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CALIFORNIA ENERGY COMMISSION

COMMISSIONER WORKSHOP

In the Matter of:	)	Docket No. 19-IEPR-06
	)	
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2019 Integrated Energy Policy Report (2019 IEPR)	)	JOINT AGENCY WORKSHOP: Energy Efficiency and Building Decarbonization
	)	

CALIFORNIA ENERGY COMMISSION (CEC)

CALIFORNIA ENERGY COMMISSION

WARREN-ALQUIST SATE ENERGY BUILDING

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SACRAMENTO, CALIFORNIA 95814

TUESDAY, AUGUST 27, 2019

10:00 A.M.

Reported by: Gigi Lastra

APPEARANCES

STATE LEADERSHIP PRESENT:

J. Andrew McAllister, California Energy Commission
Patty Monahan, California Energy Commission
Liane M. Randolph, California Public Utilities Commission
Mark Rothleder, California Independent System Operator
Edie Chang, California Air Resources Board

CEC STAFF PRESENT:

Heather Raitt, California Energy Commission

PRESENTERS:

Michael Kenney, California Energy Commission
Anne Fisher, California Energy Commission
Justin Hagler, California Public Utilities Commission
Jeorge Tagnipes, California Public Utilities Commission
Eddie Rosales, California Energy Commission
Nicholas Janusch, California Energy Commission
Tiffany Mateo, California Energy Commission
Rory Cox, California Energy Commission
Guido Franco, California Energy Commission
Scott Blunk, Sacramento Municipal Utility District
Mohit Chhabra, Natural Resource and Defense Council
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Carmelita Miller, Greenlining Institute
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PUBLIC COMMENT:

Michael Boccadoro, Agricultural Energy Consumers
Nehemiah Stone, Stone Energy Associates
Deanna Haines, SoCal Gas
Pierre Delforge, Natural Resource and Defense Council
Lauren Cullum Sierra Club California
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Reporter's Certificate

Transcriber's Certificate

P R O C E E D I N G S

AUGUST 27, 2019 10:00 A.M.

COMMISSIONER MCALLISTER: All right. Full house. This is great. Thanks everybody for coming. I'm Andrew McAllister, Commissioner here at the Energy Commission and lead on energy efficiency. And oh my gosh, we're starting off on a great note. This is awesome. Yeah, flattery is definitely -- will get you noticed.

But which is not to gloss over the fact that decarbonization of our economy and within that our buildings is a huge undertaking. And we're obviously taking it very seriously at the Commission. I know that our sister agencies- ARB, CPUC, and ISO - all feel the same way. And we're really trying to lock arms and figure out what California's path forward should be.

We have some direction from the legislature and really I think a growing consensus across the state that we have to get more serious about this. And a couple of things I'll just mention before passing the mic to my colleagues on the dais. But we do -- we are working on the California Efficiency Action Plan which has a lot to do with decarbonization of our buildings, certainly focusing on our existing buildings and also the doubling of energy efficiency, as well as getting going on the AB 3232 conversation which this will inform.

That update will form one chapter in the IEPR and is also a standalone report that is actually out for comment right now. So I would really encourage --

(Interruption from WebEx)

COMMISSIONER MCALLISTER: Okay. Hopefully that's all good. And so there's just a lot of thinking going on here. Well, I'll also mention the AB 1477 work that was in the PUC's realm, we're working very closely with them on that for decarbonizing our heating loads.

And so I'm really happy to be here today. I'll just leave it at that for now. And want to thank staff for putting together a great workshop. And both in the efficiency division, I see a bunch of staff over there, I won't name you all but really been working hard on this issue broadly and also on this workshop. And then the IEPR team, Heather and her team also. They always put together a great agenda and it's going to be I think very stimulating and hopefully we'll have a lot of public comment and a lot of debate and discussion about this going forward.

Really need to find pathways forward that are equitable, that are technically feasible, that we can identify some flow of resources to get the ball rolling and to transform markets. So it's not a small lift that we're talking about here, and all of you are key to making it happen. So thank you again for coming.

And I will pass the mic, let's see -- you know, why don't we just start on the right. My right. So Edie.

MS. CHANG: Thanks. So I'm Edie Chang, I'm a deputy executive officer at the California Air Resources Board.

And first off, I want to thank the Energy Commission for the invitation to participate on this workshop today with you here today. As Commissioner McAllister said, this is a really, really important topic. The Air Resource's Board role is we're the folks that are responsible for pulling together the state scoping plan. So kind of the blueprint for how we're going to achieve our greenhouse gas goals. We do that in collaboration, in concert with our sister agencies and a lot of input from the public. So we're happy to be here today.

[Interruption from WebEx]

MS. CHANG: Okay.

The last scoping plan that we did was finished in December 2017. And what that scoping plan does is it shows a cost effective and technically feasible path to a 40 percent reduction by 2030. And when the board approved that scoping plan, one of the things that they asked us to do is collaborate with the Energy Commission, the PUC, and the CAISO on building electrification that can reduce greenhouse gases. So it's definitely something that's sort of top of mind for us even in 2017 and as we look forward to the next

scoping plan, it's going to be really critical.

The scoping plan also is looking to reduce natural gas use wherever possible. Another component of the scoping plan focuses on short-lived climate pollutants. So these are the super polluters that are much, much more potent than CO2 and there's two important short-lived climate pollutants that really come into play as we think about building electrification. One of them is methane, obviously, natural gas. And the other one is HFCs, which are basically refrigerants. So to the extent that we can implement policies for building electrification that reduce use of natural gas and reduce use of refrigerants, there's a huge potential there for us to make progress on our greenhouse gas goals.

I also want to mention that, you know, from the other hat of the Air Resources Board, the air quality and public health hat, reducing indoor combustion is good for public health. So if we're not burning things inside, that's good for public health.

So we're excited about the potential of decarbonizing buildings and building electrification both from a greenhouse gas perspective and from a reducing greenhouse gas -- from a greenhouse gas perspective and protecting a public health perspective. And as we think forward to the challenges that we have ahead of us, it really behooves us to think about

what we can do now to change the path of where we're going to be in the future. About what sort of infrastructure we're putting in now and what is that sort of lock us into going forward.

So we're excited to hear the conversation today. Also excited I think one of the other lenses and hats we have is thinking about the exportability of some of these programs. And so thinking about are there things that we can do here that can be emulated in other jurisdictions whether that's within the United States or around the world.

So thank you again, looking forward to the conversation.

COMMISSIONER RANDOLPH: Good morning, I'm Commissioner Liane Randolph from the PUC. And thank you to Commissioner McAllister and all the great staff at the CEC for setting up this workshop.

We've had a busy energy efficiency summer at the PUC. We did a decision to modify the three-prong test and turn it into what is now the field substitution test which will allow customers to choose to electrify their appliances and continue to receive utility rebates. And for those of you who have read the decision, it is very complicated and there's a lot of detail about calculating emissions and how do you attribute energy savings between gas and electricity usage and allocating costs. But it's really an important

change that I think is going to help us move the ball towards -- towards our decarbonization goals.

We also approved the latest energy efficiency potential and goal study for the IOUs from 2020 to 2030. That study examines market and economic potential for energy efficiency. And, you know, there were a lot of changes in that decision in terms of moving, lighting, and decode. But there were also some definite opportunities that we will be able to take advantage of in terms of potential. And as I mentioned when the Commission adopted the study, the study found that we can conserve enough to be the equivalent of taking 658,000 cars off the road in 2020 and 2021 if we achieve our full potential. So looking forward to continuing to collaborate with the CEC on how we can do that.

And later on, PUC and CEC staff -- CEC staff today will talk about their collaboration on implementing SB 1477. They'll be presenting on the BUILD and TECH programs and the staff proposal that came out in July. So I look forward to that discussion later this afternoon.

So thank you for inviting me to participate in this and I'm looking forward to a robust discussion.

COMMISSIONER MCALLISTER: And feel free to come here and get applause anytime you want. You know, we want to -- we want to create some positive reinforcement.

COMMISSIONER RANDOLPH: It's rare in our world.

COMMISSIONER MONAHAN: Good morning, I'm Patty Monahan, I'm the newest commissioner here at the Energy Commission, been here about four months now.

And I've got to say, this is a nerdy crowd to applaud -- give applause for a three-prong test. I don't think there are many crowds that would do that. So.

And I am the transportation lead at the Energy Commission. And -- but I think what we are finding is that it's increasingly impossible to separate out sectors in the way that we have historically. And especially as we move to electrify more and more of transportation. We're finding that it's kind of this inextricable system where our -- we want our homes to be able to be smart, to decarbonize, to, as much as possible, move away from combustion. And we want to ensure that as we connect transportation and our electric vehicles to our homes that we do it in a way that is smart, provides grid benefits, helps us integrate increasing -- increasing amounts of renewables.

And so as we move to this system's approach for decarbonization, one of our big challenges is to make sure that we do this in equitable way. Both the CPUC and the CEC are being advised by the Disadvantaged Communities' Advisory Group which is giving us really good strategic input about how we can be more attentive to equity.

So I too congratulate staff for putting together a

really interesting workshop, and I am particularly looking forward to this discussion about how do we move away from combustion, meet our aggressive goals for decarbonization, improve public health, and make sure we're attentive to the equity considerations that are rife with this transition.

MR. ROTHLEDER: Good morning, I'm Mark Rothleder, Vice President of Market Quality and the California Regulatory Affairs with the California ISO, and I also want to thank you for inviting us to participate in this discussion today.

At the ISO, our primary responsibility is obviously maintaining reliability, but in doing so, we also have been trying to support the carbon goals of the state. We've seen a reduction in our GHG content of our dispatch just since 2014 of about 34 percent. And we've been tracking that progress. So that's -- it's really -- really tremendous progress that we've made so far.

In terms of building decarbonization and energy efficiency, we're looking forward to the discussion today to understand what the effects of those changes will have on the load, the load shape, load magnitude. But also looking for the opportunities of leveraging those new loads for actually maintaining reliability, being part of the control system and leveraging those to maintain actual reliability.

So look forward to the discussion. Appreciate,

again, the opportunity to participate in today's hearing.

COMMISSIONER MCALLISTER: Great. Well thank you all for being here. Really -- we very much appreciate it.

One thing we all need to keep our thinking caps on about is how we can provide load flexibility. I'm certainly convinced that our least cost pathway is going to be making sure that our buildings can kind of be all they can be and that they can follow supply in a way that's nimble. And, you know, we need from energy efficiency the head room to put all this new electrification on the grid, but it has to be done in a way, as Commissioner Monahan said, that's smart.

And that prioritizes the kind of investments that are going to make sense and that are doable and that are largely automatable and take advantage of the fact that, you know, it's not 30 years ago when we don't have these blunt instruments, you know curtailable rates, and simple time of use and sort of pick up the phone and call your customer, we can automate a lot of this stuff. We're in the digital age and let's think about the electric system in the way that we're all used to in other sectors which is everything's on our phone, everything's automatable, everything's make one decision and it's all running itself after that. So, you know, take advantage of the cloud, all these technologies we can bring to bear in this sector.

And it's critical that we do so because rate payers

need us to be successful on that front. And so again, it just highlights how important it is for us to collaborate across agencies and really put numbers to all of these initiatives that we're doing. And I'm really happy we have great panels in the afternoon to dig into the analytical pieces of this and a series of presentations now to provide deeper context.

So I'm going to pass the podium to Bryan Early who is my advisor and has -- want to thank him as well for helping put together this workshop today. So thanks, Bryan.

MS. RAITT: Sorry, Commissioner, this is Heather Raitt. I'm just going to jump in with a few housekeeping items, if you don't mind.

So I'm Heather Raitt, I just want to let folks know that we are being broadcast through our WebEx conferencing system and so this is being recorded. And we also will have a written transcript. And both of those items will be posted on our website. And if you wanted to make comments, we will have an opportunity at the end of the day for public comments, and you can just fill out a blue card and give it to me. The blue cards are by the entrance to the hearing room.

For folks on WebEx, we'll also have an opportunity at the end of the day for you to comment, just raise your hand feature to let us know that you would want to make comments.

And you can also use that feature if you change your mind and don't want to make comments.

And then lastly, written comments are due on September 10th, and the notice gives you all the information for how to do that.

Thanks. And now for Bryan Early.

MR. EARLY: Hi everyone, Bryan Early, advisor to Commissioner McAllister.

Just wanted to run us through the agenda of the day briefly.

So this IEPR workshop is purposefully combining topics that could, and have in the past, been entirely separate IEPR workshops. So namely energy efficiency, building decarbonization, and demand response. So increasingly, as we explore to what extent and how buildings can help the state achieve our climate goals, it's really vital that we begin to think about the system holistically.

So that's why we set today up in that fashion. So we're going to be in the morning having a series of staff presentations highlighting updated work in these arenas. We're going to hear a summary of the California Energy Efficiency Action Plan which was a combination of our statutory mandates under SB 350 to give a periodic update on our ability to achieve a doubling of energy efficiency. And our AB 758 existing building energy efficiency action plan.

I'd like to note that that has been posted in the docket for this proceeding so we really do encourage you all to -- to give it a read if you haven't yet already and then submit written comments, which as Heather mentioned are due September 10th.

We'll then be getting a specific deep dive from the Energy Commission staff on the updated energy efficiency doubling targets per SB 350. We'll be hearing from the Public Utilities Commission on the 2019 potential on goals for the investor-owned utilities. We'll be getting a status update on AB 3232, this is the Friedman Bill that called upon us to do a study by next year assessing the feasibility of decarbonization in the state's building stock.

We'll be hearing an update from both PUC and Energy Commission Staff on information on SB 1477, that was the Senator Stern bill calling upon the PUC and the CEC to establish a building decarbonization incentive program, or two, actually, as Commissioner Randolph noted.

We'll be getting an update from CEC staff on some R&D work into the greenhouse gas emission reduction potential of a natural gas pipeline system.

We'll be breaking for lunch and then reconvening for two panel discussions. The first one will be combining a discussion of energy efficiency and building decarb. That will be moderated by my coadvisor Martha Brook.

And the second will be focusing specifically on demand response and load flexibility and the role that that load flexibility should play in a decarbonized future. And that'll moderated by David Hungerford from our R&D shop.

So without further ado, I'll pass it over to Michael Kenney for discussion on the action plan.

But thank you again, everyone, for coming.

MR. KENNEY: Good morning, I'm Michael Kenney, I'm with the Efficiency Division here at the Energy Commission and I'm going to talk to you today about our 2019 California Energy Efficiency Action Plan.

So this, as Bryan mentioned, is available, posted in the docket, this IEPR docket. There is -- I saw some physical copies out on the table there. I'm sure those have all been snatched up by now.

So what is this action plan? As Brian alluded to, it's a combination of all the kind of prior reporting requirements that the Energy Commission had for energy efficiency, starting with the Existing Buildings Energy Efficiency Action Plan. So in 2015 and subsequently 2016, there was an update to that plan. And so that plan focused on existing buildings, as the name would suggest, and only residential, commercial and public buildings and just provided a roadmap to what the state should aim to achieve over the next ten years. But it didn't have a hard target

set until 2015 when we got Senate Bill 350 which tasked us with identifying ways to achieve a doubling of energy efficiency savings by 2030.

So in 2017, staff here put out that report that showed where we think we will be in a given year, where the savings are coming from, you know, codes and standards, residential programs. And so this action plan is kind of rolling in that effort as well.

SB 350 also asked us to assess how low-income disadvantaged communities are being impacted by not having access to energy efficiency and other clean energy programs. And so those particular recommendations from the Low-Income Barrier Study and the subsequent clean energy and multifamily -- in low-income multifamily buildings. Those recommendations for energy efficiency have also been carried forward into this action plan and we'll continue to track and update through this process.

But more recently, as has been raised already today, building decarbonization is a big shift in our -- in our policy thinking. And that's kind of the other major component of this action plan. So AB 3232 and SB 1477, both new pieces of legislation which we'll hear more about today, are touched on in this action plan but more broadly we're looking to have a discussion about building decarbonization and issues and potential. And then as we move forward

updating this action plan, we can make it a more robust discussion.

So the action plan now beyond just the early pieces of existing buildings, we've now expanded it to more sectors. It's now including industrial and agriculture. We're looking at the potential from conservation voltage reduction, fuel substitution, and new construction.

So this action plan is acting as a roadmap for both energy efficiency and building decarbonization. We want to address the market barriers, highlight the opportunities that exist within a given sector, and highlight what new programs or existing programs are out there at both local levels, state, federal levels, what private programs are ongoing that are achieving energy efficiency in California.

So we'll be updating the energy efficiency targets that SB 350 tasked us with identifying. And we'll hear more about that in our next presentation on the current status of those. So, just as a note for those of you who are reviewing and commenting on the draft action plan that is available, the numbers and figures for those SB 350 targets that are in there are more illustrative than final, so just bear that in mind when you comment.

And so the action plan is going to be tracking, as I mentioned, these recommendations both for energy equity and pulling in our recommendations for building decarbonization

and broader energy efficiency goals. So this is hopefully the kind of one action plan to rule them all. We don't have one-off reports and we can just kind of track plan progress through this report.

So where did -- where did we start with all this? Just a little, I guess, history lesson for those of who may not have been tracking this. We started developing what this report would look like the beginning of 2018 with an initial outline and scoping. We actually presented that at last year's energy efficiency IEPR workshop. And from there we were able to build upon it and start actual writing the first pieces of the action plan. So that kind of taking us into the early part of 2019.

But we realized pretty early on we wanted to engage with stakeholders before we started writing in earnest. And so that led us to develop and put on a series of workshops. So from April through the beginning of May we had five workshops across the state. We held them in San Francisco with the CPUC. We had a workshop up in Redding, in Fresno, Los Angeles, and San Diego. And so throughout those workshops, we were bringing together stakeholders from all different sectors, you know, bringing in program implementers, nonprofit groups, other state agencies and local governments to have presentations and panel discussions to inform the development of our action plan.

So it's really from that point when we returned from those workshops we began writing the action plan that is now available for you all to review.

So just a brief kind of breakdown of what this plan looks like, Chapter 1, we're just kind of laying out what are the goals that we're going to cover, highlighting what the different barriers and opportunities are in each sector and what new developments are ongoing in energy efficiency and building decarbonization.

Chapter 2 we're just kind of summarizing what's the important policy that's driving the action plan and just giving it, at a high level kind of, our history of policy that's related to energy efficiency.

The third chapter is kind of the most robust. And that's where we're covering our major goals. So doubling the energy efficiency by 2030, what are the programs that we're thinking about and trying to identify savings from. Energy equity, so how are low-income disadvantaged communities, rural communities, how are they accessing energy efficiency? How can we do more?

The third goal, the more recent effort on our end is building decarbonization. So as I said, we're kind of just laying the groundwork for this discussion and the action plan, we're not trying to fulfill any of the mandates, mandated reporting requirements from recent legislation.

Then we're closing that up with our updated targets. So kind of bringing together all the content from A, B, and C, and trying to identify how close are we to hitting our 2030 goal.

And closing the action plan, then, with our recommendations. So these are recommendations across all the different goals and bringing together who we think would be the lead to make that recommendation a reality. And who is there to support that recommendation and help it get it over the finish line.

So from here, as was mentioned, September 10th we would like any comments on the action plan. We will then be working post receiving those comments to finalize the action plan. And our goal is to present the plan for adoption at our November business meeting. And the next day turn around start implementing.

So we look forward to hearing from you all in our comments and hear whatever discussions come up today.

So here's some info for those of you who can pull these slides from our docket. These are links just to make comments and the link to the action plan.

And with that, I'll take any questions. Thank you.

COMMISSIONER MCALLISTER: Thanks, Michael.

I don't have any specific questions about the action plan because I've been monitoring you guys all along. But

I'm happy that it's out and I want to acknowledge the CPUC partnership on this as well for reviewing the draft and providing really helpful comments.

Anybody have any questions about it?

I guess I would just highlight how important this is. I mean, that's correct that this is a nerdy audience. You all, by virtue of your nerdiness, understand that this process is where a lot of our decisions get conditioned and eventually made. And so it's incredibly important that you bring your A-game to comments on this. Because we read every one and the good ideas, you know, especially if there's some consensus around, what we should do, even if it's -- especially if it's bold. This is where we can act. And once we adopt this action plan, then it becomes something that all of us, all of you can point to, to say hey, this is policy, this is state policy, we have to do this.

So if we can justify boldness in this action plan, then that helps us really make a big leap forward and sets a new baseline for action. So just wanted to highlight that fact.

So if there is no other question on the dais, then let's move on to the next presentation.

MS. RAITT: Next is Anne Fisher from the Energy Commission.

MS. FISHER: Good morning, Commissioners and

everybody here. My name is Anne Fisher with the Demand Analysis Office and I'll be presenting our work in progress to update the SB 350 energy efficiency doubling targets originally set in 2017 in the Energy Commission Report, Senate Bill 350, doubling energy efficiency savings by 2030.

And I do want to mention that this is a work in progress. We're working on getting these finalized numbers by next month. So I'll be kind of walking you guys through. Some of the -- some of the challenges that we've been working through.

So this is going back to 2017 and in our original target setting, the doubling goal was set to double energy efficiency savings in California from 2015 through 2029. This chart shows the combined electricity and natural gas savings projected in Quad BTUs from the 2017 report. Savings evaluated included utility rebate programs, codes and standards, financing programs, behavioral and market transformation, and agriculture and industrial sector savings.

