DOCKETED	
Docket Number:	21-IEPR-03
Project Title:	Electricity and Natural Gas Demand Forecast
TN #:	241525
Document Title:	Transcript - IEPR COMMISSIONER WORKSHOP ON ENERGY DEMAND ANALYSIS
Description:	IEPR COMMISSIONER WORKSHOP ON ENERGY DEMAND ANALYSIS
Filer:	Raquel Kravitz
Organization:	California Energy Commission
Submitter Role:	Energy Commission
Submission Date:	2/11/2022 9:22:58 AM
Docketed Date:	2/11/2022

STATE OF CALIFORNIA

CALIFORNIA ENERGY COMMISSION

In the Matter of:	)	Docket No. 21-IEPR-03
2021 Integrated Policy Report (*2021 IEPR*)	)	RE: Energy Demand Analysis

IEPR COMMISSIONER WORKSHOP ON

ENERGY DEMAND ANALYSIS

REMOTE VIA ZOOM

TUESDAY, DECEMBER 16, 2021

1:00 P.M.

Reported by:

Susan Palmer

APPEARANCES

COMMISSIONERS

J. Andrew McAllister, 2021 IEPR Lead Commissioner

Siva Gunda, Vice Chair, Lead Commissioner for Energy Demand in the 2021 IEPR

Patricia Monahan, Commissioner

CEC STAFF

Quentin Gee

Matt Coldwell

Raquel Kravitz

Patty Pham

Stephanie Bailey

Rosemary Avalos

Denise Costa

Mark Palmere

PRESENTERS

Lynn Marshall, CEC

Nick Fugate, CEC

Michael Kenney, CEC

Ingrid Neumann, Ph.D., CEC

Heidi Javanbakht, CEC, Moderator

PUBLIC COMMENT

Christian Lambert, Cal Advocates

INDEX

P R O C E E D I N G S

1:00 P.M.

THURSDAY, DECEMBER 16, 2021

MS. RAITT: All right. Well folks are logging on. Good afternoon, everybody. Welcome to today's 2021 IEPR Commissioner Workshop on Energy Demand Analysis. I'm Heather Raitt, the program manager from the Integrated Energy Policy Report, which we refer to as the IEPR. The Workshop is being held remotely consistent with Assembly Bill 361 to improve and enhance public access to state agency meetings during the COVID-19 pandemic by allowing teleconferencing options. The public can participate consistent with the directions provided in the notice for this workshop.

All IEPR workshops are recorded, and the recording will be linked to the CEC website shortly after the workshop, and a written transcript will be available in about a month. To follow along, the schedule and slide decks for today have been docketed, and they're posted on the CEC's website. Just go to the 2021 IEPR page and you can find them there.

Attendees may participate in the workshop today in a variety of ways. For those joining through the online Zoom platform, the Q&A feature is available for you to submit questions. You may also upload a question submitted by someone else. To do that, click the thumbs up icon. Questions with the most upvotes are moved to the top of the queue. We will reserve a few minutes after each presentation to take a few questions but may not have time to address all the questions submitted.

Alternatively, attendees may make comments during the public comment period at the end of the day. Please note that we will not be responding to questions during the public comment period.

Written comments are also welcome, and instructions for doing so are in the workshop notice and they are due on December 30th. And with that, I'm happy to turn it over to Commissioner Andrew McAllister, who is the lead for the 2021 IEPR. Go ahead. Thank you, Commissioner.

COMMISSIONER MCALLISTER: Great. Thank you very much, Heather. Appreciate that.

Looking forward to today's workshop; and I don't have a huge amount of comments to make. Just as everyone knows, this effort is really foundational to what the Energy Commission, to the Energy Commission's role as the Energy Policy and Planning Agency in the State of California. The forecast is really foundational to much of the planning that goes on in the state. And this is, today's sort of suite of topics is an update to the preliminary work that we heard some months ago on both the electric and the gas side, and then also on the hourly and peak electricity demand forecast, which is a relatively new product that I'm sure Vice LEAD COMMISSIONER Gunda will discuss in more depth.

But really, I want to just thank the whole team for developing, and Vice LEAD COMMISSIONER Gunda's leadership on this as well, for developing the suite of kind of updated products that are needed to inform our planning for reliability, primarily in the state in the years to come. And certainly the temporal aspect of the analysis and sort of the granularity of the analysis and just improvements all around that we'll hear about today are key to sort of

being as relevant and sort of as substantive as possible so that we can inform the decisions that have to be made in terms of investment and resource planning of all types.

So with so I want to thank again Heather for, and the whole team, Raquel and Stephanie and the whole team, for putting together the workshop, the Assessments Division staff who we'll hear from, Lynn and Nick, Michael and Ingrid, as well as Mark Kootstra, and the whole team that's kind of behind here.

Often -- and then just to remind people, the reason we're doing this in December is that we kind of have to get through the peak summer and get the data in order to be able to do the analysis and be fully up to date. And so it's always kind of a mad dash to the finish line here. And so we're hearing about a fairly well-developed snapshot today. So we're looking forward to that.

And then also getting an update on SB 350 and the updated analysis to round us out at the end of the afternoon. So thank you all for being here.

I really want to say we look forward to

your comments on this and any observations or additions or tweaks you might suggest. It is really helpful to hear that from knowledgeable stakeholders that are tuning in.

And want to thank all the staff again and EAD for the incredibly hard work and just the level of professionalism that they bring to this every day. And it's a, you know, it's a moving it's kind of, in a way you know, with reliability and climate, it's a little bit of a moving target. So it requires a lot of all hands on deck, it seems like all the time.

Anyway, with that, I'll wrap up my comments and pass it on to the Lead Commissioner on the Forecast and the Assessment Division, Vice LEAD COMMISSIONER Siva Gunda. So Vice LEAD COMMISSIONER Gunda.

VICE CHAIR GUNDA: Thank you, Commissioner McAllister, thanks for setting the stage. I will try not to repeat some of the things you mentioned. I would also just want to say nice to have Commissioner Monahan on the dais and other stakeholders as usual. This is a wonderful process that we have.

So I think Commissioner McAllister

mentioned this, but just want to reiterate that the CEC's California Energy Demand Forecast, which we call the CED, is actually a set of several forecasting products that are used in various planning proceedings across the state. They include CPUC's work in the IRP, includes the transmission planning, and the CAISO, and so on. So it really underpins a lot of the state's work and hence it requires a lot of coordination between the agencies on figuring out the methodological improvements and consistency and the data and the assumptions. So it's usually done through a very coordinated process over the year on a weekly basis where staff meet and discuss the different elements of the forecast.

So just want to thank the interagency team for the continued coordination through the Joint Agency Steering Committee forum and then kind of moving the forecasting products forward carefully through the year.

There's also a second element outside of these public workshops we have, which is called the DAWG, the Demand Analysis Working Group, that also plays a pivotal role with a number of stakeholders, including the utilities, the LSEs,

and a number of data providers and entities that are watching and are interested in the technical details typically are part of. And that's also a very important element in developing the forecast.

So the -- there are several different forms of energy use in California. Obviously when we talk about energy demand, we talk about electricity, natural gas, gasoline, diesel and many other fuels. And really the forecast is supposed to be a data driven product that develops a reasonable assessment of where we are going to be in the next 10 years. So that sets the stage for some of the planning processes.

Here I would like to just remind that this is the second of the workshops on the Forecasting results. The first one was on December 2nd where staff were able to present some high level details on the Transportation Energy Demand Forecast, the Additional Achievable Energy Efficiency and Fuel Substitution, and also introduce the CEC's Demand Scenarios Project. And a couple of important things that we heard during that conversation: you know, Commissioner Monahan's suggestion on really thinking about

this as an integrated work across many sectors and having the opportunity to ensure that the forecasting is done in a way that the metrics are transferable between policy ideation and discussion in different sectors, whether it be CO2 emissions, air quality and so on. So how do we think about the Forecast, you know, in a BTU sense, you know, specific to sectors, but also we can talk through the different sectors for policy situation.

And there's also the recognition that forecasting is not anymore a siloed effort, and it has to cross-cut many of our programs, many of our divisions. So just want to thank again for the staff for doing that. And then also the words we heard from Commissioner McAllister and Commissioner Monahan to really do that as we move forward.

So just want to finally acknowledge the forecasting team before I hand it over to Commissioner Monahan for opening comments. These two years have been extremely challenging for all of us and definitely not in any small measure, the forecasting team. We had retirements, we had losses on the forecasting team, and more

recently, we have staff that are able to -- that had to go on extended leave. So it has been a continued difficulty in adapting our work to the needs of what we need to do at the loss of resources and the way we work typically. So I just want to thank Matt Coldwell, Heidi Javanbakht, Chris -- sorry, Matt – sorry Nick Fugate, Mark Palmere, and a number of Lynn Marshall and many others behind the scenes: Ingrid Neumann who are working tirelessly to make this happen. They typically put towards the end of the end of the year put, you know 50, 60 hours a week to get this done. So I just want us to all be grateful and recognize the effort that the staff put in as we provide feedback and, you know, opportunities for improvement.

With that, thank you again to everybody for being here and helping us move this forward. So pass it on to Commissioner Monahan if you have any opening comments.

COMMISSIONER MONAHAN: Well thank you, and I want to just emphasize what Vice LEAD COMMISSIONER Gunda just said around the analysis that EAD has been shepherding and the sort of challenges that you faced in staffing this year

and the fact that here it is the holidays, and this is when you're still working many hours to get this product to the finish line. So I just also want to acknowledge all the hard work that's going into this.

And I do think that, you know, every year we are evolving in our understanding of the systems integration aspects of our forecast. And I just appreciate Vice Chair Gunda's thought leadership and Commissioner McAllister in terms of just really I think being able to connect the dots and also the staff who is just continuously trying to refine the analysis, improve it, learn from what we're seeing in the marketplace. And one of the most dramatic transitions, as I've said before, is happening in the transportation sector and we are just scratching the surface of our understanding.

There is no shortage of research in this space, and you know, what is the electrification pathway? How fast? How do we make it equitable? How do we make it good for the grid? You know, these are all really important foundational questions that I think California is at a leadership position to inform not just what's

happening across the United States, but across the globe. And I think that that's this, you know we are, California is such a leader on clean transportation and how do we continue to be that leader, not just in our regulatory arena, but also in the analysis and research that we do.

So just looking forward to today and I've really learned a lot through this whole process. So kick it back over to our leader, Heather, who is ably stewarding all these pieces.

MS. RAITT: Great. Thank you, Commissioner. Thank you.

So yeah, our first presenter this afternoon is Lynn Marshall, and she'll be presenting on the 2021 Annual Electricity and Gas Demand Forecast, and she's one of the lead forecasters in the Energy Assessment Division. So go ahead Lynn. Thanks.

MS. MARSHALL: Good afternoon, Commissioners. Okay. Next slide. So this shows the suite of products that was just being discussed. So today I'll be presenting the Annual Forecast of Electricity Consumption and Sales and Our Natural Gas Forecast, as well as Managed Electricity and Sales Forecast. Nick

will be covering the peak and hourly forecast later and then after this workshop we'll be working on getting forms showing those annual electricity sales results posted, as well as developing the LSC and Balancing Authority tables that are used by our sister agencies. Next slide.

So at this point, we've had to have hours and hours of workshops discussing all of the modeling and data changes to our forecast, so I just want to highlight a few of the key inputs. There's a link down at the page from Heidi's presentation two weeks ago that has a good summary of when different topics were covered, so people can refer to that. But the changes with the biggest forecast impact: first is, you know forecasting off of 2020 actuals, and of course, that's something we do every year but because of the -- it's particularly impactful this year because of the challenges of forecasting, what would happen with 2020 and in some cases thingsare significantly different. Updated economic drivers, and then on our -- among our load modifiers, the largest impact is from our electric vehicle additions: light, medium and an

increased heavy-duty demand.

We have some significant changes to our self-generation forecast, which I'll come back to, and then we've included incremental effects from 2019 and 2020 efficiency programs and our Title 24 and 20 building and appliance standards. And then, of course, we're doing both additional achievable energy efficiency and additional fuel substitution so that building electrification is showing up in that AA fuel substitution portion. Next slide.

So this summarizes the demands -- the various demand scenarios that cover our baseline economic forecast, and then we have high and low economic and demographic projections, and our high energy demand with high EV adoptions. And conversely, low EV adoptions and higher rates in the low case. Now let’s move forward to the next slide.

All right. So the economic and demographic projections over the long term, they're fairly similar, but there are some changes. Overall, population and household projections are lower. And in the near term, there's a little different impact. So the

previous forecast was forecasting a large drop in personal income in the near term; that didn't happen. On the other hand, on the employment side, if we could and go to the next slide, please. So employment dropped more than was forecasted, and in particular in some sectors. And the forecasted recovery is a little more gradual, so that has an impact on our forecast trajectory. Next slide.

And then this shows, going back to our Transportation Electrification, the scenarios that have been discussed at the previous workshops. So in the mid-case, we're adding about 31,000 gigawatt hours for vehicle electrification by 2035. Two-thirds of that is in nonresidential sector, heavily concentrated in commercial. So that's a big impact on that sector. Next slide.

Okay, so we'll start with our Consumption results at the statewide level. So this is all consumption, even that -- including that served by self-generation. So at the statewide level we're pretty -- the forecast is pretty consistent in the near term. You do see that higher growth, in particular due to the economic recovery in

certain sectors and transportation electrification. But the differences are much more significant when we go to individual planning area levels or in individual sectors. Next slide.

