DOCKETED	
Docket Number:	23-IEPR-03
Project Title:	Electricity and Gas Demand Forecast
TN #:	253847
Document Title:	Transcript of 12-6-23 for IEPR Commissioner Workshop on the California Energy Demand Forecast Results
Description:	N/A
Filer:	Raquel Kravitz
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	1/10/2024 8:38:26 AM
Docketed Date:	1/10/2024

STATE OF CALIFORNIA

CALIFORNIA ENERGY COMMISSION

In the matter of,	)	Docket No. 23-IEPR-03
	)	
2023 Integrated Energy	)	
Policy Report	)	re: Energy Demand
_____	)	Forecast Results

IEPR Commissioner Workshop on the California Energy Demand Forecast Results

REMOVE VIA ZOOM

WEDNESDAY, DECEMBER 6, 2023

1:00 P.M.

Reported By:
Elise Hicks

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Public Comment

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P R O C E E D I N G S

December 6, 2023 1:00 P.M.

MS. RAITT: Good afternoon, folks. We'll just give a minute for people to log on.

All right, well good afternoon and welcome to today's Commissioner Workshop on the California Energy Demand Forecast results. I'm Heather Raitt, the director for the Integrated Energy Policy Report or the IEPR for short here at the Energy Commission. And this is a workshop that's being held part of the Energy Commission's 2023 IEPR proceeding. And this is a remote only workshop. We're using Zoom. It is being recorded and a recording will be linked to the Energy Commission's website shortly after the workshop. And we'll also have a written transcript available to follow in about a month or so. We also have the schedule for today and the slide decks docketed and posted on the Energy Commission's IEPR webpage. If you'd like to see those there. We'll have some opportunity or an opportunity for attendees to ask questions of presenters. After Chris's presentation, we'll reserve a few minutes to take some questions.

If you wanted to submit a question, just go into the Q and A feature on the Zoom platform. You can click on that and you can type in your question. And if

you see one like your question that's already been submitted by somebody else, you can just click on it with a thumbs up to upvote it and then questions with up votes will get moved to the top of the queue. And then, alternatively, we have an opportunity for comments at the end of the day and those will be limited to three minutes per person. And we ask that only one person per organization make public comments.

And just a note that we do not respond to questions during public comments, but we welcome your thoughts and input. And, finally, written comments are welcome and they are due on December 20th. So with that, I will turn it over to Vice Chair Gunda for opening remarks. Thank you.

VICE CHAIR GUNDA: Thank you, Heather, to you and the entire IEPR team for hosting this workshop. I want to just begin by welcoming Commissioner Douglas, Commissioner Shiroma, Commissioner Houck and President Reynolds from CPUC who are joining us today, and will be providing some opening comments as well. Before I pass it on to them, just want to elevate gratitude to all the staff who work on the demand forecasting as one of the core functions of CEC is the analytical work and the planning assumptions that we develop and demand forecasting is one of the most important one of those.

So I just want to thank the staff for the diligent work they always do in making sure the analytical work is well vetted with stakeholders and our partner agencies, both PUC as well as CAISO to really kind of go through the rigor of the necessary improvements as they bring to the table.

So a couple of things I want to note in terms of personnel changes, much of the work on the forecast is done through the Energy Assessments Division, which is led by Aleecia. So I want to just thank her on behalf of all and all EAD through her. But I also want to just invite and say welcome to Jeremy Smith who just joined as the Deputy under Aleecia and would be focusing on the demand forecasting scenarios and data work. So welcome Jeremy joining the agency and stewarding this work moving forward.

I also want to just remind a couple of core policy and analytical initiatives that CEC has started incorporating over the last two to three years. So one of them is to just make sure the forecast gives us not only a point set that is used for IRP and other processes that the forecast flows into, but really gives us a scenario, kind of a lens on understanding what different demand forecasts could look like under different variations with the eye on really helping the

leadership and regulators and the stakeholders to understand what are different levers are as we move forward in this climate trajectory over the next 10 to 15 years, which we see as critical.

The forecast also has incorporated higher levels of electrification to ensure that the electrification is well laid into the planning so that we have the opportunity to plan for long lead time resources. So we've made those decisions in conjunction with PUC leadership and staff and CAISO. It's really important for us to really think about how can the forecast both address and help us plan for the future of high electrification, but also allows us opportunities to pull on some policy questions we might have. So I just want to thank staff for their continued work in incorporating all those elements. And with that, I would like to request President Reynolds to -

PRESIDENT REYNOLDS: Great, thank you very much, Vice Chair Gunda. And thank you for including us here in this workshop today.

As you can see, there's great interest from the PUC. We have four commissioners here and we're all looking forward to hearing more at this workshop. And I also want to thank the CEC staff for all of the work to develop the demand forecast. I know that's a huge

undertaking and it's really only possible with a great degree of dedication and commitment. So I really appreciate that. And I also appreciate the work of CEC staff to work so closely and cooperatively with the PUC staff. I know that that engagement has been taking place and I wanted to recognize it and express my appreciation as well as our partners at CAISO who are also involved in these joint agency efforts.

Just a few remarks to reflect on the fact that accurate forecasting a future energy demand is really critical. It's something we know, but we're recognizing that we have to be both accurate and aspirational. And I think you noted that and hinted at it in your comments, Vice Chair Gunda, that really what we're trying to forecast in a way that is actionable. So our processes rely on this forecast, but we also need to be - to recognize the aspirations that California has and make sure that we're assuming a high enough level of electrification that allows us to move forward and be supportive of that work. But also we're not sure exactly what the future is going to hold. And so forecasting, I think in California I think is harder now compared to any other time in our state's history.

And this is true because both of our really strong and our commitment to a future, to an electrified

future and one that is less reliant on our natural gas resources, but also because of the uncertainty of climate change and its impacts on the weather events that affect our electricity demand as well as gas demand and just all of that uncertainty makes this process even more difficult. So I appreciate all the thought that has gone into this.

The electricity and gas demand forecast do serve as very important inputs into PUC processes and proceedings including IRP, which was mentioned, distribution resource planning and resource adequacy proceedings. So I'm really excited about today's presentation and about the statewide electricity, electricity, and gas forecast results. Looking forward to learning more about the updates that CEC has implemented this year and new modeling capabilities and incorporation of climate data. So really lots of important and exciting work here. Thanks again to everybody who has done the work that brought us here today. I'm really looking forward to it.

Back to you Vice Chair.

VICE CHAIR GUNDA: Thank you, President Reynolds. I just want to elevate an important point you mentioned about the uncertainty in this next 10 to 15 years as we look at rapid electrification and plan for

it, we also need to be very careful about how we plan for both the gas system and we are seeing that on the petroleum side as well.

So it's really important to kind of make sure we cover all uncertainties as we develop our planning assumptions on both sides of the issue.

So thank you for uplifting that. And with that I'm go to Commissioner Houck.

COMMISSIONER HOUCK: Thank you, Vice Chair Gunda, and thank you to the CEC staff that put the workshop together and that are doing all of this really critical work on the forecasting. I want to thank Vice Chair Gunda, Commissioner Monahan and all of the CEC for their leadership on this important component of the 2023 IEPR as well as my fellow Commissioners, President Reynolds for their close coordination. I think we are all looking at the CEC forecasting and different components of the work that we're doing at the PUC. And this is, I can't underscore the importance and how critical the CEC's forecasting is, the IEPR is the foundation for statewide energy system forecasting and planning in California and for the broader electric system planning inputs from the CEC's demand forecast are incorporated into the PUC's Integrated Resource Plan as President Reynolds mentioned for all load serving

entities and then they feed back into the Cal ISO transmission planning process.

So all three of our agencies need to be closely coordinating and the forecasting here is the foundation for a lot of the work that we're doing. California's electricity system is as undergoing a significant transformation on the pathway to reaching our SB 100 goals and with high penetrations of renewables, electrification of buildings and transportation and deployment of behind the meter Distributed Energy Resources or DERs. It's even more critical that we address what President Reynolds referred to as looking at the aspirational goals of California to make sure that we're going to have the infrastructure and the systems we need to meet the demand that we're going to be seeing over the next few decades. Demand side resources continue to play a critical role in ensuring that we have load flexibility and meet our SB 100 goals. And I know as I've said in many other meetings, load flexibility and demand side resources are going to be a really critical indispensable tool in meeting those SB 100 goals.

At the PUC, I oversee the High Distributed Energy Resource or High DER proceeding and that proceeding focuses on preparing the electric grid for a

high number of DERs. These DERs include battery storage, customer sited solar and electric vehicle infrastructure, and we're anticipating a very high level of DER penetration, particularly in the transportation sector and are seeking to optimize the integration of those DERs within the distribution grid while making sure that the rates customers pay are affordable. The proceeding focuses on distribution planning processes and data improvements as well as electrification impacts, utility distribution, planning processes, data sharing and transparency and community engagement. The IEPR forecast again is foundational. It's a critical component that's heavily relied on for investor-owned utility investment and distribution infrastructure and continues to be an integral piece of our statewide planning process and work that we hope to accomplish. So, again, the work that we do needs to be closely coordinated with the CEC and ensuring that we're getting this right as we're looking at what our distribution grid needs to be to meet our demand side, both the resources we'll be relying on as well as the demand that customers have. And so, I think - and I'm looking forward to hearing the presentations today. I think this is one of the most important things that the IEPR is doing is setting the stage for all of the work that all

of the agencies are doing to make sure we're able to meet our mission.