This cycle, we're working with a number of separate data streams to both track historical savings and projected progress towards meeting the cumulative doubling goal. We get our first two sources of savings on historical from the IOU historical energy efficiency savings from the CDR's database. We get the POU historical savings from CMUA's

annual 1037 report. We use our in-house committed savings model to apply the K functions based on in-use EULs to estimate the persisting energy's efficiency savings impacts over the years of the installed measures. And historical savings will play a bigger role in tracking actual progress to our SB 350 goals as we approach 2030.

Our IOU projected savings are based on the CPUC's potentials and goal study. Our draft numbers are based on the proposed decision released July 15th. And the CPUC adopted new goals for 2020 through 2030. On August 15th which CPU staff -- the CPUC staff will cover in more detail in the next presentation.

Our POU projected savings are based on the POU LREM model. And the last piece is the beyond utility formerly known as nonutility so I'll kind of use those two terms interchangeably in this presentation. Those were calculated using our new in-house tool which was developed under our contract with Navigant. In 2017, our contractor NORESCO calculated energy efficiency projections for nonutility programs as part of the SB 350 target setting. And our work authorization with Navigant tasked Navigant to take NORESCO's work and format it into a tool that the Energy Commission staff can use in-house to update SB 350 projections based on new information or new assumptions that we gather and also track our progress towards meeting the goals.

So the goal with our work with Navigant was to build a tool to track and project these beyond utility energy efficiency savings. The tool took the work done by NORESCO and transferred the calculation assumptions and methods into 21 separate workbooks for the programs to sit on this slide.

One of the main goals of the work was to facilitate the transfer of knowledge from the contracting team to Energy Commission staff. When the tool was delivered in June 2019, staff can now update programs with new data, change assumptions, and do all future beyond utility tracking and projection work in-house. The beyond utility workbooks were updated for the draft California Energy Efficiency Action Plan by contacting the program administrators to obtain updated historical program data through 2018.

The beyond utility energy efficiency savings tool includes all of these nonutility programs savings. All programs in black are programs that were included in the 2017 SB 350 target setting. The programs in red were identified in Chapter 5 of the SB 350 report as potential energy efficiency programs needing additional analysis. In the 2019 update, we will include potential savings from agricultural, industrial, and conservation both as reduction programs which may help us close the gap between potential savings projections and the doubling goal. The beyond utility tool also gives us the ability to identify impacts on

disadvantaged communities and low-income populations by utility territory.

So digging deeper on some of these improvements that we've made since 2017, we were able to use a bottom of approach to estimate potential savings in the industrial and agricultural sectors based on activities not funded through utility programs.

We were able to add our low-income and disadvantage community population impacts. This is on a utility territory basis based on various ratios including technology lag factors in LIDAC areas.

We added conservation voltage production reduction potential savings using a top down estimate based on regional CVR factors based on utilities studies.

We updated our PACE savings method in 2017. Some of our source data may have included solar projects and we only want to look at energy efficiency so we were able to use better data to update our PACE projections. We're also hoping to get some better data out of Lawrence Berkley National Laboratory on PACE programs to further improve those projections.

We also made some updates to the POU savings including adjusting energy efficiency natural gross ratios to be more consistent with IOU savings projections and we also developed high, mid, and low POU scenarios whereas POUs only

come out with one projection on their potentials and goals every four years. So we use the mid in the draft numbers.

So as I said, this is a work in progress. One of the big works in progress is codes and standards. We're currently working to quantify projected savings from Title 24 beyond the 2022 code cycle. We are updating our Title 20 and federal client's workbooks based on current estimates of the new standards coming through the pipeline. We're also working to include all historical codes and standards data. There's a concern that maybe some of this was not included in the 2017 analysis and I'll get more into detail on that later and how we are proposing to -- to evaluate codes and standards historical and potential savings and how we, you know, take that data and scale it to statewide savings.

We're also working to ensure that our IOU projected savings and our JAC numbers are consistent with those adopted by the CPUC.

So getting back to those original 2017 projects, this is, again, combined savings and quad BTUs. And as Michael stated, you know, these numbers are really a work in progress so, you know, I'll give you a little glimpse of this is what we're looking at in our 2019 numbers. So, you know, we see a little bit of tailing off and some of that is due to we haven't added the future savings beyond kind of the 2022, 2024 realm and we are -- we're still working on updating

these numbers.

Some of those overall trends that we're seeing from 2017 and 2019 comparing is we're seeing some leveling off of IOU cumulative potential savings. This is due to some of the differences in the new potentials and goals study with all these new codes coming in. For example, the new potentials and goals study not including residential and commercial lighting assuming LED as the baseline. That reduces a lot of our cumulative savings and that's really the key with SB 350 is those cumulative persisting savings over time. A lot of the savings in the potentials and goals study are now coming from behavioral programs which typical have an EUL of maybe one or three years and so those savings are not persisting as much over time.

We have those enhanced agricultural, industrial, and conservation voltage reduction savings. But note that these are -- these are projected savings just based off of savings opportunities and we'd like to see more programs in place to achieve these savings. We have lower PACE projections but this is based on better data. And we are also looking at these beyond utility financing programs. We have new updated data through 2018 and these have been adjusted with, you know, actual program performance and funding allocations are up to date so that we can more accurately portray future savings in these programs.

So getting more into this idea of codes and standards, we used two different sources of data to get this -- these codes and standards numbers. It's the big blue bar with the big arrow pointing to it. In our -- in our draft data, historical codes and standards data for 2015 through 2019 came from the CDR's database and projected codes and standards data through 2020 through 2029 came from the IOU potentials and goals model. Both of these sources of data were scaled to not only include IOU attributable savings but also scaled to statewide total codes and standards savings.

What does that mean? Well, this is our proposed method and it's very similar to what we did with those two sources of data but one of the things we've been exploring is historical codes and standards data that is in our -- in the potential and goals model. So using our new proposed codes and standard calculation method, we can take cumulative, historic, and projected attributable to IOU's code and standards savings from the IOU PG model. So that's the slice that's in red down here, our IOU attributable savings.

And then using a similar assumption to what is in the -- the potentials and goals model, we can go -- instead of going from total codes and standards, we can go from attributable to total codes and standards that are occurring in IOU territories. And so that's our green slice right

there. So we're pretty much doubling the savings to go from attributable to total. And then, we're also assuming that POUs are 25 percent of the electricity sales in California which is based on our data and we have kind of some questions about, you know, how best to scale up these codes and standards savings from IOU to POU territories as well.

So this is shown in gigawatt hours as we know from the 2017 target setting that natural gas is on track to meet the doubling and we have a -- we have a gap in electricity so we focused a lot on, you know, how codes and standards can help us meet the electricity side of the doubling goal.

So this is our comparison. The blue field is those preliminary codes and standards numbers that were included in the action plan using our two sources of data CDRs and then the potentials and goals study for future. And then the red line is using that proposed methodology using only the potentials and goals study. So we would like to get, you know, your public input. Some of the reasons for, you know, the difference in these numbers, you know, we can see that there's a lot more historical codes and standards savings that are in the potentials and goals model and the -- and the model also assumes a 85 percent re-participation rate so we don't see a huge amount of -- of decay of these savings over time.

So we have a few questions for you guys. What do you

think about how the Energy Commission should calculate these total IOU territory codes and standards savings from the attributable that are in the PG study? And also how should we extrapolate those IOU codes and standards numbers to POU territories to create our statewide results? We are currently using the electricity sales, comparing that between IOUs and POUs, or there's also the possibility of using ECON demo forecasts looking at new construction, which areas are experiencing more growth than others.

So thank you and I'll take any questions.

COMMISSIONER MCALLISTER: Great. Thanks, Anne.

So, yeah, I have a comment and then a question or suggestion. So I just want to point out, you know, that -- so you're looking at these numbers and, you know, we have a lot of work to do. And, you know, when you see these continuities like starting today, you know, oh, now, it's got a ramp, you know, that's not a given that that's going to happen. So we really have to figure out how we can scale and, you know, you all are going to help us figure out what the plan forward for that is. And we have a big gap and we have some questions.

Right now fuel substitution is now much more on the table than it was in 2017 and so that's got to be a strategy for decarbonization. And so, you know, you'll see the -- you saw the wedge that's fairly small still but, you know, one

question that I have that many of us have is how do we get that to scale quicker? More quickly to take advantage of a decarbonization of the electric grid. And then how do we -- what's the path forward for decarbonizing natural gas, you know, apart from electrification.

You know, there is a lot of efficiency going on, on the gas side and it's going to bound up in this larger discussion. So how do we pick apart and unpack that in a way that's productive for programs to be designed and address it.

So I hope you're taking notes because these are all things that, you know, we want comments about.

So, let's see, and also, you know, there are a lot of eggs in the codes and standards basket here. And a lot of that has -- has to come from existing buildings and application of code to existing buildings. So.

We have another task that hasn't been brought up yet which is the AB 1414 report about how we get HVAC, you know, compliance scaled up. So that's another, you know, sticky task that is a longstanding one, you know, for decades now that we're trying to solve.

So, you know, no dearth of challenges. I guess, you know, I was -- I'm kind of hoping to see not just the mid, you know, you mentioned that this is all the mid scenario. Be nice to see some sensitivity analyses that talk -- that, let's see, that show, you know, say the high scenario and

really what's driving, what's likely to be driving a high scenario. And those are the things we might could focus on for, you know, trying to widen some of these wedges in the grafts. You know, really get some market action, get some traction and sort of stretch activities that might drive us more towards the high scenario. So that's my suggestion is sort of do some scenarios and present those to try to figure out what levers we might pull to go beyond the midcase and really get there.

Anyone have any? Yeah, go for it.

MS. MONAHAN: So I have a question that may be very basic for you so I apologize if it is but you said that we are doing a better job on the natural gas side than on the electricity side in meeting the targets for efficiency. I'm wondering, are we considering the efficiency benefits of fuel switching from natural gas to electricity? In a systems approach, it is more efficient to move to electrification versus combustion. And I'm wondering in our analysis do we ever consider that?

MS. FISHER: Yes. So I just pulled up this slide. There's a tiny little blue wedge on the top which is our fuel substitution wedge currently and our methodology has remained unchanged from 2017 numbers currently on evaluating potential fuel substitution. However, we do have some work currently being done in-house. We have a work authorization that just

kicked off in July to look more into expended fuel substitution programs so that can include, you know, more existing buildings or going out of the residential, commercial sector to evaluate agricultural industrial potential savings from fuel substitutions.

So that is a work in progress and I think that's being bundled in with the decarbonization effort and then we're kind of trying to evaluate how that fits in with the SB 350 goals as well.

MS. MONAHAN I mean, I think it is -- that's a fascinating development and it's really -- I mean, one can think when we're opening the door to looking at systems efficiency in buildings with fuel switching, we can get more expansive even at some point in the future and think about transportation electrification also as an efficiency strategy.

So it's just an interesting like camel's nose under the tent with looking at buildings in that way.

COMMISSIONER MCALLISTER: Also I guess I'd add just building on that, you know, it's different to be talking about doubling efficiency savings versus decarbonization. Right? And so SB 350 says double efficiency savings. But we're at the same pivoting to counting things, you know, above beyond all, you know, as the one true metric as emissions. Right? And so, you know, we need to comply with

both, while, you know, with decarbonization and the law that says we need doubling efficiency. But I think, you know, the long view is we've got to focus on the emissions impacts. So.

MS. MONAHAN: Am I getting it right, though --

COMMISSIONER MCALLISTER: Yeah.

MS. MONAHAN: -- that the efficiency, you're counting fuel switching as an efficiency strategy --

COMMISSIONER MCALLISTER: Yeah.

MS. MONAHAN: -- within the building sector.

COMMISSIONER MCALLISTER: That's correct. But you can see it's a small wedge that needs to be a lot bigger.

MS. MONAHAN: Right.

COMMISSIONER MCALLISTER: Right. And then I had a question, actually, is (SB) 1477 incorporated in here? I think it is and it's just a small program. But can you validate that?

MS. FISHER: So currently we do not have a workbook for the SB 1477 work. I think once it gets under development, one of the things that we did have in the tool as a capability is the ability to add more programs as they come online. So when we get that data about, you know, what types of programs are going to be funded, what the energy efficiency or energy savings assumptions and calculations will be for those programs, we can work that into an

additional workbook to be included as part of our beyond utility energy savings numbers.

COMMISSIONER MCALLISTER: Okay. Great. I guess I would point out, you know, we do have this (SB) 1477 program that we'll hear about. But the numbers just aren't that big for the -- I mean, $200 million over four years, it sounds like a big number. But in the grand scheme of things in a state this large, it's not a given that it's going to make that wedge a whole lot bigger. But so the question then becomes how do we use it to really build markets and transform them over across the state.

Yeah, Mark.

MR. ROTHLEDER: I appreciate this. As I mentioned in my opening comments, we rely on the CEC load forecast and from what I'm seeing here is the trajectory of what has happened historically is not tracking that well with what we're projecting. And it seems like there's a lot of uncertainty ultimately when you start looking out in that planning horizon. So just want to make sure that we are, and we have kind of a plan of how we incorporate that uncertainty into our joint planning efforts that drive off of the load forecast.

But also I know it's a small slice right now, but that fuel switching, it seems like more and more as you incorporate codes and standards and potentially kind of shift

from more fuel switching, that could be also a upper driver on the electricity side to loads down a downward driver. So at some point, this is not always going to drive down loads and I want to make sure that that's kept on our radar as we consider a load forecast looking forward.

MS. FISHER: Yeah. So I do want to mention that SB 350 projections are different from our AAEE scenarios, and we are working closely with our forecasting team to develop those scenarios. We do have forecasting staff who are working on the impacts of transportation electrification so that it is included in our forecasting projections.

Yeah, so I think SB 350 can be thought of as maybe a little more aspirational and our AAEE and our forecasting scenarios are more for planning purposes and are more conservative.

MS. NORMAN: Just one point of clarification. That little slice with the fuel substitution, that's a very specific workbook that's looking at some electrification in new buildings only. So none of this extra (SB) 1477 and --

COMMISSIONER MCALLISTER: Okay. Got it.

MS. NORMAN: -- that is still under that worth authorization. And I think Anne put it very nicely as far as what we're considering for additional achievable energy efficiency. That will take a lot of scenarios in consideration. We're designing those designers currently.

And then the other thing Anne did mention that we are -- this is draft data, especially for the codes and standards. It does look like we haven't captured all historical codes and standards savings in one of the data sources. So we're looking at updating that for the final report.

Oh, sorry. I'm Ingrid Norman and I also work for the Demand Analysis Office.

COMMISSIONER MCALLISTER: Thanks, Ingrid.

Anybody else? I guess I just comment that, you know, they're -- historically, the Efficiency Division and the Energy Assessments Division where the forecasting sits have kind of operated independently. And they play two different roles. And it kind of drives the PUC crazy sometimes because, you know, two voices that say different things come out of the Energy Commission. But they both have a really critical role. One of them is to work, you know, is to really be like what can we absolutely count on that's going to turn up for the load forecast.

And then the other is well, what creative thinking can we do and what -- what initiatives might we develop and sponsor and implement that would push the needle towards efficiency, increased efficiency. And so those are two different things and they have two different briefs. And they're both in, you know, the sort of origin story of the

Energy Commission. So we have to do both.

This integration discussion that Commissioner Monahan is, you know, I think really focused on, appropriately so, is forcing those two divisions to kind of question their assumptions and figure out what -- really work more closely together than they've ever worked together, than they ever had. So I think that's a positive thing. And at the same time, we're developing a lot of data initiatives. We'll hear about some of them today. But we're actually going to be able to know what's happening in the marketplace in a fairly rigorous way doing statistical analysis going forward even in a disaggregated form, you know, that could -- that we want to work with the ISO and the PUC on as well.

So these initiatives I think are -- the merging of these conversations around decarbonization is actually a positive thing. It's allowing us to see what these challenges are, it's allowing us to really question our assumptions and get the forecast right and really be realistic about where we are and then hopefully figure out how to get where we need to be. Because, you know, you all can see that gap. And, you know, I think we're the messenger and so, you know, certainly throw darts at us.

But the, you know, that is the message for now and we really need everybody to roll up their sleeves and put on their thinking caps.

MS. MONAHAN: Just one last and then I'm going to stop, I promise.

But I feel like I can't overstate my -- that the -- just my interest in that tiny little wedge around fuel switching. And because I do think we have to look at this in a system. And historically, energy efficiency has always meant a reduction in energy use primarily in the energy -- in the electricity sectors where we talk about it most. We also talk about it in the vehicles. But from a systems perspective, it's -- we need to look at things in a more holistic way to make sure that at the end of the day, we're investing in the solutions that are going to get us our long-term goals.

And so I'm very curious about public comment on that thin wedge and whether we need to be thinking more expansively about what energy efficiency means and tailoring our policies for that bigger system-wide goal.

COMMISSIONER MCALLISTER: All right. Thanks, Anne.

MS. FISHER: Yeah, so we do -- I think it was just kind of, on one of these slides but I didn't focus on it that we do have GHG emission impacts also coming out of our data streams and from that tool that we've been developing.

COMMISSIONER MCALLISTER: Great. Thanks.

MS. RAITT: Okay. Thanks.

So next we have Jeorge Tagnipes and Justin Hagler

from the CPUC.

MR. HAGLER: Good morning, everyone. My name is Justin Hagler, I'm an analyst in the CPUC's Energy Division. And together with my colleague Jeorge Tagnipes, we'll be presenting the recently adopted decision adopting energy efficiency goals for 2020 through 2030.

So first I'll go through some of the methodology that we used to do the potential and goals study and then I'll turn it over to Jeorge to kind of tell the story of 2017 through the 2019 goals and also to summarize the decision a little bit.

So first off, the study touches on a wide range of programs both deemed and custom. It also includes behavioral programs and codes and standards advocacy. The study also covers many sectors, by far the largest of which are commercial and residential. The study included a new methodology of evaluating low-income potential. But the low- income potential was not included in this year's goals due to broad stakeholder feedback encouraging us to look at that in another proceeding.

The study measures three different types of potential, technical, economic, and market for five different scenarios. Technical potential is best thought of the total available energy efficiency. Economic potential is kind of the subset of that potential that would be deemed cost

effective. And then lastly, the market potential is the subset of economic which is deemed to be feasibly adopted given market conditions.

Our study covered the time frame of 2020 through 2030 and included electric and natural gas. But this study did not include fuel substitution, it's important to note.

So this is a table of differences from the 2017 study ordered from the most impactful at the top to the least impactful at the bottom. By far, the largest changes were an update to lighting baselines, as Anne mentioned, which functionally removed lighting -- lighting measures from potential in both residential and commercial.

Updated data on new behavioral measures increased savings potential from the behavioral retro commissioning and operations category.

This is a list of the scenarios that we ran in the study. We ultimately selected the reference case to set goals, but we manipulated the input levers that you can see on the left-hand column to examine a variety of possible futures ranging from the business as usual all the way up as aggressive as possible. On the right we've listed what we used in the previous 2017 goals setting decision just give kind of a reference of what we changed.

We set goals this time based on a 1.0 TRC screen as opposed to the previous .85 TRC to better reflect TPUC cost

effectiveness policy. This slightly reduced goals because by increasing the TRC's screen, you're effectively reducing the number of measures which meet that threshold.

These are graphs comparing the previous -- the 2017 study versus the current 2019 study. So again, the previous study used a .85 TRC screen and the new study used a 1.0 TRC screen. You can note that the total stacks, it's a little hard to see on the screen, but they're pretty close. Savings from rebate programs which are the big red and blue bars kind of at the bottom of the stack dropped 36 percent, again, driven by the loss of lighting. But when you include behavioral programs which is the brown bar and codes and standards advocacy which is the black bar on top, it only comes out to a 8 percent net decrease in goals.

On the gas side we're seeing a slightly larger decrease. Savings from the residential programs are significantly diminished. And codes and standards potentials declined from the previous study due to an update on Title 24 claim, IOU claims and future Title 24 assumptions. On the gas side, this resulted in a 29 percent decrease in goals.

And now to do further comparison of the study, I'm going to turn it over to my colleague Jeorge Tagnipes.

MR. TAGNIPES: Thanks, Justin. Hi everyone. This is, my name is Jeorge Tagnipes from the California Public Utilities Commission.

And the previous slide that we showed was more of the higher level forecast looking out. Sort of what Anne was doing also looking out a couple of years. But I want to use this slide to drive down to what's going on right now. And this is a comparison of the 2017 goals and the 2019 goals. And it was alluded to earlier by Commissioner Randolph, you see in the blue chart, the goals from the utility programs, for the rebate programs, that has decreased. And as everyone's said, it's a result of lighting.

We want to highlight here it's the red which actually happens to be the same color that Anne was using in her slide. The codes and standards, that is also increasing. And that's -- I think that's a good thing. I want to make sure that folks know that the lighting, it's been an effort to do this to go from the rebate programs to codes and standards. It's been an effort of coordination with the CEC and the CPUC. But we're showing right now that even though the rebate programs dropped from one year, as we said earlier the total's only a decrease in 8 percent. And that's not stopping anyone from going beyond what the goals are adopted. So these -- you can still have programs and try to go above the targets that we set. So it's not a ceiling, it's just what we want you to get at a minimum, you can always try to pursue further as long as it's cost effective.