So looking at residential now, what we saw in 2021 was a significant increase ranging from 9 to 12% increase in use per household than in 2020. Our forecast is assuming that much of that higher use per household persists through the forecast period. So we have a lower growth rate there, but we're still quite a bit higher than our previous forecast. And that does include some vehicle electrification, which about 40% of that is offset by building and appliance standards. Next slide.

So looking at the Commercial Consumption we have a different situation. There was a large drop in 2020 and we're slowly recovering from that with a gradual rebound in employment. So that increasesthe growth rate in the near term and then as we move out towards 2035 the vehicle electrification is increasing our growth rate to 3% annually, so it’s significantly higher than our previous forecast. Next slide.

So looking at the Industrial Consumption, the economic outlook is fairly similar, a little lower in some sectors. We do have higher electricity rates in that forecast, so we do have a slightly lower growth rate overall. Next slide.

And then our AG and Water Pumping sector. So this includes three things: water pumping for the water projects like DWR and MWD that slightly lower and it reflects a long-term trend towards lower demand in that area. Also, the core agricultural activities, there's a slightly lower outlook in that sector, but then on the cannabis production, we have a slightly higher forecast, so we end up with, we have a higher starting point overall. So next slide.

So that's the consumption sectors. Now as we move to self-generation, we made extensive updates to the self-generation model. Everything from new interconnection data, modeling of the NEM 3.0, updated rate assumptions, the ITC extension, revised Title 24 modeling, POU net billing, and we did include the recently adopted 2022 Title 24 standards for non-residential PV. So some of those are increasing, would tend to

increase the forecast, some of them would decrease it and the combined impacts of those, in particular the rate assumptions, are going to vary by planning area and sector.

So overall that we have a slightly higher forecast, two and a half percent by 2035, but it varies significantly by utility and sector. So for example, in the Edison residential sector, the forecasted growth consumption is quite a bit lower, on the other hand, PG&E is higher. In the public utility areas such as Burbank and LADWP, you do see a larger increase. So that's going to impact the sales forecast that we'll show next. Next slide.

Okay, so statewide sales and again, at the statewide level, it looks like not much has changed. Slightly higher growth rate, much lower than our consumption forecast because we've got additional self-generation. But I'm going to move on now to the planning areas. Next slide.

Let's start with that PG&E planning area. So there was a large decline in commercial usage in 2020 that's not forecasted to come back fully for several years. So we end up with a higher growth rate, but we're still lower overall than

our previous forecasts, and again, PG&E had an increase. We increased our forecast of self-generation in the PG&E planning area, so we have a lower forecast overall. And then now we can show this. This is our unmanaged forecast. So if we go to the next slide we have the managed forecast.

And what we're doing here is starting with our unmanaged forecast and combining this with the Additional Achievable Energy and Fuel Substitution Scenarios that Ingrid presented two weeks ago. So she had -- there was a range of scenarios, 1 through 6, with 5 and 6 being fairly ambitious. So for our managed cases that we use for planning, some of the candidate options are: 2, the lowest; 3, the mid-case; and 4, which is high. The mid-case is usually what we use for system planning. So you can see with that mid-energy efficiency and the fuel substitution, we're now lowering the net amount of additional achievable adjustment because the fuel substitution is offsetting the energy efficiency.

So while the -- so we started with a lower unmanaged forecast, and it's lower, the managed forecast is lower in the near term. As

we go further out, we now have a higher forecast out in 2030. So next slide.

Edison, we have the opposite situation. Edison had about a 12% increase in residential use per household, among the largest of the planning areas. So we do see that higher starting point in that level persisting. And then adding the commercial electrification, and the lower self-generation forecast, we have quite a bit higher forecast; 5% higher by 2030. So if we go to the next slide with the Managed forecast, that difference is even larger because, we'll we're subtracting energy efficiency, we're adding fuel substitution. So 7% higher mid-mid managed case by 2030. Okay.

And then finally we go to, among the IOUs, we'll show the San Diego. Their 2020 residential and commercial changes offset, kind of like the state as a whole. So we only have a slightly higher forecast here, same starting point, again reflecting the commercial transportation electrification.

Now, the next slide shows that the San Diego Managed Forecast and that our managed forecast is now higher because of the impact of

the fuel substitution and less AA.

So next slide I'm going to combine all three of those to show the CAISO mid-managed case and the PG&E and Edison forecast kind of balance out. We're almost unchanged in the near term for 2023, but by 2030 we have a 4% higher managed case. Next slide.

And we'll go -- move on to a couple of the public utilities. LADWP, they had a really large drop in commercial consumption; I think among the largest, 11% in 2020. So we've got a much lower starting point there. But there also have the projections for additional vehicle electrification, much of it is concentrated in the LADWP; in particular, heavy-duty and medium-duty. So by 2035, almost 13% of their consumption is serving that EV load. So next slide.

We can show the Managed Forecast with relatively more energy efficiency potential. But we'll still have a higher mid-mid case, although there's a more dramatic effect compared to the unmanaged case; 9% lower in 2035. Next slide we will go to SMUD.

Thank you. Okay. SMUD had -- did not

have the -- as large of impact in the pandemic. In fact they had increased industrial use. When you combine that with electrification's fairly robust economic growth, we have slightly -- this was slightly higher than forecast. I think we had a one and a half percent annual in the 2020 update, with two percent annual now. So going to the next slide, which shows the SMUD Managed Forecast.

And again, that reduces -- let's back up one more. Okay.

So the forecast is reduced from like 2%, annual growth rate to 1.3%. And I think looking at the forecast, that SMUD filed with us for this IEPR, I think these, couple of these managed cases are more in line with what they've forecasted. So now I'll move on to the Natural Gas Forecast.

So we see here most of this growth, we have a slightly higher growth rate, but really that's reflecting this big drop in commercial sector consumption. It comes back gradually over the next, few years. And then we have, most sectors have really minimal growth rate; like a third of a percent per year. So this is

unmanaged. So now we can take our energy efficiency and fuel substitution and on the next slide look at a managed forecast, Managed Natural Gas Forecast.

And that fuel substitution has a pretty significant impact on the gas side. So the natural gas consumption is reduced by almost 12% by 2035. Would be some tons of carbon if we had our emission factors handy.

And I think that is all I have, so I will open it up to questions.

LEAD COMMISSIONER MCALLISTER: I had a, just --

MS. MARSHALL: I can't hear.

LEAD COMMISSIONER MCALLISTER: Can you hear me now?

MS. MARSHALL: Yeah.

UNKNOWN SPEAKER: Yeah. Go ahead, Commissioner McAllister.

LEAD COMMISSIONER MCALLISTER: Okay, great. No, I just had a quick question, more for the IEPR team. You know, this is obviously very dense. Really appreciate the analysis that goes behind that and juggle, you know, juggling the counter billing tendencies in terms of increased

electrification and increased efficiency as well. So I want to just make sure that these presentations are already on the docket and already circulated so that people --

MS. RAITT: Yes.

LEAD COMMISSIONER MCALLISTER: -- can dwell on some of the -- so they can open it for themselves and dwell on some of the graphics, even though the presenter themself might move on.

MS. RAITT: Right. Yeah. Commissioner, they're all --

LEAD COMMISSIONER MCALLISTER: Yeah.

MS. RAITT: -- all the presentations done today are docketed.

LEAD COMMISSIONER MCALLISTER: Yeah. Okay, great. I just want to invite people to do that so they can focus on the slides that are most important to them because it's hard to take in the firehose of information without a little bit of calm. So I just want to encourage people to do that if they so desire.

But thanks a lot, Lynn, for that. That was -- that was really good. Notable, the difference is from just a year ago. I mean, really quite remarkable.

VICE CHAIR GUNDA: Yeah. So Lynn, I think just from my side, I think, you know, thank you again for all the briefings. I know you guys are trying to keep everybody up to date internally. But just, you know, for the broader stakeholders that are in attendance today, could you just talk a little bit about the kind of the way we are capturing the economic variable? Yeah, economic variables that we depend on others but, you know kind of like to the extent that you see how the pandemic is being captured and you know how directly or indirectly we captured it. I think it would be a good thing for the broader stakeholders to hear.

MS. MARSHALL: Yeah. So we're using -- we used Moody's economic demographic forecast and you know they are attempting, we're using the May version, they're attempting as best they can to model out the impacts of the recession. They've done the pandemic. They've done quite a few scenarios. It's obviously been pretty challenging. The forecast we're using right now, it does have, you know, a fair bit of recovery in employment, but obviously there's a lot of impacts that are different that have been

difficult to predict and models.

So we're using things like their employment, industrial output, personal income. You know, so for the last forecast, like where the personal income forecast was way off because they didn't anticipate all of the stimulus that was -- would go out. And I think some of the individual like sector levels, because of how things played out with supply chains and which industries increased production and which decreased, that was a little hard to predict, but we'll update that again next year.

VICE CHAIR GUNDA: Thank you, Lynn. So one kind of question, and then I'll pass it on to Commissioner Monahan. Just on the, specifically on the SCE case, you kind of just talked about the higher consumption that's coming in. Do we have a sense on where it is coming from specifically and what's driving that.

MS. MARSHALL: Well, so there's two things. In the current, sort of our starting point, there’s higher residential use in our -- right. And then we're adding, in the forecast period, we’re adding vehicle electrification. We're adding that additional

load. And then when you get to the sales forecast, we're also forecasting less self-generation in the SCE area. So combined with that, that really impacts the bottom line, you know, Sales and Managed Sales forecasts.

VICE CHAIR GUNDA: Thank you, Lynn. I'm going to pass it on to Commissioner Monahan, but again, I just want to say thank you for your incredible work. Thanks for jumping in over the last month and a half, especially, and taking on additional work than you usually do in a forecasting year. Thank you.

COMMISSIONER MONAHAN: Lynn, I wonder, I have some really basic questions. So could we go to slide 13 on statewide commercial consumption? Not natural gas. So I think it's slide 13. Well, I can just walk -- I can say it, Lynn, and maybe you can just.

So basically, on the commercial consumption, the historical pattern was slightly trending upward, mostly flat though over the last decade. And then our projections have it going up. Can you just walk us through why? Why we're anticipating an increase in commercial electricity consumption?

MS. MARSHALL: Yeah. So part of that is we're, you know, the big drop in 2020. Just let me pull that slide up. It's --

COMMISSIONER MONAHAN: Yeah, that one makes sense. But it's the -- it's the --

MS. MARSHALL: Ten.

COMMISSIONER MONAHAN: -- 2000 to 2020, there's a little trend upwards, but it's pretty flat between 2010 and 2020.

MS. MARSHALL: Mm-hmm.

COMMISSIONER MONAHAN: And then --

MS. RAITT: It's on slide 10.

VICE CHAIR GUNDA: Slide 10, please.

COMMISSIONER MONAHAN: Oh, sorry. In my docket it's a different number. Yeah.

MS. MARSHALL: So, yeah. So near-term, in the near term, it's partly, you know, economic recovery. So we're getting back to previous levels.

COMMISSIONER MONAHAN: Mm-hmm.

MS. MARSHALL: But then a lot of that growth is the additional vehicle electrification. So that, you know, that 31,000 gigawatt hours were added.

COMMISSIONER MONAHAN: Oh, that's why.

Okay.

MS. MARSHALL: More than 60% is the vehicle --

COMMISSIONER MONAHAN: So if you factored out -- if you took electric -- EV load growth out, what would it look like? Would it be more flat?

MS. MARSHALL: That's why -- it's -- yes, definitely more flat. So it's probably adding at least a half a percent to the growth rate.

COMMISSIONER MONAHAN: Mm-hmm.

MS. MARSHALL: So like, yeah.

COMMISSIONER MONAHAN: And for industrial, which also, industrial was trending down over the last two decades. And then we have it kind of more on the mid-case being flat.

MS. MARSHALL: Mm-hmm.

COMMISSIONER MONAHAN: So it seems like, you know, historically there's been this big efficiency push. Have we tapped out of industrial efficiency? Is that why it's flat?

MS. MARSHALL: I think we're not basing in a continued decline in that -- in that energy intensity. It's a little hard to forecast.

COMMISSIONER MONAHAN: Mm-hmm.

MS. MARSHALL: So.

LEAD COMMISSIONER MCALLISTER: Maybe Lynn, just on that point -- that's a really good question, Commissioner Monahan. And it also has to do I think with the -- I'm sure Lynn, you have more insight on this, but with the kind of changing mix of the industrial sector in the state to be a little bit less heavy industry and a more light industry manufacturing and sort of a shift in our economic base.

MS. MARSHALL: Well yeah, and some of that, you know, the industrial includes, you know, tech related activities. So some of that is growing pretty strong, so --

COMMISSIONER MONAHAN: Mm-hmm.

LEAD COMMISSIONER MCALLISTER: Okay. Right.

MS. MARSHALL: -- you know there's different --

LEAD COMMISSIONER MCALLISTER: Yeah.

MS. MARSHALL: -- there is a different mix of resources there, industries there.

COMMISSIONER MONAHAN: Lynn, maybe we could have an offline, you could brief me offline, just so I could understand all these

factors at play.

MS. MARSHALL: Sure.

COMMISSIONER MONAHAN: That would be great.

MS. MARSHALL: I would be happy to do that.

COMISSIONER MONAHAN: Okay, thank you.

I have no other questions, so.

