BEFORE THE

CALIFORNIA ENERGY COMMISSION

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| In the Matter of: | ) | Docket No. 14-BSTD-01 |
| | ) | |
| 2016 Title 24, Part 6, | ) | |
| Building Energy Efficiency | ) | RE: 2016 Building Energy |
| Standards Update | ) | Efficiency Standards |



# LEAD COMMISSIONER WORKSHOP
## UPDATE OF TIME DEPENDENT VALUATION AND LIFE CYCLE COST METHODOLOGY

CALIFORNIA ENERGY COMMISSION
HEARING ROOM A, 1516 NINTH STREET
SACRAMENTO, CALIFORNIA

WEDNESDAY, July 9, 2014
9:00 A.M.

Reported by:
Peter Petty

## APPEARANCES

Commissioner Present

Andrew McAllister, Energy Efficiency Lead Commissioner
Pat Saxton, His Advisor
Robert Weisenmiller, Chair

Staff Present

Joseph M. Loyer
Mazi Shirakh

Consultants

Eric Cutter, E3
Brian Hori, E3

Also Present (*Via WebEx)

Robert Raymer, CBIA
Randall Higa, Southern California Edison
Matthew Plummer, PG&E
Marshall Hunt, PG&E
Michael Day, Beutler Energy Services
Jon McHugh, McHugh Energy
*George Nesbitt, HERS Rater

# I N D E X

P R O C E E D I N G S

JULY 9, 2014 9:10 a.m.

MR. LOYER: Good morning, I'm Joe Loyer. Welcome to the California Energy Commission. First and foremost, we have a few housekeeping items before we begin. We are recording this conference, we have both a recording on the WebEx and we have a Court Reporter here. If you're going to comment, please give the Court Reporter a card or the spelling of your name.

For those of you who are not familiar with the building, the closest restrooms are located just outside the doors here on the left, the snack bar is on the second floor under the white awning, well, mostly white awning. Lastly, in the event of an emergency and the building is evacuated, please stay out of my way, I'll go first, and you can follow the rest of our employees over to the park over here and we will convene over at the Roosevelt Park located diagonally across the street from this building. Please proceed quietly, calmly and, again, follow the employees with whom you are meeting and safely exit the building.

We're going to go quickly, as we do have

a bit of a time crunch. I'm going to do a basic introduction here. We will then talk about the background of Lifecycle Cost Analysis and Time Dependent Valuation. Then we will have E3 do their presentation on the new TDV for 2016. And then we will have response to comments. We did receive one comment letter from PG&E and they are here to give voice to that comment.

So with that, I'm going to go to Commissioner McAllister. Do you have anything you'd like to say before we get going?

COMMISSIONER MCALLISTER: Yes. Thank you, Joe. And thanks everybody for coming. You know, this is a highly specialized discussion. I think of TDV as sort of the most important, least understood item, I think, one of them at least in State Energy Policy. It is important, it is foundational work, it is kind of where the actual electricity grid that we have in the state today and all of the investments that have been made on it kind of where the rubber hits the road for our Clean Energy Policies in many many ways. So how we value energy for a variety of purposes is highly technical and necessarily reductive. We were talking about this a little bit before the

session where, you know, you're reducing a lot of stuff to one number, or to a few numbers, you know, 8760 numbers maybe, but still it's reductive in a way that belies, I think, its complexity. But it is really important to get it as close to right as we can because these numbers carry through to may locales, in particular how we value Building Standards and Appliance Standards, and future energy savings, but a variety of other things, as well.

One point I want to make today is that the PV valuation is not part of our analysis this year, there's a record still being developed on that, it's actually got a lot to do with both Commissions here at the Energy Commission, but even more so over at the Public Utilities Commission. There's a lot of discussion about the sort of net metering 2.0 and where you draw the boundaries around DG, generally. So that's something that will happen at a future date, but it's not part of this analysis for this TDV update.

But the play by play here is extensive and we're coming to the latter stages of it, and I want to just thank staff, Joe, for leading, and

I know E3 has been doing a lot of work on this, and all the stakeholders including the utilities and others. It's actually -- for us policy wonks, it's actually very exciting work. I know that's kind of sad to say, but it is something that is extremely relevant in California given all the policies that we're trying to implement and the technologies that are coming about, the business models and just the morphing of the electric system sort of as we watch it sort of in very tight cycles these days. So TDV is kind of near the middle of that discussion, or those discussions, and it's an important item. So I'm happy to be here and really thankful of all the work that's gone into this, and certainly encourage all the participation that people can muster on it. And I'll acknowledge my Advisor, Pat Saxton, is to my left here, who has also been very engaged on this with staff. And I'll pass it to the Chair for any comments he would like to make.

CHAIRMAN WEISENMILLER: I'd like to again thank the staff for their work on this, thank everyone for their participation. Looking at the overall arc of the Energy Commission, we've been

doing Building Standards since ’78, at least Bill Pennington and I were around at least on Day One in these things, and we’re going to continue doing those roughly every three years. We have implemented one round now, as of July 1st, we’re now working on the next round for 2016. And as Andrew has said, or Commissioner McAllister, at this point we’re really trying to go through this process, get these cleaned up, move on to the 2016, and clear the ground to start thinking about 2019 and Zero Net Energy. And so I know that’s going to be a big issue in that 2016-2019 period. Obviously the basic message is we’re not really going to dig into that today, a lot of the issues. I think this is a marvelous tool. I think a very clear direction for the Legislature is that our Standards have to be cost-effective on lifecycle basis, you know, and we’ve always strived for that. And having said that, this is our tool to make that determination.

As someone who has done these sorts of forecasts of value of power for decades, I can say if you do it long enough you acquire some humility in terms of there’s a very wide range of uncertainty, particular the people doing it love

to dig into the nits and stuff, but the bottom line is there's a lot of uncertainly. Certainly when you look back on it, you're always going to find the forecast is never correct. But I think these results seem to be fairly robust, it's not like we're at a situation where, you know, a whole bunch of things in the Standards are going to live or die, depending on exactly what we do on going about say, okay, should we be using effective load carrying capacity. Nothing is going to live or die on that; obviously we all as analysts have pride in our work and are trying to get that just right, but at some point it's going to be important just to move on, you know, and make sure that we've got -- I think we're certainly both committed for the 2016 to have a smoother rollout going forward, you know, training packages, everything much more placed timely, and certainly not to go through a delay. So again, part of this process is let's make sure it's good enough, let's move on, but let's make sure we get the pieces in place for a very smooth rollout in 2016. Certainly, thanks for your participation today.

MR. LOYER: Thank you, Commissioners.

This is Joe Loyer again. I'd like to remind everybody that these presentations that you'll be seeing will be available online under the appropriate website at the Energy Commission. We have there now the TDV that we are presenting today, hopefully for accepting, I remind everybody again that we are not actually adopting the TDV at this workshop, we are simply presenting it in its final form, and more or less closing the door on TDV and moving forward. It is a foundational document, it is foundational to the standards, it's what we use to determine cost-effectiveness.

So with that, I'm going to jump straight into hopefully the right presentation here. Yeah, very good. Okay, this is just essentially a background on where we are in our 2016 Update process. We have a quick discussion of Authorities and Standards Update Policy Drivers, and the Standards Update Process, 2016 Standards Update Schedule, and the Lifecycle Costing and Time Dependent Valuation. We get our authority from the Public Resources Code, this is the Warren-Alquist Act, essentially, and we can see here that we have Residential and Nonresidential

Building Standards since about 1978 and updated every three to four years thereafter. The Standards are required to be cost-effective, they include both mandatory and proscriptive requirements, as well as a performance approach. The Standards are always developed in an open public process which is part of that process, we are currently in the pre-rulemaking phase.

We have policy drivers from the Governor, so the latest one being the Governor's Clean Energy Jobs Plan, the Zero Net Energy Residential by 2020 and Nonresidential by 2030, the CARB Climate Change Scoping Plan, the California Long Term Energy Efficiency Strategic Plan, as well as others.

We are currently, as I said, in the pre-rulemaking phase. We've had stakeholder meetings. Right now I have highlighted here in yellow that we are in staff workshops, Draft Standards; that is, we are currently having other workshops, as well as this TDV Workshop. Eventually we will get to the formal rulemaking where we will have 45-day language, 15-day language, and an adoption. This is our current schedule right now, you can see that we started

in April, early in April. We are in the May to August timeframe as is highlighted here with Public Workshops. We plan to be finished with an effective date on January 1, 2017, but we will be adopting these standards after the 15-day language has had its 15 days at the May 2015 Business Meeting.

This is the Schedule of Workshops. You can see that July 9th we are here in Hearing Room A doing the TDV LCC Workshop, we have approximately three workshops left which we should wrap up in early August. The Standards and Measures, using lifecycle cost analysis, we use a discounted cash flow for costs and benefits, it accounts for maintenance and cost benefits, appropriate discount rates, we use three percent. We use 30 years for residential, 15 years for nonresidential. The Time Dependent Valuation is a value hour by hour of propane, natural gas, and electricity as it changes during the day, during the seasons. There are 8,760 TDV multipliers for each hour, one for each hour of the year, and the TDV actually favors saving energy during high demand periods.

And that is all for that. That didn't

take very long, did it? Moving right along into the background for the LCC, so why the Energy Commission uses least cost method, and what we did in the least cost method before TDV, adding TDV, and how TDV is developed, and the basic changes from 2005 to 2013. This again is the Warren-Alquist Act. The TDV is actually fairly simple, or the Life Cycle Cost is fairly simple. It is weighing costs to benefits, that's the whole approach. It is very simple, but in concept anyway. And this is done based on the life of the building, or the life of the measure.

Now, the annual least cost method, basically this was a fairly simple approach. We looked at the change and initial cost of the construction. We took the present value of electricity, cost savings, and the present value of gas savings, and balanced them against each other. We used the three percent discount rate, lifecycles were placed at 15 and 30 years.

The benefits with this, this was a simple multiplier for savings. We ended up with six multipliers, three for electricity, and three for natural gas. And at some point we actually folded in propane as well. This was sufficient

to show the measures under consideration were cost-effective. The benefits for TDV was that it started to account for seasonal and time of use differences. So this is based on a time series of hourly present values for electricity, natural gas, and propane. So for each hour of the year, 8,760 hours, we had a value of that hour. And we used those for residential, nonresidential, for all 16 Climate Zones, so that as 8,760 hours times 16.

The electricity TDV series, we have natural gas forecasts, we use a transmission distribution cost, emission cost, ancillary service, and peak capacity cost, revenue neutrality adjustments, fixed costs. For the natural gas, we use the natural gas retail rate forecast. And for propane, we use the Department of Energy Propane Retail Forecast.