So again, I want to thank the CEC, the staff and all of the work that we're doing together to ensure that California has safe, reliable and affordable electricity. And with that, I will turn it back over to Vice Chair Gunda.

VICE CHAIR GUNDA: Thank you, Commissioner Houck. Just for the record, we also have Commissioner Shiroma and Commissioner Douglas in attendance today.

I just wanted to close off from the virtual dais, just a big thank you to all the participants, the public that are calling in today and stakeholders you are such an important part of this process, so thank you for taking the time to continue to work with the agencies in developing these important assumptions.

I also want to note for the record that we have more PUC commissioners today than CEC commissioners, so it's more of a PUC workshop today. Just wanted to make sure.

So with that, I will pass it to Heather to have us started.

MS. RAITT: Okay, great. Thank you so much, Commissioners. So first we will hear from Heidi Javanbakht who is just going to give us an overview of

the forecast. So go ahead. Oh, I'm sorry. And Heidi is the demand analysis branch manager, so thank you Heidi, go ahead.

MS. JAVANBAKHT: Hello, everyone. As Heather said, my name is Heidi Javanbakht. I the manager of the demand analysis branch, and I am going to kick us off today with an overview of the energy demand forecast and the forecast updates for this year. Next slide.

I'll start with some background about why the Energy Commission forecasts energy demand. In 1974, the Warren Alquist Act established the Energy Commission to respond to the state's on sustainable growth and demand for energy. And as part of this act, public Resources Code 25301A requires that the energy commission conduct assessments and forecasts of all aspects of energy industry, supply production, transportation delivery and distribution demand and prices, and that these forecasts occur at least every two years. Next slide.

The California Energy Demand forecast often referred to as the CED or the IEPR Forecast is foundational to procurement and system planning in the state. It's used by the CPUC for integrated resource planning and by the California ISO for transmission system planning. Excuse me. It's also used by the CPUC. One second.

Okay. It's also used by the CPUC and utilities for resource adequacy requirements and by the utilities for planning. The forecast is a 15 year forecast of electricity and gas demand in the state. We project annual electricity and gas demand and hourly electricity loads. The forecast includes scenarios reflecting various levels of adoption of energy efficiency, building electrification and transportation electrification, and the forecast also includes one in X year net electricity peak estimates. And we update the forecast annually with a comprehensive update in the odd years. Next slide.

Throughout the forecast year, we solicit input from stakeholders through IEPR workshops and demand analysis working group meetings. We held two workshops in August to discuss the forecast inputs and assumptions and one in November that covered the results for transportation electrification, behind the meter PV and battery storage, and additional achievable energy efficiency and fuel substitution. Today's workshop will go over the annual electricity and gas demand results.

We'll have a final workshop on December 19th to go over the peak electricity demand results, which were not ready in time to present today. After that, we will review any comments submitted after these

workshops, make any last adjustments and post the final results. And the results will be presented at CEC's January Business Meeting for adoption.

In addition to the IEPR workshops, we also held four Demand Analysis Working Group meetings or DAWG meetings, and at the DAWG meetings we do a deeper dive into the details on the inputs and methodology updates with open discussion and feedback from stakeholders. And I want to thank the CPUC, the California Air Resources Board, the ISO, the IOUs, and many others who provided valuable feedback on our forecast this year. Next slide.

In recent years, extreme weather events have been occurring more frequently than they did over the last 30 years. And historical weather data are no longer sufficient for predicting future weather patterns. The team is developing new methods for incorporating climate change into the forecast and will be rolling these out incrementally, aiming for full implementation for the 2025 IEPR. This forecast cycle, we shifted from using historical weather data to using climate projections. For future forecast cycles we are exploring the use of new weather variables such as heat index and we are also moving towards a probabilistic hourly forecast and aiming to implement that for the 2025 IEPR.

At the same time that we are experiencing the

impacts of climate change, the state is strategizing on how best to meet economy-wide carbon neutrality by 2045. Many of the strategies impact energy demand and we've seen an uptick in policies and programs aimed at increasing energy efficiency, electrifying buildings and transportation and shifting load to off peak hours. As these new policies and programs are developed, they are incorporated into the forecast. Next slide.

I want to touch on - Okay, I want to touch on recent building electrification updates since this is behind one of the biggest changes to the forecast this year. The state has several goals related to building electrification. These include a 3 million - a goal for 3 million climate ready and climate-friendly homes by 2030 and 7 million by 2035. The state also has set a goal to install 6 million heat pumps by 2030 and on October 10th at the EPRI and CEC Building Electrification Summit, the top global appliance manufacturers and distributors committed to help California achieve the 6 million heat pump goal. These types of goals often lead to development of incentive programs and regulations to spur adoption and these proposed programs and regulations are the basis of the additional achievable scenario designed that is incorporated into the forecast.

Several regulations are in the works that require zero or low NOx appliances. At the statewide level, the Air Resources Board began their rulemaking process earlier this year for zero emission space and water heaters and expects to finalize it in 2025. The Bay Area AQMD adopted a zero emission standard in March of this year and the South Coast AQMD will start their rulemaking in 2024. And one other proposed standard that's not on this slide is that the CEC is also considering a standard that would require replacing burnt out central AC units with heat pumps and if approved, this would go into effect in 2026. Next slide.

When standards are in a preliminary stage, there are many areas of uncertainty. There's uncertainty due to differences between regions, the timing of when regulations may go into effect and what sectors, appliances and fuel types they may impact. There's also uncertainties around how consumers will react to these standards and what the compliance rates will be. There's also uncertainties around manufacturer capacity as well as local impacts to the gas and electric systems and grid readiness. Next slide.

In recent years due to the uptick in decarbonization and electrification policies, the forecast team expanded its use of the additional

achievable framework which previously focused on energy efficiency impacts. In 2021, the team expanded the additional achievable framework to building electrification and in 2022 expanded it to transportation electrification. Additionally, last year we redesigned the forecast framework to focus on the uncertainties in the implementation of decarb and electrification policies like those that I outlined on the previous slide. And this was a shift from the previous forecast framework that was focused more on capturing uncertainties and economic and demographic outlooks. Next slide.

This table shows the general guidelines for defining a suite of additional achievable scenarios. The scenarios increase in uncertainty as you go from scenario one to scenario six. Out of this list, the three to pay attention to are scenarios two, three, and four. These are the scenarios that are used for energy planning. Scenario three is considered reasonable to occur though uncertainties exist around adoption levels and impacts. Scenario two looks at impacts from programs and regulations that will occur, but there's uncertainty still around the impacts. Scenario four incorporates impacts from programs and regulations that are likely to occur but are still in the planning phase. Scenarios

five and six are more speculative and these are useful for looking at energy impacts from strategies that could exist in the future to meet greenhouse gas reduction goals. In the last note here is that we don't always produce six scenarios. Next slide.

The managed electricity forecast is built from a baseline forecast plus select additional achievable scenarios depending on the use case. The planning forecast is used for resource adequacy and integrated resource planning. This forecast uses scenario three from each of the additional achievable modifiers. The local reliability scenario is used for more geographically granular studies such as the ISO's transmission planning process. The local reliability scenario uses AEE, the energy efficiency scenario two, fuel substitution scenario four, and transportation electrification scenario three, which results in a more conservative forecast with higher demand in order to account for increased uncertainty when looking at a smaller geographic region. Next slide.

We also forecast annual gas demand through the IEPR process and update this forecast every two years. The inputs and assumptions are consistent with the electricity demand forecast, and this is an end user forecast and does not include gas required for

electricity generation.

The general framework is similar where baseline economic and demographic and price inputs are used to create a baseline forecast that can then be layered with various combinations of additional achievable scenarios. Historically, the Energy Commission has not recommended a set of scenarios for gas system planning. Rather the gas utilities choose the combination of scenarios, and this is typically different from the combination used for electricity system planning in order to use something more conservative for gas that minimizes risk on taking reliability concerns into account. For both electricity and gas there is a need to minimize risk with system planning to maintain reliability. The electricity system has to be ready to accommodate building and transportation electrification, whereas the gas system has to continue to be available in the event that the market is not able to transition as quickly as proposed. Next slide.

I'm going to shift gears now to go over the forecast approach at a high level. Next slide.

We produce a system level forecast and our forecast is for eight electricity planning areas and four gas planning areas. On the electricity side, this

includes the three IOUs, Northern California non CAISO, which we refer to as NCNC, LADWP, Imperial Irrigation District, Burbank/Glendale, and Valley Electric Association. On the gas side, it's the three large gas utilities in the state, plus an other category to capture the other regions. Next slide.

The common level of geographic granularity across all of our forecast models is the forecast zone. These are based on planning area boundaries in addition to climate, and I will note that these zones are different than the climate zones used for energy codes and standards. Next slide.