VICE CHAIR GUNDA: That's a -- that's a really good question, Commissioner Monahan. I think, you know, you always start out by saying basic, but you know, like actually pretty insightful questions. So thank you for raising them, and I -- hopefully we can have further discussion on that.

So I don't know if we -- if we don't have any more questions, I think we would go to the Q&A submitted by attendees from Zoom at the end of this. So Heather, I'll pass it back to you.

MS. RAITT: Yeah, actually, we don't have any questions in the Q&A, so if it's okay with you, we'll just move on to our next presenter. Thank you Lynn, so much for that presentation.

So we'll go on to Nick Fugate to talk about the 2021 Hourly and Peak Electricity Demand

Forecast. So go ahead, Nick. Thanks for being here.

MR. FUGATE: Thank you, Heather. So good afternoon, Commissioners, also everyone who's joining us online. Thanks for your time and attention today. My name's Nick Fugate and I have prepared a presentation on the draft results of our Hourly and Peak Electricity Demand Forecast developed for this IEPR.

And as the Commissioners noted, our internal schedule slipped quite a lot this year due to some unexpected absences from a couple key staff. So I have to -- I have to add my own acknowledgement and gratitude for the extraordinary contributions from both Lynn Marshall, who we just heard from, and also Alex Lonsdale, who both stepped out of their normal role and dove into the forecast to carry a lot of that weight over the last many weeks. Next slide.

So the Energy Commission's peak forecasts are used as a direct input into resource and reliability, also transmission planning studies. Commissioners spoke to this at the top of the workshop today, so I'll just add a couple of

points here. One being that a number of the specific use cases for the scenarios that Lynn and I are presenting today are outlined in detail as part of a Single Forecast Set Agreement between the CEC, the CPUC, and CAISO. And that agreement is memorialized within the forecast volume of each IEPR report.

I'm going to present today the peak forecasts, but I will be discussing updates to our Hourly Load Model as these two analyses are related. The peak forecast is actually derived from our hourly load analysis, Next slide. One more.

So by now, the motivation for using an hourly model to forecast peak demand should be relatively clear. Demand modifiers like PV, and storage, and electric vehicle charging alter the system load profile over time, and this can have an impact on the rate of peak load growth and also the timing of the peak hour. So the chart here is just an illustration. It shows the steep ramping period between early afternoon and evening caused by the significant additions of behind-the-meter PV. And then PV also shifts to peak hour here from hour 18 to, in 2020, to hour

19 in 2025. And electric vehicle charging very nearly shifts the peak hour later by 2030. Again, this is just a for illustration purposes. I'll discuss our actual load profiles, forecasted load profiles later in this presentation. Next slide.

The structure of the Hourly Model is unchanged from last time, last cycle. The HLM model's load ratio for each hour of the day, so that's the ratio of load in each hour of the year to the annual average hourly load for that year. And this is a convenient specification. The model does not have to account for economic and demographic activity when we're -- when we're estimating it because that could impact the absolute magnitude of the loads. And so these sorts of considerations can then be taken up in the 10 year annual forecast of consumption load. And then we can apply those hourly ratios to the annual consumption forecast to get our hourly load forecast.

And then we adjust that hourly load forecast to account for the incremental impacts of additional load modifiers added over the forecast period: PV, electric vehicle charging,

efficiency, and now fuel substitution. For these load modifiers, we've developed a unique set of profiles. And then as a last step, we calibrate the resulting profiles to our base-year estimate of weather-normal peak load. Next slide.

So I'm going to say a bit more about each of these steps describing what we've done for this forecast cycle, starting with the first -- next slide. One more.

So the reason I had, on the last slide I had consumption in quotes and the reason being that we're not using actual total consumption in the specification of our model, but rather a recorded system load, which we then reconstitute to reflect the impact, both of the demand response events and also behind-the-meter PV generation. So we know what -- we know what actual system load is on an hourly basis. We get that from CAISO. And we have a pretty reasonable estimate of what demand response impacts are. I use -- I have a process for estimating those. So we -- the sort of missing piece of the puzzle and it's a big piece is behind-the-meter PV generation. So to this point, we have been relying on average generation profiles to

estimate historical generation, and these average profiles were developed using metered generation data from a five year study of a few thousand systems. This study is 10 years old.

Last cycle, our self-generation modeler invested some time and effort into updating, sort of reweighting these profiles to reflect a more current mix of system orientations based on our interconnection data that we have now. And even with this update, though, we're still encountering an issue with using average profiles to reconstitute historical consumption. So on days with heavy solar insulation, our average profiles were overestimating generation, leading to spikes in the resulting consumption record. There's enough behind-the-meter PV on the system now that these spikes were becoming impactful, sometimes several hundred megawatts for a single planning area. Next slide.

So we made an effort this cycle to address the issue by attempting to simulate PV generation. We figured we could improve on our estimate -- on our average estimates through the use of NREL's System Advisor Model. We have a interconnection dataset. It's a rich dataset.

And so the general approach was to take that information, categorize systems by tilt, and orientation, and location, and then create representative historical profiles which are based on actual -- modeled using actual solar insulation data for each of those categories. And then weighed those profiles by our installed capacities to create generation estimates for each forecast zone. As an intermediate step, we also compared our modeling results against a relatively small set of CSI systems for which we had actual generation data. It was important to us that we had actually ground truth the modeling that we were doing, and the results were encouraging. So next slide.

This is an example of our simulation compared against actual system generation data for the CSI dataset, and each plot shows a different historical month and year. And I know this is a strain on the eyes if you're trying to read any of these actual numbers here, but the main point I'm trying to illustrate is that generally the simulator results track well. And importantly, for the handful of days with heavy solar insulation where production drops off

significantly, our simulated results did pretty well; they also dropped off. Next slide.

And here is a comparison of our simulated results for the SDG&E forecast zone compared against average generation profiles that we had been using as a stand-in for not having actual generation, historical generation. And this is to really illustrate the issue that I'm, you know, talking about that we're attempting to resolve. So on days with no solar insulation, our average profiles can actually tend to slightly underestimate production. And then on days with heavy solar insulation, they can drastically overestimate generation. Next slide.

So we took a --- this is a very detailed approach that we took for the simulation effort, and it was very time intensive, and so we were only able to model SDG&E's territory for this cycle. We have a number of, well we have 20 forecast zones and so as an intermediate step so that we had an improvement for the CED 2021, we asked Kevala Analytics to develop historic profiles that we could use to -- as to fill in the blanks for all of our other forecast zones. So we compared the profiles that Kevala developed

for us against what we had simulated for SDG&E, and we're comfortable with the profiles that Kevala provided. They seem to also reasonably estimate historical generation. And so those are the profiles that we are using to estimate our hourly model this cycle.

We are -- and it's something that we'll have to update every year going forward. And so we are going to continue to look to expand our simulation effort to cover all forecast zones. We're also looking to acquire a more substantial set of meter generation data because, again, it's important to us to actually be ground truthing these model results, and then we will also look to coordinate with the CPUC's Modeling team. They have an established and relatively efficient approach to a similar problem. Though theirs is focused on and benchmarked to supply site generation.

So our next step would be to make comparisons with our respective approaches and see if they produce similar results. And then from that point, there are a number of applications for this simulated data, even beyond the hourly load model. We can update our average

PV profiles for the forecast. We can develop distributions of hourly profiles around each forecast year, and perhaps improve our peak load normalization process. Next slide.

I'm not going to say anything about step two. The major updates there come from updates to our underlying consumption forecast, which Lynn already discussed, but we do have some updates to our load modifiers. So I want to show those. Next slide. Perfect.

So this one should look pretty familiar to most of us. We are using the same PV profiles as last cycle. That is the average profiles from the metered study I discussed earlier, weighted by the cumulative capacities and orientations from our current interconnection data sets. I'm going to show several charts like this. They show the non-coincident 2035 peak day impacts of each set of load modifiers by individual attack area, and then also normalized over the day. So the y axis is just a ratio of the impacts in that hour, divided by the total impact over the day. For reference, the peak day occurs in late July for PG&E and early September for SCE and SDG&E. Next slide.

Our light-duty EV charging profile is actually a composite of underlying profiles for at home charging and destination charging. For this cycle, the at home charging profile is unchanged from last cycle, where we're still using the same profile ADM developed for us, which is based on a sample of ChargePoint data, and adjusted to reflect time of use rate impacts.

For the destination charging, the profiles that ADM originally developed were based on a very small sample of charging data. So for this cycle, we are instead using destination charging profiles taken from the AB 2127 report. And these profiles were discussed in more detail with stakeholders at a meeting the Demand Analysis Working Group on September 14th. I think those materials are posted on the DAWG website, for anyone interested. Next slide.

Here we have our medium and heavy-duty profile. So this is again another composite of different vehicle classes with medium and heavy-duty vehicles. We are, of course, lacking in a lot of real world meter data. So any profiles we use are going to be speculative to some extent. For this cycle, we're relying on

the LBNL heavy-load model, which develops charging load profiles based on real world activity data for different vehicle classes.

In doing this, we expanded the underlying set of profiles from three categories, which I believe were buses and then two different size categories for trucks, to now 12 different vehicle classes. And don't ask me to name them all. And again, these changes were discussed in detail at the September 14th DAWG meeting. Next slide.

Here we have our residential storage charge and discharge profiles with charging indicated by positive values. These are also the same profile that we used for the 2020 update. Staff modeled battery systems paired with PV using NREL's SAM Model and assuming that a charge/discharge pattern would optimize the customer's economic benefit. So we see that batteries are being charged by solar in the late morning and discharged in the evening when rates are highest. Next slide.

For non-residential storage, we have another composite profile. We're using charge/discharge patterns estimated by Itron for

the CPUC's most recent Self-Generation Incentive Program Impact Report. The underlying profiles are specific to different building categories, but even within an individual category, the profiles seem to reflect different operational strategies. Some, like with the residential profiles, seem to be charging systems from their solar; so in the morning, and then discharging through the afternoon and evening. But a fair number of systems also seem to be charging from the grid at night and discharging during the day. Next slide.

Staff also projected the impacts of the transition of PG&E and SCE residential customers to a default time-of-use rate using the hourly per household load impacts estimated for the 2020 Default Time-of-Use Pilot Study Load Impact Evaluations and also the most recent PG&E and Edison transition schedules. There's no profile here for SDG&E as they have completed their rollout and the baseload modifiers for mostly looking at impacts incremental to the base here. Next slide.

Our additional achievable energy efficiency impacts have been refreshed this cycle

in conjunction with the CPUC's latest Potential and Goals Study. While the ratios here are positive, these impacts are, of course the load reduction in this orientation though, you can see the peak day impacts from more efficient space conditioning measures are pretty apparent. Next slide.

This is the newest addition to our set of load modifiers, Additional Achievable Fuel Substitution. These impacts are also aligned with the Potential and Goals Study and have been discussed more recently, or more extensively at a number of workshops, including one just a couple weeks ago. Recall that, you know, what I'm showing here is the Summer Peak Day Profile. So there's perhaps less space heating impact than you might expect to see if you were looking at say a winter day profile. And instead, what we are seeing here are the impacts, mostly from water heating and to a lesser extent, cooking end uses. Next slide.

So here's a graph similar to the illustrative one I had at the onset. So I'm showing the impacts to the overall system load profile as we layer on more of these load

modifiers each year. This is the CAISO Peak-Day profile for a number of select forecast years. Behind-the-meter, solar contributes to the -- continues to carve load out of the middle of the day, creating a steeper ramp in the afternoon. And then the significant load growth occurs in the -- in the late evening and early morning hours, and the hour of system peak is forecast to shift from hour 17 to hour 19 by 2023. After that peak shift, additional PV, well additions, have no incremental impact on the peak load. Next slide.

Okay. So admittedly I am not the most visually oriented person in the world, and I had been struggling to come up with an effective way to show the relative contribution of individual load modifiers to peak load. And it was recently suggested to me to use a waterfall chart, which I had never heard of. And I'm going to say who that person was, but I do want them to know that I would have much rather -- would have much rather spent the two hours it took me to put this chart together last night, sleeping instead. I do like the effect though, so I will say that. And I promise the next time I put one of these

together it will look a little nicer than this.

But in any case, here are the relative impacts by 2035 of incremental load modifiers projected to be added over the forecast period in the CAISO control area. Scenario I'm showing here represents our mid-baseline forecast, compared with mid AAEE, and -- or sorry, paired with mid AAEE and mid AAFS, which were, I've commonly referred to as Scenario 3 when they were discussed in the -- in the development process for the Additional Achievable Scenario developmental process. When our forecast -- in our forecasting, we've grown accustomed to referring to these as mid, low and high scenarios, but in the Potential and Goals Study in the AA process. They are typically referred by scenario; so mid-AAEE, mid-AAFS is Scenario 3. Next slide.

My thanks to Commissioner Monahan. That's all for load modifiers. I do want to come back to the final step of our Hourly Load Model process, which is to calibrate to the results are weather-normal estimate of base-year peak load. Next slide. One more. Perfect.

All right. This is another process that

has been discussed a number of times publicly and with stakeholders, so I'll just review it at a high level.

To normalize peak load, we begin with hourly system load data from the CAISO, and we add to that, again, impacts from DR events estimated by the IOUs. And this results in a counterfactual hourly load series approximating load in the absence of dispatchable DR. We then select and we do that -- we added the DR back in because we are -- our forecasts are all queued around -- well we don't include any dispatchable DR in our forecast, and so we don't want to -- we don't want to benchmark to load that does include those impacts.