The basic changes from 2005, when we initially developed the TDV and implemented it, from the 2008 update, we used the 1999 Power Exchange Day Ahead market prices, consideration of avoided customer outages, consideration of adverse impacts on customers when demand response is operated. And for 2013, we had correlating

weather and load. We used the long term market price and included renewables, the high retail rate forecast, and the statewide retail rate adjustment.

And I know I went through that quickly, but we wanted to actually get to the meat of this discussion, which is the 2016 TDV. So with that, gentlemen, are we ready to take over?

MR. CUTTER: Yes. Oh, alright, I don't need to push. Okay, this is Eric Cutter from E3, I'm sitting next to Brian Hori. We've been working on the TDV Updates for this 2016 cycle with Joe and the CEC Team. I'm going to run through these slides, which are largely an update from what we presented in April, and I think I'll go through them fairly quickly, but not too fast, and we'll leave plenty of time for questions at the end. I have six buttons to choose from. There we go. Well, the slider works, okay.

So starting off with several introductory slides to give the overview, the high level updates from the 2013 TDV update process are when the 2016 updates is relying on several inputs and outputs from the Integrated Energy Policy Report that came available in January and this is a bit

of a departure from 2013 where we relied on a variety of sources, so it's nice that a lot of the inputs are lining up right down the middle with IEPR mid case in all respects. That includes the marginal cost of energy which is coming from production simulation runs, before and for the IEPR. Two other major updates since 2013, and we'll go through this in more detail, incorporating the effective load carrying capability which decreases the capacity value over time for PV is one effect, and shifts the value to later in the evening. And we've updated the TND marginal costs. So this was also presented in April. The changes since the April workshop are, since then, the CEC Cost of Generation Report was published and we've included the updated costs of a combustion turbine which go into the TDV calculations for the generation capacity value. With that, we've changed the financing assumptions from what were presented in April, and added costs for $NO_x$ for gas and propane, which is a fairly minor impact. And then finally, this is just an accounting convention, really is calculating a value for the RPS Center, which was really already included in

the TDV, but this makes all the components of the calculation line up nicely with the avoided costs that are published at the CPUC so we can have a more direct comparison.

And this slide sends you to a reference if you want to dig into an awful lot of those updates since 2013 are documented in the Net Energy Metering Report produced by E3 for the CPUC, it's on both our website and the CPUC website, and all the details relevant here are in Appendix C, which documents all the avoided cost assumptions.

So to skip to the answer first, the next few charts show the net present value, dollars per therm, TDVs for natural gas and for electricity, and how they've changed from 2008 to 2013, and you'll notice here what stands out, and we'll describe why the 30-year residential is slightly higher and the nonresidential are slightly lower than they were in 2013. And the same goes for electricity.

So we're starting off with natural gas and propane because really, 1) there's been no updates except the addition of the $NO_x$ cost since the April workshop, so these are the same as were

presented before. One thing that stood out is the CEC Natural Gas Forecast from the IEPR shown here on the graph in the lower red line, is a fair amount lower than what we've seen in the past, and so you can see the 2011 forecast, and we're presenting here not in annual terms, but in the years out from today because that's really how it impacts the calculations of a net present value for the TDV, so you can see the escalation from the first year to the 30th year in 2011, it was much higher than it is in the 2013 IEPR. So that is one of the reasons you're seeing lower values for the natural gas and for electricity, particularly in the nonresidential sector.

And here show the rate forecasts for natural gas. We're using Climate Zone 12 as a representative case, but it's really consistent across all the climate zones. And one thing you can note here, the blue line is the residential rate forecast and you can see it starts out a little lower. The solid line is 2016 and the dotted lines are 2013. They start out a little lower and end up a little higher, but the rate forecast kind of lines up fairly well with the 2013, whereas for nonresidential which is in the

gold, you can see, is lower throughout the entire forecast. So that's the second reason, and this is also seen in electricity why the nonresidential results are lower than 2013, whereas the residential remain a little bit higher.

The bottom graph shows, again, the dotted lines, the 2013, and the solid lines for 2016 for the residential 30-year, nonresidential, and 15-year nonresidential, as the shape over the season for the course of the year.

Propane is a fairly similar story. The rate forecasts in this case are both lower than before with a drop in natural gas prices, and you can see in the bottom graph all of the TDVs, the shapes are the same, but they're all lower than in 2013.

So that's it for natural gas and propane. We'll move on to electricity which, of course, is quite a bit more involved. Here on slide 12 we see the similar story for the rate forecast, the blue line shows that the residential rate forecast from the 2013 IEPR in this case starts out higher and ends up a little lower, but is overall a little bit higher than the 2013,

whereas the nonresidential is lower. And a number of the other updates mentioned on here we'll go through on the rest of the slide deck.

To give you a sense of how the TDs look over the course of a year, these are the hourly TDVs, 8,760, and you can see there are quite a number of spikes that are driven primarily by the allocation of generation capacity value and TND capacity value to those peak values of the year. Looking at a more average representation over 24 hours on average over the year, again, you can see during the afternoon the light blue is the TND capacity allocation, then the purple is the system generation capacity allocation, and we'll explain later the double hump there, but this gives you a sense of the perspective of how the different components contribute to the overall TDVs.

So in looking at these next couple slides, so the allocation of energy capacity and TND, so here is the hourly energy component, so the dollars per megawatt hour cost for wholesale generation of electricity, and you can see it's lower in the early morning, lower in the spring, and higher in the afternoon and in the summer.

You see the months are the vertical across the left vertical axis, and the hours of the day across the bottom. Much more pronounced are when we look at the generation capacity allocated to the afternoon hours and to the summer months, again, we'll explain the double peak in a little bit. And the TND capacity is a bit more homogenous so you can see a big allocation. This is for Climate Zone 12, it's going to look a little different by Climate Zone, but generally it follows this shape.

One of the bigger updates has been moving from an allocation strictly on the top load hours to an effective load carrying capability to allocate this cost of generation capacity. This is again documented in the Net Energy Metering Report. I'll jump to the next slide, but really the impact is as we see increasing penetrations of renewables, but predominantly solar, that is shifting as you get more and more solar on the system you're shifting the net load peak to later in the afternoon, and thus the incremental –you can see a few effects -- the incremental value of adding new solar capacity for system generation declines as you get more and more PV on the

system, and you're shifting the peak load to later in the day eventually when solar is generating less or not generating at all.

MR. HORI: Eric, if you could go back to that slide. I think it's also worth pointing out that, while this slide is focused on solar because that was one of the drivers for ELCC, when we think about the impacts for the TDVs, what that's really demonstrating to us is, if you think about something like commercial HVAC that has a consumption pattern that's pretty much summer, mid-day, similar to the solar here, or I guess I could just say mid-day, similar to the solar, there's a high cost to providing HVAC now because of that coincidence with that afternoon peak. As we get more penetration of renewables, the peak you can actually see from that first chart on the left shifting later in the day as those renewables are essentially eating away the peak and shifting the peak later. That's going to mean that when you're looking at something like commercial HVAC, the cost of providing that HVAC is actually changing now, it's not as expensive in the future because it's not as coincident with your system peak anymore. And so

that's one of the things that we're seeing in the new TDVs as we look at how generation capacity is shifting later in the day, and actually even shifting to other months we see a change in the capacity value and change in the capacity cost.

COMMISSIONER MCALLISTER: Can you just expand on that a little bit? I mean, from this graph and this Climate Zone, it looks like not only is it shifting later, but it's also going down just a touch. And that makes some sense intuitively. But also, you do have thermal inertia in buildings and, you know, you do need HVAC later in the evening after the sun is no longer producing, so I'm kind of wondering where now those loads for commercial HVAC, for example, if the peak is later and you're still using your HVAC to cool a building after the main sun hours, so how that lines up.

Mr. HORI: Right. I mean, you still will have, we'll see later, that HVAC still is sort of the most expensive resource when compared to something like lighting or compared to other sort of measures. I'm just sort of pointing out that we're seeing this shift. So if you had, let's say maybe it's a building orientation such that

it actually had your cooling demands actually drop off more, maybe because of the window orientation or the nature of the thermal mass in the building, then you would see changes for that building that you wouldn't see under the sort of current TDVs that don't reflect this change.

CHAIRMAN WEISENMILLER: Because normally you're looking at it from a societal perspective as opposed to an individual customer, unless you're assuming the rates actually reflect actual prices, well, actual value.

MR. HORI: Right. When we're looking at an individual building, when they're trying to do that trade-off between let's say, you know, building orientation, window, then you actually are doing that analysis on a building by building sort of a customer specific level, so I think that's where you would see this.

CHAIRMAN WEISENMILLER: But again, your economics is based upon societal as opposed to retail rates. Right?

MR. HORI: Well, it's interesting, it really is a hybrid --

CHAIRMAN WEISENMILLER: Okay.

MR. HORI: -- so we start out with the

societal costs as the main -- which is what Eric has been showing, but then I don't know if Eric mentioned, but in that graph we also do have that little retail rate adder that we add on, so we get it up there to be consistent with the Warren-Alquist of consumer perspective.

CHAIRMAN WEISENMILLER: Okay. But do you differentiate between the adder because commercial and residential?

MR. HORI: Yes, we have different adders.

CHAIRMAN WEISENMILLER: Okay, good.

COMMISSIONER ANDREW: That's good. I mean, I guess it's worth pointing out, maybe this is self-evident, but just to put some finer point on the Chair's observation here that TDV is about the societal value, and we disaggregate it in ways that we have the kinds of information that will let us make it geographically specific for society, right? But the weight making that is actually the true representation of the cost of energy to the customer, and the TDV societal value for all sorts of reasons that we don't need to go into, don't always match up. And so that's a bit of a challenge for sort of making sure that the societal and the policy drivers here are

translated in a way that's faithful over to the customer and it's a challenging difficult thing to do, but we're talking about here the societal value and that's what TDV is meant to communicate.

CHAIRMAN WEISENMILLER: Yeah, I mean, I don't think I've ever seen a case where the marginal costs actually match revenue requirement without some scale up or down.

MR. HORI: And thankfully, if you look at this chart, the retail rate adjustment, you know, it's fairly significant, but you know, it's not more than half of the total TDV value. And you'll see that it's not sort of suppressing the time value of the underlying of what it costs.

CHAIRMAN WEISENMILLER: Uh-huh.

MR. CUTTER: So another way to look at this graph is all the components from the top down are the societal value that you're speaking of, and then the last component there on the bottom, the rate adjustment, is putting those through the utility rate, making process to represent the total cost from a customer perspective.

CHAIRMAN WEISENMILLER: Yeah, again, it's

like the scaling factor when you're doing rate design.

MR. CUTTER: Yeah.