Also wanted to quickly cover forecast terminology that you'll be hearing throughout Chris's presentation. Who will be - Chris will be presenting on the results. So we forecast total consumption, which is before PV or other load modifiers are taken into account. And then when we layer on the behind the meter distributed generation impacts, this brings us to the baseline sales. After that, we layer on the impacts of the additional achievable scenarios for energy efficiency, fuel substitution and transportation electrification, and that gives us the managed sales. Next slide.

The next few slides will walk us through the

forecast model system. Next slide please. Thanks. Okay. Oh, back one. Yep. Perfect. Okay.

The starting point for the models is the historical electricity and gas sales data reported by the utilities through the Quarterly Fuel and Energy Reports or QFER. We add this to our estimates of historical behind the meter distributed generation to come up with historical electricity and gas consumption. The historical consumption data are provided to the end use and NAICS code-based forecast models. Next slide.

Economic and demographic projections from Moody's and the Department of Finance are inputs to the models as well as forecasts of electricity rates and gas prices. Next slide.

Committed energy programs, codes and standards are taken into account in estimating energy demand for each sector. We also account for title 24 mandates for PV end storage for new construction. Next slide.

Additional achievable scenarios are developed for energy efficiency, fuel substitution, and transportation electrification. These scenarios are for impacts above and beyond the committed energy programs. Next slide.

The load modifiers in the orange boxes are combined with the baseline consumption to create the

managed annual sales forecast scenarios. And this is the end result for the IEPR gas forecast, but the electricity forecast has one additional step. Next slide.

The last step here is to produce the hourly electricity forecast from which we can extract the net peak demand. And from here we also estimate the one in X year net peak demand. Okay, next slide.

Moving on now to talk more specifically about the updates for the 2023 IEPR forecast. Next slide.

Each year that we update the forecast, we add an additional year of energy sales and consumption data. We use more recent economic and demographic data and update the electricity rates and gas price projections. And the gas prices were presented at an IEPR workshop back in April and the electricity rates were presented at a DAWG meeting in October. Next slide.

We have a few significant model changes for our forecast this year. We are forecasting out to 2040 to support CAISO's transmission planning process per SB 887. We are also conducting another round of the long-term demand scenarios to be completed next spring and are extending projections out to 2050 for that work. The long-term demand scenarios feed into the assessments for SB 100. We shifted to a refurbished residential end use

model this year, which was modernized and incorporates data from the latest residential appliance saturation study. And we are also incorporating new climate simulation data available through Cal-Adapt. Next slide.

On behind the meter PV end storage, there were also several updates on these included an improved process for determining historical capacity, which resulted in slightly lower estimates of PV capacity and higher estimates for storage capacity. Also, over the past year, the team has been working with the National Renewable Energy Laboratory to adapt their dGen model to California, and that model was used for the 2023 forecast. Some of those adaptations included incorporation of the net billing tariff as well as the extension of the ITC, of a federal tax credit. The dGen model doesn't include standalone storage, so the team also developed a separate model for standalone storage. Next slide.

And, lastly, the additional achievable energy efficiency and fuel substitution projections were refreshed to reflect the most recent codes and standards and incentive program data. The Air Resources Board included a zero emission space and water heater measure in the state implementation plan, which was included in the fuel substitution scenario 4 for the 2022 IEPR

forecast, which went into the local reliability scenario. This year, CARB held a public workshop in May of 2023 to kick off the rulemaking process. And with that signal that this is moving forward, for the 2023 forecast the team incorporated this proposed standard into AAFS, Additional Achievable Fuel Substitution Scenario 3 and collaborated with the Air Resources Board on the assumptions.

This standard is anticipated to have a significant impact on electricity demand, which you'll see as Chris goes through the forecast results. So we thought it was important to include this in the planning forecast so that the state can begin to prepare for these impacts on the electricity system. And lastly, for transportation, the forecast was updated to account for the clean miles standard, which applies to companies like Uber and Lyft and sets a target for the percentage of electric miles driven. Next slide.

The changes I just summarized were discussed in more detail at DAWG meetings throughout this year as well as the IEPR workshops. I'm not going to go over this table in detail, but it's included here as a reference in the event that you are looking for more information on any particular topic. Next slide.

And these are the next steps for the IEPR

forecast. The draft IEPR was posted for comment and does not include the forecast results because those were not completed until recently. The forecast results will be added to the final IEPR report. We will also have another workshop on December 19th to go over the hourly and peak electricity demand results, which again, we're unfortunately not ready to present on today. Written comments for today's workshop are due on December 20th. Comments on the December 19th workshop will be due in early January. Also in January, we'll take the forecast results to the CEC Business Meeting for adoption, and in February the final IEPR will be posted and taken to the CEC Business Meeting for adoption. Last slide. One more.

That's it for my presentation. Next is Chris Kavalec who's going to go over the annual electricity and gas forecast results.

MS. RAITT: Thanks, Heidi. This is Heather. I wonder if I could jump in. We've got a couple of questions for you. I think we have time to take them before we move to Chris. Does that work?

MS. JAVANBAKHT: Yeah, sure.

MS. RAITT: Okay, great. So I'll just go ahead and introduce Jeremy Smith. He's the Deputy Director of the Demand Forecasting and Scenario Development at the Energy Commissions in the Energy Assessment Division. So

happy to have Jeremy here. And go ahead, Jeremy.

MR. SMITH: All right, great. Thank you Heather, and good afternoon everyone. Our first question is from Matthew Vespa. It says, are you recommending a scenario for gas planning this time? Conservative scenarios create stranded asset risk.

MS. JAVANBAKHT: This is something that we would like input from stakeholders on. As I mentioned, we haven't in the past recommended a scenario for gas planning.

MR. SMITH: Okay. And then we got one other question from Andy Brown. Are the other forecast areas excluded from the forecast models?

MS. JAVANBAKHT: No, we do forecast for those other areas as well. They're just included in an other category.

MS. RAITT: Great. Thank you, Heidi. Thank you, Jeremy. Oh, go ahead. Sorry, Vice Chair.

VICE CHAIR GUNDA: Yeah, I just have a quick question as well, Heidi. I think in the spirit of the first question and kind of your remarks a little bit, and I think there's another question there for me as well.

First of all, thank you so much for the presentation. I've watched the evolution of the

forecasting results, accessibility, and I just feel like it's such a high level of accessibility that we are aiming for now in terms of just setting the stage. So thank you so much for being as thoughtful as you are and going through that.

I think my question is along the lines of the first question. You kind of talked about uncertainties, and I know we've discussed internally as well, both on the regulatory front, just some of the things we might have to make into the electrification realm, but also on the planning risk by creating that cushion of uncertainty, both on the electrification side but also on the gas side.

Could you just talk through how you're thinking about continued improvements? Right. I mean, I think we have a forecast again in a year. I mean, we discussed some level of opportunity here to do some mid-year updates on some issues as warranted, but also kind of how are you thinking about the reasonableness, right? So the forecast is supposed to be reasonable to occur with cushion on both ends. So if you could just talk a little bit more on the thinking of the team and any input you might have gotten from stakeholders in the DAWG process and such. Thank you.

MS. JAVANBAKHT: Yeah, sure. So your first

question, we are in collaboration with the Air Resources Board and tracking their progress on this regulation. We'll also be closely watching our efficiency division and their work on the building standard side, appliance standard side for replacing AC with heat pumps. And if there are changes to what has been proposed, we can make an update. So typically our additional achievable scenarios are for the energy efficiency and fuel substitution are only updated in the odd years. But if there's more information, if things change a lot next year, we can do an update next year and either incorporate it into next year's forecast or there's even potential to do a mid-year adoption of new scenarios if needed.

VICE CHAIR GUNDA: Great. On the second question, just on the thinking around the reasonableness to occur, I mean we've had this discussion, I think pretty robust discussion a couple of years ago on the need to look towards the scoping plan and looking at incorporating some of the elements of the scoping plan into the forecast paradigm given how long it takes to build infrastructure needed. But I also recognize the point you made on the gas side, which is the alternate side. While we are imposing a higher level than reasonable to occur to cushion the infrastructure

development, you also were talking about reducing the risk by making sure we consider.

Could you just talk about the thinking along those lines and also what we might have heard from stakeholders during the DAWG meetings and such?

MS. JAVANBAKHT: Yeah. Well, so on the electricity side, we want to be sure that we are getting a little bit more ahead of these proposed regulations and programs than we have been in the past because there is such long lead time for some of the grid improvements to accommodate electrification from both transportation and building electrification. So from that side, wanting to incorporate these a little bit earlier, a lot of signals that happened this year that building electrification will move forward. So we have bucketed it under reasonable to occur, but how it occurs, there's still a lot of uncertainty, which is why it's falling under AAFS 3.

And then - oh, did you want to add something?

VICE CHAIR GUNDA: Oh, no. So. First of all, I am really, really appreciative of thoughtfulness, of thinking this through. So is that then, given that we are assuming highly - slightly higher electrification or maybe in some cases higher than slightly electrification to allow for that uncertainty, is that equivalent amount

is what you are thinking could essentially not decrease on the gas side and hence you need to be able to cushion that gas front? Is that how to think about this?

