our relationship with our customers. While we definitely support statewide efforts and partner with IOUs and other utilities to ensure coordinated and efficient delivery of energy efficiency offerings, we still value the ability to design and respond to our customers and communities specific needs, as well as to innovate to accomplish our energy efficiency goals.

Thank you very much.

MR. GARCIA: All right. Thank you very much, Rachel.

Next up we have Mark Nelson, Director of Planning, Analysis and Forecasting for Southern California Edison.

MR. NELSON: Thank you very much for inviting us and for putting together this forum.

Up until our most recent reorganization I was actually the Director of Integrated Resource Planning. And though I have a new title, my job did not really change.

I think that it's really important to look at all of this activity in the light of the integrated resource planning and the broader planning framework that's coming to

California, also as part of SB 350. I took a quick poll of our subject matter experts before I came up here, because what I also found was that no one in our company really has that clear and broad knowledge of all of these different subject areas. It's something that's operated, and I think silos is too strong, but it's something that's operated, typically in different departments under different functions.

So one of the things that I think is really important is to get those SMEs together to have these discussions. And I think a forum like this and the subsequent, probably more technical forums, I think will be really helpful, as well.

So in talking to the SMEs, I really came up with about four or five topics. Cost effectiveness measures and measurement, we've obviously had a fairly significant discussion about that today. Impacts to the EM&V that come out of this, I think that one of the issues that we look at there is to try to get faster cycle time so that we've got the information back to get back in the planning process. I completely concur with Commissioner McAllister that this really needs to be noise in the cost process. We really need to be able to get it in, get it back out and not make it a principle focus of activity so we can do our core job, which would be getting savings instead. But it is very,

very important.

In terms of energy efficiency program design and flexibility, that came up really high on the subject matter experts' radar. And I look at, you know, especially the preferred resource pilot activity that Edison had going where we had a couple of substations where we needed to reduce or manage load behind them. And it really was a paradigm change to the energy efficiency programs to be applied in more localized geographic areas, and at the same time to be trying to target demand more so than energy.

I frequently hear that, you know, energy is the bread and butter of energy efficiency, but there are also demand impacts. And I've heard a few people mention going to 8760s, which we be, obviously, the number of hours in the year. And if you're outside our industry you say that number and people look at you like you're insane. But I've heard a lot of people talk about going to 8760s, or a few people, and I think that's really important because it's going to be very important to understand where this manifests. And I want to talk a little bit about IRP at the conclusion of my comments because it becomes even differently important at the distribution level.

Another issue that the SMEs brought up which I thought was really important was what is the level of granularity or the level of disaggregation that we need in

this energy efficiency data? And it's typically been, I would say, generally top down. Yes, there are some large climate areas and a number of measures, but it's tended to be top-down forecasting. And as we start to integrate more and more with DERs more broadly and with the distribution resources plans, it becomes really important to know, where will this manifest, not in a peanut butter sort of fashion across circuits because that's not really helpful.

What becomes important if you're going to try to avoid or defer circuit upgrades, for instance, is to have a really clear idea of what the base forecast looks like, and it's very important to know. And you can do it some, I'm sure, based on customer mix and some of those sorts of basics. But it's really important to know what's going to go on, on that circuit, because at some point someone is responsible, and that would be a distribution planner, for making sure that everybody in that circuit can be served.

And so having better granularity in geography, other things equal, is good. I'm not sure what the costs are. I'm not sure what the complexity is. I'm not sure what noise it might enter into the process, as well. I am an economatrician, so I've been down the stratified sampling road before. Again, I think we just need to be sort of careful what we do there.

And the fifth point really in talking to my own

SMEs is what's the interaction of all of this between energy efficiency, integrated resources planning and distributed resources planning, sort of down on the distribution grid. And we're still sorting out now how the DRP and the IRP interact. The IRP tends to be a little bit higher-level process. It tends to be up toward what was previously the long-term procurement plan.

But as we move forward it will become increasingly important to understand what's going on, on the distribution circuits, because many of the DERs come with energy. They're not just a capacity measure, but they're an energy measure. And as a result we need to be able to co-optimize what we do on the transmission system, with the distribution system, with RPS, with energy efficiency and demand response. And we're a long way away, I think, from having the models that we need to do that, and maybe even the legislative paradigm to do that.

But moving toward 2030, I think we have the ability to try to get all the systems in place and get a much clearer understanding of how all of these activities occur and manifest all the way down to the distribution level so that as we plan for DERs and as we plan for energy efficiency, which really is just one of the family of DERs, we'll have a much better idea how that impacts the higher level circuits and what we need to do there.

So I think we have a lot on our hands. I'm confident that we can get there. I mean, in 35 years I've watched us go from log linear paper and drawing straight lines where load growth was seven percent, and it just kind of was because that's what the picture was, to using much more sophisticated models and to taking a much bigger advantage of computing power, a bigger advantage of more data, whether it's big data, whether it's AMI data, all of those I think have a role.

So I'm very pleased to be here, and we're certainly happy to roll up our sleeves and pitch in to work on the hard part, which is the solutions. Thank you.

MR. GARCIA: All right. Thank you very much, Mark. Appreciate that.

So next up we'll go with Jonathan Changus, Member Services Manager and Regulatory Affairs at Northern California Power Agency.

MR. CHANGUS: Great. Thank you. And thank you. And on behalf of NCPA, we're very pleased to be here having what promises to be the first conversation of many on how we get to achieving the goals of SB 350. And my role at NCPA, I have a foot both in kind of program administration and supporting our members on that front, as well as within translating program results into policy positions and sharing those results with the CEC and with the legislature,

with other agencies.

And so from that perspective, I'd like to focus, I think, a little bit on some of the comments we heard from CEC Staff, especially I thought Mr. Jaske did a great job framing out some of the key kind of fundamental questions we have to address before we can dive into some of the deeper, more challenging questions.

And think, first off, the question about utility-specific versus statewide. And I think the language of SB 350, as was noted, is pretty explicit about statewide. And as Luke noted, it's one of the first times that we really cast a wider net as far as the very many activities we're doing in the state regarding energy efficiency. And I think that on that front there probably will need to be some additional assessments that go beyond the Navigant work done for the IOUs and the POUs to capture what Commission McAllister noted as the market transformation. I think that's a key piece that's going to go beyond utility programs that is going to have a significant impact and is going to be necessary, as noted in the AB 58 Action Plan in order to get us to a 2030 objective and to really optimize our energy efficiency investments.

In addition, with regard to cost effectiveness, it's a tricky one it really depends on who you're talking to, who is has a stakeholder interest. Cost effectiveness

from NCPA's perspective, from a utility that's looking at procurement investments, it's levelized utility costs. What was the cost for the KWH that we're saving, and we can compare that to some of the other utility resources.

The TRC, the PAC, you know, some of these other societal tests really don't lend themselves to comparisons with other resources at the distribution level. The levelized utility causes the most rational assessment that we can have and one that we're increasingly relying upon. But that's useful for us as a utility. It doesn't mean much to the customer.

And so cost effectiveness also means something different, as we heard earlier, about greenhouse gas emissions reductions which has historically been more of a non-energy benefit, a positive externality from our efficiency which has been focused primarily on KWH savings. And then, as well, KW. And we probably need to take a step back and figure out, for the purposes of setting the goals, it's cost effectiveness from whose perspective? Because a customer is going to be interested in what's the return on investment, how long is this going to pay off, which is a different -- that's a whole other analysis to consider.

With regard to feasibility, I guess I respectfully disagree that it's a nebulous or a hard to define characteristic, because I think that's part of what goes

into the market potential analysis that we do in our ten-year forecast, it's that we go beyond the technical potential, what's out there, we go beyond the economic potential, and we then start to factor in what are customers going to be willing to invest in, what are they going to be willing to participate in.

And I think that you cannot ignore the role the customers play or building owners in the decision to pursue energy efficiency. And that's true whether it's a utility program or it's through third-party financing, whether it's a PACE program or some other energy provider, the customers' role and the customers' interest and the customers' motivation have to be factored in. And I think that's an area that's ripe for further investigation within both the state, as well as the utility forecasting activities.

Looking kind of ahead to some of the changes that we're looking at, we have to be careful about the difference and understanding the difference between and aspirational goal that stretches us to be creative in our program design, pushes us to consider new opportunities, and resource planning, because I don't believe those two are one in the same. And I think if we're trying to make EE goals aspirational and stretch versus something that we have a higher level of confidence, then I don't know how that plays out as far as actual resource planning.

And so NCPA members have historically adopted more a resource planning approach to our potential studies required under AB 2021 and our work with Navigant as far as what we think will actually inform resource planning decisions based on program performance in the past, EM&V studies, and then looking ahead to some of the new opportunities going forward. And that's true this time around, as well.

And so I think I'll stop short there and leave time for questions.

MR. GARCIA: All right. Thank you, Jonathan.

We will go to your counterpart at the Southern California Public Power Authority, Bryan Cope, Program Development Manager.

MR. COPE: Thank you. I appreciate the opportunity to speak with you all today on these important topics of forecasting and achieving goals. And not surprisingly, I will echo essentially what Jonathan said. There are a few other issues and ideas that I'd like to expand on. And I guess the most simple way for me to start would be to, not surprising, to inform you that we've long been working towards achieving high efficiency standards. We continue -- just this last year, our last report, we set new high levels of annual savings, both on energy and peak demand. So that's an important recognition that we are

doing our very best. You know, there are always opportunities to improve.

But, you know, our members are struggling with the concept of doubling something that they've been working their tails off to get to where they are, but they don't see that as an impediment. They look forward to working with you. And I continue to encourage them to be ready to work with the Commission to get there, to double something that we thought we're already pretty high on. But we're going to keep working towards that.

You know, we are expanding our efforts in a lot of different ways. We are currently in collaboration with NCPA. The SCPPA members are working with Lawrence Berkeley National Laboratory in their (indiscernible). We have an ongoing research project to stop studying widgets. And we are looking at systems on a holistic basis, efficiency measures that we can integrate to try and make things better. You know, plug loads are great, lights are great, but if you do them together maybe that will be even better.

And so we're very encouraged by the opportunity to participate at that national level because we think that what we're going to be able achieve won't be just applicable here in Southern California or Northern California, but hopefully more large scale nationally.

I also want to step back and go to what Jonathan

started with. And I strongly support the position that SB 350 does not call for utility-specific doubling forecasts. This is a statewide process. There are so many programs that the Energy Commission and the legislature have gone to great lengths to develop with Prop 39 and SB 758, and now coming on AB 802, Codes and Standards, all of those things, net-zero homes, all of these things are going to be impactful for energy savings. And for any agency to be looking at only utility programs to be the doubling effect is short sided. I think that we're going to need to look at all of the different factors that make up energy efficiency for us to be able to achieve that long-stretch goal of doubling, in my opinion.

I think there's another concern that I've shared -- or that have been shared with me from members is that some of the policies that are in place seem to have been contradictory in some regards. You know, there was originally or currently, actually, on law we have the loading order where energy efficiency is at the top of it. However, some of the policies regarding rooftop solar and distributed energy resource development seem to potential contradict that. We need to get those in lockstep, I think, so that there isn't a competition between either buying a rooftop solar unit or battery, or even maybe a small microgrid for your house and having a batteries with your

solar system.

Those are all cool. They look great on paper and to your neighbor. But in reality our concern is that those might not be the most cost effective opportunities for customers, which comes down to the bottom line of this whole conversation.

Customers are what drive energy efficiency. We can make up the best programs if we want or we can throw lots of good money at it, it doesn't matter if a customer doesn't want it. So we need to develop programs that are customer centric and that are valuable to the utility, which goes back to the cost effectiveness.

Of course, from a utility standpoint, it is cents per kilowatt hour. But we need to figure out, what is the true metric for cost effectiveness? Because that's required by law. Is it going to be greenhouse gas reduction? Because that's going to be a different price than utility-focused cents per kilowatt hour reduction. So that is kind of the key driver, in my opinion.

Going back to the customer focus about having a choice, one thing that came to mind, one of our members suggested to me, "Bryan, you know, the state did a really great job with developing a lot of good messaging and customer outreach about the drought. And the communities around the state, you know, they responded and we saved a

lot of water this last year."

And so the concept would be maybe the state could also do something about saving energy. And rather than just put a focus only on utilities, saying, yeah, it's going to be hot this summer, let's turn down your air conditioner. If there were potentially a large-scale customer outreach program that were administered by the state, that would get the message across even more strongly than from customers who might not think the highest of their utilities, but they might look to this data saying, wow, if these guys are saying it's a good idea, maybe it's a really good idea. Just a thought that I would like for you to consider.