COMMISSIONER MCALLISTER: Is that a truly straight line on top of the light blue at the bottom? Or has that got an hourly component? It's kind of hard for me to tell.

MR. HORI: The rate adjustment is a truly straight line, as is the RPS --

COMMISSIONER MCALLISTER: Yeah, so that's re-scaler.

MR. HORI: Okay, coming back to ELCC, I think we've covered, we've talked about this. So this shows a little bit of the impact we were just talking about. The top chart is showing the ELCC, so the updated methodology, but for 2013, and it looks very similar to what we're used to, so we're showing the allocation of capacity across hours of the day for three summer months, July, August and September, and you can see, you get a little bit in July, but most of the value is in August and September and it's concentrated at the afternoon of hour ended 15:00. If we look forward to 2020, after we've added a bunch of renewables and, again, most specifically PV

generation, and this includes both solar generation utility scale and solar generation behind the customer meter, some distributed generation, here is where you see the impact of the net load peak has shifted to later in the day and to later in the year, so when the sun is shining more in July and August, we're having a bit less of the allocation of the capacity value in September, you're seeing a higher allocation, and in particular a higher allocation in the evening hour of hour ending 19:00 after the solar is no longer generating, but you still have pronounced cooling load that you were mentioning in the late evening. And so this shows how the TDVs will now place more value than before on load or load reductions in the later evening hours than in the early afternoon hours from the prior methodology.

Another underlying factor for where the value is being allocated are we're using the TMY, Typical Meteorological Year Weather Files and all the loads that are used to generate the energy prices and the net loads that are used for allocating the capacity value are driven in large part, that is the shape over the year, are driven

in large part by these TMY Weather Files, and you can see the peaks for these weather files are also occurring. It varies a little bit across climate zone, but in the Oakland, Los Angeles, Fresno, and Riverside, actually Oakland and Los Angeles and Riverside, it's really August/September is where you've seen the highest temperatures in Fresno and Sunnyvale, maybe it's a little earlier in August and July. But we see for a number of the Climate Zones the peaks are a little bit later in the year from the Weather Files than we might have seen earlier. So we're seeing more value in August and September than maybe we saw before in July and August.

CHAIRMAN WEISENMILLER: Okay, what is the time period for the Weather Files? Obviously our climate is being disrupted, so just trying to figure out how many years back the Weather Files are averaging.

MR. HORI: That's a good question.

MR. CUTTER: I wonder if anyone in the audience knows that. I think it looks at -- what is it -- 30 years of climatological data to come up with these, and it was recently updated, I believe in 2010, to these new files. But I'm not

sure exactly what the timing --

CHAIRMAN WEISENMILLER: What we found on the demand forecasts is we used to do like 50 years, and in fact we've scaled it back to 30, better match with the utilities data and also better with patterns, but certainly thinking of climate disruption, then why you would look at 50 as opposed to 30 is because 30 is more representative of what we're looking at over the next 30 years.

MR. HORI: And one of the reasons we're showing these charts is it really just surprised us to have so much of the weight being shifted to September, and we just wanted to show people that a lot of that is just because the new Weather Files are just showing much hotter weather in September.

MR. SHIRAKH: This is Mazi. We did update the weather files in 2010. I don't know exactly the years that were covered, but the two things that happened was, you know, we switched to the Weather Files, and then in certain Climate Zones we actually changed the City where the station where we considered it to be like, for instance, I think Climate Zone 16 went from

Shasta to Blue Canyon, so that also had an impact on the shape of the load. But Martha Brook would know in more detail, I can find out the time period that was covered. We can clear that up.

CHAIRMAN WEISENMILLER: That would be good.

MR. CUTTER: Okay, I'll keep going. So this is showing more on an average level the temperature effects, and you can see some of the differences between climate zones and, as we were just mentioning, there's a general shift with the update to both later in the year and a little bit later in the afternoon. And you can see what these are also showing is how the temperature from the Weather Files is changing between July and September, and you can see it most pronounced in Riverside where we're seeing a peak in July, but a higher peak in September. And

MR. HORI: Well, I think also on that is just the fact that those higher temperatures seem to be persisting longer into the evening than July, and that's another thing that's driving that later September peak.

MR. SHIRAKH: So the years go through 2008, and the beginning year was 1979 to 2008 is

the time period.

CHAIRMAN WEISENMILLER: That's good, a relatively short.

MR. CUTTER: Okay, so really where this shows up, and now we'll show you the double-peak, is we're seeing the current ones on top were all fairly even throughout the months, and so we had a single peak. What's happening with both the ELCC and the Weather Files is this first peak in the bottom, so this is the current in the red, is showing a double peak, is two factors, 1) you are having a peak in September, right, so this is showing the average over the year, so that later peak in the hour ending 18:00 to 19:00 is coming from the September months when we're having our peak net load in the evening, and the peak in the hour ending 15:00 is coming from probably the July months. So when we average this over the course of the year and over the course of three years, we end up with this kind of funny looking double peak, but it's because we're aggregating the impacts over several months.

MR. RAYMER: Can I ask a question about that?

CHAIRMAN WEISENMILLER: Yeah. Just

identify yourself on the microphone.

MR. RAYMER: Bob Raymer with CBIA. I understand the double peak, but if you look at 5:00, you've got a very pronounced dip and as drops go, that's very pronounced. Why is it such a large drop for that effectively 60-minute period? Are people in their cars headed home, or…?

MR. CUTTER: So this is seasonal in that you never have a month -- there's no month where you have a peak hour ending 5:00 or 15:00, but we have a month of August here where we have a pronounced peak at 15:00 and we have a month of September where we have a pronounced peak at 19:00. And so it's really showing that we have two months with two different peaks, but we never have a peak in any month an hour ending five. So it's a little misleading to show this as one graph because it's not like we're saying in any particular day, but it's just that at no given time in doing this you found one right at, you know, hour 17:00.

MR. HORI: Eric, if you can go back a couple slides where we show the monthly.

MR. RAYMER: I mean, it's very

interesting.

MR. HORI: I mean, if you look at the bottom chart there, as Eric was saying, you have the blue and the red for July and August, which are causing really that first early peak, and then September, you know, you do actually see a little bit of a drop there at 5:00 for the September shape, and part of that could just be, you know, just a data sampling because this is a probabilistic analysis and so that kind of small drop, you know, I think is partly explained by just data issues. But if you look at this, it certainly looks reasonable. It's just I think when you combine the different months together, that it looks like a very dramatic nonsensical drop.

MR. RAYMER: Thanks.

MR. HORI: Sure.

COMISSIONER MCALLISTER: Just to sort of try to understand and maybe explain, that's not a traditional load shape where you're seeing this incredible discontinuity of behavior between those two hours, right? This is a sweep of a marginal effect across all months that sort of ends up producing that graph. Is that a fair way

of --

MR. HORI: It's aggregating not even over just the months, it's aggregating over the 30 years.

CHAIRMAN WEISENMILLER: Yeah, right. And what you also see is an exponential function, so it would tend to be more volatile than you might think of in some ways of varying capacity. But again, it's supposed to be a better metric to reflect the actual risk.

MR. CUTTER: Right, yeah. There is no particular day that we expect to see this load shape, it's a function of aggregating this up across years, seasons, and months. Here we go, okay. The next several slides are I think best for reference, but what we're showing is this double peak in the gold is the 2016, and then the blue is the old 2013, so the 2013 is without ELCC, and 2016 is with ELCC. We're comforted by the fact that the shapes are largely the same and they're largely in the same range of magnitude, and you see this double peak persisting in most climate zones, but it's not leading to anything that is way out of whack from what we saw before, and certainly on an average basis, even when we

look at individual climate zones. So you can see the shape is a little higher, a little lower for some climate zones than others, but it's pretty consistent across all the climate zones we looked at.

COMMISSIONER MCALLISTER: So this is a snapshot of the analysis, this is a specific analysis that results in this kind of dip in the late afternoon. If and when, say, temperatures continue to evolve in the direction that we all think they're evolving, I guess what would you expected to happen? Would this curve kind of be likely to even out over time as the peak kind of gets pushed further back in additional months and not just September? Or, you know, I'm going to ask you to speculate on that a little bit. Over time, you'd expect, since months are attached, you know, one ends and the next begins, and you get these average effects, you'd kind of expect it to be a smoother curve over time, but I guess I'm wondering if that's just not necessarily what we would expect.

MR. HORI: Yeah, I would be hesitate to hazard a guess, given how complex the modeling and the meteorology is behind the temperature

forecast about how it would change the shape over months and over hours of the day. And if we're expecting higher temperatures in the afternoon, I think largely we would expect to see the peak increase, so it might be getting more peaking, as it were, but with reference to the double peak, I'm not sure how we might hazard a guess on that one.

CHAIRMAN WEISENMILLER: Yeah, but I think the basic message is our climate is changing and, you know, that we're certainly going to more extreme cases, and at this point, again, I have no clue whether one and 10 weather is a historical pattern, or whether it's going to be much much worse, and that's certainly a long term question. But again, I think the expectation is climate on steroids, much more extremes.

COMMISSIONER MCALLISTER: Well, I'm kind of thinking or wondering if this latter peak is sort of like the canary, you know, a little bit of effect, you know, this latter peak is going to start growing and multiplying and sort of subsume the earlier one. But who knows?

MR. HORI: Yeah. And I think that is a good sort of question, observation, because I

think what's important from these charts really is more the latter peak than the dip. The dip could be somewhat sort of a data issue, but I think the shifting to the later peak is a real effect that we're going to see continue and probably multiply.

MR. CUTTER: Uh-huh, and again that's driven both by the Weather Files and by the penetration of the solar on the system.

MR. HORI: Okay, so this chart, we just wanted to show how the numbers have changed since the April workshop for those who were here in the April workshop, and if you look at the chart you probably can't even see it, I mean, it's such a small change, which is comforting, although we have done updates, they really haven't changed things dramatically, I mean, hardly noticeably at all.

MR. CUTTER: I think we're getting towards the end, but what we are showing here are the impacts of the TDV across different load shapes for building efficiency measures. And this is comparing the 2013 in blue with the 2016 in gold. The primary effect with more of the capacity allocation being a little bit -- we're seeing the

value for the space cooling going up, but the value across the board is predominantly a little higher. And remember again for the Res 30-year, the TDVs were slightly higher overall than in 2013, it's most pronounced in the cooling, the space cooling, the lighting are more of a base load, we're seeing a very modest increase. And I think that's probably all I'll say there.