And then drilling down into just the next two years,

we wanted to show you what the next two years look like. In terms of adopted goals for each utility and 2020 and 2021 are shown here. The reason we're doing this is because we have a new study every two years so we're going to do another potential and goals study in two years, we'll have new numbers that will feed into the CEC's forecast and will also feed into any that programs we want to do in the future.

But the main thing we want to show here is that over the next year and including the 2020 programs that are going to be coming in in September. So we're going to be thinking about what new energy efficiency programs we should do in 2020. These are the targets that we want the California utilities to hit. This does include codes and standards. And also is just really from the first year of savings. As others mentioned, there's a cumulative effect here with energy efficiency. When something gets installed, the same is continued to and persists as long as that measure has an effective useful life.

And, yes, some of the savings are shorter for the home energy report and behaviors but that's not stopping anyone from pursuing a longer term measures, they are going to be installed and persist for many years.

Also we have the demand goals for the years for each utility and also showing we do have the natural gas goals. Now this changed to have SoCal gas. So 63 million therms

over the next -- over next year, then that also increases in 2021.

And then just to close out, one of the last slide here, is to let folks know some of the other items that are mentioned in the decision. As Justin mentioned, we did calculate the low-income potential for the energy efficiency low income but it's not included in the decision as adopted. That is being referred to, to another proceeding with the CPUC to consider how those numbers can be used.

We also mentioned the home energy reports. Those behavior programs, the decision suspended the evaluation of those home energy reports. The past seven years have found pretty solid results from those programs and the decision allows the Energy Division staff to conduct an evaluation if need be, but it's not required to as was previously required.

And also as I mentioned, in September there will be new filings, they're called annual budget advice letter filings to look at the 2020 programs. The decision provides some guidance for that so we know what to expect coming in.

And with that, this is Justin Hagler so he thanks you for presenting. And he'll have any -- if you have any questions, you can ask him.

MR. HAGLER: Thanks.

COMMISSIONERR MCALLISTER: Great. Thanks to you both. I do have a question. So the -- with the goals as

they are, and that decision has been adopted, right? The goals decision. So we have a TRC number and we have a goals number. And so it ought to be math to sort of say well what's the likely spend for the portfolio. What's that number predicted to be?

MR. HAGLER: I could take a stab at it. I don't know the exact number off the top of my head, but in the results, online results viewer for the potential and goals study, we did include a chart that estimates those costs.

MR. TAGNIPES: But the costs that he's referring to are only for, I think, the resource component of it.

In the September 3rd budget advice letter filings, those numbers will come in to see what the utilities believe they'll need to spend in order to reach those goals at that TCR level.

COMMISSIONER MCALLISTER: Okay.

MR. TAGNIPES: So it'll be coming in soon.

COMMISSIONER MCALLISTER: Okay. So I guess the reason I ask is, you know, we always talk about, okay, California spends, you know, 1 point whatever billion dollars in efficiency portfolio. And I think, you know, another area where we're going to see some flux, we're going to have to see some flux is that if, you know, if the sort of, you know, blinders we've got on with the portfolio, you know, given the need for cost effectiveness and, you know, the rules around

those programs, those -- it looks like those are going to have to shrink. That that spend that sort of within those channels is going to have to shrink and then we're going to have to figure out how we can bring some new source of funding that has different restrictions on it or, you know, fewer restrictions on it to invest in a more broad kind of market transformation direction that, you know, is going to have to make up that difference and even more.

So I'm curious to see how those numbers come in terms of what the utilities think okay, here's -- here's how much money we can push through that pipe to, you know, given -- given the UTRC and the nonlighting program limitations.

MR. TAGNIPES: Yeah, and that's correct, Commissioner. I mean, the 1.5 billion -- or 1.2 that usually I think includes I think some of the low-income spend that we had seen over the years already, the expenditures have decreased already. I think right now the past couple of years, 800 to 700 million including all the enabling programs, so Workforce, Education and Training, Marketing Education -- it was very important to get to the energy efficiency we need. But those expenditures and totals have been dropping. But the authorized spending is still there.

So if the utilities and all of us working together and everything is an action plan, if you could find the programmatic efforts that could get some of that savings but

maybe not at the cost, the spending is still there, the spending authorization is there, but they still need to meet the cost effectiveness requirements. But it has been decreasing.

COMMISSIONER MCALLISTER: Yeah. What's the -- this may not be a topic for this conversation but I'll bring it up anyway. The, you know, there's talk about sort of, okay, how can we really, you know, walk the walk in terms of all the resources and putting them in, you know, use buildings, use demand side, use, you know, distributed energy as, you know, together with supply to get to this future where we've got everything all matched up and orchestrated in this tango, you know, this beautiful dance that we're going to call real time energy management.

So what's the sort of trajectory for the procurement discussion, you know, sort of saying, okay, well, you know, there's been all this preferred resources work. It may be a conversation for -- between commissioners here which is great, you know, the preferred resources pilot and we've got some experience under our belt and, you know, what are we kind of finding the trajectory might be for including demand side resources in -- and fuel substitution in procurement.

MS. RANDOLPH: Yeah, I'll take that. I mean, you know, it's something we're working on. I don't know that I can give you a specific trajectory. You know, with IRP,

we're sort of operating on this kind of two-year cycle and so our -- the cycle we're working on right now is not going to sort of get to the level of granularity that we would like. But hopefully by next cycle we can make some sort of progress towards implementing our staff white paper on aggregating energy efficiency including it into the reference system plan and things like that.

So, you know, we're definitely working on it. It's kind of groundbreaking stuff --

COMMISSIONER MCALLISTER: Yeah.

MS. RANDOLPH: -- and it does take some time.

COMMISSIONER MCALLISTER: Yeah. And I'm really excited to work on the analytical issues behind that and, you know, we're going to hear about some of that stuff later. Looking at Carmen.

And also, I just want to ask Mark if you have any comments about, you know, what that would need to look like from the ISO's perspective in terms of okay, if we're going to go out and procure these resources, these aggregated demand side or localized resources, you know, what visibility does the ISO kind of need or expect that to have?

MR. ROTHLEDER: Yeah, I support Commissioner Randolph's statement about the IRP starting to consider these as part of the solution set or alternatives in the integrated resource plan.

I guess from a operator perspective, it'll be important to make sure that if these are solutions that are expected to be used at an operational level, we'll have to have at least some aggregate level visibility, some aggregate level of control. And we've built some of that infrastructure in place through our distributed energy resource aggregation product but it needs to kind of close the link in terms of getting all the way to the end user. And we look forward to supporting that and discussing how we can further involve the distributed energy resource program to support that.

COMMISSIONER MCALLISTER: That's great. And we're really going to depend maybe I'm just stating the obvious, but maybe not, we're going to depend on third-party aggregators for a lot of this. Like we're going to have to have functional business models that roll these resources up and present them in a way that ISO can appreciate and value. So, you know, that handing off of the baton between jurisdictions, you know, is a challenge, right? Because it's just the way our state is structured regulatorily.

So, you know, we really need, again, you know, we're throwing out all these ideas that are hard -- hard nuts to crack but we really need your help cracking them, so thanks a lot.

MS. RANDOLPH: So I just wanted to mention another

sort of thing that this highlights as more measures move into code and as we have kind of this building decarbonization conversation that is also going to involve, you know. We're seeing local jurisdictions adopting reach codes and things like that is the importance of code enforcement and thinking about kind of what resources we can bring to bear to help local governments enforce codes.

I'm a former city attorney and so whenever my friends and family mention their doing projects without building codes, I just sort of sit there slightly horrified. But this discussion sort of highlights, you know, one of the many reasons that you should follow -- follow the building codes. So I definitely want to give -- give that some thought about how we can sort of assist local governments in doing that kind of work.

COMMISSIONER MCALLISTER: Totally agree. Any other? All right.

MR. HAGLER: Thank you.

COMMISSIONER MCALLISTER: Thanks a lot of guys.

MS. RAITT: So next is Nick Janusch and Eddie Rosales from the Energy Commission.

MR. ROSALES: Good morning, everyone. I'll be co-presenting so I'll be kicking it off. My name's Eddie Rosales, I work here at the Energy Commission. I'm a staff member with the Efficiency Division.

Today we're going to be covering an update on AB 3232 progress. The assessment of building sectors GHGs.

So some of you in the audience might be familiar with this so let me give you guys, we're going over a high-level overview and where we're at.

AB 3232 passed last year as driving building sector assessment of greenhouse gases. It's unique because it is related to -- it's one slice of a pie associated with related building decarbonization and overall just decarbonization work. It is -- it's related to other strategies that are helping decarbonize the state's economy and energy systems in the state. Let me go through some of those that are linked with the bill here.

AB 32 passed in 2006. It's the state's landmark climate bill. It helped measure overall GHGs by economic sector and it introduced GHG limits to help curve emissions. For example, it indexed 2020 emissions to 1990.

SB 32 established the GHG reduction. It advanced the 2020 target to 40 percent by 2030. SB 350 did several things. It increased the state's RPS by 50 percent in 2030. It calls for a doubling of energy efficiency for electricity and natural gas customers, and it asks for better conservation of energy. It also introduced the priority for low-income communities and also disadvantaged communities.

SB 100, it raised the state's RPS to 60 percent by

2030 and established a goal of 100 percent renewables, zero carbon emissions by 2045. And last, SB 1477, and there's going to be a briefing on that just later today. It provides funding for two pilot programs that are going to help reduce emissions for new and existing buildings.

So the point here is that AB 3232 is going to play a key role in assessing -- providing a study that assesses the potential to reduce GHGs from the state's building sector, both residential and commercial.

Let me go over some of the bill directives here. At the core, these are the work directives for the mandate. We're going to be assessing greenhouse gases, GHGs, attributed to the building stock, again, both new and existing. And propose strategies to achieve a 40 percent reduction by 2030 compared to 1990 baseline levels.

Again, we're looking at both residential and commercial building stocks. At this point the bill doesn't mention so we are assuming it excludes industrial and ag.

The building stock is divided into those two sectors. So we'll have an estimate growth of by 2030 of using recent building data for those two sectors.

The bill also asks us to collaborate with all our state partners and state agencies so up here you see California Air Resource Board, the California Public Utility Commission, the Independent System Operator, all

collaborators and we've already begun work with the Air Resource Board on some of the GHG data that they keep in their inventory.

I'm going to go over some of the specific bill requirements here. So the bill is asking us to prepare an assessment draft report by fall 2020 and have a final due by January 1st of 2021 and we expect to meet those dates. We've already taken the effort to study carbon inventory data, we're also using other research assumptions, and some other efforts that have been done in this area. Last year, E3 partnered with us and they published a deep decarbonization study. So we're using that study as a pathway model to help understand what the potential in this area is.

The bill asks us to use all the best available data analysis and again, that's -- we're working with one of our collaborators, the Air Resource Board to understand a lot of their data for this built for this specific sector.

The bill asks us to be cost effective with the strategies we propose and how we plan to reduce the GHGs related to building for both again for residential and commercial buildings, new and existing.

We'll also be assessing for challenges in the low-income communities and multifamily housing developments. And last and very importantly we must speak to great impacts. So examples include great infrastructure and also, you know,

speak to emission intensities across hourly averages and seasons against the backdrop of decarbonized supply and demand scenarios. So I'm referring to the -- for example, SB 100 in the previous slides, as we start bringing up the supply side, we also have to speak to the potential of bringing up the demand side which is going to be quite a -- quite a challenge. But.

And last, here's the last slide I'm going to touch on, the -- and then pass it over to Nick.

Here's the sort of general overview of our timeline. So for the rest of this year, we are working up -- our Phase 1 is doing work on the 1990 baseline and we're going to draft benchmarks for reductions.

Our Phase 2 for the remaining of this year, we're just getting the work started assessing he data and different methods and assumptions that are out there and trying to put a quality -- quality use for our purposes in this assessment.

So next year we're going to be going into Phase 3 and Phase 4. So Q1 and Q2 of next year will be assessing the impacts of different technology that will help us get, meet that 40 percent reduction goal. And then next summer going into next fall next year we'll be doing the draft and finalizing the assessment report.

With that, I'm going to hand it over to Nick.

MR. JANUSCH: Thank you, Eddie.

My name's Nicholas Janusch of the Demand Analysis Office in the Energy Assessment Division. And today, I'm going to present where we stand with assigning a baseline for AB 3232. I wish I was here today to actually have a target, have some fancy graphs but this presentation is going to go through the scope of emissions, our approaches, potential approaches, and spoiler alert, we're planning on having a workshop in October to actually get through this -- discuss the baseline.

So a quick aside, when we're -- a staff when doing SB 350 and trying to do doubling energy efficiency, we have to have a baseline to that to assign that target. And so similar here with AB 3232, looking at 40 percent reduction emissions from commercial residential buildings, the question is so which GHGs include in the baseline? Seems like a straightforward question.

And here we show why it's complicated. So here is the 2016 numbers, even though ARB presented 2017 hours a few weeks ago showing that the emissions from building occur report in various sectors. So here we have residential commercial, about 12 percent. And of those emissions, those are just looking at fuel combustion, not the electricity sector. And as you can see here, as reported by ARB, it's 10 percent and 6 percent or 16 percent combined for the electricity sector.

And with that, well, we're looking at reducing emissions from buildings. So the Energy Commission, we did – is this working. There we go. And last year's IEPR we with our data and attributing the electricity sector by commercial residential buildings, we had an aggregate number of 26 percent is the total numbers. And so for our purposes, the Energy Commission, we're kind of focused on buildings. ARB, they're focused on reporting emissions. So we have this, you know, these emissions so what should count.

And here, it's a lot going on here. And this shows you a menu of the types of emissions that are out there and the methodologies or at least our approach to what is the estimates of those emissions and what our confidence level is. And so as you see from left to right, left for high confidence, on the right side we have low confidence. So on the left side, looking at the direct emissions, these are directly reported from ARB and looking at that onsite fuel combustion of natural gas, similar fields, also including the hydrofluoric carbons, HFCs, and that's from refrigeration and air conditioning.

And also recently reported from this latest update of the ARB inventory is residential fuel use fugitive emissions. And right here in the middle, we have the estimate of emissions attributed to from electricity generations. That was the graph that we just showed you with what did with the

Energy Commission.

And on the right side, so other emissions we have few emissions, so leakage from the upstream distribution chain and we have incomplete combustion. So of those, there's not much -- there's data out there, but it's not as certain as the ARB inventory. And with those numbers, if we're going to approach this, we're going to have to report an uncertainty interval. And particularly for fugitive emissions, if they're reported by ARB, is it just looking at the scope of California distribution chain or is it looking further upstream for the rest of the United States.

And just a quick aside, I am a former academic and a PhD economist and my kind of goal for this project assigning at baseline, I have is to be very well documented so that everyone understands their methodology so there's no, you know, hand waving occurs in the future.

So give me all these emissions, we kind of have just for now for down to two approaches. We have a direct emission approach so just going straight from the shelf from ARB's inventory or looking at the more holistic or comprehensive approach with the -- including electricity. Both have their tradeoffs and you see where the dilemma is.

So for the direct emissions approach, when you get positives, it aligns directly with ARB's GHG inventory. And another is, I would say is a positive, if we just look at

just those emissions, fuel combustion, we can control for -- so with fuel substitution and we don't want to just shift loads to another sector, we want to control for that so we can use our tools at the Energy Commission to control for that target when assigning one for the increase in load in the electricity sector.

The downside with the direct emission approach is because we're just looking at that fuel consumption -- fuel combustion component for buildings, we are not -- when it comes to demand side management activities, low flexibility and energy efficiency, that's not going to decrease those emissions we saw in 1990 baseline of just fuel combustion.

But if you look at the more holistic approach, well then we get everything. Everything's on the table when it comes to reducing greenhouse gases. But the tradeoff here is that, and it's a question we've been grappling with is there is this tension between the cleaning of the grid and cleaning buildings. And if we were do a positive value-free analysis of what's going to happen in the future as the grid is getting greener, the, you know, will we get to the 40 percent reduction target without buildings, any activities, doing anything. And we don't want to have this issue of buildings by free riding.

So when it comes to these two things, it seems as if the direct emission approach is the more aggressive approach.

And so therefore, looking at what our next steps are, we're going to be exploring this direct emission approach while trying to control for increase in electricity levels in the buildings sector from fuel substitution activities. Also trying to figure out how to adjust if we are going to have these load flexibility programs and energy efficiency does that, how that might affect the target.

And then with our methodology, as I said, being very open, have a very well documented way of estimating this baseline and tracking these emissions, we're going to coordinate with ARB to verify our calculations and the handling of increased electricity loads.

And so at the end, hopefully by October, maybe more likely late October, we'll have a workshop with a recommended approach and receive comments for our recommendations.

So with that, I'm welcoming any questions. But if there are any comments, please submit them to the docket. And if any ideas how to do this for assigning a baseline, we will encourage very constructive comments and should really try to grapple with this issue of oh, hey, if we look at these two extremes, what's the best approach to assigning a baseline.

Thank you.

COMMISSIONER MCALLISTER: Did you have – yeah, Mark.

MR. ROTHLEDER: So I can understand the difficultly

of the direct and how to account for the emissions generated by increased electricity loads, how do you do that when the electricity supply and the GHG intensity of that electricity supply is changing over that period of time as well.

MR. JANUSCH: That's like a question we're going to explore of the future, yeah.

COMMISSIONER MCALLISTER: So -- yes, I'm going to try to -- this is very wonky and I have wrestled with this a lot and still don't know what the best answer is. And so I want to just invite everybody to give us their best thinking.

Again, on this, you know, on the one hand you've got the direct emissions which is only combustion on site because there is no on site combustion from electric -- there is no on site emission from electricity. So, you know, we kick that out and we put it back in consideration in the electric sector. But so that sort of is more manageable in terms of the calculation. But if -- that's not very satisfying, right? Because then we leave -- we miss all this interesting, wonderful stuff that's going on and it's actually necessary to talk about value for grid flexibility and, you know, fuel substitution, and all of that stuff which we need policies to drive. And so it's not fully satisfied.

On the other hand, if we include everything, then basically buildings get a get-out-of-jail-free card because the system's getting cleaner over time and we're going to

reduce emissions by 40 percent right off the bat. And so -- which obviously isn't optimal in terms of providing a foundation for aggressive policies and programs.

So it's kind of like, you know, we don't have a perfect solution here. But let's not make the perfect be the enemy of the good, let's pick something good and let's move forward. But we really need everybody -- it would be great to have some consensus about what that path forward looks like.

Looks like Martha wants to make a comment. Please.

MS. BROOK: This is Martha Brook from the Energy Commission.

I just wanted to mention to Mark's point. We -- something that came out of the 2017 SB 350 work was a recommendation that we have an interagency fuel substitution working group and we actually have an ongoing discussion across agencies. And one of the things that's coming out of that is an agreement going forward on the assumptions for the hourly emission intensity of the electricity sector that includes getting to SB 100. So how it will change over time, we're calling it the long-term marginal hourly emission intensity. So a long, long, long, long, name. But it's been great work across the agency at the staff level. And other -- it's not just -- it's also anybody who -- really who wants to come and join that group has been invited and it's

been a very productive session. And I think those emission intensities will be used for SB 1477. It'll be used in our IEPR work. It'll be used for AB 3232. So I think we are working on it. Just wanted to let you know that.

MR. ROTHLEDER: Good. We look forward to supporting that.

COMMISSIONER MCALLISTER: And also for Title 24, figuring out, you know, mapping Title 24 into the CBAC tools, into the tools that show code compliance. You know, we've got sort of an add-on that shows, okay, if I can comply with code in this way, then I get X amount of carbon reduction, you know, compared to the basic building.

So we're actually using these carbon intensities in all the ways we possibly can. And I guess I would just point out that we've been working closely with the ARB to make sure that we're not sort of off the reservation in terms of, you know, that we're aligned in terms of the carbon content of the grid going forward and that we are making sure that we're on the same page going forward, because that's -- that's critical.

But again, it gets to this load flexibility issue. You know, you can't compare kilowatt hours from one hour to those in another hour because they have different carbon intensities.

And so we've been trying to socialize these issues in

all of our presentations of the commission and, you know, produce some beautiful visuals. We haven't, I think, found one that rivals the duck curve in terms of its effectiveness but hopefully we'll get there.

MS. CHANG: So I'm curious. In the goal section, talked a lot about sort of the electricity piece. Are the goals also going to include refrigerants?

MR. JANUSCH: Yes.

MS. CHANG: Okay. Thanks.

COMMISSIONER MCALLISTER: Great. Thanks, Nick. Thanks, Ed.

MS. RAITT: Great. So next is Rory Cox from the CPUC and Tiffany Mateo from the Energy Commission.

MS. MATEO: Hi. I'm Tiffany Mateo. I'm in the Efficiency Division here at the Energy Commission. And I'll be presenting with Rory Cox from the PUC.

The CPUC and CEC have been collaborating on SB 1477 implementation. And the PUC has taken the lead.

So the goal of SB 1477 is to reduce greenhouse gas emissions from residential buildings. And we're developing two pilot programs. The Building Initiative for Low-emission Development program, also known as BUILD, which focuses on all electric new construction for single and multifamily buildings. And the Technology and Equipment for Clean Heating program, also known as TECH.