So we then select a daily peak -- we then select daily peak loads from the last three summers and regress those against weather effects such as maximum and minimum temperatures, daily temperatures, calendar effects such as day, the week, month, year. And we do this to establish the current load response to temperature and then when you use that relationship to simulate peak summer loads using historical weather data from the last 30 years. And the distribution of those

simulated peaks gives us the median value, which we take as our normal estimate.

This is not product placement, I just have a dry throat. Next slide, please.

So, at a DAWG meeting on September 30th, our -- well, so we discussed the challenge posed by climate change and estimating weather normal conditions, specifically, given a series of single observations drawn from a distribution with -- of likely outcomes. So the peak load, weather temperature conditions, you know, each year, for example. If the expected value of that distribution is gradually increasing over time, sort of illustrated by this graph on the right here, then using a 30 year window to estimate what that expected value is, it is likely to give an underestimate.

And so this question of establishing a present day normal, within the context of a changing climate is, well it's an identified use case for the new Cal-Adapt Analytics engine currently under development and due to begin rolling out data products next year. So we are excited to be working with that team to improve climate considerations within our forecast,

specifically related to normal weather.

In the interim, though, we did propose a straightforward adjustment to our weather normalization process, which is to sample recent historical weather patterns more frequently during the simulation step. So next slide.

So here I'm showing our weather normalized peak estimates, both with and without that weighting adjustment. Prior to the adjustment, the results are slightly higher than CED 2019 normal levels, though our consumption forecast in that year is -- I'm sorry for our consumption forecast and this year, 2021, is lower than 2019 levels. So the overall peaked consumption ratio is higher. Lynn discussed earlier some of the shifts in energy consumption within and between sectors; residential, commercial and industrial. Each of which has a different load factor. So a higher peak to energy consumption ratio could reflect the reality of our situation now, particularly with higher residential consumption.

But I am eager to review these results with some of our key stakeholders, namely JASC and IOUs in particular, as they have their own

forecasting team's thinking about these things. And so hopefully we can touch base over the next couple weeks during the comment period. The -- this is this something we would typically do ahead of our results workshop, but we really came down to the wire this cycle. So hopefully no one has any plans over the couple weeks, right? Next Slide. One more.

Okay. So, some results. I'm going to show a series of similar slides for each forecast area, planning area, starting with PG&E.

This is PG&E's CAISO Coincident Annual Managed Peak Forecast. I'm showing a few different scenarios, each using the mid-baseline forecast but paired with different AAEE and AAFS scenarios. There are a lot of potential combinations now, so I've selected just the likely candidates for use in the single forecast set agreement. So that would be the mid baseline scenario paired with the mid-AAEE and AAFS. That's Scenarios 3 for both. And also the mid-baseline paired with the low AAEE, Scenario 2. And either the mid AAFS or the high AAEE. And by high AAEE, that would be Scenario 4.

For the mid-mid case, the -- I guess the

mid-mid-mid case, the long-term growth rate is about 1.1% annually, reaching nearly 22,600 gigawatt hours by 2035. The inflection point's really on in the forecast period. And this will be true for the other TAC areas as well, and they are impacted by the shifting peak hour. After 2023, the peak hour settles on hour 19. I do want to note the delta between 2023, between these results and our previous forecast, is a little over 400 megawatts. Next slide.

For the SCE planning area, the long-term growth rate is 0.7% annually. And the mid-mid-mid managed forecast reaches almost 25,200 megawatts by the end of the forecast period. And in the delta here is more substantial; a little over 700 megawatts in 2023. Next slide.

I have a correction to make here. For SDG&E, the forecast grows at a rate of 0.8% annually. I have shown here 1.1 and that is a copy and paste error. Everything else here is accurate, though, and the mid-mid-mid case reaches over 4,600 megawatts by 2035. And the delta in 2023 is 120 megawatts. Next slide.

And the results for CAISO as a whole, unfortunately, I do have a couple more copy paste

errors here, and I will -- I will post a corrected version of the slide deck just so that the record is straight after this workshop. Specifically, the forecast grows at an annual rate of 1%, not one 1.1%, and it reaches 52,500 megawatts, not 22,500 megawatts. And in total, the delta between vintages and 2023 is a little over 1,200 megawatts, which is -- would be significant.

I do also want to note here that the CAISO Coincidence factor derived from our hourly forecast, starts at about 94.6% in 2021, but then after the peak shift hour -- sorry, after the shift to the peak hour being in hour 19, that factor is closer to 97% and then hovers around 97.7% after 2030. Next slide.

And finally, because our monthly peak forecast is used as a benchmark for RA, I wanted to show where our forecast, you know, our forecasted 2023 monthly peaks, which are shown here by the blue line fall within the distribution of historical monthly system peaks, which are taken from the -- in the CAISO EMS data set with DR impacts added back in. And so those historical peaks are represented by the black

dots.

I will be docketing a few data files following this workshop, which will contain our detailed draft hourly results with all of the individual load modifier impacts, as well as a summary file containing the coincident and non-coincident annual and monthly peak projections, so that stakeholders can review those data sets directly. Next Slide.

And that brings me to my final slide here and next steps. After those results are docketed, staff will reach out to the IOUs to review our results and hopefully compare notes, particularly around the where are the normal peak estimates and the persistence of a higher peak to consumption ratio over the forecast period. And as an adjustment to either of those factors would have implications for that delta that we see in our 20 -- CED 2020 and CED 2021 forecasts.

Stakeholder comments are due December 30th; two weeks from today. And once -- I assume so. I think it's usually two weeks after the workshop, right? I'm now wishing I had confirmed that with Heather. Stakeholder comments are --

COMMISSIONER MONAHAN: Yeah.

MR. FUGATE: Yea. Okay, great. Thanks. Once we have considered stakeholder feedback and finalized our forecast, we will docket a final set of forms that we'll bring the CEC's -- that we'll bring to the CEC's January 26 business meeting to request adoption.

And so with that, I will pause and ask the Commissioners if they have comments or questions. Thank you.

VICE CHAIR GUNDA: Yeah. Nick, I just want to begin by saying this is really, really good work. Thank you again to you and the entire team for all the hard work on pulling this together. I'm especially really heartened by all the improvements that have been done on the behind-the-meter PV forecast, this [indiscernible], especially on the shapes, the generation shapes and such. So just wanted to commend the team on all the improvements and then pushing to the extent of using them in the forecast. So just thank you.

And I also want to apologize for you having to stay up last night for a couple hours. You know, sorry. Sorry for that suggestion.

MR. FUGATE: I did -- I did like the chart. I -- so I'm happy to now have that in my toolbox.

COMMISSIONER MONAHAN: Oh wait. Does that mean that Vice Chair Gunda is the reason why you were staying up late?

VICE CHAIR GUNDA: Yes. I mean, I think I have to -- I have to --

MR. FUGATE: He usually is.

VICE CHAIR GUNDA: Thank you, Nick. So just, I think I have a couple of high level questions, specifically as they pertain to reliability, and I think there's a lot of Q&A questions coming in. So I'll cede time to that, for sure.

Just going to your slide number 23. We don't have to put it up if we don't, if we can't. But just on the impact on the peak day profile. So you kind of showed, you know the continual reduction in kind of the load early, in the in the early hours of the day; 3:00, 4:00 a.m. But kind of moving towards the evening, you have the peak, the gross peak itself moving from 17 to hour 19, hourly 19.

So just wanted to confirm with you that

when we take this peak and then look at the supply side solar assets, so we are potentially going to have a higher net peak on the system moving forward than what we have today?

MR. FUGATE: So the -- yeah, after 2023 our -- well, so this is -- this isn't a big change relative to previous vintages of forecast. We have been projecting a shift in the peak hour to hour 19 in the last several forecasts. It's just the timing, depending on how much solar is added each year. The sort of timing of when that happens changes a little bit each, during each vintages of forecast. And so I'm just calling that out specifically as is occurring for this vintage in 2023. And so beyond 2023, our peak projection aligns with the net peak hour, on the supply side.

VICE CHAIR GUNDA: Okay. Thank you. So the other kind of question is like, if we want to go to slide number 28 real quick, on the climate considerations. Earlier this year, you kind of talked about, you know, obviously you recognize the shift in the, kind of the overall distribution, kind of the standard deviation also, kind of stretching. Could you comment on

as we continue to, you know move, you know continue to develop our forecast in 1-in-2, you know, are you -- are you expecting or is the analysis beginning to show that the deviation -- or the delta between the 1-in-2, and 1-in-5, and 1-in-10, is increasing due to climate impacts? Or, you know, it's pretty steady.

MR. FUGATE: I -- using, you know relying just on the historical data set, there's very little data to try to answer that question. And so I think -- so the answer is no, at this point. But again, that is another question that we have cued up for this to be tackled by this new Cal-Adapt engine. And so we are going to be looking to this new round of climate modeling to try to answer those questions about, not only what the shifting, kind of average temperatures are, and what a normal expected value is right now, but also, you know, what are the -- what are the potential extreme, likelihood of extreme events as well? How is -- how is that -- how has that potentially shifted already and how might it continue to shift over the forecast horizon?

VICE CHAIR GUNDA: Great. So just a couple of last high level questions and pass it

on to Commissioner McAllister and Monahan.

So on slide number 34, just confirming that you know, the peak, the difference for 2022, as we go into the 2022 a year, the projection is approximately 1,000 megawatts higher on the peak. Just confirming that, you know, as we begin to construct risk mitigation for 2022, that's what we are seeing here.

MR. FUGATE: In 2022, yeah, 1,200 megawatts.

VICE CHAIR GUNDA: 1200. Good to know.

MR. FUGATE: Yeah. And also, I don't think -- I don't think I explicitly stated this, but these peak results here are all based on the adjusted weighted normal peak, so that the slightly -- the slightly higher weather normal peaks with the weighting adjustment.

VICE CHAIR GUNDA: Got it. Thank you. The last one, and then it was your 35th slide. Just getting a little bit of an understanding into this. So as we look at the middle of the month, like the shorter months and such, you know, there are kind of the peak forecast or the monthly peak tracks right in the middle, you know, kind of the distribution. But the months,

1 and 12, especially, you kind of trend towards
the top, you know. Is there a specific reason
that occurs, and any insights that you may be
able to provide?

MR. FUGATE: For the-- for the winter months, well. I would have to go back and explicitly -- so we will be, I think in the long-term, you know we could be expecting load growth in the winter months, obviously. I'm only looking at the 2023 here. So that's perhaps not due to the fuel substitution impacts that, you know, that we weighted. There -- it would be very small in 2023. So at this point, you know there could be some impact from you know, additional electrification of the vehicle charging, but I would have to go back and look at the explicit load profiles for those months rather than the -- sorry, distracted by comments popping up.

Yeah, I would have to go back and look at the actual load shape for those individual months. I think for, you know for this presentation I was pretty heavily focused on the summer peak profiles. But that's -- that is a good question to have in mind and I can certainly

follow up with you on it.

VICE CHAIR GUNDA: Great. Thank you so much, Nick, again. Thanks to you and the entire team. Fabulous work. And I don't know if it's because I have been watching this for five years that it's slowly sinking into my head, or the presentations are becoming clearer. I feel like I follow better. Thank you so much for making them more and more accessible as well. So with that, Commissioner McAllister and Monahan.

LEAD COMMISSIONER MCALLISTER: Well, I guess I'm happy to step in. I just want to mostly compliment Nick and the team. I agree, the visuals are looking really good, and I like the waterfall chart. It's nice to get sort of a more visual appreciation of the push and pull of the various load modifiers and how they kind of add up and compare and where they end up, right?

I guess, so I think I was -- I wanted to ask a similar question to Vice Chair Gunda about sort of the uncertainty and how you're quantifying uncertainty. And particularly like your regression analyses. You know, you're kind of tracking how weather the fits those are like getting worse, or the residuals bigger, and stuff

like that and how that kind of plays into your use of Cal-Adapt. If I understood right. I'm not sure I understood right. Which tools are sort of regressions, and which are which are different, you know, different kinds of assessments. So that's one. I guess I'm, you know it's like we really do need to, you know when we start looking at peaks and, you know, beyond 1-in-5 and stuff, understanding uncertainty becomes more and more important. So I guess I'm just wondering how you're thinking about that. You talked a little about that, but I guess I'm asking you to go into maybe a little more depth.

MR. FUGATE: Sure. So yeah. Right now, we are still using regression analysis to establish the relationship between temperature and load in weather normalization step. And that there are some confounding, you know, factors to that. Well, there are no confounding factors.

LEAD COMMISSIONER MCALLISTER: Mm-hmm.

MR. FUGATE: But they include, you know, the addition of PV has been a challenge, and that seems to be slowly creeping up in SDG&E's territory in particular. And you know, you have

day that can be warm, but you have some cloud cover, and the system load looks higher than might be -- might be predicted by our model. So there are things like that that was, I sort of touched on that early on in the presentation with discussion of PV.

LEAD COMMISSIONER MCALLISTER: Mm-hmm.

MR. FUGATE: And so that could be one potential application of that is to -- is to add PV to the -- to the loads that we are regressing against and -- or that -- yeah it's the, rather normalizing kind of consumption rather than the load.

Another approach could potentially be to, you know, now that we are shifting to hour 19 as peak hour, is just normalizing that peak hour, that net peak hour explicitly --

LEAD COMMISSIONER MCALLISTER: Right.

MR. FUGATE: -- rather than the peak day. So a few different things to explore here.

LEAD COMMISSIONER MCALLISTER: Mm-hmm.