If we're looking at DEER load shape measures for, oh, again 30-year residential, again we're seeing the bigger effect. So this HVAC shape clearly is a little less pronounced than the space cooling from the CBEC model. And if I recall, for example, the space cooling here is a very kind of low load factor peaky load shape, so you're seeing that capacity value having the biggest effect. I think the HVAC from DEER is less pronounced, so we're seeing a modest increase in the HVAC, in the lighting, in refrigerator pretty darn similar. I'll stop there. We also have charts showing the non-res 15-year and non-res 30-year for different measure types of people are interested. So that concludes the presentation. There's obviously a lot that goes into the TDVs and we're happy to

entertain questions.

COMMISSIONER MCALLISTER: Just to clarify, you mentioned you're using the load shapes for each of those measures, the characteristics of each of those measures from the DEER, they're just directly from the DEER database?

MR. HORI: Right. We just wanted to give some idea on what these new TDVs would do for different load shapes, and we utilized the DEER information.

COMMISSIONER MCALLISTER: Okay. Thanks.

CHAIRMAN WEISENMILLER: When do you expect the update to the database from CFLs to LEDs?

MR. HORI: (Laughs) Well, that's a question for the PUC and I think Jeff Hirsh is there. So maybe we should just call it efficient lighting and remove the CFL.

MR. CUTTER: That's true.

MR. HIGA: A question. Randall Higa, Southern California Edison. On slide 21 you noted that the curves included both utility, solar, as well as onsite solar, yeah, that one on the bottom. I just want to make sure that's what

you did say?

MR. HORI: Yes, that's correct.

MR. HIGA: Is that true for all the other curves that they, you know, when you mentioned that includes the impacts of solar, does that include both the onsite as well as the utility solar?

MR. CUTTER: Yeah, so the scenarios are all labeled in terms of RPS targets, so 40 percent or 50 percent, and these are drawn out of the LTPP proceedings, or, sorry, the Long Term Procurement Planning and the CAISO Transmission Planning develops scenarios, and those were incorporated in the load forecasts that were used for the IEPR. So even though they've referenced often an RPS scenario, it includes all the renewable generation also from the behind-the-meter PV that doesn't count towards RPS, so it's a look at the build-out of the renewables irrespective of where they're coming from that we expect to be on the system from those planning scenarios.

MR. HIGA: Okay, so just to be clear, so if you assume, say, a 30 percent RPS in one case, you add on top of that the behind-the-meter

onsite generation, then? In other words, the 30 percent doesn't include the onsite.

MR. CUTTER: Right.

MR. HIGA: So is that identified somewhere in the report in terms of what you assume to be the onsite solar generation capacity?

MR. CUTTER: That's an assumption we include from the IEPR, so it's not part of the TDV Report. There is a graph in there that shows the breakout of the renewables and there's more background, I believe, that would be in the IEPR.

MR. HIGA: Okay, so you took that from the IEPR, okay.

MR. CUTTER: And then the IEPR in turn references -- really, the most detail comes from the – there's a link I think in the report to the LTTP planning workshop in May that has a nice slide deck that shows and there are spreadsheets on the CPUC website that have all the detail of the assumptions for all the scenarios.

CHAIRMAN WEISENMILLER: Yeah, we actually spent a lot of time on the IEPR Demand Forecast working with Edison. It includes not just behind-the-meter solar, it includes CHP, it

includes electric vehicles, it includes electrification, it includes climate change, and it includes a lot of different factors, so we could certainly debate how well it includes specific ones. But it certainly in public process came up with stuff with Edison's participation.

MR. HIGA: Okay.

COMMISSIONER MCALLISTER: And also just to be clear, this is -- you have used one scenario that ended up being kind of the consensus scenario. You haven't run different scenarios to sort of inform this particular result.

MR. CUTTER: Right, that's correct. So we looked at a lot of different scenarios, but for the TDV calculations we've done, like I call it, a "straight down the middle," it's the mid case from the IEPR, the mid case from the Demand Forecast, the expected case from the LTPP.

COMMISSIONER MCALLISTER: And you'll remember, Randall, that there was a fair amount of trauma right there at the end with respect to the Demand Forecast in the Edison Territory and making sure that the agencies were lined up on

that. So I think that discussion, I think, had a lot of participation.

MR. HIGA: Okay, so my last question is, then, so the TDV values do take into account onsite generation in terms of the values that are being used for 2016, right?

MR. CUTTER: Yes.

MR. HIGA: Okay, and the onsite solar is treated the same way as the utility solar, then?

MR. CUTTER: Yeah, in the sense it's all generation on the grid that is changing the net load shape that impacts, the predominant impact is where the capacity value is being allocated.

MR. HIGA: Okay, thank you.

COMMISSIONER MCALLISTER: I think that's the key answer there is that we're talking net load for this.

MR. LOYER: Yeah, so do we want to throw the floor open to comments? I have the schedule that we wanted to talk about PG&E, but it's not written in stone. So do you want to do PG&E first?

COMMISSIONER MCALLISTER: Yeah.

CHAIRMAN WEISENMILLER: Yeah, I guess we could take blue cards, or whatever.

MR. LOYER: I don't believe we have any. We have a pretty small crowd.

CHAIRMAN WEISENMILLER: So just make sure.

MR. PLUMMER: Hi, Matt Plummer from PG&E. I want to first thank E3 and the CEC staff for doing all the work to do this update. I think after this workshop and the last one, and many internal discussions, I wouldn't say that I've mastered TDV, but I definitely have a greater appreciation for the tremendous amount of work that goes into it.

I think overall we thought that the update was fine, that we think it will make a reasonable basis for evaluating energy efficiency measures. The one concern we did have is how the additional achievable energy efficiency was incorporated. The concern was that there might be some double-counting. We didn't have the benefit of looking at the full report, so that is one question I have. I don't know if you want to answer?

MR. CUTTER: This is for the Demand Forecast?

MR. PLUMMER: Right, particularly the mid

with AEE.

MR. CUTTER: So the California Energy Demand Forecast from the ’11 or ’12 has a mid-case that does not include the additional achievable energy efficiency. The mid case for the IEPR adds on top the, again, straight up the middle, the mid case for the additional achievable energy efficiency that reduces the demand.

CHAIRMAN WEISENMILLER: Yeah, but the mid case, the intent was to have what we used to call reasonably expected to occur conservation, as opposed to additional measures, and I believe, and we both shuddered somewhat, we have not only the 2016 Standards, the 2019, and the 2022, and of course Andrew and I were both trying to figure out, after zero net energy, you know, what’s next? But anyway, somehow those are all expected to occur, it’s certainly an impact, and it is always a little scary. I think their first chart expressed the TDV values down to light too significant, you know, many digits well past the uncertainties, but this in fact is a good question, but again, I suspect when you unpeel the uncertainties, it’s certainly among any

number of uncertainty, you know, again the results always express more precision than reality, I'm afraid.

MR. PLUMMER: Yeah, and I guess the concern was just that there be some expected savings that were actually for this cycle, those would lower the load, which would essentially maybe not be giving credit for the savings for those very measures. I guess maybe is there a section of the report that would get into just exactly how those were incorporated? Or it might be something we could follow-up with you guys to dig into?

MR. CUTTER: Yeah, it's not described in depth in the report as one of the assumptions is taken from the IEPR. I would say two things about that, 1) for the resource balance here for capacity, we do take -- instead of trying to determine when new capacity is needed on the system, which affects the dollar per kilowatt year of value of capacity, we take the additional achievable energy efficiency out. So that ends up moving the need for new capacity back from the LTPP scenario in 2024 or something, back to 2020. So that is in a sense giving the energy

efficiency credit for the capacity it's avoiding, even though we are expecting that to be there already in the forecast. And on the generation side, again, because we were using these inputs from the IEPR, and we were going through the production simulation runs, I think we were taking the mid case IEPR that did already include the energy efficiency. So it's true that we're in a sense not giving the fullest value to the efficiency if we had taken those out; however, the effects that would have both on the prices we see from the Plexos runs, you know, by reducing the demand a little bit, I think would be quite small and probably in the insignificant digits, plus it's really driven in the end by the retail rate forecast. So we would have to see the lower demand both propagate through the production simulation runs, and through the retail rate forecast to see an effect on the TDVs.

MR. PLUMMER: Okay, well, maybe if you're open, I can connect you with one of our subject matter experts on the additional achievable, but it sounds like you've put a lot of thought into it. And then the only other point that we had is we did urge the Commission to start the

conversation on how to value DG. I understand that's not something that will be resolved in this cycle, but I think it would be valuable to at least start the conversation. Many of the data needs, the methodology, my concern is that there may be gaps when we get into the next cycle and if we don't start identifying exactly what we're going to need when we come up with a value, we may come to that Code cycle and simply not have it. So I totally understand it's contingent on other decisions and other venues, but I think we still would stand by our recommendation to start the conversation now so that we're all prepared when we get out to the 2019 cycle.

COMMISSIONER MCALLISTER: Well, you now, certainly I think it's a valid conversation to have. I think the risk is if we start it and it's immediately kind of a food fight versus a reasoned discussion, and obviously we don't want to have that in this particular venue. But there's no reason why that discussion can't sort of begin to happen in various levels of formality, but at least informally to kind of start to get collective heads around a methodology and what kind of data needs there

would be if we don't already have those data.

CHAIRMAN WEISENMILLER: Oh, no, I agree with the caveat, obviously it's going to be a lot clearer what's happening with the solar tax credit and with the NEM, too, at the PUC, and we're certainly trying not to shift that debate from the PUC to here.

COMMISSIONER MCALLISTER: Yeah, they're going to come down on some key issues that we all kind of have to -- they've got the jurisdiction to do that.

MR. PLUMMER: Right.

COMMISSIONER MCALLISER: So, you know, how do you treat the -- well, whatever, we won't get into it. There's not a lot of point to putting the cart too far ahead of the horse here.

MR. PLUMMER: Well, I'll accept your invitation for the conversation.

COMMISSIONER MCALLISTER: Sure, yeah.

MR. PLUMMER: Thank you. If you have no more questions, those are our comments.

MR. LOYER: Thank you, Matt. With that, we'll throw the floor open to other comments here. Bob?

MR. RAYMER: -- talk about lifecycle

costing as opposed to TDV?

MR. LOYER: Oh, sure, absolutely.

MR. RAYMER: Okay, this is Bob Raymer with California Building Industry Association. And my points aren't on TDV, most of that is kind of over my head and so I won't be delving down into that, but I do have some issues to raise in general about cost-effective analysis.

Now, over the years the Energy Commission has focused on the differential costs of material, and going from one set of standards to the next, and the differential costs of labor related to the old standards versus the new. And if those differential upfront costs are more than accounted for by reduced utility bills, the item is cost-effective and we move forward. Some of the things that aren't considered in the cost-effective analysis, which over the last 30 years it's made sense not to do this because they weren't major factors, are retooling of the manufacturing sector that might be prompted by a change; for example, there was an isolated incident back with the 1992 standards where some changes were made and the standards relative to window systems in a segment of the window

industry, primarily the aluminum frame manufacturers, had to do some retooling. And while that was very costly to them, overall that industry did not have to see major changes, it was focused only on aluminum. And I'll get to why I'm raising these points in just a minute.