So there are seven guiding principles for SB 1477. We want to make sure that the programs benefit California residents in low-income and disadvantaged communities. Also we want to support the statewide goal to achieve carbon neutrality by 2045. We want to keep the program simple so that people can understand it easily and participate and also that'll make PUC oversight easier. Want to keep things transparent and work on long-term, self-sustaining markets.

And then the Small Business Utility Advocates recommended two additional guiding principles which we recommend the PUC adopt which are lessons learned and data reporting and cost effectiveness.

So there will be $50 million per year for four years available for both BUILD and TECH which comes from Cap and Trade. On the budget split between BUILD and TECH since the new construction and residential is subject to Title 24 and is increasingly stringent, it's easier to build low-emission buildings than to retrofit to low-emission building. So staff recommends that 60 percent of the funds go for TECH and 40 percent go for BUILD.

There are reporting requirements that come with cap and trade funds. And we've been collaborating with ARB staff on how to meet both metrics requirements and the reporting requirements.

There's going to be a third-party evaluator for both

BUILD and TECH, and the budget for that will be split evenly between the two programs. And just as a note, the budgets may change due to party comments and allocations don't necessarily have to remain the same throughout the four years of the programs.

So SB 1477 specifies that we keep track of at least these metrics shown here. And then also, Cap and Trade funds have requirements for metrics as well which are shown here.

Staff proposes for BUILD that the Energy Commission be the administrator. BUILD focuses on all electric in new construction in single family multifamily homes so eligibility includes owners and developers of new housing. Incentives will be available for near or zero emission technologies that reduce greenhouse gas emissions from new residential buildings. And at least 30 percent of the funds for BUILD must be reserved to benefit low-income residents. This is a minimum and of course more funds could be allocated to low-income projects. SB 1477 also requires that technical assistance be provide to low-income projects to encourage participation.

So the types of clean heating technologies that can be incentivized in BUILD and TEC are electric heat pumps, solar hot water with electric backup, heat pump dryers and induction cooktops so -- heat pump dryers and induction cooktops will only be incentivized through BUILD since TECH

focuses on clean heating -- clean space and water heating.

And I'll turn it over to Rory now to talk more about the TECH program.

MR. COX: Great. Thanks, Tiffany. And thank you, Commissioners. And just to -- look back a little bit of context here today. The slides that we're presenting are from the staff proposal that we put out in July. Since we've put out that staff proposal, we've gotten 25 plus sets of comments and reply comments, none of which have been incorporated or reflected in these slides. So these are very much a snapshot of where we were back in July, we just got done getting all the comments last week so we're still mulling those over. So just wanted to let you all know that.

So the TECH program. SB 1477 states that TECH is intended to advance the state's market for low emission space and water heating equipment for new and existing residential buildings, and it directs the PUC to identify and target equipment technologies that are in an early stage of market development and would assist the state in achieving the state's GHG emissions goals.

And we're really looking at this as a market transformation effort, that's the framework that we're looking at this effort in and we're really focusing on retrofits and existing buildings. And this is a government's structure that we've proposed which has the Southern

California Edison holding the contract, the PUC managing the contract, and there being a process to get a third-party implementer to implement the -- the program. And this -- and that's the -- that is the model that we're -- that we're proposal as opposed to BUILD which is the CEC managing that largely.

So TECH, I -- when I think about TECH, I think about my sister. My sister has a 100-year-old home, 100 years or so home in Portland, Oregon. And she a few years ago got a heat pump water heater from a program that was offered by the Northwest Energy Efficiency Alliance (NEEA), Portland General Electric - a local utility up there, and Roto-Rooter. And that partnership gave her a heat pump water heater for about $700. She loves it. She loves the service she got. It has the -- it was ducted to emit the cold air that the -- that is exhausted from the heat pump into her kitchen. So she has the added benefit of an air conditioned kitchen. And she is just, you know, really happy with the program, really happy with the way it happened.

And that, you know, behind that is our market barriers that were overcome. And when I think about, you know, market barriers, these are the things that we have to think about. I think the fact that Roto-Rooter was one of the partners shows a lot of innovation. We don't think about Roto-Rooter in the energy efficiency world. So that NEEA and

Portland General Electric thought about Roto-Rooter as a key partner in this. I mean, when you buy a water heater you go to a plumber. When you think of a plumber, who do you think of? You know, this plumbing company that's been around forever.

So in terms of market barriers, the things that we're trying to get over are the lack of coordination with other programs. Workforce in California that is unfamiliar with these -- with these technologies. The lack of coordination at local permitting offices, we've heard stories of permitting offices telling people these things were illegal, heat pump appliances. The lack of consumer demand, people don't know that they exist, although I think that is slowly changing, Home Depot carries them now so that's kind of exciting. And the lack of awareness among contractors. Other market barriers as well, but these are just some of the things that we're looking to overcome with the TECH program.

And the supply chains. The supply chain is very important. Like any chain, if there's one weak link, then the whole thing can fall apart. So when we think about supply chains, we think about manufacturers. They need to manufacture and promote heat pump products and increase the market share.

The representatives, the ones that are out there promoting the products and to act as a midstream ally, we

need buy-in from them. We need buy-in from distributors that can offer the sales and marketing support. Elevate the industries, makes sure that there is a heat pump water heater in the van of the plumber so that they don't have to spend time looking for it.

And then the contractors as the point of the contact for the customer, they are the trusted advisors and trade allies, they need to be on board, obviously. And then the end users who find value in these products and in the service that they received. And the health and safety, my sister being a case in point.

So this is the timeline for where are with this -- with this part of our proceeding. As I mentioned, we've got, we put the staff proposal out in July, we had a workshop where we spent a lot more time talking about this on July 30th. We received the last of the stakeholder comments last week. And we're working to put out a proposed decision November which will get comments and then have a commission vote by the end of the year and hopefully get things rolling next year.

In the bigger scheme, so in the bigger sense of things, so this really just Phase 1 of this proceeding. We still have Phase 2, 3, and 4 to go. Phase 2 is about new construction and wildfire recovery areas. We've got a few pilot programs on this regard, the most prominent one being

in Sonoma County with a partnership between PG&E and Sonoma Clean Power.

Coordinating -- Phase 3 is coordinating with the building and appliance codes with the CEC.

And Phase 4 is really the biggest and most difficult one, I think, which is the building decarbonization policy framework which will be heavily influenced by the AB 3232 work that the last speakers were talking about. So that's sort of the long term, you know, going into next year where this proceeding is going.

So with that, we will take questions or comments.

COMMISSIONER MCALLISTER: Thanks a lot for that to both of you, Tiffany and Rory.

Let's see, I don't have any specific questions, I just think the selection --

MS. CHANG: Really minor.

COMMISSIONER MCALLISTER: Yeah, go ahead.

MS. CHANG: What's the time frame for -- you just laid out Phase 1, 2, 3, and 4 - what's the time frame for those?

MR. COX: I think -- we don't have a specific -- I mean, we want to get Phase 2 going by the end of this year, get that started. I would maybe say by the end of next year we'll get, you know, we'll get Phase 4 done. And Phase 3 somewhere at the beginning of next year.

But we've been pretty busy with Phase 1 right now so we haven't really got in to the details of scheduling the other three yet. But I think by the end of next year we can get this all wrapped up.

COMMISSIONER MCALLISTER: I guess I would just point out that, you know, we have a model for doing these kind of programs already and we have, you know, 15, 20 years of experience doing programs to push market transformation. And, you know, the one everybody -- the obvious one they refer to as a template is the California Solar Initiative (CSI). This is, you know, I think, quite different from solar and so it's got its own sort of market and characteristics and stakeholders, et cetera. But this is $200 million, the CSI was $3 billion.

And so I think if we show success and we make clear progress and we come up with some lessons learned and a path forward that's very likely to have success, then we can plausibly argue that okay, we're going to pump a couple of billion dollars into this and it's really going to jump start, you know, in a way this could have more scale and really move the needle and open up one of those wedges.

And so I think if we can make a vessel that really works, we can fill it as much as we possibly can, do the work to free up some resources, you know, with legislature and at the agencies, and wherever we can get them from. So I'm very

hopeful about this program. Really thanks, thank you guys for all your work.

MR. COX: Thank you.

MS. RAITT: Next is Guido Franco from the Energy Commission.

MR. FRANCO: Good morning, Commissioners and everybody. My presentation will cover three topics. First, I will talk about new findings regarding methane emissions from the natural gas system. Then I will discuss a little about indoor quality impacts from natural gas combustion indoors. And then I'll briefly describe an ongoing project looking at the carbonization targets and the natural gas system.

The diagram that you see in this slide comes -- the original slide, the black area in the rectangle come from the US EPA. That was the view of the natural gas system that didn't include downstream consumption like old buildings, power plants, homes, et cetera.

So six years ago we in the Research Division, we develop an expanded view of the natural gas system that includes potential leaks in this case from homes, commercial building industry, power plants, and abandoned natural gas well. We talk about the research later on because I think that will be very important for the work that you are talking about today.

But before I do that, the national scale Environmental Defense Fund, EDF, and others have invested millions of dollars and several years of research trying to better improve the estimation methane emission from the natural gas system on the national scale.

This -- the figure the map comes from Omara et al. from EDF and other research groups where they presenting his extremely nice map, you know, emissions associated with a production of natural gas in the United State.

The size of the black line are the black circles are proportion to the emissions in the different production basins. On top of the -- of the name of the basins, you have a percent. That percent represents the emissions -- methane emissions equivalent to a percent of production.

The emissions go from less than 1 percent to 4 percent, actually 4.8 percent in the San Joaquin Valley and 4.5 percent in the San Juan production basins. This same group in this case first author was Alvarez, et al, from EDF. They also in a path breaking I believe paper in science. They integrated all of the work that they had been done not only the air but NOAA and others into what is the current view of methane emission from the United States.

So they presented a table, the table come from their paper showing, you know, emission from the different parts of the natural gas system. The area in red represents the

emissions in the production basins. The emissions are estimated as teragrams per year and the year is 2015. So the production emissions are in the order of 10.9 teragrams per year and the total US emissions are 13 teragrams.

So basically emissions from the extraction and the processing of natural gas prior to injection to the natural gas pipelines represent more than 84 percent of the overall emissions. I believe this is important from a climate perspective because California imports 90 percent of the natural gas that we consume for normative issues, they are not included in the ARB inventory.

Alvarez also emphasized one important point. You will not see in this table emissions form downstream meters in our homes and buildings because it was not, there were not such paper at time reporting emissions downstream in meters.

I'm going to slip this slide. So but as I said, the Energy Commission has been funding work on looking at methane emissions of downstream of meters. One of them is emissions estimates from homes. And the bottom line is that homes according to Mark Fischer, et al, from LBNL, homes in about 0.5 percent of what they consume as natural gas.

We are very glad to report that ARB used the result of this study to include for the first time emissions from the residential sector, downstream the meters in the state inventory of greenhouse gas emissions.

But we also have projects looking at buildings, commercial buildings. We have a project at GTI looking at emissions in restaurants. They are using a bottom up methodology where they go component by component measuring emissions. And the bottom line is that restaurants, according to my calculations, my interpretation of results with restaurants may be more than 1 percent of the natural -- natural gas that they consume. So 1 percent versus 2.3 percent without counting downstream emissions is an important increase.

So what about other building types? Well, we still have another contract with ICF and they're working with GTI where they're going to be reporting emission from 100 buildings in six building types. The six building types are listed there. They ended all the measurements and results will be reported in the next few months.

As far as I know the state, national, and international inventories do not include yet methane leaks in the inventory. They do include methane leaks from commercial buildings.

Okay. So I now a project was not sponsored by the Energy Commission, it was a project conducted by the Jet Propulsion Laboratory, JPL NASA. I think it's partially funded by the Air Resources Board were they use (indiscernible) Mount Wilson, looking down to the air basin

in Los Angeles. I think they do like two or three measurements a day. And they found -- they use the measurements to correlate estimated emissions with natural gas consumption. So the black line -- the black line shows now I don't remember. I think the black line shows estimate emissions, methane emissions from the natural gas system in that basin and the red is natural gas consumption.

As you see, there is a (indiscernible) and the (indiscernible) is due to higher increase of natural gas consumption in the wintertime for space heating. They use the nice correlation between emission estimate and consumption to estimate that homes and building as a whole may emit 1.4 percent of the natural gas that they receive.

I think this is a huge number. I think ARB, the Energy Commission and others should conduct or should support additional studies to corroborate or to improve the mission estimate from buildings and homes in Los Angeles.

The next project is one that just ended, the final report -- we have the final report, it's been edited and will be available in the next few months. It's a project with JPL sponsored by Air Resources Board, NASA headquarters, and the Energy Commission where they're using airplane with a sophisticated spectrometer to visually locate what is called point source of emissions. Point source of emissions are in the case a large source of emission emitting more than

10 kilograms per hour.

So they identify hundreds of point sources and together they emit the equivalent of 34 to 46 percent of ARB reports system-wide emissions in the prior inventory 2018 methane emissions inventory.

They corroborated was reported by Omara et al. in the San Joaquin Valley. The emissions are relatively high, you know, 4 -- the emissions from the extraction natural gas oil in the -- in Kern County in the south part of San Joaquin Valley can be about four percent of the 4 percent of the natural gas productions.

Now let me move to public health. Burning natural gas in our homes can result in poor air quality. Burning of natural gas emit oxides of nitrogen and O_2 particulate matter. In the slide you can see two recent studies, one by Logue, L-O-G-U-E, et al, that report estimated 62 percent of the population using natural gas for cooking in the (indiscernible) basins are exposed into levels that are exceed acute health base-standards and guidelines.

As part of a use of a study sponsor by the Energy Commission, UCLA is measure and to all the EM concentrations in homes, in less advantaged communities in Los Angeles. The purpose of the study is to develop a holistic view of the future of energy for that community and a holistic view includes everything from energy efficiency, retrofit,

electrification, indoor equality, outdoor equality, and environmental justice and over renewables.

So the next project is related to, I mean the last topic I want to talk about has to do with the issue of decarbonization natural gas. We had a project with E3, the report is already out, looking at different scenarios for California to achieve productions of 80 percent by 2050. The message for a natural gas system according to that report is that fossil natural gas has to go down substantially in order to meet the 80 percent target. The ongoing project is a different look at what will happen at the energy system looking at all the options that could be available to decarbonize the natural gas system.

We had a workshop on June 6th that was very well attended. The resource team is supposed to send me their draft final report by the end of this week. So it will be in the public in a month or two as a draft. And then will have opportunity for additional comments before the final report is available by the end of the year or early next year.

One message that is coming loud and clear from the E3 study is that renewable natural gas can play an important role decarbonizing our energy system. However, the use of renewable natural gas, in this case the way we are defining renewable natural gas to include biomethane, hydrogen, synthetic natural gas, and a mixture of fuels. So that the

role for natural gas would be to use it for applications where it would be very difficult to decarbonize, the heavy-duty trucks, industry applications, et cetera, et cetera.

So but before I finish with my conclusions, I would like to thank ARB staff, the staff of the ARB with having working collaboratively for the last 100 years. So we'll continue working with them, our collaboration has been extremely helpful.

I think the conclusions are obvious. I think methane emission from homes and buildings are important and in my opinion should be considered in future studies of decarbonization of the California economy.

The same thing about public health. I think it must be considered and the areas there are so many studies that are planned to improve the emissions estimate of methane emissions, to look at decarbonization of the energy system, et cetera, et cetera.

Thank you very much.

COMMISSIONER MCALLISTER: Thanks, Guido.

All right. We'll take that as applause for all of the speakers up to lunch.

So let's see we're a little bit past time and I want to just ask, so we're going to break in a couple of minutes. Giving our dais a chance to ask questions if they want. And then Heather can tell us what time we're going to break until

just to give people some time to get some lunch.

Let's see, anybody on the dais have questions about that? I guess I wanted to just lay out so I'm really happy to hear that we're convening some public health research on this and I think that's going to be critical. And I'll just -- a couple of sentences I'll say about why and maybe lay out a little bit of vision for what we could do if we really took this seriously.

You know, we want to focus on equity issues, we want to focus on a low-income folks. I mean there was, you know, 1477 is going to focus on, it's got a chunk of it is carved out for focus on low-income which is great. You know, multifamily work which we haven't talked about too much today. The multifamily building sector is an obvious place to go and I think, you know, we need to make the case to the legislature that we need to focus on that and put some real resources into upgrading our multifamily buildings particularly --

(Interruption by WebEx)

COMMISSIONER MCALLISTER: Particularly our low-income multifamily.

So but if you think about what it would take to show these health benefits and value them, right, I think we could do a research project, like really a longitudinal study almost, a research project with say a large healthcare

provider that has good penetration in some part of the state that we would identify. You know Kaiser Foundation is big leader in this or Sutter Foundation or, you know, any number of them. And we say, okay, we're going to do a big initiative to upgrade, you know, single multifamily buildings in this territory and then track over the next ten years what happens in terms of emergency room visits for asthma, you know what happens with those building retrofits and do they have real health system cost saving impacts.

Because we're not going to -- you know, we're all energy wonks. I'm more and more convinced that we're not going to move the market based on only the energy benefits alone, we have to incorporate these non-energy benefits, and first and foremost among them are going to be health impacts based on indoor air quality and, you know, and work across our agencies on the rest of our air quality and our indoor and outdoor environments.

But, you know, I think -- I think we would see over ten years some needle being moved in that area if we got enough penetration to be able to measure it in a robust way. So anyway, I think we ought to try to find out whether or not that's the case and do that in a rigorous way. But that's a significant study that would take a fair amount of resources. But we could work with the Department of Public Health and others to try to -- to try to frame that and do that.

(Indiscernible) and ARB would be right in the middle of it, really, if we were to make that happen.

So maybe there's some little piece of this we could carve off in the R&D division to begin to scope some effort like this and really see what it would have to look like to be meaningful. But for example (indiscernible) and include the transportation benefits, you know, tailpipe emissions reduction, all that stuff maybe, you know, we could find a way to capture that.

So anyway, I think that's the kind of project that we need to, for example, that kind of scale and that kind of rigor.

MS. MONAHAN: Can I ask a --

COMMISSIONER MCALLISTER: Yeah.

MS. MONAHAN: Just one comment on that. I also think it was fascinating that some of the data indicates that the current nitrogen dioxide standard for ambient air quality, let alone indoor air quality, is inadequate. And so I also think that this data can feed into the improvement of our indoor and outdoor air quality standards. Which will again then feed back into what kind of policies and programs we can implement to make sure that we are health detected.

MS. CHANG: And let me just really quickly say I really appreciate the focus and discussion about the indoor air quality. That's been, you know, an area that we've been

very interested in for decades. And it's a hard area to make progress in because it's in people's homes.

But I think that that really, I think it's a really interesting idea about doing a longitudinal study to see what you might be able to detect in there. And I think also, you know the appreciation of the indoor air quality issues and thinking about as we look at tighter buildings and more energy efficient buildings, sort of making sure that from the air quality side, the indoor air quality side, that's something that we're looking at too. So thanks.

COMMISSIONER MCALLISTER: Yeah. Absolutely. And we'd have to involve HCD in that discussion as well because they -- the indoor air quality issue is at least in large part under in terms of filtration and equipment that's going to make us address that, is going to allow us to address that.

So let's see. No more comments from the dais. I'm going to pass back to Heather to give us guidance on lunch and how long we're going to give everyone to go out and find something to eat.

MS. RAITT: Sure. So if we want to stick to an hour break, should we come back at 1:15 then? Does that work? Okay.

COMMISSIONER MCALLISTER: That works.

MS. RAITT: Please be back at 1:15, we'll restart.

COMMISSIONER MCALLISTER: Thanks everybody, we'l see you in the afternoon.

[Off the record at 12:15 p.m.]

[On the record at 1:18 p.m.]

COMMISSIONER MCALLISTER: Okay. Let's get started. Commissioner Randolph is going to be a little bit late joining us and Mark Rothleder had to leave but we are expecting Edie Chang and Commissioner Monahan to be here shortly.

But we're just going to get started to respect everyone's time. And I will unless Heather has something to say to kick off the afternoon, I'll pass it to Martha Brook to moderate our next panel.

MS. BROOK: Great. This is Martha Brook. Welcome back from lunch and thank goodness for inside under climate-controlled conditions. It was hot out there.

So I don't have an introduction to the panel because our panelists are going to introduce themselves and it will be obvious that we invited the right people to the table.

So then I'm going to ask -- I'm going to ask the panelists three questions and then if there's still time and we haven't been chased off, then we can have questions from the audience.

So we're trying to, you know, in a very short amount of time kind of cover the scope of the Energy Efficiency

Action Plan which as you heard this morning is broken into doubling energy efficiency; efficiency and equity, you know, bundling tightly together to meet our equity goals that the state has; and then building decarbonization.

So we've invited panelists that are going to cover all of that and we have going around the panel, Scott Blunk from SMUD, Mohit Chhabra from NRDC, Michael Colvin from the Environmental Defense Fund, Carmelita Miller from Greenlining Institute, David Phillips from the UC Office of the President, and Ronnie Raxter from the California Energy Commission.

So they're each going to do a five-minute introduction of what they're doing is relevant to efficiency and building decarbonization. And first we're going to have Scott.