And in closing, I guess the last thing I'd like to tell, you know, and this is not out of disrespect for Navigant or the model, but I will tell you that a model is a model. And I used to do production cost modeling when I was a kid, and I can tell you that models are tools. And the best modeler can make a model sing if they want to.

So if you want to tell me that you want me to have a three percent of my retail load is going to be my target, I could make that model tell you that. I can make changes to my input assumptions and my data and they'll be defensible and supportable, but it's just a model. And you need to be cautious of relying too much on models to tell you what the right answer is.

Thank you.

MR. GARCIA: All right. Thank you very much, Bryan.

We'll go by seating order, actually, since Peter Miller is there. So we have Peter Miller, a Senior Scientist under Energy And Transportation Programs for the Natural Resources Defense Council.

Go ahead, Peter.

MR. MILLER: Thank you very much, and thanks for the opportunity to speak here today.

So listening to the presenters of the workshop, I think the challenge here is not getting lost in the minutia of forecasting and planning and the models. Efficiency is afflicted with a myopia of details. There's just innumerable details. And it comes from the fact that efficiency is not that $20 bill on the side walk, it's 200 nickels scattered across the lawn. And if we keep focused on the individual nickels we're not going to really get to where we need to go.

So I guess I have a couple suggestions and ideas and thoughts I'd like to offer, but they all sort of revolve around the idea of the need to take our eyes up off the page out of the details of the model and look at the big picture. We've got some broad goals that, starting with the governor and then the legislature, set that are very ambitious,

doubling of total energy efficiency. No doubt, there will be a lot of ink spilled on exactly how we define that and what it means. But let's stipulate that it's a broad ambitious goal that's critical to achieving the state's energy and environmental objectives.

So my thought is in order to achieve that goal we've got to focus on now what's happening in the hearing rooms or at the commissions, we need to focus what's happening in the markets. That's where the ultimate answers are going to be. We need to always take our eyes up off the page and focus on how can we really advance the state of efficiency in the markets in the world where energy is consumed? And other presenters have mentioned this as well, customers, suppliers, deliverers of services. So how do we do that?

One, keep transaction costs low. We can develop detailed processes that ensure precision and accuracy. But if takes six months for a customer to go through an application, they're going to drop out. We're going to lose that efficiency. So make sure that all of our processes keep transaction costs low for customers.

Two, use best practices. Let's learn from others. There was a study done recently that looked at cost effectiveness approaches. And we were just made to see that California, not called out specifically by name, but given

our practices was the not best practices. They didn't say worst practices, but in comparison to best practices we were the counter example. And there's opportunities to improve and to learn from our neighbors, sister states, particularly in New England and the Northeast where they have better methodologies that more accurately allow them to move forward effectively.

Support new delivery mechanisms. There's a lot of stuff going on in the marketplace. And you've heard already about the value of AMI data and real-time EM&V. That's a huge opportunity, and certainly the PUC is moving forward on that. There's a lot of work and response to AB 802 and 350, and we welcome that. That's an exciting area. I know you're going to hear from Jessica Granderson later this afternoon who is doing some exciting work. And there's real opportunities there because they facilitate savings in the marketplace.

On a specific question on measurement evaluation. We spend a lot of money on EM&V. We've spent something like half a billion dollars on EM&V over the past ten years. It's a lot of money. Personally, don't think we're getting all that we need to for that expenditure. And we need to ensure that that program evolves and is focused on maximizing savings in the marketplace. And I think the (indiscernible) need to be market oriented. We should be

doing more market surveys. We should be keeping track of what's going on in the market. We seem to be doing less and less of that rather than more.

And two, it needs to be timely. We need to get results in time to make a change for the program, not three years after the program was completed, at which point the market has moved on, technology have moved on, and we've already redesigned the next generation of programs.

It needs to be forward-looking. And, you know, net to gross ratios have been a perennial issue in energy efficiency. But I think in particular, here, this idea that we're going to go and second guess ourselves, look backwards two, three, four years and say what would have happened if we didn't do what we had done, it's just not helpful. We don't do it in other areas of energy policy, in particular we don't do it on the RPS. Right now we're exceeding our renewables goals, and we're not going back and saying, well, how much of that renewables would have been developed if we hadn't done what we did? We're meeting our goals. We're exceeding our goals, and that's great, and that's to be celebrated. And I don't think we should be implying that same kind of second guessing, naval gazing, whatever you want to call it, to deficiency effort.

On the question of double counting, I mean, I think that particularly goes to this question of, you know,

the need to focus on the market rather than the models. It's complicated determining how much efficiency savings we've getting from programs, from Codes and Standards, from natural price effects, but the critical thing to keep in mind is not whether we're double counting in the model, but are we getting it in the market? And I think you can walk into any small business out there or multi-family building and you can say, hey, there's a lot we could do here. We're not getting it. And we need to design programs that go out and achieve those savings. And afterwards we'll make sure, you know, we've got to make sure that we're not over-counting savings so that we get the resource plan right, we don't under- or overbuild resources.

But it is worth noting that I think in every forecast, at least since the mid-'70s, we've overestimated consumption. We've done better on efficiency than we expected. So I think that the concern needs to focus on making sure we're getting the savings, and then we can get the numbers right to come after.

One final point is the value of collaboration, and I think that comes up in a number of different ways. And I think the panel in front of us today is a perfect example of that. It's incredibly heartening and incredibly impactful to have all of the key agencies working together. I think that's a huge thing. And as an advocate it's something I

see as incredibly valuable. There are other examples of that, as well.

On a much smaller scale, I think the California Technical Forum that's been in operation for just about two years now is an example of a wide range of parties working together, POUs, IOUs, industry, other stakeholders, agencies, to come up with consistent statewide estimates that can really facilitate better programs.

And then the final example of collaboration I think is really important is we have a history of trying to single out individual contribution, attribution to individual parties, in particular to the utilities. And when you look at what we do on efficiency where someone from a national lab develops a new technology, and someone from the industry figures out a way to get it on to the marketplace, and the utility runs a program that gets it out there, and then the commission picks up a standards and incorporates it so that everybody does it, it's a multifaceted collaborative process. And we have to start recognizing it as such and worrying less about what each individual component and who gets credit for what and more about how we can accomplish great things together.

Thank you.

MR. GARCIA: All right. Thank you very much, Peter.

And last but not least we have Margie Gardner, the Executive Director for the California Energy Efficiency Industrial Council.

MS. GARDNER: Well, great. Thank you so much. And thank you for those comments, everyone. I am the Executive Director of the California Energy Efficiency Industry Council. It's a trade association that represents the businesses that design, deliver, and evaluate the efficiency and, in large portion, also the demand response activities in the state. We exist to try to bring the perspective of some of those industry players, the companies that deliver, into these policy forums. And like NRDC, we greatly appreciate having this kind of joint situation, joint hearing. Clearly, there's so much overlap and interlacing of your individual agencies work in this area that it's just super important.

The first thing I'm going to say is just, you know, to the extent you can simplify where possible, and I'm saying that because all the complexities and in all the models and all the policies that get adopted by these agencies translate to complication for customers. And efficiency is not just the savings per building or per widget, it's the number of participants you can get to install it. And, you know, we focus a lot on savings and do we have it right and is it the right number and, you know,

the free riders, and you know, but we don't focus nearly enough on the five customers that we dropped because the sales pitch has to include, you know, long lines of exceptions, warnings that the process might take six months to a year if your project is part of this process; you know what I mean?

So to the extent you can and to the extent we can try to implement this by simplifying it, I think that will help us get to scale.

The second thing I'd like to say is we think that the doubling will be found cost effective and feasible as you move forward. And I'm going to point to a study that was done last year, the Low Carbon Grid Study, NREL and CERT put it out, that essentially looked at the electric system and looked at a 50 percent RPS, so not just a 33 percent but the 50 percent, and also had basically a doubling of energy efficiency in it. And the revenue requirements in 2030 were less than if you had a traditional grid without the 50 percent renewables and without the doubling of efficiency. So, you know, that's some marker in my mind of cost effectiveness. And, you know, it's not down in the detail which test did we use, but it is a revenue requirement and it's a big marker.

With that, I think we're going to have a series of conversations over the next months. But I did want to start

maybe with some of the issues that Dr. Jaske teed up in his presentation and just hit a couple of the slides that were of interest to us.

You know, slide number four talked about the cost effectiveness test. I think he inadvertently left off the program administrator cost test. It should probably be thought about. It's probably the most comparable to what utilities are going to pay in an RFO for resources, it's the utility cost. And so it might be the most comparable to look at in kind of the doubling. You know, it's something I think we should at least consider.

On slide number six, and there was quite a discussion on the electrification of transportation. And we certainly understand and value that role in greenhouse gas reduction. However, when we look at SB 350, we don't think the intent was to include that type of fuel switching. And I do think that if you look at the definitions in Section A, which I think was footnoted in that slide, as well as possibility of going back to the legislature to clarify what exactly was intended in that one-liner, I hope and suspect we won't find that electrification of transportation counts to the doubling goals. Is it important? Absolutely. But it shouldn't necessarily count towards achieving these goals.

And slide number eight, let's see -- oh, no,

excuse me, slide number seven, you know, talked about how to do this doubling. My sense is, and this is probably way to simple for everyone in the room, but it does seem to me that you take the AAEE forecast, you extrapolate it to 2030 with whatever growth rate it represents, you double that number and then take a linear -- you know, then just draw the curve backwards. And to me that is the simplest, most straightforward way. It may take us back to log paper and pencil, but at some level we are trying to set a goal. Nobody knows the exact answer, but that would at least set us in the ballpark of what would be a reasonable interpretation of the doubling.

And then finally, in slide number eight there are studies going on, like the Navigant study or studies, plural. I do think that if there is a chance to do some work to try to flesh out, you know, how to get to this or what is important, I would urge maybe taking a different perspective than the traditional potential and goals studies do, that if we set this goal, so the doubling that I just descried, then set the minds of the folks who know on how to get there cost effectively and feasible, so open up the gates to industrial energy efficiency that has not been essentially fleshed out very well. Open the gates to moving water in California and the amount of electricity and gas that is used there. Open up the gates to creating, what if

we did it through market transformation? Oh, you know what, that would mean changing this policy and adding this over here.

So it becomes more of a permissive exercise in help us figure out what might make sense with all the knowledge you have already from the potential studies, right, instead of, you know, looking at technical, then looking at market, then looking at economic and restricting things. And I especially think that would be important if you thought you should change some programs or policies to try to make it permissive and growth oriented toward achieving this goal. So I would think that would be an important part of this.

And in wrapping up, just we very much appreciate the opportunity to be here. We will be participating in the forums. Our industry obviously cares about this and wants to make sure the right things happen for everyone. You know, it's important to get this right for the state of California, and we're here to try to add our two cents to that.

So with that, thank you.

MR. GARCIA: All right. Thank you very much, Margie.

It looks like we have some central themes coming out of here. I think the first one would be customers in

the market. I think everybody is nodding their head on that one. And then secondarily, the access to the data. I know a few people mentioned AMI. So real quickly, before we get to the dais, let's talk about that.

So in addition to potentially getting AMI data, the advanced metering data, maybe I'll look to Margie, actually, because she's in touch with the industry. And in talking with you earlier, you worked in the Pacific Northwest, and we mentioned that, as well. Some other regions actually might be ahead of California in certain aspects.

So what other types of information can we get potential from the industry to maybe find out where some of these widgets are going or what is incenting these customers to buy these things, other than, you know, what government incentives are out there? So maybe we can start off with that. And I'll open this up to the group, as well, but maybe Margie can start this off for us.

MS. GARDNER: Well, sure. I think you have to separate AMI data which is consumption, right, at a building or an end-use facility from market data that would be more oriented towards what's selling in the big box retailers, you know, what's being left on the shelf. What are manufacturers thinking of doing in lighting? And I think you really need to be collecting all that data. So the AMI

data is the most direct for what happens to energy use. But surveys of the market and, frankly, surveys of the end use also help.

So my guess is that as the valuation -- there's a current proceeding on that's talking about changing how evaluation would look at that, and they would do more data collection in the market. I think there is a suggestion to try to put more emphasis on those kinds of pieces. And I think you're going to need them for the forecast, as well as for the estimates of energy efficiency.

The other thing that hasn't been talked about, though, is I think you are going to continue to need surveys of the existing buildings. And what I mean by that is, in fact, there was an example at lunch, I replaced my refrigerator and get a rebate for it. But guess what, I also added about, you know, three square cubic feet to my refrigerated space. So I not only did an efficiency measure, but I also added some value to me that's a bigger refrigerator. The AMI data will only show the delta -- the change in energy use. It won't every pick up that I bought a larger refrigerator.