MS. JAVANBAKHT: Yeah, well, I think so on the gas side, as I mentioned, the gas utilities do not usually use the same set of scenarios that we use on the electricity side. And I don't see that as being a problem. I think that that's smart because they need to do the same thing, but on the gas side, they need to manage risk and make sure the system is available and reliable. And so with fuel substitution and electrifying buildings, we want to make sure that the gas system is still available in the event that there's a lot of uncertainties, there is the chance that this does not roll out as quickly as we would like. So having the gas system available in that event is important.

VICE CHAIR GUNDA: Got it. Thank you, Heidi. With that, I'll go to Commissioner Houck.

COMMISSIONER HOUCK: Yeah. As a follow up first I want to thank you for the overview. I really appreciate it and just want to recognize the complexity of all of the work and the importance of it. And you're dealing with what you know from the past, what we're anticipating from the future, known unknowns and unknown unknowns, and then the aspirational goals that we want.

So I just want to recognize how complicated all of this is, especially as we're going through this transition where we're hoping to get to a certain place by a certain time. And I think one of the things we've seen in looking at the distribution planning aspects at the PUC is this need for the overall statewide planning, the top down and the bottoms up approach. And just trying to, and I know this is complicated and we're all still working through it, but I'm just wondering how we get more localized.

I know you talked generally about smaller areas, and this may be something you're getting to later or in the next workshop, but I know that the forecast zones that are based on the climate zones are still fairly large for some of the areas that we're seeing capacity constraints and impacts in. And so I'm just wondering how as we're working through all of this, we're going to be able to get some of the localized issues that we're seeing built into the forecast. And, again, this is really foundational to what we're doing and needing to be working hand in hand with the CEC on this. And so if there's anything on our end and as far as being able to communicate better. But I'm just wondering if the forecast that you're doing for this IEPR or for the next IEPR is going to be able to build

in some of the localized constraints that we're seeing in the system, particularly in regards to environmental justice communities that we've got a lot of program money we're hoping to go into those areas where we want to make sure that vehicle electrification infrastructure and building decarbonization are recognized as well as some of the more rural areas where from looking at the past, we might not anticipate growth, but we're trying to make sure that we're accounting for it. I hope that makes sense.

MS. JAVANBAKHT: Yeah. So our forecasts, like I said, is at the system level, and that's because the primary use cases for the forecast have been resource procurement, resource adequacy, and the integrated resource planning. We do take the additional achievable modifiers down to transmission. They're more localized for transmission planning, and we do send those numbers over to the ISO, but those do not get as granular as would be needed for example, for distribution system planning. It's difficult,

But we can talk more if there is a need to go that route in the future. And we do at the CEC have the AMI data, the Advanced Metering Infrastructure data. So I think there are some opportunities to start looking a bit more granularly than we currently do, but I think it

would need to be a balance. A distribution planning forecast is necessarily much different than a system level forecast. There's just so much more uncertainty the more granular you get with geography. So that has to be taken into account, but there may be some balance in there, some regional distribution or regional granularity in between the two that might make sense.

COMMISSIONER HOUCK: No, thank you. That's really helpful for me to understand what the potentials are, so thank you very much.

VICE CHAIR GUNDA: Thank you, Heidi. I don't know if any other Commissioners have any questions, but just on the last question that Commissioner Houck raised, I think to your point, the forecast has always tended to look at system level down to the allocation that was required for planning purposes, right? So we've taken that, but I think I do want to appreciate the question that Commissioner Houck raised and some of our adjunct efforts on the planning side. How can we help support potentially kind of a more granular work? I think that's something that we have been discussing internally. I think we should at least have discussion on how best to serve the purposes of PUC planning as needed. So let's kind of have that as a idea to discuss. Thank you.

MS. RAITT: All right, are you ready to move on? This is Heather. Thank you, Heidi, so much for that presentation and discussion. So I think you're ready to move on to our next presentation from Chris Kavalec. And Chris is the CEC's former Demand forecast Coordinator and happy to have him back sharing his expertise as a retired annuitant.

So go ahead, Chris.

MR. KAVALEC: Good afternoon. I am Chris Kavalec. Some of you may remember me from four or more years ago when I was leading the Forecast. I came back recently to help out. We have in the demand office a lot of new staff, a lot of very talented staff, but relatively new. So I decided I would come back and try and help out while the newer younger staff are coming up to speed. And I apologize in advance if there are questions I can't answer. I've only been back for a little over a month and I'm still digesting the forecast myself and I haven't had a lot of time to delve into a lot of details, but I will attempt to give a coherent presentation today. Next slide.

Heidi gave an overview of our forecasting process and I wanted to list and briefly talk about the models and sectors we use for this particular forecast. Our consumption and sales forecast for electricity and

natural gas. You see the models listed there and two types. Basically we have end use models which are bottom up models starting at the appliance or equipment level, and we have econometric models which are more top down. We also have supporting models that provide us commercial floor space, households, the impacts and the impacts of climate change. And we get input from our, as you've already heard, from our transportation and self-generation model outputs. And the transportation models give us electricity that is combined into various sectors for this forecast. For example, the electricity consumed by personal light-duty vehicles is added into the residential forecast. Note that the commercial sector and model shown there shows two types, end use and econometric. Typically we use an end use model for our commercial forecast, but in this forecast, our commercial end use model is being updated with data from the commercial end use survey or CEUS, which is a major undertaking. So it wasn't ready for this forecast. So we're using an econometric model for commercial.

For the residential model, the model was recently revamped, but there's still a little bit of work to do in incorporating programs and standards directly within the model. Currently some are embedded in the model. And some are we have to post-process and

subtract from the residential results. Our stakeholders look at these fancy models and sophisticated methods and they all say there's no way this forecast could be wrong, but I may just have dreamed that. Next slide.

Critical inputs to our forecast. Here we see some of the important economic and demographic drivers that we use in the forecast. The economic drivers. The first three listed here, gross state product, personal income, and commercial employment are pretty similar to what we used in our last forecast. We call that CEDU. That means the U means update. Last year was an update year for our forecast and not a full forecast. Taking a look at demographic drivers, population and number of households, we see significantly lower growth rates versus the last forecast. And next slide.

Taking a closer look. I think he went back one. Yes. Thank you.

We see that growth in households and population compared to our previous forecast in the red, and there's a notable decline and that comes about - we get our demographic forecasts from the Department of Finance who in their recent most recent forecasts have projected more out migration than they have before and a decline in the fertility rates in the state. So those projections lead to the lower projections we see here

for households and population. Next slide.

Electricity rates. You see for the major sectors, they're a little bit higher than the last forecast because of updated revenue requirement projections and using our previous sales forecast. That's the result we get. So they're a little higher overall. Our price elasticity of our models taken together, meaning the impact on demand of a given change in price is fairly low, so it doesn't have a huge effect, but there is an effect there as we will see. Next slide.

Natural gas rates fairly close to the last forecast, except in the case of residential. We have a lower - lower forecast and which will impact the residential gas forecast as we'll see. Next slide.

We spend a lot of time in our forecast talking about AAEE, but our baseline forecast also incorporates what we call committed efficiency savings, which means savings from programs that have been funded and approved and standards that have been implemented as opposed to future standards. And then we rely on potential studies and other analysis to give us the AAEE. And the graph on the left, the program impacts - you can see the cutoff point for committed programs in 2023. On the committed side, we don't have any new programs after 2023 and the

AAEE begins in the next year in 2024. So after 2023, you'll see the blue curve there. The savings began to fall off as the program measures begin to decay.

And then for standards on the right, we used the cutoff point of earlier cutoff point 2021 because our efficiency experts decided there was enough uncertainty around the 2022/2024 Title 24 standards that savings from these latest standards should move into AAEE. Next slide.

This looks at gas programs and standard savings. I'm not sure what happened with the 2021. Oh, by the way, for gas, we were comparing it not to the 2022 forecast, but the 2021 forecast because in the update year we don't do a gas forecast, typically. And I'm not sure what happened with the data for the 2021. Here you see that we don't have the whole curve for 2021. And then on the standard size we have this big dip in 2021, and I'm not sure why that's happening. I'll have to look into that further. But anyway, the blue again shows the committed program and standard savings embedded in our gas forecast.

Okay, so onto some results. Next slide, please. First, electricity consumption results. Next slide. Here we see a residential electricity consumption projected for the state as a whole. And you can see that

in the blue curve there during the forecast period is lower than in the previous forecast. And that's not surprising given our look at projected household and population growth. And also as we saw some rate increases so that by 2035, the new forecast is about five and a half percent lower than the 2022 forecast. Next slide.

Commercial electricity consumption doesn't change much. And again, that's not surprising given the similarity in economic growth rates that we saw earlier.

Towards the end of the forecast period, the rate of commercial, commercial electricity consumption begins to show lower growth, and that's because the commercial electricity rates late in the forecast begin to rise faster than commercial employment, which is the main driver of commercial electricity consumption. Next slide. Industrial electricity consumption. This includes manufacturing and mining and construction. You see a lower forecast to 2022 and once key source of this difference comes from a new starting point as we revised our historical data and we see a dip in the first couple forecast years as near term growth by industry is updated with evidence from recent history, but then it rebounds a few years out showing a high rate of growth on the previous forecast. And another reason for that

dip at the beginning is the jump in industrial electricity rates, agriculture and water pumping consumption. Next slide, please.