MR. BLUNK: Thank you, Martha. And pleasure to be here. I'll keep this pretty quick, five minutes.

So I am from SMUD and my primary responsibility at SMUD is building decarbonization and energy efficiency. I do the long-term planning around those two.

And SMUD has a 2040 goal at being net zero. That, so the plan is to be net zero and we're netting out using the vehicles and building electrification. The board has committed $1.7 billion of additional investment to hit that goal. That equates to essentially doubling our existing --

well, actually it triples our existing program's budget over that time period. And that $1.7 billion also equates to about $50 million a year over those 21 years.

All right. So in that vein, I worked with a lot of different people, including E3 to help develop a carbon optimization tool. What it does is it calculates the marginal carbon savings and cost effectiveness in order to optimize our programs within budget and market constraints. What the real intention is so that we can shift away from first-year kilowatt hour savings and on to a long-term carbon metric for all of our programs. And it does this by using the hourly marginal emissions, it's -- yeah, we'll just leave it at that. The long-term hourly marginal emissions from the grid. And it does it by we started from the ground up, each individual measure, lightbulbs, water heaters, from the ground up and optimizes from our programs based on each of those individually.

And as a little context, so this one's looking at tEE, there's a lot of new terms in this. tEE is just traditional energy efficiency, the way we've been thinking of it. And the reason to call it traditional energy efficiency is just that electrification is energy efficiency, it's just not the way we've been thinking about it, so try to talk about it a little bit differently.

But the biggest thing when you're looking at the blue

curve there, an energy efficiency measure at 8 p.m. is going to lower carbon emissions, but an energy efficiency measure at noon is going to raise average carbon emissions. So it's the temporal aspects of what we're doing, what our programs are doing, what our measures are doing that is really important. And although that is, that discussion is reversed if you're doing an electrification measure versus an EE measure. But EB is electrification, this is what we call electrification.

But whether we're doing an EE measure or an electrification measure, it's not just an A point in time, it's spread out throughout the day and throughout the year and so what the tool does is just accumulates that marginal carbon emissions through every hour of every year of the measure's lifetime.

And for program planning purposes, what this does is there is -- it gives the amount of carbon savings per measure and that will change over time based on the carbon content of the grid. And that's the gray bar at the bottom. And for program planning purposes, we're going to claim all of that carbon savings in the year that it's installed. That's only a planning metric that our programs will use. And this is -- and let me say this is not a finalized outcome, the board hasn't weighed in on this but this is the results of the tool, and what we're proposing.

So for planning purposes, we put it all in that year to be able to value the whole lifetime of that. And what that looks like from a programmatic carbon reduction is this, the energy efficiency's the blue at the bottom. And this is all in life -- programmatic or lifetime carbon emissions. And so in 2019, we're at about 1 percent energy efficiency for our portfolio, 1 percent of retail sales. And about 93 percent of our carbon savings is coming from traditional energy efficiency. But by 2040, less than I think .1 percent of our carbon savings is coming from traditional energy efficiency mainly because our grid is getting cleaner, but also we have cut the amount of energy efficiency in half over that period of time from 1 percent to one half of a percent. But by -- but if we're going save carbon, it's going to be through the electrification piece which is the orange.

And then the common concern is grid impacts. And what this shows is the orange line on top is the peak load increase from electrification. And the blue line on bottom is the peak load decrease through traditional electrical efficiency. And the big winner is every time you replace a gas furnace with a heat pump, you also get a more efficient AC which addresses our peak. So you get those two at the same time.

So at least this graph only goes out to 2030 but we're not anticipating any significant issues with our peak

because the net impact is the difference of those two and we're still down 120 megawatts or so. So our peak has reduced over that period of very significant electrification.

And that's it.

MR. CHHABRA: So good afternoon, I'm Mohit. I work with the Natural Resource Defense Council and I work on energy efficiency and decarbonization and energy sector issues.

So before I start, I'd like to start that at NRDC we've been asking this central question, given how the grid's been evolving to have more renewables in it and the makeup of the grids changing, we have climate goals and equity concerns, the questions we've been asking was the right amount of investment and energy efficiency that's necessary to meet our climate goals while maintaining an equitable grid. So that's the context for our thinking here.

So energy efficiency portfolios, they meet multiple objectives and I -- this is an illustrative list. As you can see, these are varied objectives and all of these have different end goals. And recently, we've had other policy requirements, environmental requirements from SB 350, SB 100 that add to these requirements of energy efficiency. And in sort of a post lightbulb world where we are right now in the energy efficiency programs, it's hard to meet all of these objectives and maintain an energy basis cost effective

portfolio. And we're seeing that with some of the portfolio wide evaluations recently, and so the IOU program design filings, maintaining a TRC of 1.0 is hard.

The most recent potential goals and target study that Justin and Jeorge summarized this morning does show that we have decreasing amount of programmatic potential, there are reasons for that. But at the same time, our carbon reduction goals are getting more stringent, and those are -- that direction is counterintuitive. And not saying that that is incorrect, but we need to scrutinize and make sure, again to answer this question, what is the right amount of investment in energy efficiency to meet our climate goals? And to answer that question is harder given the myriad of objectives that energy efficiency is trying to solve for with one measure of energy based and what subcarbon matters cost effectiveness.

So it propose the list to restructure the energy efficiency portfolio. And my words got moved around a little bit so I'll speak them out. The first is a resource bucket, second is a long-term market transformation, and the third is the equity bucket. I'll define each one of these. I call Energy Efficiency Resource Programs as those programs you'd want to directly compare the supply side resources to meet near-term carbon reduction and grid needs. So an IRP context, that's an Integrated Resource Planning context, what

portion of energy efficiency can compete with supply side to meet grid needs and let's set up a system where we figure out the possibility to optimal of investment in energy efficiency in dollars, grid per dollars.

There's some energy efficiency programs that save energy, meet grid needs, save carbon, but can't be evaluated in that context, they have more longer term objectives and they get at market transformation. And currently, there are a lot of programs in utility portfolios that aim to transform the market but they aren't connected. So there's research on emerging technologies, for example. Then there's codes and standards initiatives. And then there's some programs who turn clean workforce. And some of these are looked at separately, some of these are lumped in with the resource programs. So the intent is how can you create a framework so you can define your long-term market transportation goals be held accountable to that as opposed to having a mandate to spend and then having to balance cost effectiveness of the programs. Right?

And the final bucket is the equity bucket. So we have some funds reserved which aren't being spent for as Jeorge explained for cost effectiveness and other considerations. The question is how do we best spend these funds to make sure that as we transform our grid to reduce carbon emissions, that we keep -- the grid remains equitable

and improves.

And a question to ask ourselves is aside from the funds in [indiscernible] programs if what we really want from some of these programs is nonenergy benefits, should there be other funding sources that need to create legislatively so that we can actually get the kind of impact we want from these programs apart from what already exists?

With that, I'm going to say that the intent when we divided the portfolio into these three separate portfolios was really to align our policy objectives, programmatic goals, and what's happening on the ground to create a more accountable and tractable system. And you want to have unique tracking cost effectiveness budget making and other processes for each one of the sub portfolios to really be able to get the benefit that you should get from energy efficiency. As a part of my presentation, I've also included a detailed version of these five slides that in narrative lay out this plan for folks to refer to after the meeting, after this workshop.

Thank you.

MR. COLVIN: So good afternoon, commissioners, and hi Edie, welcome back.

MS. CHANG: I'm sorry.

MR. COLVIN: No, not -- no, thrilled that you're here. So my name's Michael Colvin from Environmental Defense

Fund. And I have a couple of opening thoughts. First one which isn't even on a slide but needs to be pointed out that I did not pay Guido more than $10 for all those shout outs he gave us before the lunch break. He -- you know, I'm staying compliant with the gift limit rules.

So for those of you who are not familiar with the EDF you can read this later, but we are an environmental nonprofit, we are guided by science, and we are really much more business oriented and solution oriented. And I pulled the numbers last week in preparation for this. We now have over 420,000 members in California alone that we're representing.

And as Guido sort of mentioned, one of the core parts of the energy program work that we've done in the last few years has been around methane. And as we're talking about the energy efficiency strategic plan upgrade, as we're talking about decarbonizing buildings, I think a lot of focus that you'll hear both in my slides and kind of some of the Q&A that we'll do later is it's not about the buildings, it's about the carbon. And how do we go after the carbon in the right way? And so EDF has done a lot of work on both methane research, what's the science of it, how do we target, what are the results. And what are the cost implications for it, Commissioner Randolph who isn't here at the moment that voted on the decision at the last business meeting at the PUC, they

started aligning the utility's leak detection programs with the societal cost of methane specifically, not carbon but methane specifically so that we could start thinking outright as we're prioritizing leaks and as we're prioritizing what our next steps and actions are, how do we go after the most potent methane sources possible.

And a lot of the research as EDF has done really started pointing towards wait a second, we need to align the shareholder incentives and the policy objectives with how potent those gases are. And that's one of the broader comments that I wanted to sort of point into this today.

As we're talking about decarbonizing buildings, I almost want to say we should start de-methanating buildings, but that's a weird word so not -- not going to go there.

So the -- some of the lessons learned from our methane research which I think directly apply into some of the ideas that I had for this workshop was to go after the biggest sources of emissions, the biggest leaks, you know, the oldest buildings first. Go after the highest emissions and not just lots of tiny little leaks. We go after the biggest bang for the buck that you can. And regulations work. The codes and standards advocacy that you have works. Appliance standards work. Thinking about indoor health quality standards. Edie, I know that was something that you mentioned at the beginning. They work and we need to think

about how, you know, how that's out there.

I want to echo something Scott said. You can't manage what you don't measure and measurement works. I just happened to like this visual and I was over the lunch break just talking with a friend of mine from U.C. Irvine who helped take this photograph with EDF. Aliso Canyon was I think a big motivator of how do we start thinking about why we want to decarbonizing our buildings. It's not just because it's a large untapped sector, it's because there are larger systematic impacts that are involved with this.

The other thing that we get out of this image is we do have a major gas system in California. As we're talking about how we decarbonize our buildings, we have to think about the implications on the gas system. We're in a weird equilibrium right now. And if we're going to change one part of it, we're going to have to change some others as well.

So the biggest I think take home message that I have is as I was reviewing the draft report that's out there which was excellently done, if I look at all the great work that the PUC has been doing, that the codes and standards work has been doing, we've really focused on how do we make our buildings more efficient. That's great, but that's not enough now. We need to not be thinking about an efficient building, but how do we start thinking about a decarbonized building?

And the second half of that is as Guido mentioned right before lunch, yeah, we can have a decarbonized building goal and it seems like the most cost effective way to have a decarbonized building is through electrification. Though electrification doesn't work in all circumstances either from a technical perspective or from an economic perspective. So we need to think about the buildings as the cohorts that they are in. What happens if a building just had a major amount of new energy efficiency upgrades on the gas system? We're not going to rip all that out in the next five years.

We might want to electrify -- eventually, when that equipment reaches the end of its useful life, it doesn't mean it can't be decarbonized in the meantime. Similarly, I could have a relatively inefficient home, but if I've signed up for a green care shared renewables program, technically, it might actually be decarbonized home. And so we need to think about what are the tradeoffs between an efficient building, a decarbonized building, and an electric building. Because we're using these words interchangeably but they're not the same thing.

And so I think I started to hint towards this. But the last point that I wanted to sort of mention, going back to the Aliso Canyon slide was if we think cost effective electrification is the best strategy for decarbonizing buildings, and a lot of the E3 work out there indicates that,

I think it makes a lot of sense in those circumstances, we have to think about the legacy gas assets that are in the ground. We spent a huge amount of money on that infrastructure and in all honesty, the customers who are going to be able to afford to electrify early are the ones who can afford to leave the gas system. And that means who is left holding the bag? And there's a big equity component that is attached to all of this.

So as we're coming up with our policy objectives of how do we decarbonize buildings and if electrification is a primary strategy, we need to think through well, what are those equity impacts of the gas infrastructure that's left in the ground? And how do we make certain that participating customers are not creating a negative impact on the nonparticipating customers. And just to give us a sense of this, you know, put up a picture of where the gas system is, there are entire parts of the state that don't have any gas service at all. And the strategies for new buildings and new hookups might be very different than existing buildings. And so we can't just have a one size fits all approach for how we approach this.

I think from this last slide and this slide the thing I want to really try and communicate to everyone is we might want to think about the age and the book value of the gas infrastructure as a criterion for project selection for our

buildings. And we might want to be targeting different buildings and employing different strategies. If I have a brand new gas hookup connecting to a brand new building or if I have a really old leaky pipe that is connected to something at the end of the line and it might make sense just to chop that line and to electrify entirely. Different strategies are going to be required.

And so how we decarbonize You know, there's lots of ways that we're going to want to think about how we target energy efficiency programs to certain buildings based on type. If Mark Rothleder were still here, he would be saying let's use the node price, that's a great idea. I think we should also use the book value of the gas system as another screen of how we prioritize this. And being air quality's probably another one. There's probably another five or six that make a lot of sense of how we approach the buildings that are out there. But thinking about those infrastructure investments I think are really important.

The last one and apparently I'm, you know, setting off alarms with how provocative these statements are. The last one that I just wanted to mention is there are probably some circumstances -- and this is building off of the common [indiscernible] said as well, the E3 study is showing that there are probably some circumstances where electrification is either infeasible or impractical either from a technical

reason or from an economic reasons. Economic is probably the most likely.

And so that doesn't mean that we should leave those buildings out of the decarbonization conversation. So we should think about well, what are the limited uses for hydrogen, for renewable natural gas, for biomethane, whatever words you want to use there because there's lots of different things that are out there. But we should think about what makes the most sense for those circumstances. And I would encourage the IEPR to have a clear set of vocabulary and a clear set of here's the building stocks that we're going after and here are the strategies for each one that we're going after. Again, I think decarbonization is the goal and energy efficiency is one arrow in the quiver that we're going to use to help us get there.

And with that, thank you so much. And I apologize for going a couple of minutes over.

MS. MILLER: All right. Good afternoon, everybody.

I'll be presenting something that's a little bit of a change for today. My name is Carmelita Miller. I'm a legal counsel at the Greenlining Institute and our energy equity team.

For those of you who don't know, Greenlining is a nonprofit social justice organization that envisions a nation which communities of color thrive and rediscover their

economic opportunities. Greenlining advances our policies and economic opportunities -- for economic opportunities through advocacy and community engage, coalition building research, and leadership development.

I'm giving you a brief overview of our equitable electrification framework that we're releasing next month in partnership with Energy Efficiency for All. And I do want to amend Michael's statement earlier about, you know, this is not about -- what did you say? It's not about buildings in carbon and it's about people. And so here's a presentation --

MR. COLVIN: Second it.

MS. MILLER: Here's a presentation about people and why this all matters.

I think I mentioned this, but our framework will be released next month in September.

So why does building electrification matter? It matters because environmental justice communities are hit first and hardest and many people know this but economic health and environmental consequences have recedes appetite for fossil fuels. Another reason which is equally as important is because we believe that building electrification can improve the lives and resilience of our people.

Earlier, I appreciate Mr. Franco's presentation about the health impacts of burning gas in a home in ways that

electrification can provide non-energy benefits. I think Commission McAllister also stated that we should focus on nonenergy benefits or what we like to call cobenefits, which is just music to my ears. EJ equity advocates are eager to figure out ways that electrification and I hope that this topic -- or figure out ways that electrification can provide more of these cobenefits to the residence and I hope that this topic is something that we keep talking about within this group.

The process of, you know, decarbonizing our buildings involve significant risks and benefits our communities. Which leads me to the second part of this vision which is ensuring that impacted communities are engaged, consulted with, and listened to by advocates and decision makers alike. This is not just Greenlining's responsibility, we hope that everyone in this room and those who are listening shares this goal and can share this responsibility as well.

This next slide I think many of you are -- have all also before, but why does it matter in this conversation of how to decarbonize whether to use electrification or not. The fact that people of color, especially African-Americans and Latino communities are struggling economically as a result of historic racism and redlining in California cannot be overstated.

Greenlining's approach in advocacy is similar in this

presentation in that as a first up, we have to acknowledge historic crimes that our communities continue to suffer today in order to better understand the barriers to the access to renewables, to energy efficiency than talking -- about to talk about. And these barriers are significantly hard to overcome and cannot be -- cannot be stated enough.

However, it isn't the sole responsibility of CARB, CPUC, CEC, and CAISO's job to eliminate the legacy of racism, that's not what we're talking about at all. It's -- what we're talking about is that our communities and we expect that the current and future energy policies and programs do not further intensify these consequences of legacy racism.

Barriers -- and I'm going to quickly highlight -- are not new to the commission. This SB 350 barrier study named these same barriers the environmental justice communities so that have to accessing energy efficiency and renewable energy. Earlier Rory also presented on barriers during his presentations which reflect these same barriers. It is important to repeat them in the context of conversations surrounding decarbonization or building electrification because a lack of adjust and equitable transition plan is not the same as missing out on a fair share of public funding invested through clean energy programs.

Not having a just and equitable transition plan can exponentially increase the hardships that our communities are

facing. So our people cannot make the switch on their own. Most people I'm talking about can barely afford to live in the state, they can barely keep their lights on. They are not going to talk about how they're going to convert their homes to all electric homes tomorrow.

So what do we do? When energy and security is extremely high, terms on recent report on disconnection state that between 19 to 25 percent of Californians are energy and insecure. And for those who are not familiar with this term, energy insecurity is the inability of a person to pay their bills without trading off a basic necessity, household expense such as food or medical care and we do have a lot, too many people, too many Californians who are foregoing medicine with a comfort of their homes so that they can pay the bill.

The next barrier are, you know, just is the fact that renters have limited choices. Even higher income rents who I'm not really talking about here who can somehow afford upfront costs of the switching their homes, they're not going to be able to necessarily do all of that because they don't have the property rights and the kinds of choices that they can make as someone who owns their home. They need their landlord's permission who may or may not have an incentive to switch. And if the landlord decides that they do want to switch, the renter is still facing the risk of increased

rents, or getting displaced from their homes because their rent is no longer affordable, or if the owner converts a building.

We also have regulatory barriers. And again this is also reflected in SB 350. We are facing a lack of program and funding alignment. Most of California's housing stocks, most of the housing stock where Californians live with low incomes needs more than just energy upgrades. These buildings often need to be treated for mold, for asbestos, or structural issues, like damaged walls, leaky roofs. Existing incentive programs for energy efficiency require that homes be free of these problems before being treated and have no requirement for referral or follow up.

Many residents who are very -- the next -- the next barrier is that we don't have enough education and outreach to engage Californians on the issue of decarbonizing our economy. Many residences are every interested in understanding the indoor quality benefits from electrification as well as a connection between gas use and climate change. We need culturally appropriate education that we're in this campaign and most importantly support for community-based organizations who are working with and helping residents on a daily basis.

So we need to figure out how to support the residents and the community-based organizations that are doing the

work. And while I'm not presenting on workforce in this topic, I'm going to definitely go over the five-minute limit, it is something that I want to flag as an issue as well. A transition -- a just transition plan for workforce for workers. We're leaving fossil fuel -- fossil fuel workforce. They need -- and also -- sorry.

So fossil fuel workers and also workers from disadvantaged and low-income communities who need access to the jobs that the green economy's providing. I want to highlight those two important issues as something that, you know, we definitely should be tackling as well. But I'll move on for now because we're running out of time.

Our recommendations. Don't harm people, right, to make this transition without -- as much as possible -- without harming those who are already suffering. Our recommendation is to use equitable framework for decarb policies and programs. The framework that, you know, we've created, we've vetted this through with many advocates both EJ equity -- EJ equity and environmental advocates alike.

I'd like to note that as of the steps that I'm going to talk -- that you see here, I'll read them really quickly. The first one is assess community's needs, establish community's decision making. The third one is develop equity-driven metrics, leverage program benefits, and lastly, track and improve performance.

Like to note that the second bullet is actually the one that needs more attention. And I want to talk about that a little bit right now. Because we saw a recent example of how this can actually work through the San Joaquin Valley proceeding at the CPUC. Here we saw the commissioner, staff, parties work hand-in-hand with a community-based organizations and impacted residents to develop 11 pilots that involved electrifying the residents' homes. If you're not familiar with this proceeding, please see me afterwards and especially to talk about what the role of communities' organizations and organizations CBOs who work with these -- with the residents that we're talking about.

What we learned there is that it showed that more often than not, when we provide -- when offered a community choice, communities opt for a cleaner energy option. That empowering communities to make decisions leads a stronger outcome across the board. This is a natural way to get -- to get support for programs and policies and really figure out, you know, what are the communities' needs and are you doing, are you providing them the best solution?

And the last point that I want to make is that, again, I cannot emphasize this enough, is the rule of environmental justice and equity organizations. Right now as I look around, I wonder whether next time we have a workshop like this, whether we can improve the audience attendance,

we're reaching out to more organization, we're actually doing the work. Not just helping our residents with energy-related concerns but are doing the work around decarbonization.

We held a workshop at Greenling a couple of months ago now, I think maybe more. And, you know, that workshop really debunked the myth that equity in EJ organizations are just not interested in decarb. We are -- there are a lot of organizations out there that are very, very interested in engaging this issue and I just hope that as we move forward that we can continue to invite organizations like ours.