So, you know, my guess is that in commercial and industrial those examples are even more complex. And you probably are going to need to continue or start in-depth survey work of what is in those commercial buildings.

The Pacific Northwest over periodic time periods goes into buildings and actually looks at what's there and interviews people about what they're doing. And they've done that over enough period of history that you actually feel and see and can pull out trends of data that's I think very pertinent to both the forecasting of demand, as well as the forecasting of what's left to get, what should we go after now?

That was a long answer, but --

MR. GARCIA: Does anybody else have anything to add to that at all?

MR. COPE: the one point that I caution everyone to be concerned -- the potential concern is you've got to recognize, not all the utilities in the state have AMI. There are two or three, maybe four POUs who have full AMI, and they only have those because they got ARRA funds from the federal government. Otherwise, AMI implementation full scale is expensive, and it's going to take time to get there. I think everyone recognizes the long-term value. But the value proposition and the cost needs to be balanced. And I think that's going to be something that -- it's not going to happen tomorrow.

MR. MILLER: I'll just add that part of what we need in the market is not just information, but we need -- customers will need some certainty about how that's going to

be done. So AMI data is critical, and you can have a great program where it says we're going to pay you on the actual savings that you achieve with the program. But you're never measuring actual savings, you're measuring consumption against some imputed baseline. And if a customer says, great, there's a contract, I can sign up for it, that's sounds good, they're going to want to have some certainty about what the rules of the game are. And so there needs to be clarity and there needs to be certainty so that people can feel comfortable going forward, rather than saying, okay, I'll sign up and then we'll figure out later what would have happened anyway and do a study and three years from now you'll figure out what the result was. It needs to be -- you know, we need to confident and clear and certain about what we're doing going forward, at least adjusting for the next round. But I think that's an important component of it.

MR. GARCIA: Yeah, I can't remember, was it Rachel, did you mention integrating all the data that customers get so you would have your AMI -- assuming you had AMI data, and I recognize that issue, but if you have that, plus your PV, and then you have information about -- you mentioned some of the -- you have a big group of people who are participating in these programs, you have suddenly a pool of people that you can study and monitor and compare

them to the rest of your population. So do you have any insights into that or even finding them?

MS. HUANG: Yeah. So we had just recently done some analysis where we took our AMI data, so you could see the different individual customer load profiles, and then coupled it with available data that we had, you know, both demographic. And then the other thing that we did was also the psychographic data, right, which is not only what do customers have, but based upon their customer segmentation, what is their proclivity to adopt certain DERs, so not only sort of where they are today but what's the likelihood of adoption of DERs in specific geographical locations? So as we think about grid impacts or grid opportunities, how can we marry, you know, the grid infrastructure or the needs from a grid standpoint with where likely customers are most aligned to being able to adopt in those instances?

So, you know, we've done the first analysis, but it's definitely something that we want to expand upon in order to really be able to understand how do we then set differential incentives or be able to drive adoption in specific areas where it can also have value for the utility.

MR. GARCIA: Yeah. I guess where I was getting at, too, was that do the customers have this data? Like are they able to make their decisions based off access to all their information, you know, what have you done in that way?

MS. HUANG: Yeah. So right now we've just done internal analysis for our own planning purposes. But I think, you know, as we think about, you know, how can you provide information to customers to make good decisions, I think that's something we would be definitely looking for, for the future.

MR. GARCIA: Well, I think I'll turn it over to the dais if they have any -- if you want to continue this discussion. I think we would all like to.

COMMISSIONER MCALLISTER: I'll kick off. I won't make my exhaustive list of questions quite yet. I'll kind of see how it goes so other people have a chance.

So I guess, so really a couple of questions about sort of how to keep us all accountable; right? Because I think a lot of what we're talking about is what sort of inefficiencies, sort of process inefficiencies we kind of are -- just transaction costs, we have to put in place to deal with -- okay, to keep us all honest; right? To say, okay, if we're going to say we got some kilowatt hours, well, then -- you know, and some capacity savings, well, how do we show that that's actually the case? So, you know, we've gotten to the gross, you know, attribution process, lots of things sort of in place to do that.

And I guess I certainly am open, and I think many of us, you know, maybe everybody here is open to finding

ways to make that less problematic and really sort of more to enable the marketplace to engage more effectively with efforts to improve efficiency. So there's this messiness; right? There's this messiness of dealing with this attribution and keeping us all honest.

I guess in the context of the sort of statewide versus utility-specific, I mean, if it's a statewide then how -- I guess I would ask, you know, each -- oh, I'd ask the POUS, really, sort of how do you keep yourselves -- how do you sort of come back and say, okay, we've got this statewide goal, you know, the POUs are meeting the POU part of it, you know, without having -- you know, and how does that play out in reality in terms of what kind of data we should be expecting you produce to show that you're doing that? And I think that's really -- that's why I keep harping back, you know, on the, well, if we take a macro look and we look at some basic indicators, you know, energy's intensity, you know, square foot -- kilowatt hours and therms per square foot or something like that, those are metrics that exist but they don't require -- you know, apart from attribution on the program level.

So I guess I'm wanting to hear sort of what process you're thinking about for, hey, for we've got these goals, how are we going to kind of show that we're meeting them?

MR. CHANGUS: Sure. Well, I think the first part is recognize that we have a very comprehensive annual report that details what each utility is doing on energy efficiency by programs. It has a qualitative description, as well, as what's transpired in those, where challenges have occurred. It's a fairly lengthy report for the CEC staff that are looking for something to do on a long weekend. But I think that's step one as we look at that and we look at what's being reported and shared there to see, are we continuing to progress, are we continuing to innovate?

And there's ability to kind of -- we've been doing that now for almost ten years -- to look back and see how the program has changed, how the savings have changed. Part of the analysis that we provide is a review of what have we done years' past from a KWH, KW and expenditure level to give us an idea. And the raw data maybe is more aggregated at a portfolio-level basis, to be honest, because especially the smaller utilities, the programs individually are going to start to become kind of noise on a statewide analysis. But portfolio-level analyses, and we can look at the programs, we absolutely do, and that data has provided -- the quantitative bit gives us an idea of where we're headed. And so I think that's a step number one as we start there.

And then how does that information feed into the potential studies that we're looking at? And I think, you

know, one of the larger issues that we started to talk on but we really need to figure out is that the current modeling is really based more on the widget-based world. It's starting to evolve into more systems, the performance-based issues, but that's where our EE programs are going to be down the road versus where they are today; right? And they're going to look -- they're going to have to look very different. And so we're setting a baseline for a goal many years out from now. The programs that are going to be used to meet that goal are going to be very different.

So I think there's things that we can continue to do through that existing annual report. You know, all utilities still have to pursue all cost effective, feasible, and reliable energy efficiencies, the first resource available. And so that's not alleviated by any means. Just because it's more challenging or more difficult or there's other programs doesn't absolve us of that responsibility.

So I think the annual report and our continuing obligation to develop those potential studies provide a wealth of information if there's questions about those bits. If there's more information within that, that needs further look, we'd be happy to. I mean, that's my joy in life, is helping compile that annual report. So if there's any questions, let me know.

COMMISSIONER MCALLISTER: Yeah, but you got a lot

of joy coming forward.

MR. CHANGUS: Let me know.

COMMISSIONER MCALLISTER: Great. I want to give the other -- SMUD or SCPPA, do you have --

MR. COPE: I couldn't have said it better myself.

COMMISSIONER MCALLISTER: Great. So, Rachel, do you have any comment?

MS. HUANG: Not much to add, just in that, you know, we'd be happy to report and provide additional information --

COMMISSIONER MCALLISTER: Yeah.

MS. HUANG: -- as need, so --

COMMISSIONER MCALLISTER: I mean, I think where we might be going, and I just want to keep -- you know, make sure that it doesn't go off the rails is, you know, on the one hand we have programs and we need to keep those accountable and sort of understand how they're impacting. But on the other hand we have these macros goals, which you said, Jonathan, don't necessarily correspond directly to programs; right? There's this macro -- if we're successful in market transformation then maybe the programs don't touch a bunch of projects that generate savings, and that's okay. That's actually a good thing; right? But how do we capture both and keep ourselves honest?

So that's -- and I have one other question,

actually, so -- for now.

I guess I'm interested in everybody's views, or those that just want to comment on this. So we've heard about -- and so we have AMI data in much of the state, not all the state. But we have, you know, a peak that's moving later, as we heard. We have sort of -- we have to be concerned about the load shape, especially as renewables go up and, you know, et cetera.

So how much is EE -- how can we keep EE, as a resource, well-coordinated with the other kinds of DER, like demand response, for example? You know, if EE and demand response going to -- are those two resources going to start to look more similar? How is that targeting? How are you all thinking that that targeting of efficiency to create the most value works? What does that look like going forward?

MR. NICKERMAN: So maybe I'll start with that one. So I think the, you know, the IDER process that's been put in place, which I think the vision is to update the avoided cost on an annual basis, all right, so we'll -- as that shift occurs that will be incorporated back into the programs. I think there's a companion piece that has to happen where we actually need to update DEER to make sure that the peak in DEER aligns with the peak that we're seeing in the avoided costs. So there is some coordination that needs to happen there.

But I think our vision is, you know, once you see those updates and kind of identify those peak hours, right, then you can go through and kind of identify load shapes that would be saving in those hours, right, and would help alleviate those peaks.

So that gets back to the point about having really solid understandings of, you know, how is usage happening, so surveys like CEUS and RASS, right, because they help inform load shape development and the types of end uses and savings measures that are happening on those peaks.

MS. HUANG: I guess I would just add, based upon my intro with regards to the efforts that we've taken, is we've really actually tried to do analysis with all of the DERs together. Now, granted, the process that we undertook was we had individual potential studies for each of the DERs and we kind of coupled them together and did some different types of analysis. But I think moving forward as we think about it, it's not only taking the information that we have and doing analysis and looking across the DERs and looking at those load shapes, and looking at customer proclivity and how do all of those thing interact?

But we've also talked about, well, do we need to do some more potential studies a little bit differently, as well, and maybe look at, you know, multiple DERs and what those might be? And that will be a new journey with regards

to analysis and modeling, but I think that that's something that we need to look at.

COMMISSIONER MCALLISTER: Thanks.

Anybody else?

MR. COPE: I'd like to add, also, going back to what Luke was talking about, load shapes and what Mr. Berberich was talking about earlier this morning about, well, do we need to focus on peak demand reduction?

And so I think to answer your question, Commissioner, I think EE and DR probably do start to get somewhat closer because it's important for agencies and participants, market participants to recognize there's a time value of energy efficiency savings. You know, saving a kilowatt hour from a nighttime parking lot load reduction is a whole lot different than, you know, shifting peak from 2:00 in the afternoon or 6:00 in the afternoon to 3:00 in the morning.

So there is a time value to energy efficiency. And so that's going to be critical to resource planning going forward.

COMMISSIONER MCALLISTER: I mean, it strikes me that there's a lot of complexity we don't have time to get into here in terms of just, you know, every climate zone is going to be a little bit different. And, you know, you're going to be a different peaking than PG&E. And PG&E has so

much diversity just within their -- I mean, there's a lot of issues here. And so data, again, a lot of this goes back to data and the capacity to actually deal with all that data. Okay.

MR. NELSON: And I think one thing I would like to also mention is that as you get closer to the end of the circuit it becomes increasingly important what you know about the demand response, the energy efficiency, and the loads. Because, you know, from a top-down perspective this is more straight forward. But as we move down the circuits, if you think about, you know, our demand may be 22,000 megawatts at the top and it may be, you know, the non (indiscernible) demand may be 30,000 megawatts. So there's a lot more going down at the circuits, and what matters is how it rolls up and how it coordinates.

So I think that, again, having more granularity in terms of geography is going to tend to be really important so that we can get it to the ride substation or at least substation family. And that as we move forward I think that we're going to find that that plays a lot toward trying to defer distribution circuit investment, and that could be a large portion of cost effectiveness at some forward point.

COMMISSIONER MCALLISTER: Great. Thanks. I'll open it up to the rest of the dais.

CHAIR WEISENMILLER: Yeah. I had a couple. I

mean, it's probably good again to step back and, you know, remind ourselves. I mean, I think basically the legislative direction and the governor's direction last year struck me that business as usually wasn't going to work. We really needed to step up the game. And you can argue, what does doubling mean?