Again, we see a difference in starting points as the historical data gets updated. Then a little bounce back to almost the level of the previous forecast, followed by slower growth as you can see compared to the previous forecast. This lower growth comes from the rate increase rate increases as well as in this industry there's generally been a movement toward more efficient use of water in the industry, such as switching to less water intensive crops. So those two reasons go into giving us a flatter curve for our agricultural forecast for consumption. Next slide, please.

TCU or transportation communications and utility and street lighting together is a sector in our forecast. Here we start out with a higher updated historical data followed by slightly faster growth. And this is caused mainly by increasing electricity, use by medium and heavy-duty trucks as well as off-road vehicles. Next slide, please.

And result of adding up all these sectors gives us statewide electricity consumption, which is down slightly due to our lower residential forecast. So

that by 2035 consumption is down by around 1.5 percent relative to the previous forecast. Next slide.

This chart shows you the proportion of consumption by each of the different sectors in our model out to the end of the forecast period. And here we can see the result of lower residential consumption growth with commercial growth being roughly the same as it was in the previous forecast. The commercial sector over the forecast period begins to out consume the residential sector so that later in the forecast it is the biggest energy commercial is the biggest energy consuming producer in 2040. Commercial electricity consumption is responsible for around 40% of the total with residential at about 35 percent. Next slide.

Now, in order to get to our sales forecast, we need to subtract off self-generation, meaning PV of course, as well as other technologies like wind and gas turbines, waste heat conversion, et cetera. And forecast for self-generation was presented in our November workshop along with the efficiency results. Next slide.

This is a word about this in general. We have more PV in the forecast in spite of the net billing tariff, and this is as a result of higher rates and a lower payback period and an extension of the investment tax credit out to 2034. We also have updated historical

data, as Heidi mentioned, and a new predictive model, NREL's DGen model, which changed the results. But the pace of increase for PV begins to slow down towards the end of the forecast. Next slide.

As we see here, the flattening of self-generation, electricity produced by self-generation as the investment tax credit is phased out in the mid 2030s. Next slide.

So subtracting that from our consumption projections gives us forecasts for baseline sales. So here we see the sales set off against the self generation impacts. So you can see directly the impact of self-generation and to the tune of about 74 terawatt hours by 2040. And since self-generation is higher than in the previous forecast, sales dropped more percentage wise than consumption in this forecast down by about 3 percent by 2035 compared to the previous forecast. Next slide, please.

Okay, so here we get to see some scenarios for our managed forecast, which includes a planning forecast and a local reliability forecast. Two different scenarios. The baseline sales from this forecast in the last shown in with dotted lines there, the planning forecast and local reliability forecasts in blue and black. There you can see they end up between by 2035

between the plan, the managed forecast sales that we had for our previous forecast. And that's because these two are fairly close together, the new ones. And that's because unlike the last forecast, the state implementation plan has been included in both scenarios.

So we developed, as Heidi said, five or six scenarios for each of our load modifiers. The load modifiers being AAEE, Additional Achievable Fuel Substitution, and Additional Achievable Transportation Electricity. So for our planning scenario - planning forecast, the one in blue there, we're using sort of a mid level in terms of aggressiveness for these load modifiers. And then for the local reliability forecast, we're using a more conservative AAEE case, a more aggressive, at least on the programmatic level for additional achievable fuel substitution. And the same as in the planning forecast for additional achievable transportation electricity. So the local reliability forecast was meant to be more conservative over overall. But the 2023 more, what I call more aggressive scenario for fuel substitution actually has less residential fuel switching in 2040 than the one used for the planning scenario because of the assumptions made about the zero emission appliance standards. And that's why the two, you can see the two sales scenarios converge by the end

of the forecast period. They're almost identical. Next slide, please.

And here's a look at the three load modifiers I was talking about earlier. AAEE is showing these graphs as a negative impact, meaning we're saving electricity and the red lines show the net effect all of the three load modifiers. So initially we start out negative as the savings or the load modifiers are dominated by AAEE, then the other two later in the forecast period, fuel substitution and transportation energy takeover for the rest of the forecast period. And by 2040, we show a total effect on sales of about 57 terawatt hours for the local reliability forecast and just slightly less for the planning forecast. Next slide, please.

Okay. This shows our transportation electrification impacts the dark blue bars there. Actually it says in the graph that that's managed sales, but I think that's actually consumption. Yeah, I think that's total consumption there from all sectors. So this graph is showing the proportion of total electricity consumed by the transportation sector in two parts. The yellow bars there show the impact of the transportation energy that we have in our baseline forecast. While the green bars show additional achievable transportation, we

added to the baseline transportation energy. So you get a sense of the magnet relative magnitudes. We start out pretty small, obviously are today, but by 2040 we're reaching something like 20 percent maybe of total electricity consumed. Next slide, please.

So now we get to sales forecast for the individual planning areas, and I'll go through these fairly quickly, but it is our custom to reach out to the utilities for more in-depth discussion on the forecast and to compare our forecast with their most recent forecast, both for sales and for peak and hourly loads. When we get that finished and, if need be, we make some last minute changes if we feel that they're warranted based on our discussions. So I'm not showing a lot today, but we have plenty of time for discussion with the individual utilities. So I'm showing here the same elements as in the statewide case, the two new managed scenarios, planning and local reliability, the two old managed forecasts and baseline line sales for the two forecasts for PG&E.

And we see the same pattern here. The two new managed cases end up being between the two from the previous forecast, and they're converging to be almost the same by 2040. New baseline sales, as in the statewide case, will be lower than in the previous

forecast because of a lower residential forecast. Overall growth rate for PG&E between 2023 and 2024 for baseline sales is about 1.6 percent a year. And then for the two managed cases, about 2.6 percent per year, which is the fastest of all the planning areas we're looking at here. Next slide.

For SCE, again, the same pattern that we saw before. Growth rate of baseline sales is a little bit less than 1 percent and annual average. And then the growth of managed sales is about 1.8 percent annually. And these two rates are the slowest among the five planning areas that we're showing here. And we'll be happy to discuss with Edison the reasons for that. Next slide, please.

For San Diego, average growth in the baseline new baseline forecast is 1.7 percent average per year, which is the fastest of the planning areas that we're showing. And growth of managed sales is about two and a half percent annually. Next slide, please.

SMUD is not actually a planning area, it's a forecast zone within a planning area, but it's such an important utility that we easily show it by itself. Base baseline sales. Annual average growth for the new forecast is about 1 percent a year, and for the managed forecast is about 1.9 percent per year. Finally, LADWP,

1.4 percent growth in baseline sales and 2.5 percent per year average growth for the managed scenarios. Next slide, please.

Okay, on to some natural gas consumption results. One more slide down, please. For natural gas, we use basically the same models, same methods. We account for committed programs and standards and climate change, et cetera, in the forecast. Next slide, please.

Residential gas consumption. We see a similar situation as with electricity with a lower forecast. And again, the comparison point here is the 2021 forecast. The last time we did a gas forecast. So the lower forecast for residential for the same reasons, lower population growth in rates compounded by a lower starting point for the forecast. Next slide.

Also similar to electricity, commercial gas consumption is growing roughly the same rate, a little bit different from commercial rates or from the previous gas. Many of the various very end of the forecast there. It starts to dip a little bit. And this is for the same reason as for electricity. Towards the end of the forecast we have commercial rates rising faster than commercial employment, which pushes the forecast down. Next slide.

Industrial manufacturing gas consumption,

lower starting point, but a similar rate of growth to the previous forecast. Next slide.

Mining and consumption, mining and construction consumption. You can see here a big discrepancy between the two. And this was in terms of starting points and this is due to a data source change. We changed from using all EIA data to incorporating pipeline data that was obtained from our supply office. So this affected the historical data, which as you can see, pushed it down real. And so we end up with a much lower starting point, a little bit higher growth rate for mining and construction gas consumption. Next slide.

As with electricity, TCU demand is also predicted to grow and I need to delve into this a little bit. I'm not sure why that's growing so rapidly compared to the previous forecast. I can't give an answer right now, but as with electricity, it's growing throughout the forecast period and putting those all together. We have a statewide natural gas consumption and as with electricity, we have a lower forecast and that's brought to us by lower residential and industrial forecasts, but roughly the same rate of growth as the previous forecast after the first few years of the forecast. Next slide, please. So onto our natural gas. One more slide. Yeah, thank you.

Okay, so onto our managed forecast for natural gas. Next slide. This slide shows combined PG&E, SoCal Gas and SDG&E baseline and managed forecasts and includes the two managed cases that correspond to those for electricity. So we have managed cases for this and the previous forecast. So the new managed forecast we see there in the managed forecast in orange and the local reliability forecast in dark blue. And as you can see we have much more natural gas savings in this case because the older forecast had much less fuel substitution assumed. And so these two new managed forecasts, they take a big chunk out of gas consumption, about 46 percent by 2040. And this slide shows a couple additional managed forecasts and we wanted to draw attention to one in particular. Yeah, sorry, next slide. Slide 39.

Yeah, so a couple additional managed cases and we wanted to draw your attention to the one there is some uncertainty around the timing and market readiness for CARB's space and water heater standard as Heidi discussed. So we developed a scenario that does not include it making it much more conservative shown by the yellow line, the combination of too conservative load modifiers for AAEE and AAFS. So this would get rid of the risk associated with the standard and it's a

scenario that the powers that be may consider if they so choose. Next slide.