MR. FUGATE: And then, you know going forward, there may be additional challenges with some reconstituting system loads as we have more DR and wildfire impacts in the system.

And then just regarding the climate change, in particular, I don't know yet how that will play out explicitly. I just know that we are expecting a much richer data set of, through model runs, through this Cal-Adept process.

LEAD COMMISSIONER MCALLISTER: Mm-hmm.

MR. FUGATE: It can give a much broader range of, you know, potential temperature draws, both not just in, not just going forward into the future, but also for kind of present day situation. And so that could kind of inform, you know, our understanding of the distribution of temperatures right now, rather than -- rather than relying on kind of the one data point we get each year.

LEAD COMMISSIONER MCALLISTER: Yeah. Okay. Well, that makes a lot of sense, and it does -- yeah. Glad you're sort of brainstorming with the team about ways to, you know, improve the fits and stuff, and then that all makes sense. Let's see.

I wanted to -- so it's interesting, right? With the push and pull of all the different, you know, load modifiers. You know you maybe don't end up in that different of a

place in terms of net consumption, you know, at least in the near-term, but you know your point about load factors getting worse, essentially right? Getting lower, your sort of peak to -- peak to average ratio, you know, getting bigger. That seems like something worth tracking. I mean worth tracking explicitly like, I mean, that's a -- that's a key long-term metric and maybe, you know, we need to maybe start to redefine that.

I mean, but utility systems have always thought of -- thought about the load factors as kind of a gauge of how optimally you're taking advantage of your infrastructure. And it seems like that's a, you know as that goes down, that's obviously, you know, the ramp goes up in the evening and that's, you know, the CAISO is facing that increasingly, as we all know.

But that seems like, you know that obviously ties to flexibility and sort of the value of flexibility in shifting load around. And so I guess I'd like to kind of maybe do a little brainstorm with you all about that. And are there are there metrics that we could be kind of tracking year to year, like capacity factor,

load factor, something, some modified definition of that, given that we have, you know, electrons flowing all over the place in, you know, different directions.

MR. FUGATE: Yeah.

LEAD COMMISSIONER MCALLISTER: So anyway, just kind of updating, or thinking about, what load factor actually means and how we would track something like that.

MR. FUGATE: I do think that's a really good point and just sort of agree in general about having, kind of adding to our set of metrics about, you know, the load and then also our forecast in general.

I saw a question pop up. I don't -- I don’t want to jump the gun here, but I saw a question pop up in Chat about how the, sort of the long-run trend in our weather normalized peak loads.

LEAD COMMISSIONER MCALLISTER: Mm-hmm.

MR. FUGATE: And that was a question I had in mind my myself. And unfortunately, we have only been, sort of had a standard process for this that we've been implementing for a few years now. So I only have a few data points, but

it might be worth going back and kind of renormalizing a longer set of historical peaks to see if there is a -- some sort of trend there.

LEAD COMMISSIONER MCALLISTER: Okay. Yeah. Thanks. And I just --

MR. FUGATE: So, but that could be -- that could be another metric that we track each year.

LEAD COMMISSIONER MCALLISTER: Okay. Yeah. I'd love to love to participate in that discussion.

And then just finally, I wanted to compliment you, also on the -- on the updating of the solar load shapes, and for the generation shapes, and stuff. I think that's, yeah, it's good to -- if there's any -- I mean, you know, in a sense, the sun hasn't changed and, you know, PV is still generating with a similar profile if it hasn't moved from, you know, one roof to another. But it would be nice to -- it would be good to know if, as you update that, you get any, you really note any differences from you know, the -- when you had more limited data to when you, you know, when you have a chance to update that and compare notes with the PUC. It will be

interesting to know if sort of anything fundamental has sort of shifted or changed and how you're looking at behind-the-meter PV, so. But I'm glad you're doing that. That's really good.

MR. FUGATE: And a lot of credit, Vice Chair Gunda, to your advisor Sudhakar contributed extensively to that effort.

LEAD COMMISSIONER MCALLISTER: Yep.

VICE CHAIR GUNDA: Thanks, for that.

LEAD COMMISSIONER MCALLISTER: Okay. So well, thanks, thanks a lot. Yep. Moving on to Commissioner Monahan. Go ahead.

VICE CHAIR GUNDA: Thanks, Nick for --

LEAD COMMISSIONER MCALLISTER: Thank you.

VICE CHAIR GUNDA: Yeah.

COMMISSIONER MONAHAN: All right. Nick, I just got to heap it on around the impact on net peak hour. That is -- I'm going to use that chart. And I wanted to just comment. Can we show that slide? It's, I think it's slide 24, or the 54th in the full deck. I think it's slide 24, although I -- there may be a difference between what I have and -- there we go.

VICE CHAIR GUNDA: Oh, this one. Sorry. Thank you. The waterfall.

COMMISSIONER MONAHAN: The waterfall. It shall forever be known as the waterfall. Although I don't know because it's going up and then down. It's a perfect waterfall. So, I mean, this is the best slide I've ever seen to show the potential for transportation electrification to be a DR to a flexible load, right. That this is the opportunity. And this is only in the mid scenario, which actually doesn't get us to California's goals. So I would say the high scenario gets us closer, and that might be one to also show in the IEPR because it'll highlight even more the opportunity for that to be a flexible load.

And I think, one question I had for you, Nick, and maybe it's for, a broader question for the team is, you know we keep saying like, oh, we need an EV happy hour when EVs charge instead of curtailing renewable energy in the middle of the day, we're plugging in and we're making -- creating a benefit for all electricity users by driving down rates. And that -- and that's -- it would be great to have some data to

be able to show that and. in particular, like well, what's the, you know we're looking at net peak hour, but what is the potential for some of these more flexible resources to bite into the, you know, use the electricity that we would otherwise be curtailing? And is there anything in the IEPR that looks at that? Maybe it's a question for Vice Chair Gunda. I don't know.

VICE CHAIR GUNDA: I will see if Nick wants to add something, but yes, I think that's a good question. So Nick, do you have anything that you want to add first?

MR. FUGATE: No, I don't have that. I'm not sure if there's --

VICE CHAIR GUNDA: Yeah.

COMMISSIONER MONAHAN: But aren't you happy that all of us love this slide so much?

VICE CHAIR GUNDA: So yeah. Commissioner Monahan, I think the -- I think this is kind of a two part answer I think, or kind of a reaction to your question. I think the last time you raised your comments in the previous workshop, I think the workshop was -- it was also centered around this idea of how can our planning products be more of an insight into the policymaking side. I

think the forecast historically has been a very much of a planning product and less of a policy flexing kind of product. So I think that's a -- I just want to note that, and I think a part of the policy side of this work is being contemplated in the demand scenario side, and the integration of the demand scenarios into the broader SB 100, and that intersection of both the climate change as well as the grid stability. So I think that's kind of how we have been thinking about it but would love to kind of have further conversations on thinking this through.

COMMISSIONER MONAHAN: Yeah. I mean and I was actually thinking that there's a policy dimension, definitely. But I was actually just thinking of the data that Nick and the team has -- have been drawing on that, especially HEVI-Pro and the models that are being used for AB 2127, that look at it, just sort of what, here's what we expect just under a general, you know, just the way things are today. Here's what we expect the charging behaviors to be. And a lot of, especially the light-duty charging, really overlays with where there's solar. And so we just without even, you know, much policy, I

think there is a fair amount of renewable energy in the middle of the day that we will be capitalizing on, and then if you add policy on top of it, it could be even greater.

So I'm not suggesting we do any additional analysis for this IEPR at all. The team needs to sleep, but just something that's to think through going forward is that how do we do analysis that helps inform that potential for electric vehicles to be a DER, and particularly, to capitalize on renewable energy that would otherwise be curtailed.

VICE CHAIR GUNDA: Yeah. So I will I try not to create another chart for Nick between now and -- but I think -- I think to your point, I think, you know really kind of a -- kind of a heat map to kind of show the different hours and the opportunity across these different sectors in terms of delta. Essentially creating the waterfall across many hours to show it in a -- in more of a heat map format, I think would be a really good way to do it, and I think we probably could dig into it right after the forecast.

LEAD COMMISSIONER MCALLISTER: Yeah. Can I just add something here? I think this is a

great train of thought here and you know the, necessarily right, the categories along the bottom here are specific to analyses that staff is doing, but load flexibility, just pure load flexibility is not there, right? It's kind of built into transportation, as Commissioner Monahan said. And battery storage is there and that's sort of, you know, inherently load, you know, flexible capacity. But you know, this focus on the net peak hour, you know, sort of what resources could we bring to that hour or to the peak to add, you know, add swing here and it'd be nice to kind of be able to understand not only in the transportation side, but also on the building side, you know, what value it can bring to this net peak hour and the few hours on either side of it.

VICE CHAIR GUNDA: Yeah. If Eric Cline is listening to this conversation, I would definitely flag it as potentially one of the data insights early next year that we can dig into the data and put that out there.

LEAD COMMISSIONER MCALLISTER: Great.

COMMISSIONER MONAHAN: Yeah, thanks for this discussion. I feel like we have these

talking points about, you know, we can run our EVs on sunshine and, but to have data behind it would really be helpful. And so just appreciate your receptivity to this conversation. And hear what Commissioner McAllister is saying that transportation education isn't the only potential DER out there.

VICE CHAIR GUNDA: Yeah. Very much looking forward to this conversation. I think we're going to take it a little bit more holistically next year in the IEPR process, and I'm really looking forward to that.

But Commissioner Monahan, I just want to say thanks to you. I think you have definitely, you know, broadened discussion points this last two workshops. I think it's really great that we all get to speak because of the big issues, we don't get to talk behind the scenes. So making this more of a -- more of a common practice where we get to just discuss and brainstorm is a great idea. So thank you for raising these questions.

With that, I would, if we don't have any more questions from the dais, I would like to go to the Q&A. Heather and Heidi. I'm guessing I pass it on to Heidi.

MS. RAITT: Go ahead, Heidi

MS. JAVANBLAKT: Oh, sorry, Heather.

Okay. So yeah, there are a few questions in the Q&A. The first one, I think Nick has already touched on a little bit but wanted to give him the opportunity to talk some more if he wanted to. So the first part of this question it's from Christian Lambert, Cal Advocates.

He mentions a typo on slide 34 that's already been addressed. I'm going to skip that. But the second part of this; So they said the sum of the three TAC area coincident peaks approaches 1,300 megawatts worth of increase over the 2020 forecast. The 2019 and 2020 IEPRs both had their own significant peak load forecast increases and now the 2021 has yet another large jump in the peak load forecast. What insights can staff offer into the drivers of these large increases over the 2019 and through 2021 IEPRs?

MR. FUGATE: I apologize. I just need to read this. Yeah. So with the, we call it the 2020 forecast. We were -- we were looking at a situation where -- so I guess at a high level, the underlying driver to our peak forecast is consumption load. And then right we are -- and

then while we are layering on all of these load modifiers, but the main driver for growth is the underlying consumption forecast. And in 2020, we were looking at a situation where we were forecasting a significant decline in consumption, relative to what the type of weather normal peak load was for 2020, which created a significant, kind of, if we had just applied that through strict application of our normal modeling process, it would have led to an even more drastic increase in our peak load forecast, which we thought was unreasonable.

And so we addressed that by sort of transitioning from that, that 2020 load factor to something closer to our 2019 load factor. Sort of assuming that this was an impact, you know, artifact of Covid, and we would sort of gradually transition back to something more normal. So I think going forward we're, you know this is something that we're going to have to think about, sort of track closely. As Commissioner McAllister had suggested, this is kind of, you know, year to year load factors and brainstorm with IOUs and other forecasters to make sure we have a handle on and a reasonable explanation for

how things are changing in that respect.

MS. JAVANBAKHT: Thanks, Nick. The next question comes from Mike Florio who asks, is there an upward trend in what is considered to be a normal temperature condition? And I will just add that this was discussed at a DAWG meeting on September 30th, and I'll put the link to those meeting materials as a response to the Q&A. But Nick, did you have anything more you wanted to say?

MR. FUGATE: Yeah. I do want to say more on this because what we discussed at the, that DAWG meeting you just referenced was sort of looking at just kind of general temperature trends, or temperature trends sort of more generally. But I think it would be interesting and worth doing to go back several years and sort of apply our weather normalization process to a number of previous years to see sort of how the results translate to any sort of, you know, increasing trend. I think that -- I think that makes sense to look at.

MS. JAVANBAKHT: Okay. And I know you've already answered this, but I thought it was important enough to mention it again and what are

the plans for uploading the IOU load, DER, and load shape data?

MR. FUGATE: Hi Phil. I owe you an email response. I promise to get to that shortly. But to answer your question -- I'm sorry. Yes, we do have plans to upload the data. It will be in the same sort of format that we have posted those files previously and it will be draft for the moment. And I do have to hope -- I do hope to have those up by tomorrow.

MS. JAVANBAKHT: Okay. And then next, there's a series of a couple of questions from the same person. So what weather event for 2021 were you showing for PG&E, SCE, SDG&E, and then also for CAISO? And then what is the weather normalized peak for CAISO in 2021?

MR. FUGATE: Well I assume -- wait. What whether event is for 2021? Oh. So I assume that is the -- I assume that is asking what the -- what the actual, sort of peak load events were for each of the TAC areas. I can look those up and maybe drop them into the chat, I don't have them off the top of my head. On slide 23, CAISO annual peak CAISO annual peak.