And there was also, I think, generally among those of us talking there was a sense that, you know, looking at our programs, you know, where you have rented space, be it residential, be it commercial, that's where our programs, you would tend to think, have the most difficulty. You know, and certainly in terms of thinking from an equity basis, most of our low-income citizens are in rented space.

So again, it's sort of like how do we -- you know, and I think for today -- you know, ultimately, again, we're getting more -- we're going to have to get more into the program discussion later. Today is the base case of what are the metrics we can use to be tracking this? I think none of us want to be in a situation ten years from now of saying, oh, yeah, we had this great goal and, oh, by the way, nothing seems to have happened, either because it was somehow allocated nebulously to something to make it happen, or just how do we -- today's question is really how do we track that?

And I guess one of the interesting things is some

of you have AMI data and some of you don't. We're going to study that and try to understand, for the entities that have AMI data, or Margie and Peter who follow that, what are the big -- you know, again, my basic metrics thing is how do we use that to get some metrics that can help us track progress and sort of separate out, you know, what we'd like to see happen versus what's really going on in the market? Do you two have senses of AMI's specific data uses that really, you know, turn people around, or programs that can really help the sort of low-income rented space area?

MR. MILLER: Well, I'll take a shot at it. I think the AMI data is going to be very helpful for programs in particular sectors, particular kinds of technologies. It's not going to be helpful for everywhere. I don't think we're looking at AMI kind of program for a low-income renter. But I think it will be helpful, and it will be helpful for getting a better sense of load shapes and impacts on peak.

But I think if we're looking at overall progress in the market, we want to be out there in the market and doing market surveys, both, as Margie said, of what's on the shelf, and then on what's going on in people's homes and businesses and buildings. And we should be keeping closer track of it. I think that involves, you know, a lot of surveys and sending teams out and tracking progress.

MS. GARDNER: And I don't think my answer is really related to AMI. It's related to the tools we have now, right, to measure savings. And AMI is an enhancement to the extent we can incorporate it for those utilities that have it. But the question I think you want to do is we've set this goal, right, you're going to set this goal, and then I think you need to do the study, it used to be called the potential study, but now it should become the opportunity study of what is the best way to do it?

In this market we should be doing a market transformation effort to influence these players, and that will get us one percent. In low income we know that they are not responsive to those kinds of things, so we know we have to pay 100 percent. You know, whatever it is, design/redesign the thinking of what should we do based on how do we get to this goal effectively?

You have a lot of information. You just haven't looked at it with that lense on, would be -- you know, and you are going to use AMI data to prove it over time. But at the beginning you're going to have to use what you have, it's not AMI data. It's potential and goals' data that needs to be translated into how do we make this opportunity real?

CHAIR WEISENMILLER: And again, for the IOUs that have had AMI, I mean, can anyone say, okay, here's -- or

SMUD, here's a program we've done which really, based upon that date, you know, just sharpened it in some fashion?

MS. ALEXANDER: I'm sorry. So I believe I might have been the first to talk about AMI data.

CHAIR WEISENMILLER: Sure.

MS. ALEXANDER: I didn't mean to turn it into too much of a thing. I think the general concept is more data. And you could have it, and even if you don't have it there's proxies for it. And the real solution is not AMI or not survey X, but it's the practice of using analytics and algorithms to understand more things about the market and customers.

So I think for those who don't have AMI data, it can still be teased out through other ways. Maybe that is by getting best practice algorithms from others who might have it. Maybe it's by finding their own insights by marrying real estate data and demographic and psychographic data onto it. So I would just like to offer that, that I think it's a practice of analytics and being curious and using a pilot and test and launch and then revisit kind of discipline that is really more of what many here may be talking about, more than just the specific dataset.

MS. HUANG: So I would just add maybe on that.

To answer your specific question, we're just at the point where we're using some analytics' tools to look

at, okay, you know, pre and post, but we don't have any conclusions to share today or anything like that.

But I guess just to kind of go on the point made earlier is that I think you can also -- how do you develop those algorithms; right? It's like what are those factors? If you do some analysis with data that you have, then for those that don't have AMI, how would you extrapolate or know which variables are driving what information and be able to use those? I mean, it goes back to models, so apologies on the models' piece.

But, you know, how can you utilize that information to better understand or apply in situations where that AMI data might not be available? Because, you know, even though we have AMI data available today, there's so much data that's available. You can purchase data. You can -- you know, you have data that other parts of the organization within your own company have that they use to help refine their estimates that maybe other parts of the organization aren't using. And I think that's really what we see with this concept of big data. But, you know, we're on that path. We're not at this maturity level yet.

But needing to bring together all those disparate sources of data and understanding how when putting them together, how that can give insights is really the key piece that we see as the opportunity.

MR. CHANGUS: And I would just add on to that, that education and outreach is still going to be a critical piece to this. Because AMI data that we all understand means this is a cost effective decision for you, Customer X or Customer Y or these whole classes, for you guys, this is really in your best interest. It's going to improve the comfort of your house and it's going to save you money. Do they understand that? And we've seen time and time again that just because something happens to be in the economic best interest of a customer doesn't mean that they're going to do it.

We've seen that in particular with -- I might get in trouble here -- but with like solar and in the amount of customers that are actually pursuing the deeper energy retrofits before installing the rooftop solar system is low. They'll do the easy LED. They do the appliances. But they're not doing air in-duct ceiling, even though that, on a per-dollar basis, is going to be a much bigger bang for their buck and minimizes or decreases the solar they have to install, but they're not doing it. Why? It's in their own best interest. And I think if we just assume that if we can design it as such that it's in their own best interest they'll just do it, we're missing another part.

So meter data, AMI data is part of it. And energy audit asset assessment of what's going on with the customer

is another part of it. But there's a fundamental understanding and sensitivity about how customers use energy that many, many, many don't have that is going to be one of our greatest obstacles. And we can model, we can study, all of that, but that's -- to harken back to what Bryan had mentioned, I think that's something that the more we can all get together on just getting the message out, like we did with the drought. This is a serious situation. And it's not just a lovely goal, it's critical to us in our GHG bit in making energy savings, energy conservation and sensitivity when we're using energy just in our daily lexicon and much more common is going to be one of the single most important efforts that we do in achieving the goal.

MR. NELSON: And certainly as we look at AMI data coupled with SCADA data out of our control systems, we put that together frequently when we're doing special studies. I'm not aware of any large scale project, as you're sort of alluding to, which would be how do you couple AMI data with data in terms of own versus rent, for instance, to try to determine whether there's a disproportionate opportunity there and maybe a way to monetize that? It's a concept that we, you know, that we certainly have heard something about, but I haven't seen anybody actually do that yet.

MS. GARDNER: And I'll just add, I'm going to

propose that that happened with CEUS and RASS, and that CEUS and RASS be done every three to four years, and it actually be intentionally linked with this future AMI data so you know what's happening in the buildings, as well as with the AMI data link. That's the better way to do it.

COMMISSIONER MCALLISTER: That's great. So, I mean, I think with the CEUS right now -- well, the plan for the CEUS and RASS is to allow them to be more targeted so that, you know, with the AMI kind of analysis as background so that we can sort of get the most value out of that to do kind of what Peter was talking about before, at least that's the plan. So we'll see, you know, how quickly we can make that happen. And we really depend on you guys to sort of suggest what the details might look like.

COMMISSIONER PETERMAN: So let me chime in here with a quick --

COMMISSIONER MCALLISTER: Yeah. I wanted to make sure we got that in the forecasting.

COMMISSIONER PETERMAN: -- a quick question. First of all, thank you for a very interesting discussion. One of the things that I have found helpful is hearing what's happening with the publicly owned utilities, because I continue to struggle with the importance of the statewide nature of targets and programs, and yet the different jurisdictional responsibilities and roles. So I do

appreciate the AMI discussion. I had a few questions on that, but I think that has been well covered.

Just getting back to Chair Weisenmiller's comments about metrics for performance. I'm just curious, particularly with the publicly owned utilities, one of the things that we have been looking more at the CPUC have been energy efficiency on the supply side and for reliability purposes. And I'm just wondering, at the POUs, have you looked at including energy efficiency in supply-side RFOs? And on the broader question of metrics for performance for energy efficiency and supply side, any additional comments about how to approach that thoughtfully?

MR. COPE: Okay. As far as SCPPA goes, Commissioner, the closest thing to energy efficiency that would equate would be our annual RFP for renewable resource development. Part of that, an integral part of that is for storage resources. So we are requesting, we'll call it demand-side, both utility-owned storage development and behind-the-meter storage opportunities as part of that RFP. That's as far as an integrated policy plan or program process that we have directly linked. However, all of our energy efficiency program managers are directly involved with their resource planning people. And that's really the connection that we rely on is at a member level.

MR. CHANGUS: Yeah. And we at NCPA have pursued a

number of efficiency measures at our plants to increase output, primarily because they're renewable. So that's where RPS and energy efficiency together. Geothermal; extending the lifetime there was part of it. We don't own a lot of the TND (phonetic) system itself, but individual members have pursued TND upgrades from an energy efficiency perspective to reduce line loss. Palo Alto comes to mind in particular as having a program on that front for many years.

COMMISSIONER PETERMAN: Okay. But you've not done kind of an all-source RFO yet that includes efficiency --

MR. CHANGUS: Like what we saw --

COMMISSIONER PETERMAN: -- other types of generation?

MR. CHANGUS: -- with Edison earlier?

COMMISSIONER PETERMAN: Uh-huh.

MR. CHANGUS: No. That is an area, I will say, that is of increasing interest, not just from an energy efficiency but from the, you know, preferred alternatives in general, there were some lessons learned, I think --

COMMISSIONER PETERMAN: Uh-huh.

MR. CHANGUS: -- from the Edison one --

COMMISSIONER PETERMAN: Uh-huh.

MR. CHANGUS: -- and something that we're interested in building on going forward.

COMMISSIONER PETERMAN: Great. I was just

checking to see if there were any lessons to learn from you on it yet. Thank you.

SMUD?

MS. HUANG: Yeah. We haven't done an RFO from that standpoint yet.

COMMISSIONER PETERMAN: Well, I'd be interested in seeing you do one.

MS. HUANG: Duly noted.

COMMISSIONER MCALLISTER: Yeah, really.

Just on that note, Mark, do you have any sort of newsworthy sort of updates on the preferred resources pilot or that effort, in particular sort of, you know, whether you -- what pieces of what you got from that are -- you're convinced are incremental and additional?

MR. NELSON: We're out with an RFO right now, as well, so that's underway.

I think the incrementality is always going to be the challenge here because no one knows precisely what's it the baseline and no one knows precisely what you got and what you may have accelerated. So again, it's kind of the AB 802 sort of effect where something was going to happen, you simply accelerated it.

So I don't have any hard news to report, but those are definitely the issues that we continue to look at. And we're gearing up right now for same thing, smaller level,

again down in the distribution circuits as part of the DRP. So that will be another challenge, although I think if there's a bright side to that, those circuits are a lot easier to watch because they tend to be smaller circuits. They're 12 kV circuits feeding into 66 kV substations. And you can monitor the circuits, and you could also pull the AMI data further down circuit. So we've got a little bit better vision into that than we did perhaps into Johanna and Santiago which hook up to big 220 substations, you know, with 1,000-plus megawatts of load behind them.

COMMISSIONER MCALLISTER: Great. Okay. Thanks everybody, really interesting. And I think that even the sort of route we did through the program world was helpful, even though it wasn't sort of strictly related to forecasting, so that's okay.

MS. RAITT: Thanks. I'm not sure if we wanted to take a short break or just move on to the next panel?

(Colloquy)

MS. RAITT: So hi everybody. We are going to just move on to the next panel, instead of taking a break.

So if our next panel could come up to the front tables, that would be great. And if everyone else could just go ahead and take a seat, that would be helpful, too. Okay. Okay, so if folks can please go ahead and take seats, that would be helpful. Okay.

(Colloquy)

MS. RAITT: Okay, so our next panel is on Modern Energy Data Analytics to Improve Energy Saving Evaluation and Energy Demand Forecast.

So our first presenter is Malachi Weng-Gutierrez from the Energy Commission.

Thank you, Malachi.

MR. WENG-GUTIERREZ: Good afternoon. My name is Malachi Weng-Gutierrez. I actually work in the Energy Commission's Demand Analysis Office. And I've been asked to speak briefly about our energy data collection rule-making activity.

On January of this year, I think it was January 13, the Energy Commission adopted an order instituting rulemaking to develop and implement regulations and guidelines to support the California energy efficiency, renewable energy, and GHG reduction goals.