There's also an appendix here that shows some gas results for the utilities, which I won't go over today, but again, we were happy and to discuss the results more in depth with utilities. So with that, I guess I'll turn it over to the Commissioners. And take it easy on me. I've spent the last four years in the park feeding the pigeons.

(LAUGHTER)

VICE CHAIR GUNDA: Chris, I have to just start by just welcoming you. Thank you so much for coming back. It was a good surprise hidden. I didn't know that you joined the EAD back and really appreciate you lending your experience and expertise to help support the staff that are working on these issues and could benefit from census. Thank you so much.

So I have think maybe just a couple of questions. I think one is on the process, so these are the draft results I take it. And then you mentioned having the meetings with IOUs next. And so could you just comment on the process just for the record on how we approach the process here? You're muted.

MR. KAVALEC: The way I would plan it out would be we sit down with the utilities, go over the

results and their concerns and compare our forecast to their forecast. Late December, early January. It's tough with the holidays but - and out of that may come some changes based on they have plenty of information we don't always have for their own forecast. And so some changes may be warranted. And with or without changes, we would then, I would imagine brief the Commissioners and JASC and go forward from there and hopefully get that all done in time for adoption.

VICE CHAIR GUNDA: Great, thank you. So if we can pull your slides back up. I just wanted to go back to just the opening slides. If somebody can pull Chris's slides up. Sorry, I don't have the deck with me, so I don't know exactly which number it is, but I think it's the third or fourth slide in Chris's presentation.

MR. KAVALEC: Try the next slide.

VICE CHAIR GUNDA: Thank you. Thank you. Precisely. Thanks so much.

So Chris, how it's just in terms of the household and population, could you just expand a little bit on how those forecasts that we depend on generally are developed? How do they capture uncertainty in their work and are we using kind of a median of their forecast? How do we choose this information?

MR. KAVALEC: Yeah, back when we were doing

three baseline scenarios, we would sometimes get two or three scenarios from DOF. But now we're only doing one baseline forecast, so we're relying on what they call their base case or most likely case. So that's what you're looking at here. But I agree and that's an argument to go back to doing additional scenarios because demographic drivers like this are very critical to the forecast results.

VICE CHAIR GUNDA: Thanks, Chris. I think along the lines of the struggle we've had with the climate and others and how big of a variance they show and the impact, as you said, of these economic demographic variables are being so huge, I think it'll be good for us to kind of consider how do we tackle this uncertainty as some of these major trends are happening. Okay, so thank you for framing that.

So the other question specifically is on the ag sector. So just wanted to - I think it's probably two or three slides from here. Yes, thank you.

So just wanted to Chris ask about in terms of the ag, the broader decarbonization and in a broader kind of the electrification push in ag sector, I recognize that we are probably at the beginning of recognizing the importance of that. Could you just explain what are the main drivers in the ag and the

water pumping forecasts are? What are the main drivers and the importance of those inputs and how to potentially start thinking about reducing the uncertainty in those major drivers?

MR. KAVALEC: Let's see. You're really testing my memory here. The ag and water pumping model uses econometric regression models that include rates and population and income. And I guess I'll have to defer on this question because it's been so long since I've thought about the ag forecast. Again, it's possible because there are demographics involved, you can do different scenarios for ag and water pumping, but as far as technology trends toward more efficiency, et cetera, I guess I'm sorry, I can't really give you a good answer at this point.

VICE CHAIR GUNDA: Yeah, maybe I don't know if Heidi or Nick are online able to comment on this. I think Heidi, I think the question is what are the variables that most move the ag forecast and the pumping forecast and how are we thinking about the potential, the transition of the ag decarbonization and how do we develop the necessary inputs, but also thinking through how to support stakeholders in the ag community with potential analysis that they might need into plan for their transition. If you could just comment on that,

that'd be helpful.

MS. JAVANBAKHT: Yeah, sure. I know the drought is a really important consideration, has a huge impact on water pumping and electricity consumption for water pumping. And the other, and Nick may be able to say more on the variables that go into the ag forecast. We're in the process on the electrification side, we've got kind of two parallel efforts going on. The first is the development - sorry, my throat is scratchy today. The first is the development of a fuel substitution tool for this segment, for this sector that I think is planned to be implemented for the 2025 forecast. And then the second piece is we are in the process of working with ARB and the PUC and ag - the ag industry and putting together a survey to understand transportation electrification needs in the ag sector. There's a lot of off-road equipment and on-road equipment that will need to be electrified under CARB's advanced clean fleets rules. And so getting a better handle on that and where it will need to be located is really important.

VICE CHAIR GUNDA: Got it. Thank you, Heidi. So one last question. I think maybe the slide before the 13, it's more of a prop for the question Heidi. I know we've spent a lot of money and time and resources and

grateful to the staff for the work on the residential survey and the commercial survey and I know we are integrating them. The latest survey results into the forecasting models on the industrial sector.

I think there's a couple of questions. I think we've always kind of dabbled with the idea of potentially doing some sort of a survey to better understand the industrial sector. And I think I want to frame that question within the context of we have so much money that is being put in by the federal government right now into broad economic development and industrial development in the nation. Are we capturing those potential impacts? Are we planning for those potential impacts like a single battery plant could have a significant load and I just wanted to understand what is the roadmap. Maybe if we don't have it, we can defer the question on incorporating the decarbonization impacts of industrial sector into the forecast.

MS. JAVANBAKHT: So similar to the ag sector, the fuel substitution tool for industrial is also under development. There's a few other things that we're tracking and hoping to incorporate into the industrial models going forward. One important one being all the changes that are happening at refineries and that we anticipate to continue happening at refineries as the

need for gasoline and diesel declines as we electrify transportation. How does their electricity and gas needs, how do their consumption change

MR. KAVALEC: Vice Chair, let me add to that. I don't know what's happened since I left, but what we really have always needed is a large scale industrial survey that looks at all their equipment, looks at their motors, especially that they use and trends and develops trends in that regard. But it's very difficult to do. They don't want to do it and the utilities don't want to bother their big industrial customers because they're so important to them. So it's hard making progress. I don't know, maybe the landscape has changed a little bit, but the ideal would be a nice big industrial survey - energy survey.

VICE CHAIR GUNDA: Heidi, anything you wanted to add?

MS. JAVANBAKHT: Yeah, I was going to add that that would be incredibly useful, but I think also very complex just because the industrial sector - it's just such a diverse set of industries with really unique equipment. So to have that sort of survey would really require a lot of time and money to conduct, but it would be extremely valuable.

VICE CHAIR GUNDA: Yeah, Heidi, then I just

want to recommend a couple of things here both for ag and industrial. First of all, I think on the industry I just want to recognize Commissioner McAllister and Commissioner Monahan who are kind of leading some of the decarbonization policy work for the industrial sector. I think, at a minimum, as we have more industries given the given, I am guessing most of them do plan their demand charges. They understand their forecast for specifically the energy bills and stuff. I think it might be helpful to potentially pull together a working group or kind of a round table, which is some industry to have a deep dive conversation on how to better embed similar to what you're trying to do on the ag side. And I recognize that you're planning to do that working group as well or some sort of round table.

I would really like us to put something on the table at least as a preliminary scope of what support the staff needs to move this conversation forward in the upcoming months so we can really think through. So I just want to point out, as we think about let's say an offshore wind industry in California, that is a humongous entity in terms of if the turbine blades were to be made in California or so it just has a huge implication similar to the Lithium Valley, the extraction of lithium from there and potential in a

battery manufacturing. So I think it's really important. I think we're at the cusp of having pretty big errors in industrial sector and I think on the ag sector, the alternate place, which is a lot of the ag community, I think we discussed this before, do not necessarily have the means to understand what this means for them for planning.

So I appreciate everything you're doing in leading this work, so I just want to put that on the record for us to really move the conversation forward in the next IEPR cycle.

MS. JAVANBAKHT: Yeah, sounds good.

VICE CHAIR GUNDA: Thank you. And Chris, thanks again. Super nice to see you on the screen. Welcome back.

MR. KAVALEC: Thank you.

I want to just see if anybody, any other Commissioners have any questions?

Okay, I don't see any. There are some really good questions in the Q and A. If we have time I would love to consider them. Thank you.

MS. RAITT: Yes, we do have time. This is Heather.

So again, Jeremy, if you could just go ahead and moderate those for us, that would be great.

MR. SMITH: Okay. All right, there we go. Thank you Chris, for the presentation.

So we've got the first question, this is from Jon Bradshaw from PG&E. We've got slide 22 already pulled up. Great. So he says, looking at the managed sales forecast slides like this one, I observed that the planning forecast and local reliability scenarios are fairly similar in the California energy demand 2023. What does the CEC think this result suggests about forecast uncertainty? For example, did uncertainty decrease relative to the California energy demand update 2022, which had a larger difference between the planning forecast and the local reliability scenario?

MR. KAVALEC: Great question. I would maybe ask that Ingrid, if you're still here, you might weigh in on the uncertainty or someone from the efficiency folks.