Thank you.

MR. PHILLIPS: Good afternoon. My name's David Phillips, I'm the associate vice president for energy and sustainability at the University of California and the office of the president.

And I was selected today to represent the client perspective on these issues with U.C. being an early actor in this phase.

And just to give you some background about why -- why we're involved in this. The U.C. system set the goal to become -- to make our buildings carbon-neutral by 2025. So it's some 20 years ahead of the state and we've been at it now for many years and I think we've got some good lessons learned. One of which is back in -- checking back to the discussion this morning is when you're trying to go to zero,

you don't have to worry about baselines. So that was one really interesting point. You don't have to worry about units. It's really great for those that are challenged in that regard.

Energy efficiency is really important. Our leading campuses have already reduced their per square foot energy use by 50 percent. We have many examples of that in the U.C. system. So it's really important. But to get to zero, it's insufficient, we figure that out. And like the state, we have -- we don't have a pool of money to throw at this carbon neutrality goal. We need to figure out how to do this in a cost effective way. And so that's where partnerships become really important. We realize this and at a customer meeting from Southern California Edison, I can go to the next slide, I'll show you that the partnership's here. They heard loud and clear that we had these goals as a customer -- I'm sorry, I'm a little bit ahead of myself. And Edison worked with us and the California State University system to develop the first of its kind incentive that uses carbon as the metric.

And so I'm going to provide just a very high level overview of this incentive program. But I -- from my perspective, I think it really addresses a lot of the challenges that we heard about this morning and I'm very hopeful that this will provide a solution for the state as well.

So these are the participating campuses from both the SCU system and the University of California. And we recognize that when it comes to carbon neutrality and reducing emission, there's good load and there's bad load. And -- and there's a -- there's a lot of actions that we could potentially take to decarbonize that would take place off campus, that would potentially be even out of state type solutions. We really want to first to provide a pathway for others to follow. We want to first deal with on campus solutions as much as possible.

So this -- the clean energy optimization pilot focuses on actions behind the meters. So we have typically at these campuses we have master meters that measure all of the electricity that's provided from the utility and all of the gas it's used. And the items there in the circle identify all of the potential solutions that will help us decarbonize and move forward toward this goal.

So the basic measure is the bottom line use at the electric meters to the campus and the actions we take are in that circle. And I'll provide a little bit of an overview how this works. The inputs are the raw energy data. And the -- you'll see there there's a baseline for what would happen in the absence of action. Because the grid is getting cleaner, even if the campus is doing nothing, our emissions will go down because of what's happening in the state.

But on a yearly basis, we do a tally of how much electricity and gas was used on the campus. And we do some adjustments for the good load, so electricity that's used for transportation. We have to do some adjustments for weather and square footage so that we can encourage smart growth on the campuses. And we convert all of that to greenhouse gas emissions in a very systematic methodology. And any reductions in the greenhouse gas emissions from the baseline are then incentivized through this program.

This is the basic math of how it works. There is a net reduction in greenhouse emissions from the campuses. We multiple that by a cost of carbon that was developed and changes -- that can change over time. And we did some work to estimate what the life of those changes would be, you know, multiply those together and you come up with the incentive payment.

It really shifts the risk profile to some extent from traditional energy efficiency programs and that the customer has to take a lot more of the risk to make this work happen in that if at the end of the year, the savings aren't there, we don't get the incentives. And if at the end of Year 2 or Year 3, if we backpedaled we don't get incentivized. So there's built-in mechanisms to make sure that the savings that we see are long-lasting and persistent and move us forward in that action.

How is this funded? That comes up a lot. It's funded through the cap and trade auction revenues. So that was different than many of the energy efficiency programs. That was the funding mechanism to make this happen.

So these are the goals and the benefits. I think it aligns with a lot of what we heard this morning. We want to -- it really does provide an option, a market-based option that's driven by customers to figure out what's most cost effective. So on our campuses, they can decide whether, you know, long-lasting behavioral programs are more effective than going with heat pumps. Whether we really need to attack our central plants as the big opportunity versus dealing with small building loads. It really puts that in the hand of the people that are focused on this new currency of carbon to make actions happen.

The goal of the program is also to do this as simply as possible. Existing programs are very administratively complex. Some of our partners on the campus have really grown tired with the amount of effort it takes to get the programs through. So we intentionally started with the Blue Sky Program to how could we make this effective and yet simple to administer?

And the benefits are that all of this aligns with the goals to get to zero to focus on the new metric of carbon. It -- it allows all technologies, it's really technology

agnostic. There's methodologies that strongly encourage electrification but it also with the basic methodology would allow for the incorporation of hydrogen or renewable natural gas as another way to address greenhouse gas emissions.

And because the universities were chosen as the pilots, we really have all of the kinds of buildings that you have in the state. We have residential, we have laboratories, we have transportation, we have hospitals. So we have a good cross section of buildings. So if it works for the CSU system and U.C., we're confident that it'll work for the rest of the state.

And I've left you with some references. I'd love to talk about our policies, our sustainable practices policies, because we just last year adopted an all-electric building policy or one that strongly encourages all electric building design. But I'm limiting my time to the clean energy optimization pilot today.

Thank you.

MS. RAXTER: While the presentation's coming up, my name is Ronnie Raxter, I'm an energy commission specialist here at the Energy Commission. And I'm here as a representative of our building energy benchmarking program.

I'm going to do a quick overview on what benchmarking is, the stipulations for the program, and then give you a sneak peek at the disclosure aspect of it.

So benchmarking is creating a baseline that indicates how much energy a building is currently consuming. That baseline can then be utilized to measure the energy efficiency performance of that building over time. Once a building is benchmarked, you can use the existing information to quantify energy upgrades and track future consumption to confirm that the projected savings and return on investment are realized.

Benchmarking allows building owners, tenants, and the general public to better understand the buildings that they inhabit making clear the opportunities for energy efficiency and clean energy investments.

The building energy benchmarking program requires annual reporting of the prior years' energy consumption. Compliance is obligatory and there are two segments of the program. The first segment is commercial and the second segment is multifamily. Benchmarking for commercial buildings began last year reporting 2017 consumption data. And public disclosure will begin this year. We're expecting the dashboard to be launched next month. And it'll be disclosing 2018 data.

Benchmarking multifamily buildings began this year reporting 2018 consumption data and the public disclosure aspect will begin next year disclosing 2019 data. If you have a building that is more than 50,000 square feet with no

residential units or if you have several buildings on a single property than when combined have more than 50,000 square feet, has no residential units, and a shared utility meter, then you must comply with the commercial segment of the program.

If you have a multifamily building that's greater than 50,000 square feet with 17 or more units or if you have several multifamily buildings on a single property that when combined have more than 50,000 square feet, has 17 more residential units and a shared utility meter, then you must comply with the multifamily segment of the program.

You are required from the -- sorry. You're exempt from the program if your property does not meet the minimum square feet requirements, the residential unit conditions, you do not have a certificate of occupancy for more than half of the reporting year or the building is scheduled to be demolished within one year of the reporting deadline which is June 1st every year.

Additionally, as of today, the cities of Berkeley, Los Angeles, San Francisco, San Jose, and San Diego all have their own benchmarking programs that either meet or exceed the requirements of the statewide program. Due to this, the Energy Commission has granted their jurisdictions an exemption from the statewide program and if a building owner in an exempted jurisdiction reports to their local program,

they do not have to report to us.

As I stated previously, we'll be disclosing the 2018 commercial building consumption data this year and this presentation is to provide a visual as to what the building -- building energy benchmarking program dashboard will look like. And this is what it'll look like.

You have categories on the left that you can utilize to narrow down what you're looking at and even compare two cities or areas. And the map and the two graphs are color coded by the property type. In the center of the map you have pin drops. And if you hover over the pin, more information about the specific building will appear. It'll show the property type, year built, gross floor area, the site energy use intensity and if available the ENERGY STAR score.

On the top right, there is a graph for the site energy use intensity which is the annual weather normalized energy consumption per square foot of building space. And on the bottom right there is a graph showing the ENERGY STAR Score. An ENERGY STAR score is the score from 1 to 100 that can be utilized to easily determine how energy efficient your property is. A score of 50 is the national median value. And a value under 50 means that your property's performance is in the bottom 50 percent of similar buildings. Whereas a score of above 50 means that your property energy performance

is in the top 50 percent of similar buildings.

I kept mine quick.

MS. BROOK: All right. Thank you all very much. That was really informative and appropriate. So thank you.

So our first question to the panelists is in regards to energy efficiency. And the question is, where are the largest sources of energy efficiency potential not yet realized in California's programs? And to the best of your knowledge and experience, do you think California can cost effectively double energy efficiency by 2030?

Let's see. Carmelita, do you want to start? And I'll call on a few of the rest of you.

MS. MILLER: I can start, though my focus will not be on energy savings. I think a great potential that we're really not looking at especially because we're talking about energy efficiency is the actual impact of our energy efficiency programs on our residence of health-seeking comfort. I think that we've been discussing this for a very long time with the SB CPUC in particular about how we can evalue and how we would measure both quantitative and qualitative nonenergy benefits or cobenefits so that we can further address a way that we measure cost effectiveness for these different programs and make sure that we're actually affecting the, you know, the people that we said we were prioritizing.

So we would be really interested in talking about, you know, what's -- what are -- you know, what's a potential there? But then of course, it's kind of the circular issue because then we end up having to also ask well, what are the values of the things that we care about of these nonenergy benefits.

It's not, you know -- you know, where we are right now, I think it's not super ideal. It's not great as an advocate coming from my own perspective and my experience, it's not great when somebody asks me, you know, we get energy savings, but what is ability of this particular program to reduce a number of disconnections in this community, Carmelita? And I can't -- if I can't answer that, that's not the best feeling from the advocate's perspective, right? And this is why we push -- we push all of you, whether we can do better.

So I think there's -- there's a great potential there. These are -- these are the kinds of benefits, information and benefits that are community members are definitely looking for.

COMMISSIONER MCALLISTER: Hey, Martha, can I -- I want to just build on this a little bit. Because I want to build on Ronnie's presentation for just a second and then ask a question.

So Das Williams, you know, helped, he authored AB 802

years ago and we're now kind of reaping the benefits of that bill and I think it's a great story of how, you know, some long-term planning and getting the right bill in place and implementing it systematically over time, you know, over five, ten years can really pay off. So we're going to have information about every multifamily, you know, building above a certain size. As that data comes in, we're going to -- we already have, you know, good data with a commercial, we've had decent compliance and it'll get better every year.

And so with multifamily and particularly low-income multifamily, we're going to have a pretty robust, you know, within a year or so characterization of that building population. That at least, you know, big chunk of it, big buildings. And that will enable us to design programs and policies that could appropriately target those and, you know, interact with all those building owners and kind of just really create an ecosystem of collaboration, I think, and hopefully identify some funds and, you know, channel it towards those buildings.

So -- so we're going to have good information, but I think, you know, at sort of the state level and it's going to be building, you know, building level. We're going to find that in order to retrofit every, you know, low-income apartment that needs it, then it's going to be a lot more money than the state can easily marshal. I think. I mean I

suspect.

So how could -- how can we kind of work together to really understand the scale of this problem and figure out how many resources would be needed to solve it. Like, you know, we're always kind of in this like we've got a lot of crumbs and we're sort of fighting for crumbs. But like we really need to focus on what's the main -- how are we going to solve the main problem? And so, you know the equity issue just runs -- just looms huge. We're not going to meet our goals if we don't solve that problem.

Anyway, so I guess I'm wanting some ideas about how we can kind of strategize. Maybe it's just a back of the envelope, you know, calculation. Okay. This many units at this much per units. Estimate the scale of this with assumptions and if we want to attack this bit of the problem, how much is it going to cost? Because the numbers are going to be large. And I think we just -- if we're going to get there, we have to face those numbers, you know. And it would be nice to have sort of your expertise to be able to look at the particular sectors that you work with.

I'm looking at Carmelita just because I think that, you know, that is really the most important piece of this.

So anyway, any thoughts about that would be really welcome.

MS. BROOK: Okay. We're going to -- we're going to

keep going, we have about 20 minutes, I think.

So Mohit, I think you volunteered to chime in this potential and are we going to meet the doubling goals?

MR. CHHABRA: I'm going to talk a little bit more about the potential. And I think CEC's reports outline well that there's a dearth -- there's a lack of knowledge in the industrial agriculture sector. And there's a couple of reasons for that. One is that these -- the energy use patterns of these sectors in each building are unique so they don't lend themselves to simpler mass market-type programs as well as the residential and commercial sectors. And there's sort of a chicken and egg problem. Because until you have that information to understand how to tackle these sectors, implementing programs in these sectors seems really expensive and full of barriers.

So at some point in time, the knowledge base of what's in these sectors and what moves these customers will have to be created to be able to act upon from the potential study at the PUC and other avenues.

So I'll say one, a good example that came up was the strategic energy management program implemented by the energy trust of Oregon that has good success, it's been evaluated by the same evaluators that work in California for the PUC and it has had good results.

I'll say two things quickly. One is more targeted

programs, the age of average is over. We need to figure out who are the higher energy consumers with respect to what they should consume for the kind of service that they're getting and target them. We have the data, science, and tools to be able to do that. And then grid efficiency, like conservation water reduction. It's outside the domain of demand side or supply side but it's in the middle and a significant amount of energy is lost in transmission distribution and how do we capture that?

Thank you.

MS. BROOK: Let's see. Ronnie, do you want to speak to this?

And David, I would welcome your comments after that.

MS. RAXTER: I talk fast. Sorry. I talk fast so I should be able to go through this pretty fast.

The statewide building energy benchmarking programs stop where other programs go further. For example, New York City requires benchmarking annually and auditing and retro-commissioning every ten years. The city of San Francisco requires benchmarking down to 10,000 square feet for nonresidential buildings. And requires audits that include lists of cost-effective retrofits or retro-commissioning measures. The city of San Jose provides a list of measures the building owners can select one of and they have to implement if their energy STAR score's below 75.

Those local programs require some form of audit and/or upgrade activity to implement energy efficient improvements. Where our program solely provides awareness. We are as Commissioner McAllister pointed out, we intend to use that awareness to help build more programs. But as it is right now, it's just consumer awareness as to how much buildings are consuming.

For the second half of the question is can we cost effectively double energy efficiency? I absolutely believe we can. Getting the current consumption data from large buildings is the first step. This will give us insights into which buildings are already operating in an efficient manner, and which ones -- and it'll highlight which ones are not and they can benefit from energy efficient upgrades.

The second step would be to have an audit to clearly indicate which retrofit options would be available and most cost effective. I love using my house as an example because I've done a lot to my house over the years. When I bought my house, it was the first house that I've ever actually owned or lived in, I always lived in apartments. I didn't have any previous experience pertaining to what the energy cost difference from an apartment to a house was until I got my first electricity bill which was outrageously high.

Most of my neighbors when they realized how expensive their bill was automatically turned to solar and they had

solar installed. Because I worked in the energy industry, the first thing I did was I benchmarked my energy consumption and then I compared it to similar buildings. And I realized my consumption was way over what a standard building my size should consume. That triggered an energy audit which I did on my house because I knew how to. The audit uncovered that my newly built house only had incandescent bulbs and I had a lot of west facing windows which increased the solar heat gain in the summer and how often my AC was running.

So if I had just gotten solar without an audit, I would have needed a 7 kilowatt system. At the time, solar was about $4 a watt so $26,000. I invested roughly $700 on sunshades and LED lights and that brought what I needed down to a 4 kilowatt system which is only $16,000. So for a roughly a $700 investment, I saved was it $12,000 on solar. And because it knocked down my bill $200 a month, I got the investment back in about three months, four months. Four months.

Now if you take that and apply it to large commercial buildings, which is what we're disclosing this year or next year, multifamily buildings, it'll give us real insight into those multifamily buildings, how that energy is being consumed. And we ideally get audits to be able to determine what those are. We can identify which ones would be the best investment or the best bang for our buck.

Thank you.

MR. PHILLIPS: So for -- for the state, I guess I have kind of a mixed feeling. I know the campuses that have been really into this and have the right incentives got there so that's a point of optimism, but I also know that the programs that existed then don't exist now so we need new programs and encouragement. And I also know even despite that, some of our campuses really had a tough time getting there for a variety of reasons, lack of capital. When they can't borrow any more money to do these programs, it's basically a decision between doing energy efficiency or building a new science building, you know, what's going to win every time?

So and then conversely for some of our other users like the hospitals, there's a lot of energy efficiency work in hospitals that has a good payback, but it's nothing compared to what they could get from investing in a new MRI, for example.

So it's -- even with U.C. where we have strong leadership and encouragement to do this, it's still a challenge. So I would say overall for the state without really bold new programs that address all of those kinds of issues, I think it's going to be a challenge.

MS. BROOK: Thank you. And I'll just say that one of those past programs that was so successful was monitoring

base commissioning which is why you have all those meters in your buildings and you can do the decarbonization now because you can track so that's pretty awesome.

Okay, so we're running out of time so we're going to jump to the last question and if for some reason we get time back, then we'll throw in the last one.

But my second question is, and some of you have already been hinting at this so it's -- it's -- maybe we'll go faster than we think. Is it okay to focus on emission reductions rather than energy efficiency? And assuming that there will always be a consumer protection component of our policy mandates, how should rate payer dollars be directed to reach the state's carbon neutrality goals?

So we've already heard from Mohit on his suggestion. Let's see. I'm going to first call on Scott to answer.

MR. BLUNK: Thank you. I think it's -- we've been having the conversation for so long of should we do EE or should we do electrification, I feel like we're fighting amongst ourselves. We should -- really and what the tool that we created is aligning one metric carbon for both of those whether it's energy efficiency or decarbonization and then create programs around what saves the most carbon.

I do think we can reach a doubling goal from the previous question if we're aligned around what it is we're saving which I think from what I -- what we want to do is

carbon. The -- there is a role of energy efficiency and I'm not suggesting that energy efficiency should go away, but my graph there was really trying to show if we're saving carbon, it's going to be in electrification. EE has a lot of benefits that we don't want to forget about but we don't -- I don't want to see us running energy efficiency programs just because that's what we've done for decades. And there's a lot of us in the rooms that have been doing it for decades and it's like, oh, we can't, we've got to do EE, we've got to EE, we've been telling everyone this forever.

I think what we need to do now is decarbonize and then run programs which may be EE based that address health grid constraints that address different issues than carbon. The carbon is what we're after now in my view.

COMMISSIONER MCALLISTER: Scott, can I ask a question?

MR. BLUNK: Sure.

COMMISSIONER MCALLISTER: I'm going to ask you to speak on behalf of all the other POUs.

I guess I'm wondering if the approach you're taking might be able to develop a template that goes into the standard practice manual that serves to kind of reorient all the POU programs over time. Like if you show success, do you think, you know, through SCAPA and CUPA, you know, sort of you could have that conservation through your -- the group of

POUs?

MR. BLUNK: Well, I don't want it to stop at the POUs.

COMMISSIONER MCALLISTER: Well, certainly, certainly. I'm trying to limit the question somehow.

MR. BLUNK: I mean, yes, I think -- I think what would we develop a SMUD you can change for energy mix and carbon intensities and apply to any POU today. IOUs just by the nature they operate, it's a little different, the outcome. But the carbon savings is carbon savings whether you're an IOU or POU so yes, I've already worked -- I'm out there kind of trying to explain this methodology to other utilities, other POUs now and had a little bit of success and some uptake already. But, yes, I certainly hope that it's something that we -- we, the POUs, can align around. But of course I'm not speaking for anyone, probably not even SMUD right now, just myself.

MR. BROOK: Okay, we're going to let -- we're going to let Michael answer this question as well. And then we're going to use the rest of our time to hear if there's any additional questions from the dais.

MR. COLVIN: Thanks so much, Martha. You asked kind of a multipart question so I'm going to try and answer as fast as I can.

I think it's worth noting you have kind of a hook

part of your question, you know, is there a consumer protection part. I think it's really important to note for this conversation, consumer protection is not just cost effectiveness. If all we do is copy and paste cost effectiveness protocols and TRC values and evaluation protocols from the energy efficiency portfolio and think that's going to get us to decarbonize buildings, we would have failed.

I think those are extraordinarily important programs. I think there's -- I spent years of my life working on them. I could tell you more about EE house effectiveness than I ever want to with (indiscernible). But the point is they are not directly transferrable. If the goal is ultimately using all the work that we're doing in IERP and all the work that we're headed towards of getting to 100 percent carbon neutral supplied grid, what we're going to do between now and 2045 when that goal hits, the programs have to be different for that tranche of time versus how do we maintain them afterwards? And we need to be thinking about this on that temporal basis. I really like that comment you made earlier.

There's one other consumer protection thing that I have to just reiterate from my earlier presentation. If we're thinking about consumer protections, we do have to think about the legacy investments that are in there, especially the stuff that's already been made so that way as

we're making changes, we're not letting weird things happen or we're not exposing customers to places that we don't want to.

So what do we do for the actually rate payer dollars which is I think is the main thrust of your question. Well, let's go back to what is our goal? We need a market signal from the governor and from this document to align with our carbon objectives. We need to be able to say a lot of the technology that is out there is available today. There's entire parts of the U.S. that have no gas service, that are all electric, parts of the state that have that, that are running these technologies. We need to bring that market into California and we need to align it with the carbon goals that we have. We create the market signal, the rest will follow.