One of the activities identified under that rule-making proceeding involved considering amending the Energy Commission's regulations specifying data collection and disclosure, which are actually found in California Code of Regulations, Title 20, Chapter 3, and section 2501 to 2511. Now I don't know if you guys know that chapter specifically but it is a data collection component, and it covers things such as our quarterly fuels and energy reports. It covers

our forecast assessments and energy load and resource data collection activities. It also covers things like the petroleum information reports, wind performance reporting systems, electric generation, and qualified departing loads CRS exemptions.

In addition, the sections 2501 to 2511 cover confidentiality of data, disclosure agreement information, and other security and confidentiality-related elements. So those are all under the purview of this rule-making activity. And we're in the process of actually developing draft language now.

The amendments will help the Energy Commission implement provisions within the senate bill -- implement provisions within Senate Bill 350 and the Assembly Bill 802 that have been discussed today, and we hope will also help clarify existing regulatory language.

I believe the last time we updated those regs were many, many years ago. We probably want to look at these regs repeatedly through time to make sure that they are updated and relevant to our current data needs. And so that's something I think this round we may not wait so long to do another rule making. I think it's been many, many years. I think it was early 2000s that we did it last time.

So I think today's workshop has highlighted many, many data needs. Even earlier this year when we had

workshops on methodology there was the discussion about the peak load shifts, also identifying needs for data. And we certainly will be having more workshops coming up on 802/350-related activities which will highlight data needs, as well. So all of those workshops and activities and the comments that are provided in those workshops will feed into the development of our regulatory language.

And that's not to say that the regulations themselves, the actual codes that exist out there, are the only mechanism through which the Energy Commission collects data. We have many opportunities to work with other agencies and utilities and others to collect data through other mechanisms. But the rule making is just one of those activities that we've identified and we started this year to help implement, where appropriate, we can use the rule making as an activity -- or as a mechanism for data collection.

Among the needs that we have to increase the desegregation of the data that we're collecting is to improve the representative -- representativeness of our demand forecast, as well as characterization of other load-modifying resources. One of the things, I think it's numerous mentions today, about photovoltaic systems, behind-the-meter influences, all of those things are going to influence the demand for loads -- loads in general in

different ways, in different regions. So getting more data that are regionally specific will allow us to have better forecasts in the specific areas that we are trying to forecast in the future as we try to desegregate our forecasts even further.

There was a couple of mentions about 8760. And I know in our methodology workshop we also talked about that being potentially a goal for us, is to move toward sort of an 8760 mentality going forward. So that's something that we're considering when we're developing the regulations themselves.

And I think I was going to keep it fairly short because I wanted to get to the data processes and the actual presentations that are going to be presented here by the other panelists here. But one thing that I had recently done was pick up Nate Silver's book on the noise and the signal -- or The Signal and the Noise. And he had noted, also, in that book, and I think it's been sort of mentioned here today is that there's lots of data out there, but what we're really trying to do is gather knowledge from that data. And so it's not necessarily that AMI data itself is the solution. It's really how do we incorporate -- how do we gather the knowledge we need from the data that's out there? And so that will be interesting to see how the panelists have approached leveraging new processes for

analytics, as well as the data sources that they've been able to utilize in their work.

So with that, I certainly am open to any questions or comments. Otherwise, I'll just hand it over to Jason Harville. All right. Thank you.

I guess one last comment and plug for myself. There's going to be an August workshop on the actual regulatory language itself. We're going to have draft language that we'll be presenting in an August workshop. So I hope that we have broad participation in that workshop. It would be great to hear everybody's comments on what we're proposing and what's out there. It's certainly not the final, but it is a draft version. And we hope that we do have lots of participation. Thank you.

MR. HARVILLE: Good afternoon, everyone. I'm Jason Harville, like Malachi mentioned. Good afternoon, Commissioners. I'm here at the Energy Commission. I work on Distributed Energy Resources. And I hope you all are finding this as interesting as I am.

I think Commissioner McAllister said it really well earlier. He said data driven decision making is the new norm. And this is true across all sorts of industries and all aspects of our society. And we really are on a cusp, and it does sort of seem like the energy sector, if you will, is a little bit behind the curve there but

anxiously ready to catch up. As you can hear, a lot of these conversations are getting diverted pretty quickly to how are we going to use this data? What is this data? What are these methods and techniques and analytics that we can bring to bear to answer these questions?

And so I'll let my, in the interest of time, let my panelists introduce themselves. They have some brief presentations. Then we can get to the discussion, hopefully.

MR. SHUMAVON: Are we going to do introductions all around, then presentation, or should I just introduce myself at the presentation.

MR. HARVILLE: Oh, you can just come and introduce yourself.

(Colloquy)

MR. SHUMAVON: All right, hello. I'm Aram Shumavon. By way of a little bit of background, I worked at the Public Utilities Commission for a little over a decade and interacted a lot with this building, as well as with the ISO and a great many people in this room, so hello.

Kevala is a company that I co-founded a couple of years ago that is really focused on helping decision makers, both inside the regulatory world and inside the market participant and advocacy decision-making process really better see data and act on it. So really briefly, what I'm

hoping to do is just to speak through a couple sort of big picture-framing issues, and then dive into some real-world examples, if technology works and lets us actually use this live demo that I'm hoping to show you.

But to frame things, as everybody is aware, we are moving away from sort of a push world view and to a much more dynamic and integrated energy economy. We in Kevala call that an energy-plus economy. It is important, and I apologize, I am an economist, I will sound like a dork, because I am, for much of this presentation, but we really want to emphasize that huge amounts of the driving force for decisions that are happening in the energy world are actually exogenous to the transaction of buying electricity from any number of providers.

And the example I like to give to make people aware of that is we expect a much larger amount of decisions that may be made at a point of sale, but ultimately will affect the way the grid behaves. They're going to be motivated by strange things like $20 off at Safeway or a Whole Foods in exchange for some behavior because there is greater value associated with transactions that happen outside of the purchase of electricity that will allow people to leverage change in the electricity sector.

So on this slide you can see things get very complicated in the sort of now- and forward-moving state of

being. That is going to actually get much larger and include much more than just the internet of things. It's going to include a lot of consumer behavior that is not stuff that we are used to thinking about inside these buildings.

When we look at those kinds of behavior we integrate them into much more traditional energy policy processes. And so what you're actually looking at here is everything from the bulk power system side, including the value of energy supplied by the bulk power system, but also the grid edge behavior externalities, like health, including environmental health and environmental justice, and then, of course, climate which will be driving a lot of changes that we're not particularly well suited to modeling at this particular moment.

We take all of that and we think of it in hyper granular ways, like where individual PV systems are located, or the size and probable energy consumption for individual buildings across the state and country, and then we add analytics to that. So we really think of ourselves as a search and analytics firm for the energy vertical, which is a little different from policy-shop world that I lived in for a long time but really is the way to visibility, as we see it.

So we put all of that together in the form of a

database that allows for both public and private access. So everybody can see public data, and only certain individuals can see private data, whether that be personally identifiable information or value-added analytics that we add to that, and then all of this is interfaced through the web.

What that looks like then is really skinned by whatever the end user needs. And I'm going to walk through some examples and a live demo, but I just want to briefly walk through them here to sort of show you what this might look like.

We can take a technology, like solar which we refer to as having a production profile, and then rank it based on the value of delivered energy in the form of locational marginal prices at every locational marginal price node and every substation, rank those so that you've got cloud cover adjusted PV production and you can zoom right in on which is the substation you should be interconnecting at in order to capture the highest dollar value for the energy that your resource is producing. You can then click on that and actually pull up information about the feeders and the buildings associated with those. Those kinds of activities are really just one way to process the underlying data. That's actually focused on trying to drive efficiency into system sizing and location so that the

program dollars go further. But the solar industry really just thinks about that as what's the easiest way for me to interconnect to the most valuable system, and we build systems for them to do that.

When we think about the kinds of problems that we expect to be seeing in increasing frequency, integrating DG on the distribution level, we're starting to build tools that we refer to as a one-to-one map of the entire energy infrastructure.

So what you're looking at here is a feeder area in red. We have all of the buildings mapped, including the size and performance characteristics of those buildings that come from the building shell data in light blue. And then we can generate hourly consumption profiles and hourly production profiles for all of the PV on top of that and allow us to generate a dynamic integration capacity analysis which essentially shows you how much DG you have at any given hour for the amount of load on that same feeder. This is going to help you with costs. It's going to help you with reducing the need for interconnection studies where you have fast-track processes by just allowing any market participant to see places where you might be able to have a lower probability of interconnection costs associated with interconnection studies.

Another example of that in the EV world, some work

that is soon to be underway here in California, looking at when vehicles should be charging based on where they can minimize the wholesale energy costs associated with the time and location of their charge. So in this example, a person who lives in Las Colinas decides whether they charge at home at night or in downtown San Rafael based on locational marginal prices, or potentially in the future a utility demand response program. This is all being set up to happen via API so that there's actually no human interaction with that.

And then the last example is an integrated locational benefit analysis integrated with DG potential. So you're actually looking at a levelized costs for a given technology that reflects the localized value and the ability on that feeder to integrate the technology in question.

So I'm just going to see if I can figure out how to go to an example of what that looks like. Just so you can see, these datasets are live. We can do things like filter by low-side voltage if you're trying to interconnect in a particular area. And what you're going to get as a result of this is all of the substations, in this example, in Connecticut that have -- somewhere around here I have -- it's hiding from me -- energy value descending is going to give us a rank of every substation in Connecticut based on whether it has a low-side voltage of 23,000 or 23 kV or

less, and then what that topography looks like.

The idea here is that eventually we are moving into a world where every individual building is going to be modeled and integrated so that we will be doing dynamic power flow analysis or versions thereof that will allow us to make determinations as to whether a given building is well suited for meeting a bulk power system need. And so the idea there is don't try to put energy efficiency measures focused on say AC cycling in an area where either there is not a clear wholesale signal for value for AC cycling or where you don't have the built infrastructure in place to really facilitate capturing that value. So if you don't have a lot of daytime load you're probably not going to get a lot of AC cycling.

So that is at the highest level, the fastest I can go through this. I'm happy to answer questions or show more examples. We're very focused on transparency in our analytics and the assumptions that we make. So if there are questions, I'm happy to take them.

MR. HARVILLE: I think -- sorry. I think maybe we'll hold questions for just a moment afterward, so keep those in mind.

Dr. Pincetl?

(Colloquy)

DR. PINCETL: Good afternoon, everybody. Thank

you very much for inviting me. I am honored to be here. I a little bit daunted but also kind of humbled by the whole idea of what we're trying to do here. And I think part of it is trying to catch up with a system that has over 100 years' history and trying to move very fundamental kinds of changes.

And one comment I'd like to make after listening to a lot of the discussion this morning is for us to actually remember that when we're focusing on people and behavior, people have inherited a system. They've inherited the houses that they live in or the buildings that they do their business in. They've inherited a grid. They've inherited many, many, many decades of choice about what kinds of energy systems the state and the nation have. And they have really a structural condition under which they make choices. And I think it's pretty important to remember that because a lot of the discussion is about getting people to change their behavior. And they are capable, certainly, of changing behavior. It's not so easy always. We have bad habits we'd like to change and now how difficult that is.

But I would like us to also remember that they must change their behavior under conditions that they have by and large inherited and not chosen. And I think that helps frame part of the challenge that's before us.

So I would like to talk to you about a project

that we have been involved in for nearly five years now, and to thank, actually, very deeply the CEC staff for helping us get going on this, and the PUC staff for supporting this. And as someone earlier said, we really need as much collaboration around these topics as possible. And so we are only the product ourselves of the structural conditions under which we operate.

We are, as people have said sort of ad nauseam, and myself, in the era of big data, and so let's use it. So the question is: How do we use it, and to what purpose? And I believe someone just before me, and maybe it was Aram, you have to think about what you want to know about the big data, because just having big data alone is pretty much insufficient because it just makes a lot of noise and you don't know what to do with it.

So I perceived at one point that we actually didn't know very much about building energy use. And remember, buildings are what people live in, and they structure how energy is used in many ways. And initially went to CEC and said, you know, I'd kind of like to do an urban metabolism analysis and know what's going on, what energy flows come into cities, how they're used by whom, where, what the waste flows out are, and discovered that there was no publicly-available data on building energy use.