In addition, not considered in the cost-effectiveness calculations for updated standards is necessarily the redesign and reengineering of home plans, in addition the retraining of site superintendents, contractors, and crew from the subcontractors, 1) these are very difficult things to quantify, but they have not been included and for good reason, by and large with the exception of aluminum frame windows in '92, they've been relatively minor costs compared to the general labor and material costs. That brings me to the 2016 development, and that is in particular there's two items being considered, the advanced wall systems -- now, this is for residential -- the advanced wall systems and the high performance attic proposals. Both of these represent a quantum leap in engineering and design changes over past practice. For production housing, in particular, we've been

using a 2 X 4 based on 16-inch wall design since Post-World War II, with everybody coming back from the war, you know, we saw the emergence of production housing, and this has been the standard design operation for residential construction for decades and decades. And the fact of the matter is, moving to advanced wall systems, moving to high performance attics, is going to save energy, there's no question, if you do it right you're going to save energy here. How much could be the subject of debate, but it will save energy. What I'd like to raise as an issue for you to consider is the fact that, 1) in particular, the advanced wall system is going to require some major major manufacturing retooling for just about all of your window manufacturers, 1) they're going to have to maintain a product line that still provides product for the existing wall systems, but for the most part they're going to have to consider one or more tweaks to their product line for a deeper wall, cavity, or a larger amount of foam board insulation on the outside, both of those represent interesting engineering designs and interesting problems. The bottom line is we heard back in our forum

that we held with the CEC back in April that there is concern amongst the window industry, most of them have a deep concern about being able to provide a product early on in 2017 across the state that can meet this need.

COMMISSIONER MCALLISTER: Bob, could you describe that sort of, you know, essentially it's a manufacturing process issue, and then the labor needs to sort of feed that process, to do some abstraction there. I mean, what does your system look like and how would it have to adapt to that?

MR. RAYMER: From a mechanical engineering standpoint, you have tools and dye systems and extrusion systems, these are large machines, many of them are far more advanced than what we would see from 30 and 40 years ago. A lot of these is computer aided design now. Be that as it may, it's one thing to have an extrusion that encompasses a three-inch deep frame as opposed to a three and three quarter-inch frame, or four-inch frame. And it costs, as we heard back in April, it costs about a hundred grand to retool one of these machines to do that. And of course, from an engineering perspective, you've got a problem with that because, once you

retool it, you no longer can make the product for the existing dwellings. You're now making a newer product. And so that gets to the issue of, well, is the window manufacturer going to effectively have sort of two production lines, if you will? Some of the big ones are going to do that. The big question here, and the point that I'd like to raise home, is can they do it by January of 2017? I suspect that all of this could come into play probably by 2020 easily, but not necessarily January of 2017. More importantly, there's the engineering and redesign that will have to take place for the home design, in general. This is not just an isolated product, forget about windows for a moment, we're now looking at maintaining the structural and seismic integrity of the walls, while either moving the 2 X 6 studs to 24-inch on center, or even keeping them still at 16-inch on center. You can do it either way, but both of them raise some interesting dynamics for where you're going to put drawer frames, window frames, how you're going to handle corners, overhangs, you know, cantilever portions of the house, we don't build rectangles or squares --

COMMISSIONER MCALLISTER: Can I, let's see, so relative to the engineering and design challenges, the constructability of those new designs, which do you see, I mean, they're part of the same process, but which do you see as the more difficult hurdle or the big deal?

MR. RAYMER: First off, I see industry heading to 2 X 6 construction over the course of time. I also see the moving to 24-inch on center. But that will probably happen in a six to nine-year period at the national level, you know, NHB has done research where they say the major changes in design for residential takes 17 years to accomplish, that's not at all the case for California. Things happen here a whole lot quicker than elsewhere. My concern here is for January 2017, is it reasonable to expect that the plans and designs that are commonly used for production housing today are -- all of them -- are going to have to get retooled to incorporate the wall and the high performance attic. But that can happen, and it's going to happen, the question here is can it happen on January of 2017. Now, on a very positive note, staff is providing an alternative, sort of an off ramp, if

you will, where as long as we maintain a high quality envelope that meets the 2013 Standards, we wouldn't have to necessarily implement the high performance attic or the advanced wall system with the addition of some solar on the roof. All of it, bottom line, you have the same impact on the grid. And so that's good, providing that the builder or the company can afford the solar component.

Now, for the larger builders, you know, the KBs and the Lennar's of the world, they will be able to handle that because they've already got a good handle on solar. My concern here is the small and medium-sized builder. Is it reasonable to expect them to be able to hit the high performance attic and the advance wall designs in the same rulemaking, or to go to solar? No, they're not going to be able to do it. And the question here is where can we find some other low cost alternatives, in essence, are there any other magical low hanging fruit that we can grab onto for January 2017, that perhaps the small and medium-sized builders who don't have the financing wherewithal to have access to mass quantities of solar so they can get it at a much

reduced rate? How can we handle that? Effectively, I'm saying what's being proposed for 2016 or 2017 is going to save energy, the question here is involving such major changes in common design practice, can we do a good job of this stuff and do it across the state on January 1, 2017? That's my big concern.

COMMISSIONER MCALLISTER: So, I mean, I guess in this context, you know, this workshop today, I guess I'm hearing that you're feeling like it imposes cost on the industry that somehow ought to be internalized --

MR. RAYMER: Yes.

COMMISSIONER MCALLISTER: -- into the valuation process or something?

MR. RAYMER: That's a very good way to put it. From a lifecycle cost analysis, with this particular update as opposed to, you know the 12 or 13 that we've gone through in years past, that there should be some attempt to quantify what it's going to cost to retool, you know, machines out there and for certain segments of industry; more importantly, what is the design change cost that's going to be associated with advanced walls and high performance attics? In

essence, since every plan is going to have to go through this, every builder, this isn't just a case where in 1992 we were already using a lot of vinyl frame windows, so it didn't impact the entire industry; these two things are going to impact every home design that's out there. And so it can be done, the question is there's a cost associated with it, and should it be included in lifecycle cost analysis as opposed to years past this time around? I think it should be.

COMMISSIONER MCALLISTER: So, Bob, did you want to comment? I also want to get –

CHAIRMAN WEISENMILLER: A couple questions. I mean, Bruce is just, as you noted, this is the standard practice it sounds like before I was born, so looking around the room at all the things that have changed over my lifetime, I guess it's probably time to think of changing this. Having said that, I guess part of the question is looking at, you know, we have substantial utility incentive programs and to the extent that, particularly asking the utilities in the room, the issue and certainly you may want to be reaching out to the PUC Commissioners, is there something we can be doing right now with

those incentive programs to help the building industry make this transition?

MR. RAYMER: Yes.

CHAIRMAN WEISENMILLER: And can we get something very concrete on that to just say, okay, we understand that, and frankly my fear is, you know, when I talked to the Chinese officials, we're talking very seriously about them going to a Zero-Net Energy goal, and you can really see China saying, okay, we're going to move that, now how do we move into this new technology space? You know, not just LEDs, but what are the components we can do to really drive down housing costs and efficiency? And obviously the last thing I want to do is suddenly, you know, some of these things you can't really think of moving offshore, but how do we not once more have part of a manufacturing base be stalled and be overran by aggressive companies overseas.

MR. RAYMER: And I have a response to that. The cap program that is administered by the PUC and the local utilities, the IOUs, if you will, is just now being rolled out, of course, in conjunction with the new standards. And there is going to be a focus on design assistance to, in

particular, production housing. And we've already been assured and we've been very supportive of the attics and the walls, let's see what we can do to get as many medium and large-sized builders doing this stuff now not only so that they've got designs ready to go come January 2017, but the workforce, this other -- that third point that I was raising -- you have this sort of increase in humanity that's coming back to the construction market, we hit the low 19 percent, we're back to about 50 percent now, by 2017 we should be back at 85-90 percent, hopefully 100 percent, but that means you've got more than half a million people coming back into the construction industry over that three-year period. These people need to be retrained on this stuff, it's not something that they've gone off and done something else for the last seven to eight years, they're going to have to sort of not re-learn their job, they're going to have to learn a significant enhancement to the job that they've learned for the last 20 years. And that's going to take time and effort. And so maybe this Cap program can help us kind of hit this ramp up, but I've had 33 years of doing this

and I can tell you with no exception, this proposed update represents a dynamic change in common design practice. It can be done, but can it be done on January of 2017? Can we do it well and not have a slew of construction defect litigation, class action lawsuits coming back because we didn't have the bugs worked out? We've got a big mountain to climb here is what I'm saying.

CHAIRMAN WEISENMILLER: Well, certainly on the training part, it would be very good to again think through how we respond to that specifically in terms of how do we have training programs where they're needed, you know, obviously trying to avoid something where we've got a whole trained workforce for you which is where the housing construction is, and at the same time have that sort of quality jobs part, so trying to figure out what are the training needs, what are, again, the incentive needs. We need to really pull the utilities in. I think the vision has always been to have -- obviously we do a lot of the research, the utilities do a lot of the incentives to move that out, and eventually as it becomes more standard practice, it moves into the

Standards.

MR. RAYMER: I hear you. For my purposes, it seems first things first, let's get the designs right. On a very positive note, Commissioner McAllister was the keynote speaker at our design forum that we had back in April, and for the first time we brought in segments of industry from all over the country, the windows, the walls, the roofs, insulation, you name it, were all there giving presentations. I think this thing went on for eight or nine hours, it took a whole day on a Friday in April. And we got a lot of good information, so industry who normally gets involved the day before the adoption is involved well before the Draft Standards starting moving forward. So unlike the previous updates that we've got, you've got a lot of people kind of watching this; just because they're not here today, I mean, let's face it, TDV isn't that sexy. But for other purposes, you've got a lot of people watching this. On a positive note, the wood industry and CALBO has some great people who specialize in structural and seismic design who are very familiar with what's being proposed, and so we've got some key

players that are ready to help us with these various designs. And staff is coming up with a half dozen sort of proscriptive approaches, but you don't necessarily have to go to 2 X 6, you can get by with 2 X 4, you don't necessarily have to go to 24-inch on center, you can do it as long as you've got a certain amount of rigid insulation on the outside of the house. So there are going to be a lot of alternatives, but they all involve getting your act together ahead of time.

COMMISSIONER MCALLISTER: So let me --

CHAIRMAN WEISENMILLER: Just for one second, so the one thing I really want the utility reps in the room or on the phone to take a very very clear message to your management that we're going to be looking for proposals from you on how to help in this transition preferably in the next, I've got to say, the next couple weeks to start getting people engaged because, as we all know, and certainly in that engagement talk to Bob on how to do this.