Okay. I'm getting applause, thank you. The -- going back to an earlier comment I made about what the role of the rate payer dollars, well, we need to think about what's the -- there's sort of two main tranches, what are we going to do for the codes and standards for new buildings and what are we going to do for the existing building stock?

If we can approach buildings in that kind of initial bifurcated split, then some of the policy programs that we do through the PUC with our efficiency programs that we do with our advocacy and codes and standards development at the CEC,

you know, they are kind of different pathways of decision making that we need to go through. But we need to map out what is the building stock and what are we trying to do? And then we can use the rate payer dollar really effectively within that. But magically thinking that oh, well, we'll just throw some money at this is not going to get us there.

Two other quick points. As we're talking about rate payer dollars, I would encourage us to be a little bit flexible to try some things out or starting a set of four-year pilots, that's great. We want to be able to move some money around. But we need to recognize that part of the goals that Carmelita was just talking about and I think that goes toward some of your questions, Commissioner McAllister. Part of our goal is we want to make certain that we're not leaving folks behind. So as we're doing our fund shifting and as we're trying to think things out, fund shifting should be one way that we want to be able to shift funds to where things are working well and we want to recognize that.

But we don't want to fund shift away from a really hard to reach target audience that we just need to give more time or more attention to that we need to have some sort of breaks on well, wait a second, we need to make certain that we're aligning where our total budgets are actual spend is with what our objectives are. And so we need to think through the customer protections on that in particular with

respect to the low-income community.

I wanted to echo something that I think Edie said at the beginning of the day which has been ringing in my ears all day. If we're thinking about indoor health quality as sort of a major cobenefit of why we want to decarbonize which I think is really true, then we need to think about well, what can we do for appliance standards specifically for, you know, rate share generally don't fund appliance standards in the same way as we do some of the other stuff that's out there. But I think having that kind of monitoring in that role is a really new kind of an innovative spot to be spending some of this.

The -- I have one last thought I'm sorry. So sorry. One last thought, last thought. The last thought is we need to think about the classic split incentive problem of as we're thinking through the temporal component of this, there are certain things that a renter can do and certain thing that a builder owner can do. And there might be things that we can do at the end of the life of a product. And if we're encouraging early replacement, what are we going to do to encourage early replacement if you're a renter versus if you're an owner?

And thinking through that kind of decision making framework will be really important to say well, wait a second, electrification of work in this circumstance and this

place and here and maybe a green tariff will work in this circumstance and this here. And maybe this zero-net energy framework will work here and maybe some renewable natural gas will work for this industrial loping over here. Let's think through what that portfolio probably been thinking owner versus renter is really important. I'm hoping that all the work that Ronnie's doing on the map matrix will help us get up to owner versus renter as we're doing the building mapping so that way we can come up with the different strategies throughout there.

Thank you.

MS. BROOK: Thank you. Do we have any --

COMMISSIONER MCALLISTER: Yeah, I have a question.

So that was great, thank you all for being on this panel and just the innovation that you've talked about. And I know you had to select what you talked about just to fit the time and I know you could have gone on with all sorts of wonderful things you're doing.

Really excited about the optimization pilot. That's really going to be great. I'm psyched to have it be funded by non-portfolio money just so we can sort of see how that world is going to work. Right? And so we can tweak that going forward. And kudos to the PUC for adopting that and approving that.

Let's see. I guess -- so I want to say thanks for

Mohit for the -- sort of that high-level vision. We'll just dividing up into those three areas. I think that actually makes a lot of sense, intuitively that makes a lot of sense. We focus on equity. And we, you know, focus on the programs. And we sort of call a spade a spade, really, and dedicate the appropriate resources to those three areas. So I really appreciate you and NRDC for coming up with that.

So I have -- I do have a question, I guess. So Michael you mentioned the, you know, getting a handle on the book value of the natural gas system. And I want to -- I'm not able to do it all at once in my head and we need all your help to figure this out. But I totally agree and we -- who knows what we're going to find if we map all of the characteristics of the individual pieces of the grid onto, you know, through CalEnviro Screen and onto the actual people that actually have that actual service and see if it makes sense. And see if there are obvious places where we would go to retire chunks of it or it's totally a mismatch.

You know, maybe the new stuff is where, you know, is where we would like to go retire, but it sort of doesn't make economic sense. So I guess I'm wanting to conceive of a research project that we could fund with RD&D money or that there -- you know, maybe EDF has already been working on this.

So go and get your thoughts about that.

MR. COLVIN: We'll give you more thoughts and our comments back but I will make the quick observation now that PG&E has been doing some really interesting work on this. I would encourage you to do some reach out with them specifically on they have a much more radial style of the system so they can cut off that sort of like long branch that was only serving a couple of customers and if that branch required a major upgrade on the pipe, it was really cost effective for them to say, well, you know, instead of spending $10 million to fix this pipe, I'm making a number up, I spend up to $8 million encouraging everyone to electrify, I will have saved all my customers some money.

Now the one hook there is that those customers had to voluntarily waive their obligation to gas service. And obligation to serve is going to be a really important criteria to think through how do we, you know, ask customers to give something up in the name of maybe better service or maybe not. What are we asking them to give up and how do we think that through I think is going to be a really important policy that we need clarification on.

I think the last building IEPR document had a lot of phenomenal language and I think we now need to build upon that thinking through this obligation to serve. And the reason why I go through encouraging mapping that out with the gas system now is I think there's going to be a lot of

different customer profiles that we haven't even thought through yet. And we don't want to be designing 50 different policies but we do want to start thinking through well, what are we going to do in different circumstances? It's not just as simple as a four-quadrant box.

COMMISSIONER MCALLISTER: And maybe it's going to take us to use some of our authority to gather the right data to actually reinformation to actually make that --

MR. COLVIN: And I would --

COMMISSIONER MCALLISTER: -- sort of valuable research.

MR. COLVIN: And I would encourage some PUC led data requests on this as well.

COMMISSIONER MCALLISTER: Thanks a lot everybody.

MS. RAITT: And folks from the next panel. If you'll go ahead and we'll have place for you at the front tables.

MR. HUNGERFORD: Good afternoon. There we go.

Good afternoon, I'm David Hungerford, I am with the Energy Research and Development Division. I lead the efficiency integration team. I'm here today to talk about how load flexibility can contribute to decarbonization.

First I want to distinguish between load flexibility and demand response. Demand response as we used to know it was concerned primarily with reliability. Load flexibility is concerned primarily with renewable integration, the

ability to match demand to load. The timing for demand response was typically peak time and rarely. And for load flexibility in theory, it should be operating all the time.

In terms of cost, demand response was costly. You took money from rate payers and paid it to someone else so that they could reduce load and compensate them for the cost of lowering production.

With demand -- with load flexibility, it's more in aligning -- aligning incentives with a creating a value proposition for customers so that they're willing to reduce load or manage their load in exchange for lower costs. And ultimately it's a paradigm shift. It's a shift from a system where supply always meets demand to one where demand follows available supply.

We have three -- we have three distinguished panelists here today to talk -- to talk about the possibilities for load flexibility.

The first is Brian Gerke, he's a research scientist in the energy technologies area at Lawrence Berkeley National Lab. And he's currently the lead analyst for the Public Utilities Commission's demand response potential study where he develops forecasting tools to help chart a path for the future of demand response of California. He -- his prior career was in astrophysics where he studied galaxy formation in the large scale structure of the universe. Which I guess

means that if you lie awake at night wondering what was happening before the big bang or why time slows down as you approach the speed of light, he's the guy to ask.

Kevin Wood leads the Building Electrification Initiative for Southern California Edison. Her team provides strategic direction for the development and delivery of building electrification pilot programs and services for residential and nonresidential customers. She's been in the electric utility industry for over 35 years in various engineering and management positions as varied as generation design, distribution design, street lighting, advance metering, demand response, and energy efficiency.

Carmen Best leads Recurve's policy outreach and development. Recurve, formerly known as Open EE, offers solution for enabling demand flexibility as a market-based procurable resource. Carmen also leads open source stakeholder processes for methods and software to revolutionize deployment of distributed resources. She was formerly with the Public Utilities Commission and lead for MNV.

And I think we're going to start today with Brian so he can lay a background from his work for the Public Utilities Commission on load shifting and demand response potential.

Brian.

MR. GERKE: Thanks a lot, David.

So David just spent a lot of time distinguishing for us between demand response and load flexibility. And I'm going to go back and call it demand response in the context of the DR potential study. I'll also say that as someone who's studied both astrophysics and energy systems, astrophysics was easier.

So this is just the high points from a study that we're wrapping up for the CPUC, it's Phase III of the California DR potential study in which we're focusing on what we refer to shift demand response. Shift being sort of a shorthand term for load shifting. Demand response, again, moving loads around instead of just shedding loads certain time of day.

So a lot of you will have seen talks that start with plots that look like this. Typically the plots, when you see them are the output of some sort of dispatch model showing all of the problems that we're going to have in California's renewable future. This is not the output of a dispatch model, this is May the 1st of this year, actual CISO operations. And we can see exactly the sort of problems that have been predicted. So just to orient you to this figure, the dash across the top is the gross demand on the CISO grid. The green band is the renewables, primarily solar and wind. And the solid curve is the net load on the grid. And you can

see the large ramp down in the morning, the large ramp in the evening, the peak occurring after sunset, and in the middle of the day, some level of minimum generation from the other resources that need to be on the grid in order to meet that peak leading to some level of curtailment of renewables which is the red abandoned region.

And on this particular day, we curtailed about eight gigawatt hours of renewal energy which corresponded to about 4 percent of the total generation capacity for renewals in that day. And I pick this day because it was a pretty average day for me. There's an awful a lot of curtailment happening in May.

And the cost of that curtailment comes from these inflexible resources in the middle of the day. You've got nuclear across the bottom which is not flexible. The hydo is failure inflexible this spring because it was fairly a wet year and so all of the large hydro is dumping water as fast as it could to make room for all the snow melt that was coming later. And then there's thermal generation gas that needs to be online in order to meet that evening peak. And in order to be online, it needs to be generating at some minimum level in the middle of the day.

And so you're in this situation which -- which is -- is somewhat frustrating where you're trading off renewables in order to have gas on the grid so that it can meet your

peak in the evening. And so what you would like to do is move some of those loads from the peak times into the middle of the day and better utilize that system.

So why do we need shift demand response? The first would be to alleviate the curtailment of renewables. As I said, this is pretty close to an average day. So on average, I think it was 8.8 gigawatt hours per day in May. If you value at the current EIA estimate for the levelized cost of energy for new solar builds, that represents about $11 million in value that was effectively left on the table in May. Solar generation that was built but wasn't able to be used.

And the other reason that we want to be shifting loads around is to ease these ramping rates. We've got almost a 12 gigawatt ramp in the evening on this day. And that's leading to some high prices at some certain times. So last year I think it was in September, we say day ahead prices spike up to almost $1,000 a megawatt hour which was a record at that time in the evening. That was driven by a lot of different things but the ramp didn't help in that matter. So that's the why.

And then the when, there are two different ways to answer when do we need this resource. First, it is not a rare occurrence. These ramps are going to happen every day because the sun rises and sets every day. So this could

potentially ease our ramping rates every day of the year so it could be a very commonly used resource. And the typical need on a daily basis as shown here is to shift your loads away from these morning and evening peaks primarily into the middle of the day and to a lesser extent in the overnight hours.

Typically, you're going to have two big opportunities to shift every day, one in the morning and one in the evening.

So we do some work to study the amount of load that is available to be shifted in California. A least in the IOUs service territories.

Oh, before I move on, I just want to show that was an average day. To give you a sense of how bad this can get, this was May 27th which was the worst day in May for curtailment actually, the first day that California had seen up to this point where we curtail almost 40 gigawatt hours.

That's not entirely fair because that's Memorial Day and so the loads were quite low and I suspect will always be curtailing on holidays. But we'll see more and more days like this as we move forward. So the future is now for the California grid and we'll have to figure out how to deal with this.

So the primary output of the DR potential study is a supply curve for this load shifting demand response resource.

And just to orient you to this plot, across the horizontal access, we have the amount of energy that you can make available to shift on average when you need it over the course of a year. So every time you need to do load shifting, you would get approx -- you would be able to shift about that much energy for a given levelized cost outlay of procuring that resource. That's the total cost regardless of who pays for it for actually getting that load to be enabled to be flexible.

And so we can so that -- so that's the levelized cost in dollars in dollars in kilowatt hour per year in order to enable one kilowatt hour of energy to be moved around at the times that you need it

And the curve itself, as we move up the supply curve, you see down at the bottom -- at the bottom of this when you're spending very little money per unit energy, you're essentially going out and targeting primarily large energy consumers. Where you spend some money to put in technology to make the load flexible and you get a large amount of energy back because it's a large energy consumer. As you move up the supply curve, you're targeting smaller and smaller sites and so you get less energy back for your spend of installing the technology.

And we can see at the low end you're primarily getting this from industrial sites, industrial process

pumping loads and some amount of commercial HVAC. As you move up in cost, you get more and more of the commercial HVAC. And as you get to the higher prices, you start to be able to enable residential sites as well.

But this is not a very intuitive unit of cost dollars per kilowatt hour per year. So to give us a point of reference, we put behind the meter batteries in the same set of units and you can see that in the gray line it says battery threshold, it's a little bit hard to read there. That is essentially the cost of putting it behind the meter battery.

And so you can compare the price of enabling demand response to the price of building a battery. If you're above that threshold, that's essentially saying you might as well just buy a battery at that point because load shifting demand response is effectively like virtual storage. Below that price, this is a virtual storage resource that's cheaper than putting behind the meter battery.

And at that battery threshold, this is forecasted out to 2030, you have a resource of about 6 gigawatt hours that you could shift around at the times that we need it. Which is not nothing. As you saw, we were getting about 8 gigawatt hours of curtailment in May of this year. You could do two shifts per day. So if you had 6 gigawatt hours or resource, that would help you out. By 2030, the problem's going to be

worse, so it's not enough. But it's also not nothing.

We can take that --

MS. MONAHAN: Can I ask a quick question --

MR. GERKE: Yeah, go ahead. Sure.

MS. MONAHAN: -- just -- can you go -- so the battery threshold, is that the assumed cost of the battery in 2030?

MR. GERKE: Yeah. Yeah. With some fairly conservative assumptions about cost reductions we haven't been --

MS. MONAHAN: So if we keep on this curve trajectory with battery price falling pretty rapidly, the battery threshold could be below the reference price.

MR. GERKE: It could be lower than that.

MS. MONAHAN: Okay.

MR. GERKE: Yeah.

COMMISSIONER MCALLISTER: I want to just make sure we're all understanding the metric here. So this is a kilowatt hour of storage that can be used, you know, anytime you want.

MR. GERKE: This is --

COMMISSIONER MCALLISTER: You're kind of comparing apples and oranges here to some extent, right, because these different technologies aren't necessarily equivalent from a service perspective. Like HVAC is not the same as a battery, for example.

MR. GERKE: Right. Yeah. Well this is not exactly the same but it's essentially saying I can take this energy service that would have been used at a certain time and instead move that load to a different time. Which would be equivalent charging a battery and then discharging.

COMMISSIONER MCALLISTER: Okay.

MR. GERKE: And some of these technologies are thermal energy storage technologies so it's even more --

COMMISSIONER MCALLISTER: But you're assuming it can be used every day or whenever --

MR. GERKE: Right. Yeah, something that can be used every day. And this is average at the time that you need it. So these are the loads around sunrise and sunset, typically.

So if we take the price just below that battery price, we can break that down a little bit more and start to look at where these resources are going to come from. So broken down by utility service territory, building type, and end use we can see there's some interesting patterns there. There's a lot of pumping load in the agriculture sector and the PG&E service territory. SCE has slightly more retail, PG&E has slightly more office space in terms of where these things are going to come from. But you can start to break this down and figure out where these sources come from.

The main point I want to make here is that at this price, there's very limited potential coming from the

residential sector. There's not much residential load that can be enabled for the price that we're looking at.

And the reason for that has to do both with technology costs and with customer participation. So this plot shows three bars for each end use. There's a technical potential which is the total amount of load in that end use that you could potentially shift around if you could magically shift all of loads around however you wanted to.

The orange bar is then how much of that load you could enable to do load shifting if you're willing to pay $500 per kilowatt hour per year in that metric which is exorbitantly high price but I picked that price so that you could actually see something in the residential sector.

And then in the -- the blue bar is the -- is the reduction you get when you consider customer participation levels in this things. And you can see that you get huge reductions in the amount of resources available in the residential sector. And this is because when we analyze this, we're using as inputs to our models historical residential participation rates in DR programs which are fairly low because historically you're asking people to let the utility turn off the air conditioner in the hottest day of the summer or something like that which is a hard sale.

So you may be able to come up with new customer engagement practices for things like shifting water heating

load as your electrifier or something like that where you're not actually going to change people's perceived level of energy service and you can get much higher participation rates.

So to look at what that could do for us, first we built an electrification scenario that involved getting the state to its 2045 goals which meant by 2030 we needed to have penetration of around 30 percent of electric space and water heating. We ran that through a model to find out how big, I want to focus on the electric water heating which is dark orange which you can't even see in the top. So if you run with our referenced costs and participation assumptions, the electric water heating resources, this tiny little bar up at the top.

And then we did sort of a blue sky scenario in which we assumed that we could increase participation rates by drop costs by three times to ten times. And in that case, suddenly the water heating resource becomes much, much bigger.

And so one way forward to try to enable especially these new electrification loads is going to be focus on new ways of engaging customers and especially ways of driving the costs of the current practices for a lot of these technologies.

And so one of the problems that I run into as a

modeler is not really having the right data to build a model of what load trip demand response is going to look like because it has never been done before. And so one of the things I want to point out is that in order to really move forward and understand how we're going to do this, we have to do this. And so I want to point out this report that came out from the load trip working group at the CPUC at the beginning of this year in which we identified six very specific fleshed out pilot concepts that try to get at this resource in several different ways that are sort of ready to go and have people who are eager to do them and just urge people to take a look at this and think about how we can get there.

MR. HUNGERFORD: Thank you, Brian. We're going to move on to Kevin Wood from Southern California Edison.

MS. WOOD: Good afternoon, Commissioners and others. Thank you, David. Thank you for inviting Southern California Edison to this workshop.

We're really happy to be here to talk about billing electrification and load flexibility who -- which we used to call demand response. We've been doing it for very many years, since the early 1980s with our summer discount plan and our basic optimal program. So we look forward to seeing how we can use shift and shed, different kinds of load flexibility to meet the new needs that are coming on the

grid.

So we've seen many studies that point to billing electrification as a cost effective component of an economy wide approach to reducing greenhouse gases in California. Recently E3 released a study that also shows that it's cost effective or customers can actually save money by purchasing all electric homes or replacing their gas space and water heating with heat pumps.

So that's great news but a common question is, you know, if we have this idea of millions of heat pumps and electrification on the system, what does that do the grid?

So E3 actually did study this question and as it turns out, this is from their cost analysis -- their customer cost analysis work. Billing electrification actually slightly -- or increases the winter peak but it slightly reduces the summer peak. And that -- it's been talked about earlier today, I think Scott talked about it -- due to the efficiency of a heat pump over an AC compressor, you get that summer efficiency piece. And then of course you're adding the winter load piece due to the space heating and water heating.

So really what this has the effect of doing is improving the load factor of the grid. And I think somebody else has a 6 percent, that may have been Scott as well. I think our -- the E3 study actually corroborates that

6 percent. So it's an improvement of the load factor in the grid.

So we know this is a simplified study. You know, it didn't look at distribution level effects, didn't look at weather extremes. So, you know, we need to do a little bit more study on those areas to see what this really plays out to be. But it's really comforting and promising to know that these intersect, billing electrification and energy efficiency and they complement each other and supports much of the details that we've heard earlier today about combining the two and leveraging the two.

So this is another snapshot from the E3 study. And this is looking at the impacts of flexible water heating schedules on customer bills given various time of use rate. And so what we mean by flexible water heating schedule, this is just an assumed lowering or minimizing of the use of the water heating during peak times. So just shifting that to off peak times. So we're -- this is a form of shift DR.

So the bars -- let me walk you through, there's a lot of information on this slide. The bars represent the difference in annual bill savings between a heat pump, water heater, and the gas equivalent for the vintage of homes. So we have home vintages of pre-1978, 1990s, and new construction. So this is the difference in bills. So bars above the zero or X-axis represents bill savings. Bars below

represent areas where customer could see more cost relative to the gas equivalent.

So you can see most cases with the exception of new construction in PG&E TOU rates and Edison TOU rates that there's bill savings for the difference between a heat pump and a gas water heater. In the older vintages of homes, the gas equivalent is a gas tank water heater. In the new construction, it's a gas tankless and that's a very efficient piece of equipment so you don't get as many bill savings. Except in SMUD territory where they have extremely favorable rates. Way to go, Scott.

The hash -- so that's the bars. The hashed bars, then, represent the changes you can see in bill savings if you could shift the water heating usage out of the peak periods. So the take away here is that the larger differential in peak to off peak rates, the better -- the more bill savings you get. So Edison happens to have a 12-cent differential in our TOU 4 to 9 rate. PG&E's got the 4 cents, and I think SMUD's around the 4 cents You can -- you can see that it's driving a little bit better of a bill benefit for customers with a larger TOU differential rates. So I think that's all I have to say.