And that led to participating in a whole series of

proceedings at PUC and developing essentially this energy atlas which is a web atlas that provides access to the, we still think, largest and most disaggregated building energy data available in the nation. We were able to get adjust-level building data from PUC under a non-disclosure agreement. And we've aggregated it to follow Judge Sullivan's ruling and the guidelines about aggregation so it can't be reverse engineered. I'm willing to tell you about our security protocols at some other point, but they are fairly stringent.

And we were able to put together more than 600 million monthly energy records at the service address and account level, and include a number of the POUs in the region. We combined this with parcel data. We've talked about parcel data. We've talked about the need to know about these buildings. These buildings are really, really important. So we know energy use per square foot. We know energy use by year built. And we overlay in the residential sector sociodemographic information.

And, yes, Commissioner Weisenmiller, it's possible to know renters and owners at the single-family residential level, not just at the multi-family level. And what you're able to do through this process is really get a much deeper understanding of patterns of energy use, using monthly data, across geographical space according to different

characteristics.

So we can query by building type, so single-family, multiple-family, residential -- so that's residential, commercial, industrial and institutional. We're able to query by building age. We have trenches of building age, certainly pre and post Title 24, and more in-depth than that, electricity, natural gas, combined BTU and greenhouse gas emissions. And we can do this at the neighborhood level in Los Angeles County, 272 neighborhoods, plus a few more county unincorporated areas that we have put together. And you learn quite a lot about energy use by different buildings, by different people across geographical space. And we have learned a number of lessons, so I'll go very quickly here.

One of the lessons we learned is the Malibu effect. This was quite a revealing lesson. So in Malibu we have much newer buildings. It's a new city. People have money. They tear down their old buildings/residences and build new ones. And thanks to CEC guidelines, their per square foot residential consumption is the best of the county, but they use ten times per capita energy use than the small crummy houses in South L.A. communities. So that's a very interesting finding that is concrete, if I may say so, because they use a lot of concrete, relative to the rebound effect.

And so when we're talking about how to then move to SB 350 goals, it's a kind of sobering lesson; right? So maybe it opens up a whole realm of other kinds of questions. For instance, if you're building a house over a certain amount of square feet, maybe your energy conservation standards have to be even more stringent such that the overall level of consumption doesn't go up; right? That rebound effect is something that we have to take extremely seriously.

The other kind of lesson that we are beginning to look at with the atlas is the ways in which building energy use allows better planning for increased heat days. That's the other question that -- issue that SB 350 doesn't really begin to look at. I don't know if it could. But the issue is we're going to be chasing after increased energy use to address increased heat days.

And so how do we think about targeting the buildings in a much more proactive manner than simply saying we have this fantastic incentive program for you and guess what, you're going to have to pay for it because it's going to be good for you because you're going to be saving energy. Most people's energy bills in California are, frankly, not that high. And if they are, then people just don't do -- they do without, which is the characteristic of poor -- of low-income neighborhoods in South L.A.

So I think that it raises a very serious question of are incentives enough? Is some kind of energy saving potential enough? And I would say that for whole swaths of California communities, it certainly is not. It is not going to get us there. And those are the communities that are probably going to suffer the most under increased heat.

So how do we implement SB 350 in a way that is going to ensure that the people who don't respond a lot to dollar savings, the very wealthy, right, what is it going to be, $250 savings on a whatever, right, are brought into these programs. And those that are the most disadvantaged are brought into the programs, too. And simply offering people discounts on insulation is not sufficient. And I don't mean to disparage that. I'm just saying the goals are pretty big.

The data that we've developed across, if you'll have a chance to look at the atlas, I hope, facilitates benchmarking because now you actually know the kind of energy that's used in your buildings by the different kinds of -- by square foot analytics, so you can set your thresholds at a point where it makes sense for that city.

We also have greenhouse gas emissions accounting for the energy use so cities can then develop their greenhouse gas emissions accounting, which they have a very difficult time doing, actually, because there's not enough

data for them, and it's hard to extract good greenhouse gas emissions. And with the fuel mixes that gives you the greenhouse gas emissions, it's not such a straightforward thing.

The other thing that this kind of data can do is really compliment with what Aram showed us, and what are the other strategies to compliment energy efficiency? Well, we talked about solar this morning. We haven't talked about things like urban albedo. We know that urban albedo makes a big difference in heat gain in cities. We need to have a much bigger picture of how we move towards less energy use that includes urban morphology. It includes what would be the impact of shade structure? How about the orientation of new buildings? And all of these factors are really, really important and complex that can be brought into asking these questions with data.

So we advocate real data for policy and targeted investments. And I echo my colleague at Stanford who talked about greater data access and transparency. And we have the very good fortune of now being able to have the energy efficiency participation data from 2010 to 2012 from SCE, SGC and San Diego Gas and Electric. And we are going to begin to map these different programs. I'm not sure what we're going to find, but at least we're going to match it in real time to real data to real buildings to real people and

see what emerges. Are there patterns about actually who -- that you can extract in a more easy way? Who subscribes to these programs? Where are the gaps? What does it mean that, you know, refrigerators are more wanted in this area and air conditioner, you know, replacements in this area? We need to begin to understand this kind of information.

We also have updated consumption data from 2006 to 2014. And the gray area there is what we're going to be mapping. So this is what we're beginning to add to the atlas, the 3.5 million records. And we welcome people's interest and curiosity and questions and suggestions about how to do this.

And then finally, you know, you can see what disaggregated data shows you about the patterns of energy use, and I guess I'll stop there. But I think that we need to really take much more consideration of the urban morphology and really the people who live in these buildings.

So I have answers to your questions, but maybe I'll get to them when we do the question and answer. All right, so thank you. I'll go through that and go to my conclusions.

MR. HARVILLE: Great. Thank you, Dr. Pincetl.

Dr. Granderson, would you?

(Colloquy)

DR. GRANDERSON: Good afternoon, everyone. Thank you, Commissioners, for having me today. Thanks to the audience here.

I'm Jessica Granderson, Staff Scientist and Deputy Director for Building Technology and Urban Systems at Lawrence Berkeley National Lab. I am a little jealous from the preceding two talks. I don't have any fancy slick tool to show. I think I'm going to be followed by yet another. I do want to start with just some of my thinking, collecting my thoughts before coming here today, around some of these topics of the role that analytics is going to play in our industry moving forward.

And the first thought I had was just, you know, what is it going to look like for the state to leverage systems analogous to those that have been used to very strong benefit in the private sector? We work with a lot of enterprises, building owners and operators in their localized use of analytics.

And I was just talking to Macy's. Enterprise-wide across 700 to 800 sites, they've been, since 2005, looking at 15 minute interval data, I mean, ten years across all of those properties. For the last I've years they've been integrating that with control-level system data. They're, you know, continuously monitoring over 100,000 points in the system, so we're getting up into some bigger orders of

magnitude. And what are they using that for? I think very strong parallels with the state agenda, they're tracking portfolio energy use. They're forecasting their utilities. They're identifying efficiency measures and verifying savings and performance.

So there are clearly similar opportunities for California where we're at, you know, over 80 percent smart meter penetration. I think that last panel highlighting some of the like, oh, what do you do if you don't have it? But statewide, you know, we're over 80 percent and, you know, really looking at some largely untapped insights for -- others out here, I'm sure, have better numbers than I do -- some 13 million buildings.

So the past two presentations actually gave really good examples of some of these points, as have the conversations throughout the day, as to what analytics might enable.

First, if we just think of metered longitudinal consumption profiles and models, we had some dialogue around the value of models and, you know, that they're all wrong, and some are useful. Anyways, we can aggregate for application-specific resolutions. Thinking spatially and temporally, we can begin to get these normalized and really increasingly critically the time-dependent savings and efficiency valuation. And a lot of screening and targeting

capability to enhance program delivery, use and location of storage, and distribution energy resources. And I just left a dot, dot, dot. I think a lot of -- there's some chicken and egg at play around what questions we might be able to answer if we had more and more availability to data and as the dialogue and exchange goes between the data, science and computation community, the energy efficiency and policy communities.

So if we think about that AMI data and then the increased power for insight that we can get if we combine it with economic, market demographic and grid data, you know, giving us the ability to really complement our top-down approaches for forecasting. And I think as highlighted previously, managing some of the complexity of that DER landscape.

My team has been working on the use of analytics for streamlined gross savings estimation. Sometimes this is called M&V 2.0. I guess like half the people really hate that label and half the people think it's fine. We're beginning to understand it to mean the use of more data, either in terms of frequency or resolution or more in terms of volume, combined with analytics and computation at scale to reduce the time and the cost of savings estimation through leveraging automation. And really importantly, that what's new is that scale and automation piece and not so

much new methods. We're still implementing and delivering industry-standards methods. And these approaches are delivered in both proprietary tools, as well as open algorithms or models that are published or posted in open source code repositories.

Some of our efforts here are summarized. This is a multi-year portfolio of work. I think it's really picking up steam. And of particular relevance now to California, kind of accelerating quite quickly with 802 legislation. So we have developed transparent, large-scale statistical tests to verify and compare and contrast tools, different tools, M&V performance. So model X compared to my standards piece-wide linear regressions, or tool X compared to tool X, answering a lot of people's questions around can I even trust generally an answer that a tool is giving me? Is it all smoke in mirrors under the hood or is there really something there?

Having tested many models and tools, we're now in the process of taking them and applying them to historic program data, comparing and contrasting with prior savings quantification results and beginning to get a little bit of estimates around time and cost reductions that are possible versus more traditional methods where we're investing a lot of resources in each and every facility that we touch. We've transferred some of our open-source algorithms to tool

providers, as well as implementers and utilities who are looking to develop customer interfacing tools or in-house tools for the projects that they delivery.

And it came up earlier, what are some of the -- what is some of the value to AMI? Where has it like really, really helped? And one concept that is, you know, beginning to get a lot of interest, and I think we'll be able to explore more, is that of continuous feedback and being able to provide insights. As a program or project rolls out, are you pulling the savings that you expected? Has your measure gone offline? Can you jump in and fix something that's gone wrong? And ultimately will that improve the results that we're getting?

Two other things that we're looking to do is really engage the regulatory and evaluation community around what are our quantitative acceptance criteria for these gross savings outcomes? Can we use principles of confidence and uncertainty to prove that we've got a robust and quality result? How do we document that? And how do we do so transparently so that someone else can check and verify?

Moving forward we'll be looking to pilot some of these approaches in live programs so we can really kick the tires hard on the value proposition. What are those labor and time cost savings? What are the tradeoffs in accuracy? How do we very practically give practitioners these

automated tools but allow them to also include their professional expertise for the really tough cases where you can't just let a computer do everything. So in terms of actual work flows, what does that look like?

A couple words about looking forward. We have the opportunity to take advantage of storage and computation at a scale that's really new to the industry. I was looking for images. I found I don't know how many that were like, you know, smart meter data analytics using Hadoop and various, you know, big IT and computation, where everyone is very excited about what can we do for energy efficiency applications? So I think storage is easier.

When it comes down to runtime on our analytics, as we want to build baselines and profiles and do longitudinal trajectories over time, we haven't in the efficiency field like done great in optimizing our algorithms for runtime at the scale of millions and millions of data points. And the analytics vendors are coming up very quickly and spending a lot of resources and bringing those promising algorithms to reality.

I think if we think about building larger and larger systems, there's clearly some role about sampling as we trial things and get bigger and bigger. I heard some comments earlier that, you know, we will still need to do detailed site investigations and surveys and so on.

And what's very exciting to me, particularly on the applied research side is that, you know, this combination of working increasingly, combining data and computer science with IT expertise to complement our efficiency, delivery, implementation and policy is like a new cross-disciplinary area that's really coming to the forefront.

I will say that, you know, limited access to data is really one of our biggest hindrances today. How will California lead in opening information up for the public benefit? You know, I could have any grad student out there who's so excited to come up with the next new method to answer the question. And we all go, sorry, I don't have the data. And that's something that's pretty sobering, actually, when you think that, you know, national laboratories/universities don't really have access to this incredibly valuable information out there, not in a way that's as routine as we would like.

So that's all. Thank you.

MR. HARVILLE: All right. And finally, Dr. Patel? Thank you.

MR. PATEL: I'm not a doctor yet. So my name is Siddartha Patel, and I'm a PhD candidate.

(Colloquy)

MR. PATEL: So I'm a PhD candidate, studying with

Professor Roger Gebal (phonetic) in the Civil and Environmental Engineering Department at Stanford.

This presentation comes out of work that we've done alongside Sam Borgeson (phonetic) who is with Convergence Data Analytics. And we've been developing what we call VISDOM, the Visualization and Insight System for Demand Operations and Management. And today I'm going to focus on insight into demand that can support DR and efficiency program development and evaluation. So I'll briefly go over a problem statement, our approach, kind of an overall vision, and then I'll share some results, some insights that we've obtained so far.