MR. RAYMER: We're engaged with the PUC, but you know, we meet on a quarterly basis and we kind of need to ramp up now.

COMMISSIONER MCALLISTER: Well, that was what I was going to suggest, is sort of what is a little SWAT Team approach, or maybe not so little, but how do you get the right stakeholders in the room, sort of have a process, lay it out, sort of instill it with some sense of urgency, you know, results focused? From my perspective, I applaud you for sort of getting everybody together and starting the machinations for really making sure they understand what's coming because I think it is pretty clear what's coming, I mean, I think staff has done a good job, we've had a lot of discussions about how to distill this 2016 update into the key issues. Relative to previous cycles, which predate me, but you know, sort of historically my understanding is that there were a lot of large constellations of issues on the table, that we all had to work through to get to to get to the final results. And so maybe any one issue was kind of small, but they added up. But this time it's sort of a few key issues that we're trying to resolve, and essentially practice changes are front and center. And so we've sort of tried to keep distractions to a minimum with smaller issues and sort of focus on the big

picture here with just a few key issues that we can work through. And you know, I think that interaction between staff and industry and other stakeholders has been very open and transparent and productive. So I wanted to sort of get --

MR. RAYMER: It has. And it's a very positive working relationship that we're enjoying now that perhaps we didn't have 15 years ago, looking in the past. But the fact of the matter is, there's a very good line of communication with staff. We're all aware of these problems, nothing here today is new. And so on a positive note, that's a good thing because we don't want to wait until, you know, December 31, 2016 to try to figure out what are we going to do now. We know these things ahead of time.

COMMISSIONER MCALLISTER: Certainly the professional side of the building industry, I think, can get engaged and I think solve a lot of these problems, there's going to be some costs, and hopefully the utilities and ratepayers can fund some of that, and there's some savings, that whole system can engage and provide some resources. You know, I would just also look at the kind of rubber hitting the road stuff, you

know, I'm not intimately familiar with the sort of labor issues that you described briefly here, but I think to the extent that the workforce -- that folks actually out there building the buildings need training, that needs to be very intentional and planned out beforehand. And I guess I just don't know whether it typically is or isn't, but I think in this case it's very clear that the implementation, the devil is in the details, you know, that buildings have to get built, and built well. And so that issue, I think, is probably one that needs a little noodling on to figure out how we make that happen.

MR. RAYMER: We have two huge issues in that area, 1) probably the majority of workers who are going to be working on these homes in January 2017 and throughout the years after aren't in the workforce right now, they're doing something else, they're beginning to come back. And so it's not like an educational effort that's in place today is going to help us with that, it can certainly smooth things out a little, but we're going to have to be focusing on this probably the 18 months leading up; but the second

issue is that about half of our workforce doesn't have English as a primary language, and that is something we became very familiar with with Cal OSHA's fall protection rules back in the year 2000. More than half of our workbooks that we put together to explain the new standards for fall protection were in Spanish. And those got used first, quite frankly, we went through 10,000 of those way ahead of the 10,000 we had in English.

COMMISSIONER MCALLISTER: Well those are exactly the kinds of issues that I'm referring to, and I do believe they're solvable.

MR. RAYMER: Yeah, they are. They are.

COMMISSIONER MCALLISTER: Certainly, you know, maybe the issue isn't you're not going to know who these people are until closer in to the applicable date, but having the systems in place, having the protocols in place, I mean, all of that ready so they can plug right in and get trained and get with the new program, I think is really important. So that's the kind of strategic planning I think we ought to be starting now.

MR. RAYMER: Yeah. Lastly, and this is

something the CEC hasn't done in the past for the most part, you're going to be developing tiers for the Green Building Standards as you had with the last two iterations of the Green Building Standards. You've developed tiers primarily going 15 and 30 percent beyond. We may see another more aggressive package added to that this time around. Given that the Standards are about to be exceptionally stringent, to the extent that you can, as time permits, and resources allow, which is a tough sell right now, but local jurisdictions are required by law to show to do a cost effective analysis if they adopt something that goes above the Regs. And to the extent that the Commission can help provide analysis so that they don't necessarily have to reinvent the wheel, particularly for the more aggressive packages which are a tough sell, that could be very helpful. And that concludes my comments.

COMMISSIONER MCALLISTER: Okay, thanks a lot, Bob. Mazi, are there any particular points you wanted to talk about in terms of the discussions that are ongoing?

MR. SHIRAKH: Yeah, just very briefly.

Actually, I want to thank Bob because, you know, they're engaging us very early in the process.

COMMISSIONER MCALLISTER: Absolutely. I can't say more positive things about this. I mean, obviously we have to get to a result that we can all live with, but I think the tenor and just the civility and just the proactive, just positive relationship, I think, is really great.

MR. SHIRAKH: It's a very positive cooperative relationship and, you know, the fact that they are letting us know about these issues early on is very helpful. I just wanted to highlight a few points and I think Bob actually mentioned them. The 2016 Standards is all about giving Builders choices, for both high performance attics and high performance walls, and providing an off ramp, which is the PV offer, and I think Bob mentioned all of those.

So talking about like walls for instance, there are several different strategies that we're pursuing and we're talking to the builders and others, some of them are more disruptive, some are not as disruptive, and the same goes for high performance attics. For instance, as Bob mentioned, to meet the U Factor for the high

performance walls, you can go to a two-inch exterior continuous insulation which would require some adjustments to the windows, which could be done at the manufacturer level, or it can be done by field adjustments to the framing and so forth. But they can also do that with a 2 X 6 construction, with only a one-inch, or one and a quarter-inch exterior insulation, which is not as disruptive, and it's already probably being constructed in a good fraction of the homes.

In addition to that, what's important is the industry, the manufacturers are responding in a big way to our proposals. And they're being very creative and innovative. For instance, last week we talked to an insulation manufacturer who was telling us they can give us a continuous insulation, an ESP product, with an R value of R8 per inch at a very favorable cost. Again, because we're pushing this, we're putting the message out there, the industry is responding. And if that materializes, you know, that basically solves our problem because it's – so we're pursuing that with the manufacturers and others. But the key is that, because we're

there, we're putting this message out there, people are responding. And if we vacillate, you know, we'll lose that momentum.

For advanced attics, the same thing, there are manufacturers out there that are creating tiles on the roof that have insulation imbedded in them, and with some higher reflectance that can meet our high performance attic criteria. And that's not disruptive at all, you know. So there's innovation going on, there's the various choices.

The other thing that we're providing is, of course, this PV off ramp for both high performance attics and walls, and our simulation which we shared with CBIA shows that for a very modest amount of PVs, they can actually trade away both of them on an order of about half a kilowatt to one kilowatt in basically all 16 Climate Zones. So, you know, with that modest amount of PV, for those builders who are not comfortable with pursuing one of these measures, they can trade away one or both, or keep one.

We're also working with the CPUC and the IOUs on the idea of incentives. Bill Pennington and I, we've been in contact with them, we

understand the value of the incentives both before the effective date and even after the effective date for certain measures. And one of the other points is, if the manufacturers are retooling, shouldn't we expect that the cost of the product reflect that cost of retooling, and if they are doing extrusions or something that's different, you know, you would expect the cost that we get from the product should include all that.

But the point is that we're aware of all of this, we're going to be working with manufacturers and the utilities and the builders, and we have this workshop coming on later this month, July 21st, which is probably going to be very exciting, probably more exciting than this one.

COMMISSIONER MCALLISTER: More exciting than this one, I would hope, yeah. Although this one is heating up, I like it.

MR. SHIRAKH: So anyway, I think we're still in the early stage and I'm hoping we can reach some consensus on this package of standards and the measures.

COMMISSIONER MCALLISTER: Thanks very

much. You know, I really have to express confidence in staff on this, I mean, you guys are doing a great job, and I really like the sort of solutions oriented conversation and really trying to knock down the barriers as they appear, and that's really what we do. I mean, the marketplace is what actually makes all this happen in practice, and so we really need to sort of listen and prod and figure out what's going to work to get the goals that we have in California. So good stuff. Thank you very much.

MR. HUNT: Good morning. This is Marshall Hunt, PG&E, Pacific Gas & Electric. And I have the pleasure of being on the statewide IOU Codes and Standards team, along with Randall Higa and others. And it's very important that we engage, and we have been engaged, in coming out of the 2016 process which we're deeply involved with now and we are definitely interacting with other parts of our company. So there's four different ways in which we're supporting exactly what Commissioners are wanting, and certainly if you want to talk to your compadres and your Commissioners over at CPUC, it would be very very helpful because, in the last word, we only can do

what the CPUC approves. And it's really about market transformation. So we have the Cap program, that's the California High Performance Homes Program, we have the Compliance Improvement Program, which includes the Reach Codes which Joe Loyer works with us on, then we have Workforce Education and Training just like Bob talked about, and a really important one is Emerging Technologies. And in our tactical plans in the Codes and Standards group, we look at these as all serving to bring the industry up for both '17 and '20. So we are very very focused on the loading order, of course, and so the energy efficiency for us is the very first thing because the buildings show essentially is there forever. So we are working closely with Mazi and Bill and look forward to having a Cap points. What you do in the new program is you get paid, depending on your savings above Code, but you also get a bonus for doing certain things. And prior to our most recent discussions, we had had Cap points for Code in transition, Code future understanding, we want to get costs for doing that, and per your input I will be taking back a very strong message that we need to simplify. So we have five or six

measures in this Code compliance Cap points. And now we want to shrink it to just two per Mazi and Bill's input to this. And we're getting good support from the CPUC on that, and so I hear you loud and clear, we need to simplify and we will do that. Certainly on the -- did you have a question on that or…?

COMMISSIONER MCALLISTER: I just wanted to, you know, if there are issues, we all know that the attribute ability question comes up over and over and there are structural issues there with sort of what's kosher and what's not, and I would just invite you to make sure that you're bringing that message, you know, it's sort of a little bit one side applies to us, the other applies to the PUC, and hopefully those match up somehow, and often they don't, or sometimes they don't. So to the extent if that becomes a barrier, then we certainly need to hear about that quickly and sort of have that conversation across Commissions --

MR. HUNT: Excellent.

COMMISSIONER MCALLISTER: -- and over time try to solve that structural problem.

MR. HUNT: Yes, because we're not really

talking here about necessarily a resource acquisition that you'd have in a standard energy efficiency program; rather, we have a market transformation issue, so the total resource cost issues change dramatically. In our Code compliance improvement efforts, we've dealt with the Reach Codes, as I said, we're also doing a pilot that was directed by the CPUC down in the Fresno area for PG&E and other areas for the utilities, in which we're going to work with the change out issues on HVAC residential, and that's a huge challenge, but we want you to know we're not forgetting the retrofits, it's very very important.