Yeah, so in 2021 is a forecast here. So

we are showing -- so 2021 does not reflect actual conditions, but this is the results of our model output. So they will not necessarily align. And then what is the weather normalized peak for CAISO in 2021?

So yeah. This looks like the similar question to the first one. I will have to look that up.

MS. JAVANBAKHT: Okay. That's all the questions from the Q&A.

VICE CHAIR GUNDA: Thank you, Heidi. And I just want to acknowledge everybody who asked the questions and also I see the presence of our colleagues from the Cal Advocate's Office at CPUC in the IEPR workshop. Just express gratitude for your presence and continuing to engage on the forecast. I will also thank you so much for that.

So with that, if we are okay, Heather, I would like to move to the next presentation and call on Ingrid, and Ingrid to go through the presentation. Oh, sorry. Michael Kenney. Sorry, Michael.

MR. KENNEY: No, that's okay. So good afternoon, everybody. My name is Michael Kenney.

I'm an energy specialist in the Energy Assessments Division. And today I'll be discussing the history of the energy efficiency savings estimates mandated by Senate Bill 350. Next Slide.

So Senate Bill 350 was authored by Senator DeLeon and passed in 2015. It put into action many clean energy goals, and important for the discussion today was the goal to double statewide energy efficiency savings in electricity and gas end uses by January 1st, 2030. The legislation also called out a series of programs and policies to assess towards this goal. This included programs that would save energy using cleaner fuels or fuel substitution, thus reducing greenhouse gas emissions as well. Overall, the legislation stipulated that we should assess savings that are cost effective, feasible, and do not adversely impact public health and safety. Next slide.

So to understand the sources of energy savings in California, the staff at the Energy Commission researched the known and expected programs and policies contributing efficiency savings between 2015 and 2030. We then assessed

their current status and expected growth or decline in the future. This included savings coming from utility programs, codes and standards, and a variety of policies and programs funded by taxpayers or private funds, such as the Greenhouse Gas Reduction Fund and PACE Financing. The projected savings from these programs resulted in cumulative annual electricity, gas, and then combined savings, which were shown as Btus. These were measured against the 2030 goal. Next slide.

So staff held multiple workshops and prepared three different interim reports discussing how the efficiency doubling at baseline would be set, how the savings would be calculated, and from which program savings were estimated. A final report synthesizing these topics was adopted in October 2017.

The report found that the 2030 goal, as a combined energy metric, is 0.4 Quadrillion Btus. The report also projected that the current suite of programs would fall short of achieving that 2030 goal. Next slide.

In 2019, the energy savings estimates were updated and published as part of the 2019

California Energy Efficiency Action Plan. The updated estimates included analytical recommendations from the initial assessment, such as including industrial and agricultural programs, expanding fuel substitution assessments, applying savings from possible conservation voltage reduction programs, and disaggregating savings from low income and disadvantaged communities. Next Slide.

So to further this effort, a tool was created to assist staff, allowing us to assess energy savings and permit simpler tracking and editing of program information as things change over time. So this tool allowed us to track, analyze, and project electricity, gas, and those combined savings. It also allowed staff to create scenarios based on a range of variables, including compliance rate, funding levels, and market penetration. And it gave us a streamlined process for reporting savings and greenhouse gas reductions by utility service area, sector, and end use. Next slide.

So the updated savings estimates for 2019 show expected programmatic activity would fall short in a reference scenario. An aggressive

scenario was designed by adjusting financing and incentive levels, as well as standard compliance rates and program participation. So this modified scenario showed what it would take to reach that 2030 goal. Next slide.

So that is where we're leading up to, to today's analysis that will be updated and explained by my colleague Ingrid Neumann. I'm happy to answer any questions about the target setting process and the reporting up to today. Thank you. And I'll pass it on to Ingrid.

DR. NEUMANN: Hello. I am going to update you today on the SB 350 Tracking and Projections for this year and 2020. Next slide, please.

So for 2021, we utilized the same energy efficiency savings, accounting, aggregation, and extrapolation methodology and tools, as were developed with great care for our use in 2019. Next slide, please.

As you can see on the timeline on the bottom here, the SB 350 analysis goes from 2015 through the end of 2029. The goal is a January 1st goal in 2030. This means there are seven years of historical tracking and eight years of

future projections that are included in this work. So it's very important that we updated historical data, as well as add emerging programs, and revised projections to our 2021 SB 350 Update. We added new energy efficiency programs. We incorporated updates to codes and standards in the savings projections. We considered overlap and customer segments being targeted by different programs, and we considered market based activities that could result in EE savings that are not being captured elsewhere.

Many of the values that went into the projections draw from the same projections that are used in our additional achievable energy efficiency forecast. Now that's a forecast that rolls forward with the baseline forecast that was discussed earlier today, each cycle. Whereas the SB 350 tracking and projections are always on a fixed timeline, so always from 2015 through 2029. So the SB 350 analysis is not incremental to anything, like the AAEE forecast is incremental to the baseline forecast. It is only incremental, if you will, to savings that were already committed prior to 2015. So programs that began after that time that had first year

savings, then are made cumulative and decayed, according to the lifetime of their end uses across that projection period. Next slide, please.

Now, SB 350 doesn't exist in a vacuum, right. It exists in the broader policy context of building decarbonization, and the SB 350 language does allow for fuel substitution, as long as overall energy consumption is reduced. So we considered it in our work towards this 2021 SB 350 Update. Between 2019 and 2021, we did develop the Fuel Substitution Scenario Analysis Tool, which was used to support our AB 3232 analysis recently published in the California Building Decarbonization Assessment. Next slide.

More recently this year, we developed a new forecasting product, the Additional Achieving -- Additional Achievable Fuel Substitution, or AAFS, which is also an annual and hourly load modifier to the baseline demand forecast. Like AAEE, it's focused on firm projections and programs since the core scenarios are used for planning and procurement purposes, as was presented by our Forecasting Unit in their managed forecast.

So this is the type of analysis that we used for our SB 350 analysis. There's something very similar to what's included in our AAFS for building electrification projections. Next slide, please.

We incorporated new data, such as from utilities and other on ground incentive programs. We incorporate electrification resulting from local ordinances as well as from the recently adopted 2022 Title 24 California building standards.

Those encourage building electrification, especially in the residential sector. So that's added to the efforts in the 2015 through 2029 SB 350 analysis. Most of the building electrification is a projection. There is very little historic or committed savings in there.

On the timeline, you also see some of the other analyses that were done here at the Energy Commission having to do with building electrification or fuel substitution. And what the SB 350 analysis is different, because of the different timescale, it's also different because it's not a what-if, it's not speculative in the same way that the FSSAT was using the technology

based fuel substitution that was used in support of AB 3232 from 2020 to 2030, as well as the difference as not being a load modifier to the baseline forecast but having its own independent analysis that's not incremental to anything else. Next slide, please.

All right. So from all the input workbooks, of course, we remove fuel substitution , because that was a speculative amount of fuel substitution for all electric new construction. That was loosely based on how many buildings were being built at the time, perhaps being motivated by local ordinances. That's now incorporated in the workbook on local ordinances that has both EE savings, as well as fuel substitution components. So for the last point, we did add the fuel substitution dimension to existing workbooks that quantified energy efficiency.

we also have a list here of new workbooks. Notably, the CCAs and REN Program Savings, right Those are not yet included in the Potential and Goal Study. So those consist of both EE savings as well as fuel substitution impacts. Then we did model separately residential and new construction fuel

substitution from all electric new construction, according to the 2022 standards and beyond, as well as tendencies in the commercial building standards to have partial or full building electrification for some new construction.

Then there were some programs, such as the Clean Energy Optimization Program, the Heat Pump Water Incentives in the SGIP, as well as our statewide Tech and Build programs, projecting some impacts from those. Projecting impacts from the pilot program, Food Processing Investment Program. And then also, we did create workbooks for the IOU Low Income Fuel Substitution, because the low income sector is reflected in the Potential and Goal Study of -- for the IOUs in the rebate programs, the Energy Efficiency Rebate programs. And while fuel substitution was included for our market based customers, in the Potential and Goal Study there was no specific low income segment there. So that was modeled separately.

And then the POUs, of course, submit their energy efficiency projections with the CMUA Report. We got a fresh new report this year. That only comes out every four years, but they do

not formally submit fuel substitution or building electrification projections. So we obtained that information from interviews with POUs that we're willing to share that information with the Energy Commission. Next slide, please.

So our goal here for SB 350, or the SB 350 Update in the 2021 IEPR, was to shed some more light on the difference between our Business as Usual track, and the track we prefer to be on, which meets energy efficiency and GHG goals. Next slide, please.

So something that we want to consider when we first look at these slides, or the graphs on the next slides, is that energy efficiency, of course, saves energy. So we reduce the gigawatt hours of consumption or demand. And the MM Therms of gas demand.

Fuel Substitution or Building Electrification is a little trickier. Though it displaces gas, right. So you can kind of still say that it saves gas, it does add incremental electricity demand. So that would take away from the electricity side of the savings that we would see on the -- on the graphs. Next slide, please.

So first, I want to define our Business

as Usual Scenario. So we have basically two fundamental scenarios that translate into three scenarios here for SB 350 in 2021. So our Business as Usual Scenario 1 is exactly that. It's kind of our reference using, you know, all of the existing codes and standards savings. committed IOU and POU program savings. Anything that already, has occurred and will continue occurring, as well as projections for IOU and POU program savings, as coming from the Potential and Goal Study, which was adopted by the CPUC for the IOUs, and from the 2021 CMUA report that -- for the POUs. And then the additional CEC analysis on POU Fuel Substitution. Next slide.

Then, of course, we incorporated the Title 24 California Building Standards Energy Efficiency Savings and building electrification components for both new construction and additions and alterations. The projected components here are for the 2022 standards, as well as somewhat more speculative values for the 2025 standards. But of course, those are in the process of starting their development. There will be 2025 standards. Exactly how those will look, you know, we do not know at this time

and so we included those at a 20% compliance rate because there's a little bit more uncertainty there.

So then similarly, for the Title 20 (California State) Appliance Energy Efficiency Standards and the Federal Appliance Standards, we added some new savings, starting in the more near-term, at reference compliance rates for the California standards because those are being developed by the Energy Commission and we have, you know, there's less uncertainty around those. Whereas for the Federal Appliance Standards, we included those at a 20% reduction because those are just starting to ramp back up after being neglected for the last few years. Next slide, please.

So lastly, there are the various Beyond Utility programs that we included at reference for conservative levels, depending on how much historical data was available and how many assumptions needed to be made to generate EE savings or fuel substitution impacts. Next Slide.

So this is our first slide of results here. On the left hand side, we see the

electricity savings for our Business as Usual Scenario. And then the right hand side, we see our gas savings for the Business as Usual Scenario. The blue are the energy efficiency portions. The orange are the fuel substitution portions. The gray line is the SB 350 doubling target. And you can see for the electricity, the blue wedge would actually go to just slightly below 60,000 gigawatt hours at the end of 2029, but the hashed orange fuel substitution, it's efficient electrification, but it does add a little bit of electricity so that blue hash -- oh sorry, the orange hash piece actually diminishes the blue wedge that we have, right. So it drops it down by that orange hashed amount.

So what this means is that 66% of target electricity savings are met with this scenario. But then if we look on the right hand side, the gas piece, you know, those are both savings or displaced gas, if you like, for the orange fuel substitution portions, those really do stack, and those -- the SB 350 targets are exceeded there, right. It's 126% at the end of that period.

The other thing to notice from these graphs is that traditional energy efficiency

becomes more difficult to add at the same rate as it was in earlier years. So it doesn't really look like a linear wedge anymore. It does sort of taper off. What that means is that if I could save, you know 100 gigawatt hours with something last year, that measures already taken, right. So some of that low hanging fruit is taken. And maybe the next best measure that I can take for next year only saves 90 gigawatt hours. So cumulative savings continue to grow, but new first year savings do diminish over time. Next slide, please.

So then we took all of the elements here of this Business as Usual Scenario 1 and put it into a High Electrification future. What that meant was that we were focusing on aggressive building electrification instead of gas efficiency. So we maximized programmatic electrification impacts and then only cut first year gas EE savings through 2024. So there were no gas energy efficiency savings, first year savings, starting in 2025. But the savings occurring before that time would decay, according to the useful lifetime of that end use. Next slide, please.

So those are the results that we would see from this scenario. And you can see that because we're adding more electrification, it's more aggressive, right even if it's efficient. You know, you could maybe see how efficient it is because we were getting 66% of the way to the SB 350 target on the Business as Usual Scenario. And now here in the High Electrification future, even though we're adding electricity, we're still getting 64% of the way there. Of course, on the gas side, we were about at 126% and we're all the way at 152% now in the High Electrification future.

You can also see on the gas side that the cumulative savings, like that blue piece, stays there for energy efficiency, but it starts decaying as new gas -- no new gas savings are being added, starting in 2025. Next slide, please.

So then our third scenario was an Aggressive Scenario 2, which was only modeled in a High Electrification future. So in addition to existing codes and standard savings and committed program savings, and elements in the Business as Usual case, we maximized IOU and POU electric

Energy Efficiency programmatic savings potential. And we focused on a High Electrification future by again, including aggressive building electrification instead of gas efficiency. So once again, there was no gas energy efficiency, starting in 2025, but there was higher electric energy efficiency as well as the high building electrification. Next slide.