So the problem statement, I think this echoes things that people have said before. So the grid has kind of come to where it is without the benefit of a very detailed understanding of what drives end-use consumption. And that means that basically demand is more or less taken as a given and the system is built around it.

We know that, you know, one change, for example, in the next few decades is that we're going to be bringing online just massive levels of renewable and distributed generation. And that alone will require fundamental changes to how we manage/plan/operate the grid. Particularly, my interest is demand-side flexibility. I mean, some of that will be what shows up in the results that I'm going to go

through.

So our work, our approach is to build tools that use machine learning and statistical models to find patterns, drivers and determinants of demand, of how people use energy, and then to, within that, look for opportunities for demand-side flexibility.

So in the context of smart efficiency and demand response, this means, you know, kind of conceptually it means learning customer characteristics from their meter data. So we have meter data sets and we try to extract a set of customer characteristics from each person of each meter, I guess. We want to segment and target customers based on their actual consumption data. And this is alongside conventional approaches that rely on demographics and, you know, other kinds of information. But how can we segment them based on what they've revealed to us in how they use energy?

We think there's an opportunity for data-driven program evaluation and modeling how households respond to various programs, and we're hoping to develop an iterative learning process for these programs. And, in fact, this graphic is kind of our overall vision for a virtuous circle of program development. It kind of relates to what Dr. Granderson was mentioning. I'm going to explain where data can fit in here.

So we have a collection of tools that are designed to draw actionable insights into the patterns and drivers of individual demand and aggregated-level customer demand. And it's based, you know, we based this all on very large sets of meter data. So we know that the meter data reflects a whole series of important characteristics and granular characteristics, so the site, the building, appliance ownership, occupancy patterns, individual energy preferences and behaviors, so that's all in there.

And so we start with the time series meter data. And our tools compute various usage statistics and model estimates based on machine learning algorithms that are designed to capture many different aspects from many different angles of how a particular household or business consumes energy. And we believe, we think, that some of these characteristics correlate well with larger energy efficiency and demand response program goals.

So I'll explain, you know, four different ways that these characteristics could be used in improving program design and evaluation.

So one, program goals can be developed on a data-driven assessment of how people are actually consuming electricity, how individuals are actually consuming electricity, and how that relates to grid needs.

Two, we can segment and target customers whose

consumption is best aligned with the goals of a program.

Three, the messages we use to recruit and encourage customers can be personalized based on insights that we've derived from their meter data.

And four, changes in key metrics over time can be used to steer programs during their implementation and to refine their evaluation. And I think that's the point that Dr. Granderson was making.

So I'm just going to share a few results now.

So here's one. The histogram here is what percent of the always-on load constitutes -- what percent of the always-on load constitutes a household's total energy consumption? The mode, it's probably a little hard to see here, but the mode is at around 40 percent. And there are significant numbers of people to the right of that. So there's an insight you get from just running a simple statistic, basically, on a gigantic set of meters, and you find that maybe there's some work to do on base loads. Maybe there's quite an opportunity here.

And the next thing is we can identify. We know who those people are to the right of the mode. That's simple statistics.

Here's something, a model-based analysis. So we developed a model for estimating the total annual cooling energy, so how much cooling energy is a given household

using? And then you can map that. And surprise, surprise, the zones where it is highest are, you know, in that hot part of the state, in Zone 13 there. So that may not be -- I mean, it's one thing to map it out and get a sense of where is it highest, where is it lowest, and how does that actually vary quantitatively?

Within that we can ask a targeting question. So now we limit ourselves to Zone 13. And the takeaway from this slide is that even within the San Joaquin Valley the top 20 percent of households are using more than 45 percent of the cooling energy. So the chart here is a cumulative sum. As you move from left to right it's summing the top cooling load, the households with the highest total cooling loads. And, you know, where the dash marks that are basically showing that when you're at 20 percent on the X axis, so when you've included the households with the top 20 percent of cooling load you've captured 45 percent of the cooling load of the entire population. So that's -- you know, there's a clear story for targeting for either demand response or an efficiency program related to cooling loads.

This last result I'll share is about program evaluation and predictive modeling. So this comes out of work with the Behavior Analytics Group at Lawrence Berkeley National Labs. So we have data from an experiment that a utility conducted with about 100,000 households who were

offered various pricing programs. The exercise that we were interested in is could we predict which households were going to opt in to the program? You know, I mean, it's retrospective, but could you build a predictive model for which households were going to opt in to the program?

So the X axis on this chart is the enrollment probability. And the red line there, it's the average enrollment probability across all households, which ended up being at about 19.3 percent, which is actually pretty good for an opt-in program. So about 19.3 percent was the average opt-in rate.

Our exercise was could we find identifiable segments of the customer population that had meaningfully different enrollment probabilities?

The blue bars you see in this graph are segments that were based on psychographic methods provided by the utility. And just the height of the bar is the number of people in the segment, the size of a segment. So what you can see there is many of the groups, many of the psychographic groups are concentrated around the population average. It means there's not a lot of information there if you're trying to spread people out and identify segments that have very different likelihoods of enrolling.

The black bars are customer segments that we developed based on a conditional inference tree method using

those household characteristics that VISDOM computed. And, I mean, obviously what you notice is that there's a greater spread. And this is kind of a sort of proof of existence, that there is some predictive power in the customer meter data. And it appears, at least in this case, to outperform the psychographic segmentation practice of this particular utility.

So I'll just say this is preliminary. It's not published yet. It's pending publication. And there's still work to do in making this robust for out-of-sample prediction, but that's exciting to us and we're working on that.

So really the question here is putting data to work. And, you know, these programs should be designed, developed and implemented using energy data.

Here's a series of fun questions you can ask here.

So can you identify and eliminate free riders from the beginning?

So can you -- how do you identify households that are likely to save money from a program without changing their behavior or making any significant response to a program?

Can we improve cost effectiveness? And I think if we're to believe what's in that cumulative sum plot for cooling load in the San Joaquin Valley, the answer is, yes.

If for the same total acquisition costs, if you concentrated on the people who have more of the thing that you're trying to reduce, that's going to improve the yield.

We can develop more focused messaging, like I mentioned before. Maybe that increases the likelihood of enrollment in a program. And those last two taken together, you know, when programs are typically judged by a comparison of the recruitment and implementation costs versus the savings that the program yields, improving the recruitment and implementation costs, or certainly the recruitment costs, you know, can make programs that are not currently viable possibly viable.

So just -- oh, yeah, and the last thing is using customer metrics to evaluate program outcomes. So the idea here is how do you identify, how do you rigorously identify segments of households or types of households that responded particularly well or particularly poorly to a given program? And that has obvious implications for improving the next cycle of program design and enrollment.

So I'll end with, you know, where are we going?

We want to develop models for predicting program performance. You know, we have some initial evidence that consumption patterns can predict program participation and outcomes, and perhaps better than psychographic and demographic methods. And obviously, the better you can

predict the better you can target, and maybe you can have more bankable program outcomes before the program is implemented.

Our group is working on VADER, the Visualization and Analytics of DERs. So this is a project to integrate massive heterogeneous streams of data for real-time monitoring, analytics and control on the distribution side.

And the last thing, again, we're very interested in finding partners for applying the VISDOM architecture and the platform to the research needs of the state of California, utilities, and other energy service providers.

So thank you.

MR. HARVILLE: All right. Thank you. Very interesting.

So I think I'm just going to sort of open up a broad question and maybe stimulate some conversation, and then ask the dais for questions at that point.

It's already been touched on a lot, we've been talking about a lot of difference techniques. There's been machine learning thrown out there, references to the scale of storage and computational power available to us. I think of something along the lines of Amazon web services or these types of tools that are becoming available and that aren't necessarily being used on the public side of things here.

Oh, great. Thank you.

And so I think just probably I want to ask, how can modern analytic tools and techniques be applied to really get it, measuring and inferring this customer behavior? And embedded in that, I guess, is the implicit question of which tools can best do that? Because we're hearing a lot of tools. And, you know, there's a lot out there, there's a lot happening right now, and it's kind of hard to separate the wheat from the chaff. And so I was really interested -- excuse me -- really interested to hear Dr. Granderson say that she's been working on doing that.

And so I was wondering if maybe you could start us off and just what do you think are the most promising areas that will allow us to infer this customer behavior?

DR. GRANDERSON: You know, I tend to do most of my work in the commercial building sector. And so in that context when I think about customer behavior in the commercial sector, you know, does that really boil down to how we're doing controls, and how the building is really operated, and how investment decisions are made?

So, you know, in thinking about some of that I think certainly with deeper metering or some of the load disaggregation capabilities that we're seeing from emerging tools, we can do a lot of just understanding around end uses and equipment-level consumption versus best efficiencies out there. We see excellent examples in today's tools' market

for targeting and screening both capital and operational measures, looking at where things are being set back, shut off, ad overnight base load, I think you showed in you tool.

I think the picture gets more interesting if you can add additional data sources beyond AMI and the kind of weather streams that you get off a weather feed and subscription. Here is indeed a proliferation of tools out there. When we say, you know, which is the best for X, I think that's nice framing but probably doesn't match the reality of what's out there in the marketplace and emerging out of the research community. The best tool to infer or measure customer behavior, you know, probably hasn't been built yet. And versus all the options that are out there today, I think one quickly finds that depending on who the user is, whether you're a program administrator or a planner or, you know, how you're actually using the tool and the specific question you're trying to answer, it takes you to a different level of subtlety.

So I think that brings us back to thinking around what are the different application cases that we're looking to support? What's the data that we're going to need to answer the questions in those domains? And then what are the analytics that we can bring to bear to get the best answer?

MR. HARVILLE: Great. Aram, I know you all -- go

for it.

MR. SHUMAVON: Yeah. So just I'm going to probably stop getting asked to these things for the things that I'm going to say here, but I'm going to say them anyway. I think the first think I would recommend is, yes, AWS, yes, Google's app engine, those are great. I think that the state procurement process does not lend itself to answering these kinds of questions really in any way, but especially not in an efficient way. If you're worrying about, you know, your AC load associated with your server room, you've already lost the war; right?

I mean, like the distributed computing power and the pricing efficiency associated with the business models that an Amazon or a Google bring to the equation are so much further beyond the ability of the state procurement processes to handle that I would strongly encourage thinking about finding other entities to manage that, because they're just going to go use those services.

And it turns out that it's actually much easier to handle security there than it is inside an organization where you've got your own sys admins that don't actually have really the best practices for security in place and things along those lines. You completely encrypt your datasets and you limit the points of interface with it, and you've got security that is much more robust than most

organizations, no offense to the utilities in the room, including the utilities have the ability to sort of put in place now.

So I would really everybody to think about solving problems in the cloud and capturing the efficiencies of these systems that have been dealing with incredibly large and incredibly complicated datasets, by the way, that are both static and backwards looking. For example, you crawl the internet and you get a snapshot of all the websites, and then also these really dynamic usage things. So the reference to Hadoop is great. CASSANDRA (phonetic) is another example that enables processing of real-time or near-real-time data over very large datasets in ways that it's just really difficult for large bureaucracies to efficiently tackle.

MR. HARVILLE: Great. Thank you. I think we could move to the dais, Commissioners, President Picker.

COMMISSIONER MCALLISTER: So, I mean, I don't think that gets you uninvited. I think that's makes you sort of a leading thinker on some of these issues. I mean, these are exactly the sorts of approaches we need. I think many of us understand that the state is being stretched and our sort of paradigm on some of this stuff has to come into the 21st century, and that's exactly, I think, why we're here.

I guess, you know, I see -- so this were very -- this was a great panel because I think the four presentations actually really complimented each other really well. And there were data, some similar types of data to do different things. And in particular we, at the Energy Commission or at the agencies, certainly at the Energy Commission, we're interested in this sort of somewhat maybe minimalist, at least to start, you know, data foundation for forecasting, but that does have to be, you know, localized. It has to be, you know, temporal for a longitudinal analysis and trending and that kind of stuff. That's what we do. That's what forecast has to grapple with now in our modern reality.

But we also can do, you know, trending for non-forecasting related policy to design, you know, and target initiatives that maybe have the state implementer on them but aren't forecasting, per se, you know, it's all going to be related.

But then the same kind of -- I think, you know, we've heard on various panels that similar analysis can help target programs that are going to go out there and harvest. I think that's been -- I think long term that's been a difficult thing for the utilities to do, is have a program and then exclude some people from it. But, well, let's talk about like how to include the right people in a program, and

where it's not relevant let's not pay the incentive. And that's -- you know, I think that there's an appreciation of that, but we actually have the tools to now target in a very specific way and we should use that.