Workforce education and training, we have our training centers. Any time we can get more support for that, it sometimes sees a soft side, if you will, of energy efficiency, but as we've heard loud and clear from Bob, is it's critical that we have the people out in the field that can do the work, along with the technologies, and lastly, that's what brings us to emerging technologies. So as part of this cycle, we were able to have an emerging technology project which supported the high performance attic and the high

performance walls. So as we look forward, I'm making a plan and others are making plans where, as we look forward to 2019 Standards, there's a whole list of emerging technologies that we need to implement, and we may need to find creative ways to make sure we get that funding. So I wanted to assure you that the Statewide Codes and Standards Team is very much engaged in this and looks forward to working with you, the building industry, and other stakeholders. Thank you.

COMMISSIONER MCALLISTER: Great. Thanks.

CHAIRMAN WEISENMILER: Well, thank you. I would note that at the last -- the PUC had their En Banc on efficiency and President Peevey invited both of us to be there, and certainly we talked about it afterwards, obviously one of Mike's frustrations is looking for creativity and imagination from the utilities, and often finding it wanting in this area. So certainly trying to get the message out to really be creative, be engaged, to be helpful here, and certainly the PUC Commissioners looked to us for comments on where things are working and not working.

MR. DAY: Good morning, Commissioners, Director Oglesby, and fellow usual suspects. I

was actually reflecting on this, that at the start of TDV many years ago, probably half of us were still in this room, and there were others there, and some of us had more hair, or darker hair at the time, but it's amazing the number of us that are actually the same group of people. I've got a lot of respect for TDV, I think it's really led the world, but today I'm not here to praise TDV, but to protest in a sense. We're working on 2016, but on July 1st we had the new Standards go into effect. That has put manufacturing go dark. There are pieces of equipment, the highest efficiency pieces of equipment, the pieces of equipment that manufacturers and investors develop to specifically target TDV, things like the aqua chill unit, like the ice bear unit, the things that have the highest value cannot be processed through the current version of Title 24 Compliance Software. Those manufacturing lines are dark. Those manufacturing workers are sitting at home. And we're working on 2016.

I got a lot of comments I could make about why are we working on 2016 when the current system doesn't work unless you have plain vanilla

air-cooled 13 seer carrier units, but the basic point is, please, I understand that there's a long lead time that we need to get working at, I've been in a lot of these revisions, but please, if it's not working -- and it really isn't working right now for a lot of technologies, the engine does not allow it to be computed, give us some sort of work around, please. Let us put our people back to work, let us continue to work with the utilities to put these in the emerging technology programs. We can't sell it legally when the stuff doesn't work, and here we are working on 2016 when 2014 doesn't. Maybe we get special dispensation to use the old Codes, the old compliance software, until the new software is allowed to work? Something, anything. But please let the people who have invested in emerging technologies that take advantage of TDV, the smaller niche stuff that's where our future lies, we're excluded from the marketplace because 2014 is not working. And I don't have much more to say other than that.

COMMISSIONER MCALLISTER: Thanks, Michael. I think the reality is that, as you said, there's a lead time, you know, the fact

that we're anticipating the 2016 update does not in any way mean that we're devaluing the 2014 implementation. There are a lot of people who are not in this room who are working on that and getting the bits and pieces together, and this is a bit and a piece that needs fleshing out. I know it's important to you. I don't know if, Mazi, if Martha were here she'd probably have something to say about that, about the compliance tools for 2014, but certainly --

CHAIRMAN WEISENMILLER: Yeah, no, I was going to say, I mean, the reality is 2014 is in place, we're moving on to 2016. The reality is that there have been compliance issues and certainly we're not going to hold off on 2016, but we're trying to stay focused on the compliance issues, and certainly again this is not necessarily the right group in this room to really take up those issues, but certainly following up with Rob, Martha, you know, Dave Ashukian, and trying to say, okay, just as we all have our software on our phones updated fairly periodically, that the compliance software is going to keep being updated, and then getting better, and part of it is trying to make sure

that, again, we're sort of setting the priorities on what people need as we go forward to get more and more of those niche technologies in.

MR. SHIRAKH: This is Mazi again. I agree, you know, most of our staff is still working on implementation of 2013 standards, and Martha Brook is very engaged in updating the CBECC Res, and if there is any special features that people require, they should be talking to her and she has a list of priorities and they're going through that and constantly updating. So I don't see that as a problem. And again, I totally agree that 2016 shouldn't get in the way of implementing 2013. Thank you.

MR. LOYER: To that end, we actually pay good money here to have Brian, Eric and Snu brought up here to Sacramento, and I note that they haven't answered a question in quite a while, so if anybody, I would like to refocus on the TDV, and please, yeah.

COMMISSIONER MCALLISTER: I would just point out -- Jon, come on up -- but I think the people that are embedded in the various things that we do here understand that TDV is a key tool on all of these -- now, we're talking about TDV

within a specific context here, but, you know, Title 24 and Emerging Technologies, and all these things get mediated by that, you know, they get evaluated through that lens. So I mean, it highlights the fact that people doing good stuff know that TDV is important. So some of these comments aren't exactly on point for this workshop, but that's okay because this is the kind of stuff that we need to hear.

MR. LOYER: They're very good comments.

MR. MCHUGH: Jon McHugh, McHugh Energy. I'd just like to make a first comment, which is that TDV seems to be extremely stable, and if you look at the results when we looked at the average cost and the impacts on various measures, you see that the increments in TDV change things but they are essentially adjusting around the edges. And my expectation is that's primarily driven by the fact that the total value of the TDVs are based on the projection of revenues. And to the extent that our projection of revenues are good, then the overall values, you know, the present values of savings from particular measures using TDV are going to essentially match those forecasts. Am I getting this right, that in terms of the total

values that's really driven by the forecast of revenues?

MR. CUTTER: Yeah, I mean, the revenue forecast obviously is a big driver as you'll see from this, and the light blue is such a big part of that. The other reason for the stability is just, you know, while we've been updating things like the marginal energy cost and the capacity cost, there haven't really been any major fundamental changes in that since we've started. I think this ELCC is probably the largest real sort of change that we've seen. And even so, its impact is really in the out years, so when we do this averaging, we see a little bit of this dual impact. But it's not a major change.

MR. MCHUGH: Right, so the double hump is something that happens in 2020, and since this is discounted, when you actually look at the present value this is smeared out? Is that correct?

MR. CUTTER: It's smeared out and it's also only one of the components.

MR. MCHUGH: Right.

MR. CUTTER: When you look at the chart, the purple, it's a fairly small thing when you look out over the whole year.

MR. MCHUGH: And I actually had a question about this picture. So is this the average cost for each hour over the course of a year, or is this a particular day of the year that we're looking at? Or what is this?

MR. CUTTER: This chart is the average over the whole year.

MR. MCHUGH: Whole year, okay.

MR. CUTTER: And it sounds like, you know, there's some questions about the Energy Code having an impact on estimates of, you know, future load growth and that sort of thing, but my understanding is that, you know, new construction is somewhere around 1.5 percent, or 2.0 percent of the total building stock. So what happens in the Codes is it's not going to have a huge impact on what you're evaluating. Am I getting this right?

MR. CUTTER: Are you saying you wouldn't expect a big feedback loop between the impacts of the Codes and the sort of costs that we're using?

MR. MCHUGH: The loads, yeah, and the avoided costs, yeah. I mean, it seems to me it's a secondary or tertiary effect because, like I said, you know, the other 98 percent are the

existing buildings. And to some extent they're being updated, but they're not having the same step change that the Energy Code places on new buildings.

MR. CUTTER: Well, I think there's a couple ways to look at this. One the one hand when you're looking at the marginal effects, I think you're right, it probably is a small change and there may be some sort of self-attenuation in the energy market, so to the extent there are lower demands there may be lower construction of new resources, but then I think you also have to keep in mind that the timeframe of what happens in the Building Code, it's 30 years, and so I think when you look at the impacts you're going to have for that extended amount of time, I think it is a pretty big impact.

MR. MCHUGH: Yeah, I guess by that time you're now looking at 40 percent or so of the stock turnover. I would just try to understand a little bit about the differences between the capacity profile and that of TND, you know, you show the double hump here with capacity, yet TND, it's actual peak looks like, in terms of peak cost, is approximately right where your little

dip is between the two peaks for energy capacity. And I'm wondering is this somehow capturing the issue that there's additional renewables on the grid that you're not using as sort of the basis of your capacity costs, and this is why the profiles are different between the capacity costs and the TND costs?

MR. CUTTER: Well, the TND costs, or I should say, the allocation of TND, as you remember, right now it's still using the temperature proxy, so you're right, it doesn't actually have any way of recognizing what the actual net loads on the utility grid might be, and how that might be affected by the installation of behind the meter renewables, etc. And that's just a fact related to the way those allocation factors are currently derived. If we could get actual utility net loads and move to that sort of paradigm instead of the temperature proxies, then maybe you could capture that.

CHAIRMAN WEISENMILLER: I don't know, again, one is generation when you have a certain amount of smoothing over geography for, say, solar. On the other hand, if you're sizing your distribution system for, say, that subdivision,

you know, you have to assume there's going to be some period in your sizing for the peak at that sub. Then again, you can't quite say, oh, wait a minute, the fact is it's going to be sunny somewhere in the state, you know, I can sort of scrimp on the distribution system here. I mean, again, you come back to what is the cost, what's driving the cost, and so it's what is driving your TND system, particularly your distribution system. And again, it's going to be much more local. And certainly if you put in energy efficiency device and it doesn't work, you know, you put the load up. But again, the solar has that variability issue.

MR. CUTTER: Yeah, you're absolutely right. I mean, I'm sure as you know, TND planners are very conservative and they're always worried about the failure case, not only of behind the meter devices, but even of their own equipment in terms of building in the contingencies. But I think, you know, there could be some improvement perhaps of recognizing when the likely peaks of the system could be if we could actually get load data from utilities, rather than using the temperature proxies that

we're using. And just to give you some background, what we did back when we first did TDV, since we didn't have utility load information, we compared hourly temperatures with hourly loads for some areas that we did have, and we found a very strong correlation at that time, so we were able to use temperature as the proxy for the loads.

COMMISSIONER MCALLISTER: Well, so would you then -- what geographic boundaries would you use if you didn't use Climate Zone?

MR. CUTTER: Well, see, that's one of the challenges we had and the concerns we had about moving to more precision with the load information because then you run into the problem of, you know, different areas within the same Climate Zone, they could have very different net load profiles, and so are you really accomplishing that much by trying to move to that precision when you may need to just average out that information anyway for implementation purposes.