So these are the results we see from that scenario. On the left hand side, the orange hashed sliver for electricity, for the incremental electricity, is the same as it was for the building -- Business as Usual Scenario 1 High Electrification because the amount of fuel substitution or building electrification is the same. Of course, the blue wedge is significantly larger because we added very aggressive or very optimistic levels of electric energy efficiency.

So we can see that we got really close to the electric savings target there. It's 91% of the way there, to the SB 350 doubling. And then on the right hand side, the gas looks exactly the same as it did in the previous High Electrification future because we're still using Business as Usual gas projections through 2024

and then stopping first year savings, starting at 2025. Next slide, please.

So then to really evaluate how close we're getting to any goals here, we need to convert, you know as we're having both energy efficiency and building electrification, we need to convert to a common metric of BTU savings or a combined energy goal here to see which scenarios reach the SB 350 doubling goal, and perhaps when. Next slide.

So this is what we see when we convert our MM Therms and gigawatt hours to BTUs, or quadrillion BTUs because it ends up being a rather large number. And these are all savings. So we have our traditional energy efficiency savings in blue, and then the savings from the fuel substitution in orange and we meet 84% of the combined SB 350 target at the end of 2029. If however, we extrapolate our projections past 2029, so throughout the forecast the, I guess past that -- this SB 350 forecast period, next slide, then we can see that the full 2029, or at the end of 2029, SB 350 doubling target is met in 2036. So this isa Business as Usual scenario i.e. if we don't make any changes to current

programs and projections. So it's later, but it is still -- it is still met eventually. Next slide.

This is the Business as Usual Scenario broken out by the sector, as well as whether it's an energy efficiency saving or a fuel substitution impact, we have in blue. And blue gray is the various energy efficiency savings. Residential and commercial, of course, are the largest, as to be expected. And then for the fuel substitution, that's very much dominated by the residential sector. There's just a little bit of red that you can see here for commercial fuel substitution, and I'm having trouble seeing the industrial fuel substitution too, because that's really coming mostly from a few pilot programs in our Business as Usual case here. So next slide, please.

So on this slide, we took the data and disaggregated it a little bit further. Rather than by doing -- breaking it up by sector, we broke it out by program. So the pattern portions are the EE portions. The solid portions are the fuel sub-portions. Everything in blue is for IOU programs. Everything in green is POU programs.

In pink we have our own Title 24 California Building Standards. In purple we have our own, or our own as well as the Federal Appliance Energy Efficiency Standards. And then in orange, we have the Beyond Utility Programs. Next slide, please.

So this is an attempt to show what is the difference between committed savings and projected savings. There are some approximations in here, trying to break it out. And on the brackets we can see that the bottom four, you know, sort of layers or strata almost it looks like, we have again, with the same color coding, blue for IOU programs. Green for POU programs. Pink for the Title 24 Standards. Purple for Appliance Standards, and orange for the Beyond Utility Programs.

We have the committed savings that then would decay after the first year savings stopped being added for committed savings. Then the projected savings with the same color scheme for energy efficiency, and then the projected building electrification or fuel substitution savings is on the very top stock. And this is all for the building or Business as Usual

Scenario 1. Next slide.

So then we move on to the Business as Usual Scenario in a High Electrification future and we get a little closer to the SB 350 target line. We get 90% of the way there at the end of the projection period. If we project beyond 2029, next slide, then we see that the full 2029 SB 350 doubling target is met in 2032, so three years later than we'd prefer.

And lastly, or actually, let's look at this in a sector break down again. The sector breakdown looks very similar to what we saw with the standard building or, I keep saying building. It is building, right. But Business as Usual Scenario. And, but what we can start seeing is we can start seeing that orange. Well there's a little tiny orange slice at the top here for industrial fuel substitution as that starts being added in the High Electrification future. Next slide, please.

All right, so this is the last SB 350 scenario for 2021. This is the Aggressive Scenario 2 in the High Electrification future in the combined goal. So the combined SB 350 doubling line is in gray, and the two wedges sum

up to exceeding that that target in 2029. We can actually see on the next slide that the target is actually met a full year earlier. So this would require, again, aggressive electric energy efficiency as well as aggressive building electrification. So that would be a deviation from our Business as Usual track right now. Next slide.

And again, this has the sector breakdown for those, and it's very similar. What has grown here are the blue wedges here for the electric energy efficiency. The fuel substitution, or building electrification portion, is the same as it was in the other High Electrification future. So there's nothing really new to see there other than that it's stacked on a higher energy efficiency savings amount. Next slide, please.

All right. So here this is an attempt to compare how the sectors look from one scenario to the next. So on the left hand side, we have the same Scenario 1 Business as Usual break down by sector. And on the right hand side, this is the Business as Usual Scenario 1 in the High Electrification future. It's the same graph, except it's flipped. So we kind of took the

mirror image, and the reason we did that is so that we could better compare those 2019 values. It's a little hard to see when they're not right next to each other. So we do see that the blue energy efficiency portions have diminished, and that makes sense because in the High Electrification future, we are stopping gas energy efficiency savings in 2025, right. It's only the cumulative savings from prior to 2025 that then our decayed out. So it's reasonable to see that energy efficiency savings and total are diminished.

But on the other hand, you could really see what the residential fuel substitution portion, we have a Business as Usual version of fuel substitution here for 2021 versus an Aggressive version. That yellow wedge is huge, and it really has grown a lot between those -- between those two scenarios. So next slide, please.

All right, so here again, the actual values for the energy efficiency reductions, but those pale in comparison to the additions from the fuel substitution. The industrial value is, you know, maybe a little bit silly, but you're

starting out from this very small pilot program to actual achievable amounts that could be motivated if we developed programs for those industrial savings or fuel substitution impacts. Next Slide.

So then this is the same type of comparison here, and this time with the Business as Usual High Electrification wedges on the left and then the mirror image from the Aggressive Scenario in the High Electrification future on the right. So the fuel substitution portion should be the same, but they're layered on top of much higher energy efficiency savings. And all of this -- all of this additional energy efficiency savings are coming from the electricity portion, right, because we're really in a high electrification trading off added electrification for gas energy efficiency. Next slide.

All right. So this is really, really showing that there's still a lot of room for electric energy efficiency, maybe less so in the residential sector, more so in the commercial sector. And then ag and industrial, you know, there are few programs currently motivating

savings there. So that's something that one could examine. Next slide, please.

All right, so we were saying that SB 350, you know, exists in the context of building decarbonization. So in order to really look at that, we would want to convert the gigawatt hours avoided or saved, right, and the MM Therms saved to GHG emissions that are averted. So we want to convert all that with emissions factors to MM Tons of CO2 equivalent that are avoided. And then we could see which scenarios saved how much and maybe compare those to some other emissions goals. Next slide, please.

So it turns out that both SB 350 and AB 3232 consider targets or goals in the relative near term. They both look at a -- meeting a certain value by January 1st, 2030. So that seemed like the most reasonable comparison for these -- for this type of analysis. So as we know, SB 350 focuses on doubling energy efficiency savings using a baseline of 2015, so that energy efficiency baseline that was then doubled was set by the combined energy efficiency savings, as projected by 2015 AAEE. So then how does this work for AB 3232? What are we

comparing there?

So there is one thing we need to clean out right away is that SB 350 has more sectors included than AB 3232 is looking at, right. AB 3232 is seeking a reduction of GHG emissions from a baseline of in 1990 for commercial and residential buildings. And it's a 40% reduction from 1990 that's being considered. So for this comparison, we only took the SB 350 savings from the residential and commercial sector, so that would be more of a one for one comparison.

So then if we looked into the recently published AB 3232 analysis in the Building Decarbonization Report, there were two, there was a dual baseline set. So there were two baselines. One for system wide emissions, which included the generation required for serving residential and commercial buildings. And that was found to be a -- they say to reach that 2030 goal, one would need 5.5 MM Tons of reduction from the Business as Usual case at that time. So the Business as Usual case, then, would include, you know, things like energy efficiency, etcetera, right. As -- and so we want to compare to this Business as Usual baseline.

Similarly, the direct emissions they didn't include the generation for those buildings. And so then the overall values were less, so 40, or were different. So then the 40% ended up being a larger value of 22.1 MM Tons of reduction from a Business as Usual required. So now let's look at what we see for GHG reductions for the three SB 350 scenarios that we developed for 2021. Next slide.

So we have here the MM Tons on the vertical axis. The Years are the horizontal axis for the three scenarios. Scenario 1 in blue. The Scenario 1 in a High Electrification future in orange. And then our Aggressive in a High Electrification future in red. So all of the GHG savings are being measured, with respect to the Business as Usual EE savings and negligible fuel substitution because for the AB 3232 analysis there was negligible fuel substitution that would have been included in a Business as Usual value that we're measuring these reductions against. Next slide.

So that means for our Business as Usual Scenario 1, we're only looking at GHG reductions from new fuel substitution. So our new Business

as Usual projection. So that blue line gets us about half of the way to the 5 and a half MM Ton reduction in the system wide emissions goal. That's set by that horizontal line at five and a half. Then if we looked at a Business as Usual Scenario 1 in the High Electrification future, since we're, you know, using aggressive electrification, we have more GHGs reduced. And it's the orange curve that reaches 80%, sorry, 86% of that system wide emissions goal as set by AB 3232.

And then lastly, for the Aggressive Scenario 2 in the High Electrification future, we have both the aggressive fuel substitution as well as the difference between aggressive electric energy efficiency and the Business as Usual electric energy efficiency. So we could take that difference and include the added GHGs reduced there. And so that actually looks like you're meeting the AB 3232 system wide emissions goal as early as 2027. Next slide.

All right, so this is a little bit more of a breakdown of this Aggressive Scenario 2. The blue portion is showing the 34% of additional electric energy efficiency, the GHG reductions

from that. The orange wedge is showing the 66% of GHG reductions coming from electrification in the Aggressive Scenario. Next slide.

And not surprisingly, more GHG savings can be obtained from electrification than from traditional EE, but the traditional EE was necessary to help, you know, reach the SB 350 doubling target. So they do work -- they do work in concert. Next slide.

All right. So this is the final slide, and we have some long-term considerations because of course, we understand that there are longer term goals than just 2030, especially for building decarbonization and carbon neutrality.

So in our analysis that was reported in the recently published California Building Decarbonization Assessment, it indicated that even if in that assessment, one might want to refer to the system wide emissions for meeting the AB 3232 goal. What could be learned also was that GHG reductions on the order of the direct emissions goal would need to be attained in order to be on a trajectory for the economywide carbon neutrality goals that are set by various executive orders for 2045 and are wanted, perhaps

to be accelerated even.

So to remind you, the direct emissions goal was a reduction of 22.1 MM Tons from a Business as Usual Scenario. And even our Aggressive Scenario 2, developed for the 2021 SB 350 Update, wouldn't meet that particular GHG reduction goal. Now it's also important to note that the SB 350 is not looking economywide, like the carbon neutrality goals are looking. So they're -- it's hard to draw one for one comparison there, but one could say that more work must be done in order to reach these carbon neutrality goals, even for buildings.

So as someone else had previously mentioned, the Energy Commission is working on a Demand Scenarios Project, which was formally introduced in the IEPR workshop two weeks ago, and this work will elaborate on various potential and possible futures towards mid-century decarbonization goals. So that'll be a long-term economywide analysis that can compare to these 2045 goals.

And that completes my presentation today. Thank you.

VICE CHAIR GUNDA: Thank you, Ingrid.

That was super helpful. Really well done, thorough. Given that Commissioner McAllister is lead on building decarb as a whole, I don't know, Commissioner McAllister, would you like to kick off any questions that you might have? I have a couple of questions.

LEAD COMMISSIONER MCALLISTER: Yeah, absolutely. Well, I mean, feel free to go ahead. I do have a list. I have some comments and a couple of questions. Yes.

VICE CHAIR GUNDA: Please, please, go ahead.

LEAD COMMISSIONER MCALLISTER: Okay.

VICE CHAIR GUNDA: I'll follow you.

LEAD COMMISSIONER MCALLISTER: Great. So, yeah, I really appreciate this analysis as well, Ingrid. Well done. This is really kind of exactly like I think we envisioned it at the beginning of the IEPR cycle, and it's really nice to see the sort of execution in your graphics and sort of the order in which he presented the analysis, I think, was really helpful to kind of walk through because it's not easy. And particularly, this, you know, the AB 3232 report, you know that we recently put out sort of helped

us think about this in a more holistic way. Or at least with respect to buildings. But the fact that you've got SB 350 efficiency doubling and then, you know, overlaid or you know, alongside the carbon emissions reduction goals. And then, you know, fuel substitution obviously is a kind of a linkage between the two in some way, you know. That translation really needed to happen and you -- and you all, you and the team, have really, I think, done that in a way that is transparent. So thanks to you and the whole team.

And I'm really looking forward to the Demand Scenarios Project that you, and Mike Jaske, and others are working on. So I'm really looking forward to helping move that forward. So this is a huge integration task. So I just want to thank you for that.

And just the explicit distinction. Your color coding was fantastic. The explicit distinctions between sort of what is EE and what's electrification. I really, really appreciated that. And you know at, toward the end, you know I think the, you pointed this out, there wasn't a graphic, but you pointed it out

that if we really do take the direct emissions baseline, it's much more challenging to get there with the tools that we currently have and the toolbox. And that, you know, we really do need some creative thinking to be able to scale energy efficiency and fuel substitution electrification, particularly electrification, because that's kind of the twofer. I just wanted to -- I wanted to just comment on, maybe this is for attendees who maybe aren't sort of always paying attention to these -- to these issues with respect to, you know, efficiency in a form like this. You know, it's not sort of this topic is a little bit unique in terms of, in the context of the forecast.