So, you know, these data conversations I think are relevant across many of the things that we do. So we're here to talk about the data foundation of the forecast. And I guess I'm interested in what any of you have to say about getting -- how we can efficiently, you know, state procurement aside, get data sort of mapped -- laid into the foundation in a relatively automated way and combine it with other types of data that enable us to then impose whatever methodology? You know, there's a methodology discussion for forecasting going forward that's in parallel with this discussion.

So what are the challenges to really -- you know, if we're going to have -- 15 years from now we're going to be able to look back and say, okay, we've got a 15-year dataset that we can really use to get trending solid in this or that area or this and that building sector, et cetera. How can that be done in a way that is actually manageable?

DR. PINCETL: So I think that's a multi-layered question. And if you are really interested in targeting much more precisely the sectors and the people who need to be included, I'm not sure that efficiency is the right term.

There's also I think we have to begin to bring other sectors up to greater data integration in order to be able to do those kinds of things. So one of the things we're realized is county assessor data is very different county to county. That needs to be taken care of if we're really going to be doing something systematic across the state. And ultimately it will be better for the counties, too. But they need help and support to make all of those building records look alike.

The other thing that is obvious is the utilities report their own consumption data in different ways. And so even among the MOUs, we went and presented the atlas to the SCPPA this last week. And it's a kind of organically developed set of practices, and I think it's probably fairly similar among the IOUs.

So in order to begin to be more efficient you really have to think about what the baselines of the data are that you're using. And you can't skip steps and expect to get good results.

COMMISSIONER MCALLISTER: Anybody else want to comment?

I mean, we had a workshop last year, I think, and RMU actually sort talked about data exchange protocols and sort of how to link data. I don't know if you're thinking (indiscernible) on that, but certainly Jessica, as well.

DR. GRANDERSON: I think Stephanie summarized some very good themes and pillars around what it takes to aggregate data across different resources. I mean, you have to, of course, have access and permission to acquire that data, get it into a common format across all sources and types that's going to, you know, allow for a synthesized uniform analysis across. And then being able to lay out and understand then what is your methodology for how now you're going to slice and dice that data, I think, you know, that relating to what baselines are you using?

You know, with respect to forecasting, I mean, I was trying to absorb some new information myself today around different components of what builds up that forecast. And I think some, you know, concerted kind of multiple sides of the table, data science, and bigger computation number crunching with those modelers from all sides to understand, you know, what are those current methods for the committed savings from the Codes and Standards appliances? Where are the real dangers for overlap and double counting with the new methodologies that are coming into play? And how might those be revealed in the data that we might possibly get our hands on seems to me a very important part of that puzzle when we really do talk about integrating these new sources of information to improve a forecast going forward as we strive to meet the goals that we've set forth.

COMMISSIONER MCALLISTER: Thanks.

Anybody?

MR. SHUMAVON: If I could just really quickly --

COMMISSIONER MCALLISTER: Yeah. Go ahead.

MR. SHUMAVON: -- add to that, I think when I made a reference to the one-to-one map, I really emphasize that the one-to-one map is coming. If we think big picture about what -- in Silicon Valley, you know, there's been a drive towards mobile. And people think about this in terms of the device that's in their hand because this is a mobile device, and that must -- it's all about me; right? So mobile must mean my mobile phone. It's actually an incredible device for gathering information.

And mobile really means localized, and that means geographically granular. And the entities that process the most data in the world have already moved into this incredibly geographically granular world view. And they have figured out very amazing kinds of efficiencies that they don't show us that just come to us as little snippets of joy, like when our Uber is exactly at the corner that we expected it to be at because we're pretty sure that like that's the fastest way to get to wherever we're going. And they're just looking at millions of data points and geolocating them down to within just a few feet or where these devices are.

All of that is actually happening in the home with devices already. And so I would really encourage driving towards that one-to-one map. I don't think we're ready for mapping every device in every house. But if you look at these statistical models for describing distributions of probably consumption, and you look at the very readily available public information about say building permit data for where PV systems have been installed and where energy efficiency upgrades have occurred, we are months, not years away from a one-to-one map of the entire electrical system.

And it's really important to realize that the power that that has is going to drive so much more data into the system and so much more efficiency into that, that the goal should be, not in a Big Brother sort of way, but in a how do we as policymakers utilize that level of information and driving hard towards it as soon as possible.

COMMISSIONER MCALLISTER: Thanks.

Anybody else? No? Okay.

DR. PINCETL: So I actually have a more policy-driven kind of question.

I was very surprised and struck by the adamancy of the customer privacy folks at the data-sharing proceedings of Judge Sullivan. And I think that there's a little bit of contradiction in what we're trying to do here. And I think it's -- if we can begin to think about what we want to

achieve and how in a more explicit way we will have more success.

So I do think that people don't what you interfering in their households. I actually think they don't want you telling them what appliance to turn on and what appliance to turn off, and so on and so forth. And that having smart meters allows utilities ultimately to do that; right? And in a way, if we really want to achieve the ends of SB 350, we're going to have really bear down on use, right, end use.

So there's kind of a muddle in there. Because what we're saying is, okay, folks, well, here we're going to give you the information and you're going to manage your load, and besides, we're going to give you some incentives to do so and you'll save some money. But the real goal is to, in the end, reduce energy use by this extraordinary amount. And, actually, we'd like to get into your household and figure out what you're doing in order to be able to target those programs.

And so I think that in that mix there's a very precarious set of conditions that the more we're explicit about with the public and the more they're engaged in the mission, the less people will be resentful and question the mission.

And I raise this because I think it's actually

fairly significant. And we really need to think about the messaging in a very, very, very careful manner. And it's not just better incentives and better understanding of what drives people do things. It's bigger than that.

COMMISSIONER MCALLISTER: Yeah, thanks. I mean, we're getting a little bit into the policy area, apart from data. I mean, I think, you know, maybe that's really a question for another day, how we utilize this data and how intrusive we're going to be and how -- you know, are we going to have to move towards mandatory at some level in terms of, you know, if people aren't doing it voluntarily, what does that look for a given local government? You know, maybe they want to go further, who knows?

MR. SHUMAVON: Can I just really briefly, on the mandatory versus opt-in or whatever it may be, if you just look at the number of green button data requests for PV systems out there, it's pretty amazing. I think it varies by solar company, but most of them are in that sort of 25 percent PV system to green button request rate. Those are active, I would like you to have my information to figure out how to save me money, requests where they have willingly turned over their data.

So just with the right incentive, I think you will have people standing up and saying, yes, to pretty large percentages of penetrations, certainly enough to do the

statistical work that --

COMMISSIONER MCALLISTER: Interesting. So I've kind of kept away from that particular thing, but I personally think that one of the -- you know, for today, because this is not exactly what we were talking about, but personally I think that third parties that -- you know, it's not necessarily the agencies, the utilities who are going to figure out what it is that people actually want to buy, and somebody's got to do that and they need data to do that.

So a corollary to all we've been talking today is how did those folks get their hands on this data? And, you know, the paradigm right now is just as you said, somebody pushes their button and sends it to them. But, you know, what is that going to look like going forward? I don't think we know.

So anything else? I think we're wrapping up here?

CHAIR WEISENMILLER: Yeah.

COMMISSIONER MCALLISTER: Great. Okay. So we're a little bit ahead of schedule now. I think public comment was scheduled for 4:00, but let's go ahead and do it.

Let's see, does Heather want to manage this or -- okay.

In any case, anybody in the room, let's just start with folks in the room. We don't have any blue cards up

here. I'm not sure we told people they need to fill them out. But does anybody want to make a comment, a public comment in the room? It doesn't seem like it. Long day. We're all ready to go home.

Let's see, do we have folks -- nobody online? Nobody on the phone?

MS. RAITT: Nobody on WebEx. We can go ahead and open the phone lines --

COMMISSIONER MCALLISTER: Okay. Great.

MS. RAITT: -- just to make sure.

MR. UHLER: I would like to make a comment.

COMMISSIONER MCALLISTER: Oh, great. Go ahead.

MR. UHLER: Am I the only one or am I clocked?

COMMISSIONER MCALLISTER: I think you are, yes. Go ahead. And let us know who you are.

MR. UHLER: My name is Steve Uhler, that's U-H-L -- my name is Steve Uhler, that's U-H-L-E-R. I'm calling you from the county in the state of California with the largest increase in carbon footprint for electrical generation. So I have a real big interested in seeing if you can help reduce that.

Now there are some things that I've tried myself, like using QFER, but I find the data is inconsistent and inaccurate. And if I go over to the ARB, and particularly we'll take one site which would be McCullen (phonetic) here,

a generating plant, ARB doesn't have any data after 2010. And I'm really looking at the situation of don't even think about using Amazon web service if you can't even get QFER or get a list of power plants that is complete.

I thought I would go over to the docket, because that seems official, to find -- to correlate the data, but the docket doesn't use the Energy Commission ID. So you need to do a lot of work on some of the basics there.

Now I don't know, you know, when Jerry Brown was governor before, he had an Office of Appropriate Technology. That should be able to cut some -- you know, if you were to reintroduce that or kick that back in or some sort of skunk work, you could get around, let's see, what was that, around the notion that the government can't handle using Amazon web technology or services without going through a third party.

I'm here in town. The County is Sacramento that is the highest increase. I know some people at the Energy Commission. I'd be glad to come out and point out a few things. 600 million records, that's pretty easy. I've got a little machine right here that can crunch that. It doesn't take a big machine. And we've got terabytes of spaces on hard drives easily purchased. I would be glad to show a few techniques.

I have a website, www.mpd.com. You can go look at a blending of CAISO stuff which is some pretty good stuff.

They had a pretty good week last week, some of the lowest carbon in our electricity within that system. I wish I had that kind of electricity here in Sacramento, but there's some stuff to look at.

I have another site, ugemrp.com. And you can go browse through and you can go look week by week and see if we're doing anything.

Each of these sites will enter you through with -- when you first look at it, because I guess some people at the Energy Commission can't even look at -- don't even have HTML 5 browsers, but there's a little bit of instruction. But once you get in I think you'll find some stuff. You'll be able to measure what we're doing and where we're at. And there's some folks there at the Commission who know me, and I'd be glad to help out. We could move this forward and save the taxpayers quite a bit of money.

Thank you.

COMMISSIONER MCALLISTER: Thank you.

Anybody else? That's it? All right.

Well, I want to thank -- should be make final comments here? Yeah.

So I think I've gotten a lot of my questions answered. And I think we've started a really good conversation here. And I really hope we can get it going and continue to collaborate with the all the agencies who

are the dais, I think most importantly the CEC and the PUC, to really keep both hands doing -- sort of both hands coordinated.

I want to thank Commissioners Peterman and President Picker for coming and sharing this time with us.

And I'll pass off to comments from the Chair.

CHAIR WEISENMILLER: Again, I'd like to thank everyone who participated in today's workshop. I think it's a good start. And looking forward to written comments later on this topic. I'm sure Heather will remind people when they are due.

MS. RAITT: They're due July 25th.

CHAIR WEISENMILLER: Like I said, this is the start of a series of workshops or discussions on this topic. So again, thanks.

Carla?

COMMISSIONER PETERMAN: Hello. This is Commissioner Peterman with the CPUC.

Thank you very much for the workshop. I agree, it was a good start. I think today's discussion laid out well a number of the questions that we have to answer as we move forward to implement AB 802, SB 350. I'm looking forward over the course of the summer to getting some more answers, and particularly I'm looking forward to your comments on how we can better utilize data in order to help us answer some

of these questions regarding what is the doubling, how to define cost effectiveness, et cetera. So thank you, Chair Weisenmiller and Commissioner McAllister for the opportunity to participate. Thanks.

PRESIDENT PICKER: Thank you. And I'll just add to my colleagues comments and say that I'm looking forward to further meetings through the summer where we dig into these questions even deeper.

COMMISSIONER MCALLISTER: We are adjourned. Thanks everyone.

(Whereupon the IEPR Joint Agency Workshop on Energy Demand Forecast and Doubling of Energy Efficiency, Data and Analytics Needs, adjourned at 4:02 p.m.)

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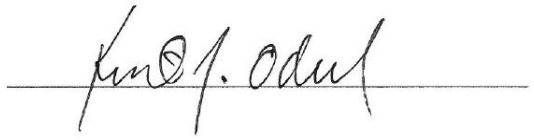

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July 20, 2016