CHAIRMAN WESENMILLER: And also, it's like when you look at the utility distribution planning, it's often straight line, you know,

local division straight line, and then you come back to where is the population growth going to be in California, you know, how comfortable are you that you could forecast it within the different counties at substation level, not particularly the bottom line?

MR. CUTTER: You're absolutely right. And just because we can get more precise in the calculations doesn't mean we're going to get any more accurate with what may happen.

MR. MCHUGH: And with these new capacity and TD capacity factors, do you have some recommendations about on the implementation side when we're looking at reporting the results of, you know, the hourly savings from a particular measure, how to calculate the peak load reduction associated with a particular measure? You know, we try to report back not just the kilowatt hours saved, TDV KBtu, but also KW peak demand. And unlike non-coincident peak, and I'm sure we'd prefer to do something that is a little bit more sophisticated that identifies what is the impact on the grid system associated with a particular efficiency measure, I was wondering if you guys have any thoughts about how we might report peak

load reductions.

MR. CUTTER: Sure. Well, I wouldn't want to necessarily place anymore requirements on the compliance software --

MR. MCHUGH: No, no, yeah, this is not the software, yea.

MR. CUTTER: But I think you might actually have to go to that sort of level of detail because the cleanest way to report out, you know, a peak reduction number would just be to do a weighted average reduction using the same allocation factors that have been used here to allocate out that capacity value.

MR. MCHUGH: Just for capacity or also TND?

MR. CUTTER: Well, if you wanted to be really precise, you would do it separately for TND versus generation.

MR. MCHUGH: I see.

MR. CUTTER: But I'm not sure I really would place much stock in a TND number just because of the variations you really have down at the TND system.

MR. MCHUGH: Oh, right, okay. Okay, thank you very much.

MR. LOYER: If there are no more comments in the room, I'll go to the people on the WebEx. If you have a comment, please use the raised hand feature and, George, I'm going to unmute you and we're going to go with you first.

MR. NESBITT: Yes, can you hear me?

MR. LOYER: Yep, you're on.

MR. NESBITT: George Nesbitt, HERS Rater. Several things. I think when we used source energy, although source energy was simple, simple to understand and graph and to sort of convert between site and source, and it was viewed against electricity, but it didn't put any value as to a kilowatt hour used at midnight have the same value as during peak, so TDV does make a lot of sense. A couple things. In the spreadsheets with all the hourly values for all the different climate zones, and gas and electric, and propane, and residential and nonres, it's a lot of data. It would be nice to have the average values, sort of a median value, a high-low value, for each climate zone, for each scenario. The other thing is electricity is expressed in Btu's per kilowatt hour, natural gas Btu's per therm, and so you can't make a direct comparison as to sort of how

they compare, you know, how much more is electricity versus natural gas or propane, so you can't really compare those. And I don't know if any of that was in any of the bigger reports.

In looking at that mass data, although it may be hard to see it in that form, graph form may help, but it doesn't seem that the data really varies that much seasonally and time of day, and then you get these massive spikes at specific times, yet in reality, I mean, I think summer peak through the time of days is a lot more smooth, and when we have a serious peak I think that varies year to year, climate by climate, you know, it could happen in June as well as in July or August, and that's going to vary on weather. So I'm not sure, it's almost like maybe we're too caught up on the trees and not the forest at times, and I'm wondering if time dependent values shouldn't be a little bit more like a time of use rate, a little bit more blocks of time. And then certainly within that block, average out all the effects more evenly, rather than having a spike. The one thing I'm not sure of is, okay, we're saving time dependent value, but how that really translates back into

saving actual site energy or source energy, and I think really you actually need to look at that, whether we're actually saving energy. You know, are we building homes that are using less real energy per square foot? Is our per capita energy use going down? So I think that's -- and then I'd just like to actually comment back on a couple of Bob Raymer's. Where I live in the San Francisco Bay Area, I can't remember the last time I worked on a project that was 2 X 4's; 2 X 6 has been standard, and probably for seismic reasons. And when you get to multi-family, it's all 2 X 6 and, you know, I think some things like continuous exterior insulation have not been common in the custom market as much, but my understanding is a fair amount of production do go to like one code stop-go and over foam, but I definitely agree, working as a HERS Rater, working with people, I work with a lot of engineers, a lot of builders who are clueless. You know, people who have been in the industry for four years, but have probably never crawled into an attic to make sure the insulator actually put something there. And just a lot of basic lack of knowledge. It's not that everyone in our

industry needs to be an expert, but someone needs to be expert enough to direct people to actually get things right. So, I mean, I think we struggle a lot with getting things done right in the field and that starts with the design engineering and goes down to the contractors. So I'll leave it at that.

MR. LOYER: Thanks, George. I think in reply to some of your comments, you know, I want to thank you for your comments and I think in general you are supportive of the same ideas that Bob had, too, to generally look at the industry and provide education, and the additional costs that we need to be aware of when we're looking at cost. As far as the TDV is concerned, I think if we look at the high-low for each of the climate zones, I think that's easily doable, that's just a spreadsheet function and that's something that we can add. But in comparing natural gas to electricity, it's a little bit more challenging. You do have to have a natural gas device comparing to an electric device, and that's the critical element. That's the critical link. And so, in trying to compare the TDV of natural gas to the TDV of electricity, in the form that it's

in, it's really sort of a non sequitur, but I think if you turn and look at instead of using the KBtu per kilowatt hour, the KBtu per therm, if you convert those into the dollars per kilowatt hour, dollars per therm, you might get closer to something that you might be looking for. But we can also talk off line about any other statistics or valuations of TDV that you think might be good.

MR. NESBITT: Yeah, well at Source Energy it was simple: therms, it was 1:1, and kilowatt hours were 3:1. And so certainly it was obvious, and more in gross value and it could be the average for each climate zone what's the value of a kilowatt hour versus a therm, and it appears to be maybe about 6:1. And I think it's important because one of the negative consequences of the rush to Net Zero Energy as being the Holy Grail is the idea you have to convert to electricity, which could increase actual source energies because we're really not going to have enough renewable and then the whole thing of -- and then moving to electrification on transportation, well great, if you're charging at night you're not necessarily using renewables. And if you're not

putting solar on your roof and charging it directly, you're not necessarily really using renewables. And so we do need to discourage electric use and I think we are. And the other thing is, as a user of the Energy Code, the values I get out of the software are all TDV per square foot, and so that's the gas and the electric and all the end uses, you know, it's a single number. But, yeah, I mean I agree, you can compare -- just in total, is it 6:1, 4:1, you know?

CHAIRMAN WEISENMILLER: Okay. Actually, George, why don't you follow up on these off line so we can move on to other comments?

MR. LOYER: Okay, I'm going to go ahead and mute you, George. And --

MR. CUTTER: While you're doing that, just to throw in on the comment, you know, I think it comes down to sometimes there's a worry of a false level of precision by doing hourly allocation, and whether that is going to drive spurious results somehow. But it's really the reverse in the sense the allocation of the capacity value, while it comes out in specific hour, behind that is a probabilistic analysis of

how likely are we to be short of capacity at a given hour. And then by the time we go through averaging that all out over the course of a year, you get relatively smooth shapes like you see here, and this double peak is actually an issue we do want to capture going forward because it represents a real change in the system that wouldn't be captured if we try and do a fairly simple average of TDV across the TOU period. So you actually get more of these step changes if you try and simplify the approach, whereas you get more of a smoother progression, both over time and between measures by going to this hourly analysis, which may look overly specific, but really is fundamentally probabilistic in nature and represents at the end of the day a fairly well-weighted average, that there really isn't the chance that a particular shape of a particular device is going to heavily weight it by virtue of our having allocated capacity to a particular hour.

MR. LOYER: Okay, should I see if George has a comment back? You still have your hand raised. George, do you have anything else that you'd like to add?

MR. NESBITT: No, sorry.

MR. LOYER: Okay, very good. No one else has their hand raised online. If there are no other comments in the room, then I think we can bring this to a close. Commissioner?

COMMISSIONER MCALLISTER: Nobody else online? Okay. Or on the phone? Well, great. Is there an additional comment period here? No, this is just a presentation of the final --

MR. LOYER: This is a presentation of the final TDV that we'll be going forward with in our 2016 Rulemaking.

COMMISSIONER MCALLISTER: Yeah. So, you know, really a lot of progress. I think we've got sort of nice alignment for the moment, and then some issues I think that we're gaining clarity on, you know, which ones and priority on those that need to be teed up for the next go round. And so I'm quite satisfied with where we are right now. I mean, obviously it's been a lot of work and these decisions about how to approach the methodological decisions obviously have had a lot of brain power on them, and I think we've come to reasonable compromises where we need to and are in kind of a good spot. I think John's

point that it's pretty stable and, you know, several people have said, you know, including the E3 folks, that we are talking about kind of marginal impacts, you know, fundamental changes don't tend to happen, it's really kind of making sure that we're tweaking it in the right ways incrementally as we go forward and that the results are pretty robust. You know, changing assumptions here or there is not going to change radically the results we get. So I think we have a good tool to move forward with for the 2016 round and, you know, this will be a resource along the lines of the Demand Forecast, where it's something we do, a lot of brain power, a lot of effort goes into it, and then it's a nice foundational resource for the state moving forward. So I'm happy with where we are, and thanks for the presentations, and thanks you guys for all the work you put in on this.

CHAIRMAN WEISENMILLER: Also, again, I would like to thank folks for their participation today, and staff, and E3 for the work that's been done. Again, my takeaway is one that results do not seem to be remarkably sensitive to some obscure methodological tweak, but sort of flow

out. Certainly we are seeing that the utility system is changing around us, I think, in terms of as climate and everything else is changing. But again, I think moving in the general direction is good.

I think the other aspect that obviously in these areas you always have models, you have assumptions, you know, the modelers all of whom interact in their fashion. But the basic most important assumption, it seems like gas prices really flow out of things we adopted for the IEPR for use generally, it's not like we then ran off and came up with a special set of assumptions to justify these forecasts, as much as this all -- it's pretty much gas price is a very joint Energy Commission and PUC, and so again I think it's allowing for consistency across some of our decisions. So again, thanks.

MR. LOYER: With that, I'd like to thank everybody for attending on the WebEx and here in person, and we'll bring this workshop to a close. Thank you very much.

(Whereupon, at 11:23 a.m., the workshop was adjourned.)

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I do hereby certify that the testimony in the foregoing hearing was taken at the time and place therein stated; that the testimony of said witnesses were reported by me, a certified electronic court reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

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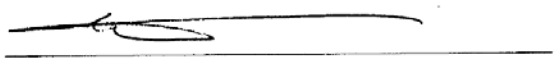

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