So I guess I just wanted to point out that heat pumps are really a key technology here. I'm not sure that you even mention them, you know, Ingrid, but in terms of having a twofer. You know, so we were really kind of wondering a couple of years ago how we would get to our efficiency doubling goals because, you know, that conversation was shifting towards emissions. And you know, we're already a pretty efficient economy and we had a lot of programs doing a lot

of things, and building codes, and appliance standards, that are always in development. But doubling those efforts, it wasn't clear what the path was going to be if we took a straight efficiency, just through a straight efficiency lens.

And so you know then we, as we really started to consider what building decarbonization could look like, and as heat pumps really got to be ready for prime time, and you know, we started seeing that they were both inherently efficient, you know, multiples of 100%. You know, like 300 and 400% efficiency, and they were electric, which meant that they could take advantage of the cleaning, the increasingly decarbonized electric grid.

So really, the 350 goal has really gotten new life breathed into it, and we saw that we're, you know, we can be on track to actually meet and exceed that with some pretty clear policy directions and some programmatic efforts. And so as I said, you know, it breathed, you know heat pumps and electrification, generally have kind of breathed new life into the 350 goal achievement. I'm sort of, you know, very optimistic about that

now. And more broadly in the emissions.

You know, the other takeaway is just that, you know, we've really got to scale these efforts. And you know, I hope that 2022, 2023, we're going to see, you know, infusions of resources into that effort and we're really going to need everybody rowing in the same direction across the state. So it could be a huge job creator. It could be a huge, you know, just pipeline of projects to do what you were just talking about, Ingrid, you know, to really -- so five years, five, 10 years down the road, we would look at these -- at these graphs again with actual data from that period and see that we're on track and maybe beyond our goals. So anyway, that's the optimistic me talking.

I actually had -- the question I had written down was about this the onsite emissions, the direct emissions, and you address that verbally. And so I was kind of hoping there was a graph there, but I understand why there's not, or a chart. I understand why there's not -- why there's not one. So let's see, I guess I don't have any questions that are going to stretch you in a new direction. I've been -- I've been

obviously paying attention to this along the way, and I think as we develop the path, sort of the pipelines and the sort of recipient, ideas for what programmatic initiatives we're going to do with federal infrastructure funds and id Build Back Better passes, we'll get some funds, and you know, we'll see kind of what comes down the pike in terms of the budgeting, etcetera. You know I can't really predict all the details there but, you know, I think I'm hopeful that that we'll be able to sort of, you know, make this analysis proud by actually executing and going even beyond these projections, hopefully.

So I'm very excited about where we -- where we are and where we can potentially go for the next couple of years. So anyway, all this is to say thank you and really be encouraging to our whole team. I think, you know, Michael, you know now you're the AD and I think you're leveraging all your experiences from efficiency division. But this cross division team that's wrestling with these tough, you know you're trying to sort of figure out how analysis, you know, how you should analyze to both reflect reality, but also project the possible. And I think that's always

the balance we have here. And I really appreciate your thoughtfulness and rigor in trying to kind of manage this discussion and be explicit about, you know, what needs to happen in order to reach our goals. So I really, really enjoyed the presentation. Nice job.

VICE CHAIR GUNDA: Thank you, Commissioner McAllister. I -- I'm glad that I'm following you because it's, you know, I second everything you said, and I think it's really great. I especially know that Ingrid has been putting a lot of hours, you know, and given the way that the swim lanes work in terms of project timing, it is always like a squeeze towards the end and a lot of pressure to get this analysis done very rapidly. So, you know, I'm grateful for the team for thinking about the more broader analytical tool that that kind of accommodates this kind of analysis. So Ingrid, to you and Michael, you're still in the family, even though you kind of moved away from the Efficiency Division. So I thank you for continuing this.

So let me just elaborate a couple of things that Commissioner McAllister mentioned, and I want to make sure that I put it on the

table. I think Commissioner McAllister already pointed out this. The building conversation has moved from energy to carbon, and we can see, you know, as the conversations in the scoping plan are going, you can see the trajectory towards more equitable buildings, right. So that the idea here is energy and equity. So as we transition the economy, how do -- how do every sector provides an equitable opportunity?

So I think, you know, as you think about, you know, again, just recognizing your efforts here, Ingrid, of taking the energy and then converting that to the broader CO2 and then kind of comparing across different policy arenas, you know, I would -- I would challenge ourselves to think about how do we begin to take the non-energy benefits conversation and kind of putting that overlay as we move forward. I know we can't do that right now, but it's like, how do we begin to think about a broader framework that that cuts across policies that, you know, to provide the equitable transition conversation we're having. That's one.

I just has a comment. And two, just at a high level, you know, again, recognizing that

there's a lot of work that happened in top leadership on how to think about 350 from the early time to like now, and I just want to ask ourselves to continue to think about what are the policies coming down the pike and how do we evolve the thinking around the building decarbonization to fit that more broadly.

One question for you. Obviously, we didn't put the direct emissions on the chart. You know, when it's -- I don't know why would why we would put it, but at the same time, do we, you know the, one of the scenarios for the building, for 3232, was the refrigeration, the refrigerant. You know, the whole thing around the refrigerants and the, I forget the actual Bill number, which would have helped with some of that. Are you able to track that in your analysis now, as a potential scenario, or we're not thinking about this yet?

DR. NEUMANN: Yeah. Okay. So there's a couple of things, right. So there's the bit for CARB with SB 1383 and the way it was dealt with in AB 3232 was an all or nothing right. Whereas obviously, in conversations with CARB, as we were progressing through the work, they were also

progressing through their work, and we're hoping to get some data from them early next year so that we can make some better projections there based on the work that they're doing towards SB 1383, right.

So basically, you know it's not going to be a zero. It's not going to be a nothing, but it's maybe not -- it's very similar to our own SB 350, maybe, right? You know, maybe we're 80% of the way there, if we do XYZ, you know, and that sort of thing. So we're hoping they could tell us that kind of stuff.

So for this, I did not include any refrigeration impacts. So like the refrigeration, so there was an AB 3232. That was a what-if analysis, which was really technology based fuel substitution. Whereas here in the, for the energy efficiency in the fuel substitution, it's more programmatically based. It's not a specific technology being substituted, but it's also more grounded than because it's -- you're looking at, you know, programs that are, you know for the committed portions, that are funded, right. And building standards that are coming down the pipeline.

So it's just a different type of analysis. So the answer is we don't have -- we have something by end use, but we don't have specific technologies assigned to those, right. So then it would be hard to do what we did in AB 3232, where there was an incremental amount of refrigeration emissions then, that was added every time we added a heat pump, right, because they use refrigerants. And then one could use, in addition to that, what emission reduction one could get from the SB 1383. But both of those incremental refrigerant values were a lot smaller than any emissions from the electricity consumption or than the gas consumption that's displaced. So this is a little bit of a different approach there, but it's, you know, plus or minus, you know, maybe a few percent and not including any CARB efforts there with emissions.

VICE CHAIR GUNDA: Great. I think that's a -- that's a good point to make, and I think in the -- in the write-up for this volume, you might want to connect those dots just a little bit, in terms of why they're different. Because that would be helpful, right. I mean because again,

going back to the broader discussion, I think it's to Commissioner Monahan's point over the last two workshops, is the -- is the challenge of talking about all these different policy goals with some cross-work of metrics. That's helpful.

So, you know, let's kind of put that in our pockets to just think through and kinds of how can we advance that conversation.

And I think finally, before we go to the Q&A, I don't see any Q&A. Heather, you could just chat. Put it in the chat if we are good to just move to public comment after this. But just one final question, specifically.

So as we think through the work of, you know the long-term considerations, you obviously talked about the Demand Scenarios and such. How far are we? I'm not going to open this can completely, but just going to just touch it. You know, the conversation around the vehicle integration, right. Vehicle to grid integration and then the kind of boundaries, the messes that we have around. You know, what is at a building. What's not at a building. You know, how are we tracking that and what are we thinking? Are we always going to just keep this tight to the end

users we currently have? Or are we planning to expand them more holistically?

DR. NEUMANN: I don't, I mean from my involvement in Demand Scenarios, I would just say that we're including our own analysis on building electrification and building energy efficiency. So something along the lines of long-term AAEE and AAFS, and then something similar with the transportation forecast.

VICE CHAIR GUNDA: Yeah.

DR. NEUMANN: So I, I mean as far as you know, how that's going to be broken down, as far as locationally, I think that's not been -- not quite been determined yet.

VICE CHAIR GUNDA: Okay. Yeah, I think what -- I think the flag here is just that, you know, as we have more and more transportation electrification discussions, to the extent that they have the overlap of the buildings, and then to the extent that they have 350, 1383 interactions, having clarity on how we are thinking about these analysis and where the boundary is would be just helpful. I know we all know those boundary conditions pretty well, but this is an evolving situation, just call that

out.

So with that, again, thanks Ingrid, to you, Michael, and I know that EAD team, a large amount of EAD team, Ida, I know, the supervisor, thank you for all the work and the -- and the collaboration with Efficiency Division and also sometimes R&D on important issues. So thanks to all of that.

And with that, I would propose we go to Q&A. Heather, I will hand it to you.

MS. RAITT: Sure. Thanks. Commissioner Gunda, I don't see anything in the Q&A, so if you'd like, we could go straight to public comments. And Rosemary Avalos is here from the Public Advisor's Office to help us with that. Thanks.

MS. AVALOS: Thank you, Heather. Commenters, please allow one person per organization to make a comment, and comments are limited to three minutes per speaker. And I'll first go to call on the folks using the raise hand feature on Zoom.

So at this point, I don't see anyone who has raised their hand yet. Let's see. Okay. I don't see any hands raised here. Okay, and I'm

going to give a reminder to the folks on the phone.

In order to raise your hand on, if you're using your phone, you dial *9, and *6 to mute unmute. So let me give it a few minutes here, a few seconds here. Okay.

I don't show any hands raised either on Zoom or on the phone, so that concludes the comments from the Zoom in online and on the phone. So I'll turn it to Vice Chair Gunda.

VICE CHAIR GUNDA: Yeah. Thank you, RoseMary.

I just want to say now, in closing, you know we had two really good workshops. Again, and I'm just kind of invoking the sentiment of gratitude to the staff in EAD, the Forecasting Team and more broadly, you know, other divisions that are helping with the forecasting elements. Really thank you for your excellent work, you know with -- given the limitations on resources and a number of the staff stepping up. I know Mark Palmere, you know, Lynn Marshall, and a number of you who are stepping in to take over work that needed to be done.

So thank you all. And to Heather and

your team, thanks for another excellent workshop. Look forward to the comments, public comments and responding to that from our team. So I don't have anything else other than thank you.

So Commissioner McAllister, I'll pass it to you before I close the --

LEAD COMMISSIONER MCALLISTER: Okay. Great. No, just really a nice afternoon here of, you know, update information -- updated information and just a reflection of all the great work that's been happening.

And I did want to just acknowledge the partnership with the PUC, as well. With the Potential and Goal Study and just kind of working through the ins and outs of that. And I know, you know, a lot of interaction with various stakeholders who informed that and the contractor that does that work. And I think that's a strong partnership that only gets stronger over time as we engage further on these issues. And, you know, draw some, connect some of these dots and build bridges across energy sources. So I think that's a really, bedrock partnership as it is in other areas. But here to.

So thanks for -- thanks for the day.

VICE CHAIR GUNDA: Yeah. Thank you, Commissioner McAllister.

So I think I want to just close by saying thanks to everybody for being in attendance today, all the speakers, the Q&A participants, and generally being a part of this conversation. All the stakeholders who were able to join. Your commitment of your time to engage in these workshops and help push both the quality and the rigor of the work. We just really appreciate your participation.

I know we're going into holidays pretty soon here. So happy holidays to everyone. And for those of you who are going to take the time to provide comments before December 30th, extra thanks to all of you. So we welcome written comments, and once again, those comments are due by close of day on December 30th. Instructions on how to provide written comments are included in the notice for this workshop, which is posted on the CEC website.

So with that, I would call the meeting to adjourn, and so thank you all.

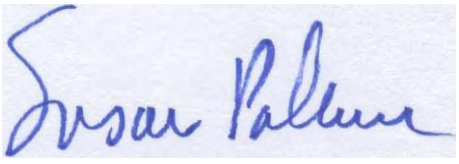
(Off the record at 3:49 p.m.)

REPORTER'S CERTIFICATE

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.

AND I FURTHER CERTIFY THAT I AM NOT OF COUNSEL OR ATTORNEY FOR EITHER OR ANY OF THE PARTIES TO SAID HEARING NOR IN ANY WAY INTERESTED IN THE OUTCOME OF THE CAUSE NAMED IN SAID CAPTION.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS 10TH DAY OF FEBRUARY, 2022.



SUSAN PALMER
CERTIFIED
REPORTER
CERT 00124

CERTIFICATE OF TRANSCRIBER

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 transcribed by me, a certified transcriber and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

And I further certify that I am not of counsel or attorney for either or any of the parties to said hearing nor in any way interested in the outcome of the cause named in said caption.

I certify that the foregoing is a correct transcript, to the best of my ability, from the electronic sound recording of the proceedings in the above-entitled matter.

MARTHA L. NELSON, CERT**367

February 10, 2022