MS. NEUMANN: Sure. This is Ingrid.

I mean we included the CARB's SIP strategy first in 2022 in the local reliability scenario. It had just been adopted then. We learned more about that and worked with CARB since then and have included it in both the planning and the local reliability scenarios because that rulemaking process has started and we will continue to revise that as that rulemaking process moves forward.

MS. JAVANBAKHT: And what I would add to Ingrid's response is that this chart is only showing a couple combinations of scenarios rather than the full set. So I think there's five AAFS scenarios and six AAEE scenarios. Ingrid correct me if I'm wrong on that.

MS. NEUMANN: That was in 2021. So this time we actually have six total and the SIP strategy and other zero emission standards are included in AAFS 3, 4, 5, and 6.

MS. JAVANBAKHT: So it would be the full suite of scenarios that would capture uncertainty here. And so the two lines being closer this year does reflect perhaps a little bit less uncertainty in that we are anticipating CARB's proposed zero emission space and water heater measure to move forward in some form, whereas last year there was more uncertainty around that.

MS. NEUMANN: That's correct.

MR. SMITH: Alright, great. Thank you Ingrid and Heidi.

Our next question is from Claire Broome. For additional achievable transportation electrification, does the model assume light duty vehicles only result in demand for charging? How is the potential for use of the vehicle battery to shift or offset residential load like

a vehicle to grid modeled?

MR. GEE: Hi, this is Quentin Gee. I'm the manager of the advanced electrification analysis branch, work with Heidi's group a lot. We both do the demand demand work. My team includes the transportation energy forecasting unit that does work on this.

So yeah, good question Claire. And one that we hear a lot about and it's quite important. So I would say for the forecast so far, the transportation electrification forecast both in the baseline and in the AATE 3 Scenario that is recommended for the planning scenario. We not capture - we only model demand for electric vehicles. We don't treat them as a potential source of supply or anything else.

I would point out that we are going to be looking at for this IEPR forecast year in the chapter or in the section where we talk about the forecast, we will hopefully present a scenario on what we call vehicle to building, where this will not be a part of the forecast set, but it will be something where we present the possibility of what it could look like if people were to a small segment of the population or certain segments of the population were interested in using their vehicles as a source of energy during times when prices are high.

So we can integrate - we're looking to

integrate the scenario in with our standard load modeling work. That load modeling work is available. We discussed that on the November 15th workshop on the load modifiers where we discussed transportation. So we're hoping to do something with that. I can't just say yet where we're at, but in the long term we do hope to be able to, as we have more confidence in the technology and with the market adoption pathway for these opportunities, that'll be able to integrate them and include them in the forecast. But as of now, we don't have sufficient evidence to think that they're reasonably expected to occur.

MR. SMITH: Alright, great. Thank you, Quentin.

Our next question is from Jerry Melcher. If we could go to slide five for this one. Thank you. He says on slide five, California state population projections derived from the California population projection tables from the Department of Finance report P4 shows a drop in 2030 California population projection by about 3 million or 6.7 percent between the previous 201- based reports. During the DAWG workshop on July 15th, it was noted that due to a cyber attack at the Department of Finance, the release of updated California household projections has been delayed. However, at the DAWG, stated that they are

using 2019 household projections in their forecast. Might this lower population projection have an impact on future energy and electricity demand since the number of households are tightly coupled to population. Thus should household projection also be lowered by 6.7 percent.

MS. JAVANBAKHT: I can answer this one. Since that DAWG meeting and since our August inputs and assumptions workshop, the Department of Finance did release updated population projections. I think they released them either late August or early September. So both of these data sets, the households and population are coming from Department of Finance and our recent data sets. So they are consistent with each other.

MR. KAVALEC: I want to add something to that. This is Chris. One thing we agreed years ago, I don't know if it was ever formalized, but to use data for our demographic inputs and because they're really sort of the official forecast for California, but you sometimes end up with incongruities between the demographic forecasts and what Moody's is forecasting. They also project demographic variables and we saw that in this forecast we had not much change in the economic variables, but a large change in demographics that Moody's is not yet showing.

So my point being using these two different sources that aren't always consistent with each other can sometimes present a problem. And that's something I just wanted to put on the table for our featured discussion.

MR. SMITH: All right, great. Thank you, Heidi and Chris.

Our next question is from Jane Roschen from Cal Advocates. Can you please explain in greater detail the decrease in average annual percent growth of self-generation energy from 2022 to 2023 seen in the majority of planning areas?

MR. KAVALEC: Let's see, do we have Alex or someone else from self generation? Mark?

MR. LONSDALE: Yeah, I'm here. Chris, I'm here. Can we pull up the slide real quick because I think it's easier to understand the difference with the chart being presented.

MR. KAVALEC: That will be slide 20, I believe.

MR. LONSDALE: Nineteen, possibly. The chart that shows the average growth rate. Yeah, so something to note here in the last two columns, the CED 2023 average annual growth rate that's referring to the increases seen or observed from 2022 to forecast year

2040. However, if you look at the 2022 average annual percent increase, that's looking over a different time period. That's looking at the increases from 2021 to 2035. In the November 15th IEPR workshop, we presented our capacity forecast results out to 2040. And what we noted is there is a decrease in the rate of adoption the latter half of the forecast, that is after 2034 in result of the reduction in the eventual elimination of the ITC tax credit, which is a 30 percent tax credit. So reducing the payback period, the economics, it takes a while in our modeling to see a return to similar levels of PV adoption that we would've observed with the ITC tax credit pre 2034. So I think that explains most of the differences in the average annual percent increases that are observed in this table.

MS. JAVANBAKHT: And Raquel, if you move to the next slide, you can see that on this chart, the blue line flattens out. Otherwise the rate of increases that slope is a little bit higher than the previous forecast.

VICE CHAIR GUNDA: Alex, just a quick follow up question on that one. So what's the most recent historical data point we bake in to our work?

MR. LONSDALE: Yeah, so we bake in the interconnection data. So we collect data via QFER form 1304 B. We process the data that's submitted in January

of 2023. So that captures all of calendar year 2022 interconnections for behind the meter solar storage.

VICE CHAIR GUNDA: Right. And could you just remind us the forecast, I remember you presenting the deviation of - or kind of the move away from only solar to solar plus storage systems moving forward. Could you kind of just provide a little reminder on when does that shift accelerate, which kind of years is it in the 20 next few years or where does that take place?

MR. LONSDALE: That's a great question. The acceleration of the amount of solar plus storage actually have the slides up. Let me just quickly take a glance at that, see if I can give you a clear response.

MR. PALMERE: One moment I can actually answer that.

MR. LONSDALE: Thanks, Mark.

MR. PALMERE: Yeah, it basically is the entire - like starting at the beginning of the forecast we see an increase in solar plus storage pairing compared to historical. And yeah, it's just reflected in the model. I think a lot of it is due to the more beneficial scenario for pairing just the incentive to store electricity energy generated instead of selling it back to the grid as well as the higher TOU rates. Also incentivizing having battery storage. So there's just a

lot that a lot of factors coming to play also like decreases in our forecast cost of a storage system, a lot of factors coming into play to make solar plus storage being a financially sound investment. And yeah, we did, our model shows a slightly lower payback period for a solar plus storage compared to solar standalone. We don't have it chart for that because basically the model doesn't compare them directly, so you can't really make an apples to apples comparison. But looking at the numbers overall, we feel confident in our model that it is lower for storage. But yeah, Alex, if you do have the specific chart I think that we did share, I don’t know if we can share it, but I think that might be helpful as a visual aid as well.

MR. LONSDALE: I don't think we have those slides available right now. I'm not sharing my screen, I think sharing their screen. But in the link provided by Stephanie, folks can review the DG forecast presentation that Mark and I provided at that workshop. And on slide 18 it shows the statewide solar PV capacity additions by configurations. And in that slide you'll see that the amount of paired solar, the share of paired solar reach is approximately 45 to 50 percent by 2030 forecast year.

VICE CHAIR GUNDA: Thank you Alex and Mark, thank you so much. It - it's great to see everybody here

and just kind of picking on the answer, so thank you so much.

MR. PALMERE: Of course. Yeah, you're welcome.

MR. SMITH: Yeah, and actually while we have that team here already, there's a related question, so maybe they can just comment on this one from Selim Boutlane, what is driving the self-generation increase for the next 10 years versus the 2022 forecast?

MR. PALMERE: I think the main two factors are the higher electricity rates and a lower cost of cost per watt of installation of a PV system. And yeah, basically those are two factors that are very favorable for higher amounts of solar adoption and that will lead to a higher levels of self-generation. And yeah, I mean there's been a lot of changes between this forecast and the last forecast, both in how we modeled them and with some factors we're modeling. Another one that's important is the extension of the tax credit and as well as the forecasting larger systems for Title 24 residential installation. We have slides related to that in the presentation. Alex mentioned the same one on the link to the November 15th workshop. That's the final final presentation. In that list we have slides about our residential Title 24 forecast sizes, some charts of payback period and how it's going down and why. Yeah,

it's basically a number of factors that are more favorable for PV adoption in this forecast compared to last forecast.

MR. SMITH: Okay, thank you, Mark.

So our next question is from Sunny Zeng. We could go to slide 22. Thank you.

Could you please explain the difference between the managed sales versus baseline sales? For example, are planning minus managed sales equal to new sales from service planning versus customers already paying rates?

MS. JAVANBAKHT: And I'm actually going to send you to slide 15 instead of my deck. So back in my deck I defined all these different terms. The baseline sales is the consumption minus distributed generation and then the managed sales layers on the additional achievable modifiers.

VICE CHAIR GUNDA: So Heidi, just want to extend that question. I think if Sunny is looking for how do we calculate new sales, I think maybe it's kind of a question. Could you indicate how they might be able to do it or at least follow up?

MS. JAVANBAKHT: I'm not sure I follow. What do you mean by new sales?

VICE CHAIR GUNDA: I think, for example, I

think the question states for example, planning minus management sales sequel to new additional load, right? New sales. And I think they might have a question on how to think, how to estimate what's being actually added to the system in terms of sales.

MS. JAVANBAKHT: So okay, you mean as in new accounts?

VICE CHAIR GUNDA: Yeah, the new megawatt hours, gigawatt hours.

MS. JAVANBAKHT: Well, we're not really thinking of it in terms of number of accounts. We have that information, but what we're really looking at is the total sales, if that helps. And then also just to clarify the labels on that chart in those labels, it's a dash, it's not a minus. So when we're saying planning managed sales, it's just referring to the planning scenario, the managed sales corresponding to the planning scenario. I don't know if that helps clarify things.

MR. KAVALEC: Yeah. And as we discussed during my presentation where it's three components, you add two of 'em and you subtract, which is the AAEE. So what we show difference between the managed and the baseline is that net impact of those three additional achievable load modifiers.

MR. SMITH: Okay. And our last question in the Q&A is from Christian Lambert from Cal Advocates. Could you provide a summary of the combined heat and power assumptions for the self-generation forecast? Are there assumptions around decreasing behind the meter CHP capacity in the later years?

MR. PALMERE: Yeah, I can take that one as well about self-generation. Yeah, so the assumptions are basically we are holding it constant throughout the forecast period. And that's due to a number of factors that mainly there is a lot of uncertainty regarding retirement of such facilities. So we think that probably the most safe assumption would be to keep it constant and not assume that there will be a decrease in capacity but also not increase the capacity. And same with the generation from those facilities. Obviously with older facilities there is some degradation rate, but at the same time in our model, since we are keeping it constant, that considers the possibility that there will be replacement facilities that will be generating at a higher efficiency. So basically, yeah, we figured the safest assumption would be to hold capacity and generation constant for those facilities throughout the forecast period. That's what we believe is probably the most likely way to go for those types of facilities.

MR. SMITH: Okay. Thank you, Mark. And the rest of the staff are answering the questions. And thank you everyone for submitting those. I think is it back to Heather.

MS. RAITT: Jeremy, yes. And thank you to the whole team and to the contributors. Helpful discussion. So with that, I think we're ready to move on to public comment period.

And so this is an opportunity to let us know, you can press the raise hand icon, looks like a high five icon on Zoom to let us know that you'd like to make a comment. And if you would, then we will open up your line for any comments you may have. And if you're on the phone, just press star nine and that will effectively raise your hand.

So we'll give folks a moment to see if anyone wants to raise their hand so far not seeing any, oh, here we go. Matthew Vespa, if you would like to go ahead. Yeah, sure. If you could identify any affiliation you may have and spell your name for the record, that would be great. Thanks.

MR. VESPA: Yeah, of course. Matt Vespa, M-A-T-T V-E-S-P-A. I'm a senior attorney with Earth Justice. Thanks for the presentation today. And I wanted to elaborate a little bit on my initial question, which had

to do with the gas demand forecast.

And I guess I'll just make the observation that we've been talking about the importance of gas system planning for years, right? We need to manage the transition, avoid unneeded investments in the gas system, trended asset risks, all of that. And I think a baseline ask from environmental and environmental justice advocates was for the CEC to really take over the gas demand forecasting and have those be the inputs for gas system planning. So I'm a little concerned that we still may defer to the utilities for their gas demand forecast, which are currently being used to justify new capital investments in the gas system. So they're using right now the AAFS, the fuel substitution scenario two, which we saw from the slides today is extremely conservative.

Basically business as usual gas demand, very different than scenario three, which we're using on the electric side. And so I understand there's a need to be somewhat conservative on some of these things, but I think on the electric side, if we overstate our demand, we're going to need those resources down the line. On the gas side, if we overstate our demand, we are stuck with these stranded assets costs we should not have incurred. And so there's some balancing there I'd really

like to see.

And, first and foremost, I think just as you direct electric utilities on what scenarios they should be using for their planning or you really have this key role in determining what is being used, I think the CEC should be doing on the gas side and also be taking what are reasonable assumptions, which is the scenario three. And I'll put these on written comments, but since we have this opportunity, I just wanted to say that verbally. And thanks very much for the presentation today. I appreciate all your work.

MS. RAITT: Thank you for that. So again, I'll just put out, if anyone else wants to make verbal comments, just press that hand icon, high five icon to let us know that you would like to make comments. And if you're on the bone press star nine. All right. We're not seeing any, I'll just before we close this out, I'll just take this moment to just give a couple next steps. Just a reminder, written comments from today's workshop are due on December 20th and we welcome those and we go over those carefully. So appreciate any written comments people want to submit.

Oh, and is Claire Broome has a comment. So go ahead Claire.

MS. BROOME: This is Claire Broome. I

represent 350 Bay Area at the Public Utility Commission and I've really appreciated the process both for the IEPR and for SB 100.

The point I would like to make is for SB 100, we've been discussing the opportunity to have a maximum DER scenario as a way to advance the state's goals in a generation and storage. And I wonder whether it is possible as you look at scenarios, alternative scenarios, where with the appropriate policies you could expand the behind the meter generation and the behind the meter storage. You are looking at demand based on projections for transportation, et cetera. But another role for distributed generation is to offset PV installations in remote areas which require transmission.

So I'm hoping that as you consider your demand scenario, you would think holistically about what the state's SB 100 goals need and not just be constrained by some of the scenarios based on current policies and projections. Thank you.

MS. RAITT: Next, does anybody else have any questions? Excuse me, comments? Looks like Kurt does see, or maybe just lost. Okay. Well, I'm not seeing any more hands raised now.

So I think we can close the comment period,

Vice Chair, and I'll just pass it back to you.

VICE CHAIR GUNDA: Yeah, thank you Heather. And I just wanted to recognize the comments that just Matt made as well as Claire. So thank you so much for those comments. I think recognize the prudency in thinking through what those reasonable levels of risk mitigation are to avoid stranded assets matter. I think that's a really important point and I just want to recognize that and look forward to your comments and discussing that.

And Claire, the comments specifically on the DER resources. I think our hope is to use the SB 100 as kind of an analytical policy framing opportunity and then to figure out ways to migrate some of those additional assumptions on potential higher levels of penetration of DER into the forecasting. So we kind of try to learn both from forecasting work into how to think about scenarios and scenarios, work on how to think about forecasting, but really appreciate your continued engagement and we'll take that as a point of continued evaluation. I thank you.

And, in closing, just wanted to recognize the staff and just a big welcome again to Chris, but also just the tremendous work Heidi, you and the entire team is doing. And thanks to both Jeremy, Alex, and Mark for

jumping in and answering a number of the questions as well as Quentin. So thank you all for making this a unified work - and Ingrid. All of you jumped in to help answer the questions. So I look forward to comments. And then for the discussions with the IOUs, and again, the forecast is such an important foundational work to support the state planning activities and cannot underscore the importance of the work you all do and look forward to moving this forward.

I want to make sure that I welcome Commissioner Shiroma or Commissioner Houck if they have any comments and then we can close. Okay, commissioner Shiroma.

COMMISSIONER SHIROMA: Yes. I just wanted to add my thank yous as well to you, Vice Chair Gunda and your team there at the Energy Commission. The presentations were very impressive about the questions that were raised today, were also very informative. It's very, very impressive and essential work. And I know that we're looking at how do we get as close as we can to the projections because if we don't, the consequences are quite dire. So thank you so much for the workshop today, very informative, educational, and I look forward to hearing about the one hour modeling efforts coming up in a few weeks. Thank you.

VICE CHAIR GUNDA: Thank you.

Commissioner Houck, please go ahead.

COMMISSIONER HOUCK: Just really quick, again, also want to join and thanking the staff and everyone and you Vice Chair Gunda for the workshop. It was very informative and I look forward to further discussions on looking at modeling, especially for looking at some of those constrained areas that we're seeing and how to incorporate some of our policy directives into the forecasting. So thank you again.

VICE CHAIR GUNDA: Thank you, Commissioners Houck and Shiroma. Thanks for being here with us today. And thank you for all the public and stakeholders who joined today and all the work that you put in to helping us make the products better in supporting the welfare of California at large.

And in closing, again, Heather, thanks to you and your entire team for pulling off another workshop. With that and Heather, your permission, we are adjourned.

Thank you.

(OFF THE RECORD AT 3:12 P.M.)

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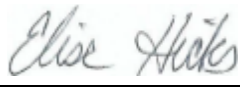

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January 10, 2024