There's a lot on this slide, sorry about that. So even though heat pump technology is actually very prevalent in other parts of the county and in other countries, it's

still a little bit new in California. It's still very much new and we're still getting used to it and we've got a lot of work to do. The technology is reasonable mature, but that's the reason we need to do some pilots and continue to do these pilots not just to test technology but to test things like how we can shift, install the whole supply chain, customer acceptance, and so forth. So I'm going to talk about a few pilots here.

I think Carmelita talked about the San Joaquin Valley disadvantaged community pilot. The chart -- the green Ps on the charge represent the 170 San Joaquin Valley disadvantaged communities. We're piloting in -- well the state is piloting in about a dozen, Edison has about three communities that we're doing pilots in. Primarily that's a fuel switching but fuel switching from propane in wood. So we'll be electrifying 449 customers in that pilot. We're running two demand response or load shifting studies. One is a traditional shed study with water heaters. So we'll be looking at shed strategies like we do with our summer discount plan or AC cycling programs, setbacks, turn on, turn off, and that sort of thing.

A smaller study will look at about a dozen customers where we're going to add controls and we're going to test a true shift strategy where we're going to pre -- preheat during the day and, you know, test customer acceptance, test

controls, communications and things like that so we can really test that shift strategy around the heat pump water heaters.

Tiffany and Rory talked about the build and tech pilots so there's a couple of things to think about there. Not a lot of detail presented this morning but a lot of detail in the staff report. And one of the components is this idea of a kicker incentive for strategies or technologies beyond just the baseline strategies. So it's possible that we might be able to see a grid connected water heater kicker for that -- where's Rory? Is he gone? Oh, he left. Okay. I was trying to get a reaction out of that. So I think that's possible.

And then another point of SB 1477 is that it really does have to address or not increase utility bills, that's, you know, kind of one of the -- one of the tenants of that legislation. And so providing additional grid connection value through demand response payments or time of use rates could kind of help offset any potential increase in bills that might happen due to that.

And then finally, recently, we got a proposed decision from the CPUC on the self-generation incentive program. There's a set aside of a $4 million across the state for testing or figuring out -- actually, heat pump water heaters are already eligible for the S chip. This is a

study to figure out, you know, there's very little participation by heat pump water heaters. And so this is a study to try to figure out how we can boost participation of heat pump water heaters in that S chip program.

So just in summary. Move really quickly on billing electrification to capture the advantages of the lower summer cooling loads with electric heat pumps. So that's really important. Really kind of a pleasant surprise out of our E3 study.

We're also looking at electric rate and in particular time of use rates, you know, with that larger peak differential could help with the shift strategies.

Continue the pilots just so we can design programs for the benefit of customers and the grid. I didn't talk about these next things, but just briefly, you know, significant partnership with manufacturers to evolve the technology both in terms of sort of niche markets, multifamily, commercial, and also in control technology. You know, keep on with the aggressive building and appliance codes, reach codes, work with cities and so forth and huge emphasis on customer awareness education and outreach is really going to be needed both for just general billing electrification as well as, you know, helping customers to understand load flexibility possibilities.

That's all I have.

MS. BEST: I'll take your mic. Great.

I'll second or third or fifth the thank yous for the invitation and for the opportunity to share some perspectives on load flexibility today. This room holds a lot of memories of talking in the IEPR but today I'm going to be sharing a little bit different perspectives.

I want us to step back for a second. Because I think it's actually illustrative of the conversations we've had all throughout the morning. If you just start from like 2005, the number of bills and regulations and initiatives that we've enacted as a state will make your head spin. And to me, it kind of reminiscent of a crazy quilt at this point. Though they've all well-intentioned policies, I think, they have had some unintended consequences of pulling state agencies in multiple directions with potentially competing priorities and approaches and coordination between agencies which I can attest is one of the biggest challenges of state service is when you're asked to coordinate with an agency that has slightly different valuation frameworks.

We do have siloed proceedings, that's a well-known challenge for delivering demand side management energy efficiency and DR in particular, and that's a clear barrier that we've had.

We've tried forced coordination in this state through CPUC IDSM programs that I think people are probably familiar

with. Just since 2016, we've invested about $2 million in these programs and there is zero carbon savings claims for those programs.

And I say this not to shame anyone. Everyone has done their due diligence in trying to enact policies and make things move forward. But I think we've been limited in our ability to put the right level of urgency on breaking down the silos. We have many new opportunities now with data infrastructure and a common valuation structure that will allow us to take a step back and reconcile these policies around a common metric and a common framework for tracking progress, which we've heard a lot about today, very encouraging. Carbon is one solution that can bring us all together.

So I want to talk through a solution that kind of has three prongs today. The first being this common valuation framework because carbon can bring us together around that common valuation. It can be driven through targeting and performance that goes throughout the market. And it really can be enabled by building bridges through data infrastructure.

So I'm going to talk through each of these today. Let's start with common valuation. There are a lot of other folks who talked about it today in a lot more detail. I'm going to step it up a little bit higher. And I want to bring

a few different angles. First, it's great that the CPUC has taken up the integrated distributed energy resource proceeding, a lot to be proud of -- proud of there. It was several angles in that multitrack proceeding that have shown a lot of promise. But I think the recent adoption of a TRC for all DERs, while I recognize that it's a temporary path forward, it keeps us from tackling some of these systematic rethinking that we need to do on how we're valuing things in the whole system.

It's great that we have pilots and DR and solar and battery and storage, but we need to start thinking about how those common valuation frameworks are applying to all interventions given these new policies and opportunities. And I'm tracking the IRP to see if the common valuation framework can come out of there as well and I know that it's a tough transition to make.

I would like us to take a look, too, at some other states that have tackled valuation straight on. New York, for example, has tried to rethink how valuation is structured. It's not a simple task. But I think that they're likely on the right track by focusing on when and where these resources are being delivered. And they've adopted a concept of the value stack framework that's worth looking in to.

But ultimately, it's not clear where the winning

strategy is necessarily going to come from but I think models that are grounded in procurement, local procurements, auction mechanisms like DRAM if they're not contaminated with cost effectiveness rules could be where we can reinvent our valuation structure around the marginal cost of carbon and really drive performance accountability throughout the system.

So now I'd like to shift to how we can use data and infrastructure for targeting and performance. Data makes all the difference. We're lucky to be in a state that has invested in AMI infrastructure because it means that there should be no such thing as a noncost effective program any longer. And I'm going to run through a few slides about AMI analytics and how they demonstrate the potential for these missed opportunities if we don't change our frameworks. And then I'll give -- I want you to think as I go through these slides, think about how we could reconstruct a goals and potential framework that first is integrated with DR or load shifting, whatever we're going to all it going forward. And second, designing it in a way that focuses on consumption analytics instead of just relying on measure based analysis which is how we generally do it today.

So this is a residential program. We have an electric research curve in the middle and the metrics on the right-hand side, I'm going to walk you through a few

different angles on this.

So step back and imagine that Apple was trying to sell their new Apple watch to everyone in the state. And didn't target early adopters, didn't segment, and didn't necessarily care about who was going to be interested in the fitness doodads, and all those other things cobenefits that an Apple watch could bring you. Probably wouldn't work very well, right? Clearly I didn't get any marketing, I wear a Bamboo watch. But I have been called multiple times to see if I wanted to install a pool pump and I don't have a pool.

So we need to be thinking about DER interventions in the same way. Targeting the people that need it and how they're going to get value from it. So like I said, this is a typical home upgrade program with no targeting applied. And you look up in the right-hand corner, about a third of these participants are negative savers and about 17 percent are delivering summer peak savings. Not bad.

If you look at the same portfolio but from the avoided costs and GHG impacts, also all in, not bad. They're delivering some decent GHG impacts, and some okay avoided costs per KWH. This is all with no explicit planning for peak impacts but of course it's embedded in the voided cost value.

So now imagine a world in which we focus on just the top 50 percent in this program. Those that -- the top 50

percent with summer peak savings. If you do that, you will see immediately 40 percent fewer negative savers and you will see a 40 percent more -- or 40 percent increase in summer peak savings as well.

So in essence, you're deriving more values from these interventions. And when you look at this from a voided GHG, you can double your avoided greenhouse gas and double the avoided costs that you're capturing.

So if you take this one step further and you go to those who might have some high shoulder savings, you can add in a filter to tackle them and you'll see that you drop your negative savers even more, 75 percent fewer negative savers and you double your -- you still double your peak KWH summer savings.

But the real kicker here is that you can quadruple your avoided GHG savings and also quadruple plus .5 your avoided cost. So my point in sharing this is that when you are looking at these things strategically, this angle is going to the opposite end of the perspective wherein 25 percent of the projects at the bottom half of the savings are really dragging your portfolio. Fifty percent of them are negative savers and their energy use is increasing.

With this status quo, we're living with this drag of 25 percent of the participants being negative savers and increasing the energy use. We can't afford to do this. And

we can't afford to model our potential as sector averages that are going to include this type of drag on the opportunity and not reflect the benefits of targeting for DR potential and shift potential in addition to the energy savings potential. Now these customers might be good candidates for other things, but not necessarily for energy efficiency and DR interventions.

There's the sad face of the -- their missed opportunities of carbon reductions. So when you look at targeting alone, even if you didn't change any of our cost effectiveness structures, that serves as a near-term solution that could do a lot to expand load flexibility and overcome some of these historic barriers that we're talking about in DER resources and focus our dollars where we can get the biggest bang for the buck. But I think it will have greater effect when it is coupled with accountability for those that are delivering in the system, and ultimately the customers and the grid getting the value that's derived from those interventions.

So this is an image of a Pay-for-Performance Program. And this is just one example, a piece in the puzzle. Performance needs to be part of the equation up and down the market system, including the CEC and the CPUC noted at the top to ensure we can our carbon goals. And when you think about performance -- performance, you can also think about

adding in kickers for equity metrics, you can add in kickers for external funding, et cetera, on the project finance box. It creates a lot more flexibility in how we can address these issues when we really can't -- we can't envision every type of technology that's going to be coming forward. We can set up market structures that enable others to be mining the data and also finding those opportunities.

And with respect to regulatory agencies, I think that performance accountability for regulatory agencies in particular really needs to focus on outcomes and not anticipating every measure that could be installed. I think that's a fundamental shift in how we do approach our oversight. And with AMI and Open Source accounting structures, we have a new opportunity to do that. You can expand investment with confidence because -- and bring in other investors with confidence because you're paying for what you're getting, not just what you're planning.

And that brings me to my final and favorite topic which is building bridges for data access.

We need to build these bridges of information to connect market actors to build trust and to maintain this accountability in a performance-based system that will tie resources together on a carbon basis.

This is a picture of the Bay Area and I think that it helps illustrate how complicated it can be to navigate around

the Bay. Imagine there were no bridges. And in an increasingly complex delivery world, the connections that we need to data are really important. Because we all know that data doesn't decarbonize, interventions do. Data doesn't set policies, analysts, stakeholders, and commissioners do. And data doesn't make investment decisions but it is foundational for our prioritization and tracking performance.

So markets like this, if we want them to work, they need to be equipped with data access protocols that are viable and manageable. There needs to be processes for secured data sharing, and these ultimately need to drive transparency for this common valuation structure.

Recurve is working with the CEC and NREL on some new ways to be sharing data securely using a concept called differential privacy, that I won't get into now. But it will open up, it will step beyond some of the rules that have made may have seemed manageable about ten years ago but are really not going to hold up in this new paradigm of bringing lots of different stakeholders together and market actors to drive this new investment.

So ultimately, I think that accelerating load flexibility really requires flexible markets to drive the investments. We need market based behind the meter solutions that allow us to drive the impacts on carbon reductions when and where they matter most and build out a data

infrastructure that can support a market environment to confidently increase investment and meet our goals across all of the resource options that are available.

And I welcome any questions. Or we'll take joint questions I think is the next step.

COMMISSIONER MCALLISTER: David, can I -- I'm going to jump in here. You have questions prepared, though, right, in case we don't have enough to talk about.

MR. HUNGERFORD: I believe I have you questions, if you prefer.

COMMISSIONER MCALLISTER: Let's see, I wanted to -- so all three of you, thanks a ton for that. Because I think, you know, the data rich and sort of, you know, highly informed narratives that you all laid out there are really compelling.

I wanted to ask Carmen in particular. You know, you presented a lot of -- you know, a lot of intense sort of data rich slides there, lots of -- lots of graphs and stuff. And I wonder if you could, I think there are probably many people in the room and certainly I want to get this on the record that may not really understand kind of the concept that you've put into place for the back end that produced all of those.

So, you know, what data is really behind those curves and how you're using the law of large numbers to get some

conclusions that are statistically robust. I guess that would be helpful to kind of talk about what this paradigm actually is.

MS. BEST: Sure. So I think -- we have a few concepts at Recurve and one of them starts with meter everything which I don't think we've trademarked. But it's -- it's the concept there is really when you do have AMI data in particular. In that example, it was through a partnership with one of the -- one of the investor-owned utilities that we're working with, looking at all their residential programs.

So it's really just taking AMI data, running a prepost analysis based on the Open EE meter which is derived from the CalTRACK methods which is a billing analysis that has a standardized operation structure that's an open source software tool, that's the Open EE meter. And then once you do that, when you have AMI data, you are able to see the load shapes in essence from those interventions and it's an hourly derivative of when and where those impacts are happening.

One of the opportunities -- I think it was the last panel, I think it was the last panel -- or it was Brian, in fact, that says as we're deploying programs, we need to be -- and these pilots, we need more data to be doing load shape analysis. And we can be doing that now. I think a requirement that all programs track load shapes would be a

reasonable thing to do even today. And it will really enhance the way we can see how these things connect. And right now Recurve is just doing it with utility clients and others to see how these differential impacts will play out.

We're doing it both where there are program interventions that have happened and also when there hasn't been a program intervention, you can just do year on year analytics like we did with the CEC to see how trends are changing in consumption.

COMMISSIONER MCALLISTER: So. Thanks. I guess, you know, this -- there -- this could spin out and like I'm sure there are lot so ideas that nobody's even thought about yet that this could provide a basis for or a platform for. But in particular, you know, if we want to do better programs and we want to create that accountability you talked about, you know, and even by contractor, you know. If you have enough projects that are in this -- in the database and you've got prepost, you know, you could actually say, okay, well, what are HVAC systems and retrofits doing for us? You know, what are this or that contractor, what results are they actually producing, you know, on what population.

MS. BEST: Right.

COMMISSIONER MCALLISTER: The potential here is just immense for targeting resources where they're going to have the best impact. And I'm so I'm really -- also want to give

PG&E some kudos for really, you know, walking the walk here and getting CalTRACK sort of funded and going and PUC for supporting that. Because I think it really -- the more programs we can move over to doing this kind of, you know, essentially it's realtime, you know, data driven evaluation, the better. You know, so anyway, I just want to make the punt for that, so thanks.

And then I will just point out, Brian, apparently, you do need to be a rocket scientist to do this. You know, we always say it's not rocket science but maybe it is.

So I'll pass it back -- exactly -- pass it back to David.

MR. HUNGERFORD: I asked the panelists to -- to look at a set of questions around which to build their -- build their presentations and they all did that.

So the answers to these questions were hidden in the presentations, there won't be a test. But I do want to come back to a couple of them. And one is, what sectors, customers, end uses are we likely to see the most load shift coming from? And I want to be a little more sophisticated, then well HVAC because -- because, you know, obviously we're not going to get much AC load in February or and not that much in March and October during the worst of the duck curve.

So could you guys speak to that on where we -- and include the idea of what -- of what's feasible with customers

as well as the idea of what loads have the most potential mathematically.

Do you want to start Brian?

MR. GERKE: Sure. I mean I think that it's -- you start in the same place as you start with traditional DR programs with the big, you know, industrial customers and large energy consumers because you're going to get the most bang for your buck there in terms of there's a site that's using a lot of energy. And especially for industrials and pumping, a lot of that can be moved around fairly, straightforwardly, and you're only having to deal with one person in order to get them to do it.

So that's a good place to start. I would say in terms of sort of seasonality, that is an issue. And we get into that a little bit in the study that we're doing right now and looking at how large the resource is in the summer versus the winter because you need it more in the winter and the spring and there is more load available in the summer, at least right now. And so that's a bit of a problem.

That problem starts to go away as you start to electrify space heating in particular. And we find that once you have a decent amount of electrified space heating, suddenly you have this space seating resource that you can move around as well. And so the seasonality, seasonal variation in your resource becomes less at that point and

you're shifting loads at different times of day but you're -- you're able to do -- you're able to do a little bit more.

So that is an issue, it's -- but it's something that will mitigate as we move in the direction we need to move in to some degree.

MS. WOOD: So, yeah, good question. Mostly I've been focusing on residential customers for building electrification purposes. So, you know, as our studies show, you know, electrification does flatten out, seasonally flattens out at the grid level at least. So that's a good thing. So yes, it gives us an opportunity to see how we can shift the winter loads as well.

One thing that keeps coming up in the work that I'm doing is, you know, we talked -- my slides were mostly using water heating as examples of shifting. But you can do this with space heating and cooling. And -- but it starts with significant energy efficiency. So it starts with a tight building envelope. You go and retrofit, add, you know, insulation. You know, tighten up the envelope. And you can use your home as storage. So I think there's a lot of opportunity there. I think there's a lot of education that needs to happen and start with funding -- continue to fund that energy efficiency that will allow the home to be a battery.

COMMISSIONER MCALLISTER: Have you gotten any

feedback from customers about their sort of tolerance for, you know, taking over some of the control of their HVAC units?

MS. WOOD: The control piece, I guess I don't know that we've gotten direct feedback on the control piece. We still have, you know, couple of hundred thousand customers on somebody's account plan. We can basically -- we -- in hat program we do give them the option of a couple of different options where they can opt out of events or have a 50 percent cycling. They go for the money and so they -- they're fine with us turning -- 90-some perfect will go for the money. So they're fine with us turning that off.

I mean, it boils down to comfort. And so, you know, if you use the house as a battery, if you can make it so that they're not inconvenienced in any way, then you can pay less. And I -- I don't know the specific answer, but I suspect if we get over the comfort issues, you know, we might be able to get over the control issues too.

COMMISSIONER MCALLISTER: Okay. Thanks.

MS. BEST: With respect to the question about what technologies are likely to save the most, I don't have a good answer on that yet. But I would make a plug for doing actuarial analysis on what types of programs and interventions we've had in the past, having led measure verification at the PUC.

In optimizing and prioritizing our evaluations there, we really focused on parameter level updates and I think we need to shift back to doing more actuarial analysis on whole billing interventions so we can see what sorts of technologies are driving those savings.

And then when you have that imbedded in the programs and you have flexible program designs that are more performance based, you can adapt to what things are working and combine them with behavior plus technologies, et cetera, to try to optimize as you're going rather than trying to optimize based on a report that comes a few year after the event.

COMMISSIONER MCALLISTER: Have you gotten to the point of being able to talk to investors about what projects are going to be the ones that are most bankable?

MS. BEST: I have not.

COMMISSIONER MCALLISTER: Well, I mean, you're sort of the community that's creating the sort of transparency into project impact.

MS. BEST: Right. I would say it's still in the fairly nascent stages. But definitely talking with implementers as they're designing their program interventions and where they're likely to put their investments doing a lot of we called them back casts, so looking back on programs that have worked and then thinking through how you might want

to modify them based on the meter based results.

COMMISSIONER MCALLISTER: Thanks.

MS. BEST: Uh-huh.

MS. RANDOLPH: I guess I'm just trying to think about how to phrase this question. This kind of goes back to what -- was it David? Yeah. From U.C. was saying about sort of as -- as users are weighing their what they were going to spend their dollars on, how do you sort of recognize the value when it's incremental spending that they're not necessarily going to be able to recover very quickly.

And sort of how do you entice customers to think about shifting their load at a -- particularly for residential customers where they're not necessarily going to see a huge bang for their buck, they're going to see a small bang for their buck, but they're not necessarily going to see a huge bang for their buck.

So, Kevin, I'm sure you guys in looking at your residential programs have been trying to think about how do you get that, the sort of -- you always get the early adopters who want the cool, new way of doing things. But how do you move past the early adopters?

MS. WOOD: Yeah. I mean, it's interesting in the case of our summer discount plan. So that's been a program that started way back when we used it just for reliability. And so we -- and we -- you know, paid well and we didn't use

it very much. So we did get quite a lot of -- over 400,000 customers I think or at least over 300,000 customers on that. It's dwindled since we've been using it.

So it's really just what is it worth to me? Like, what -- I mean, that's just the bottom line is what is it worth to me? So it kind of goes back to making it the least inconvenient as possible, the least noticeable as possible. And batteries are great. They're still really expensive. But any time you can kind of use that sort of battery type of technology where customers are indifferent, they don't notice it. So that's -- you can pay less. I mean.

And then, of course, you know, you get the early adopters and you know, get climate, you know advocates and so that's a population. And then hopefully, you know, what we see is, you know, like in solar, the price of things comes down, the installation cost comes down as he supply chain gets used to installing things so the costs comes down. You make it as convenient for customers as possible not to notice, you know, on a load ship scenario and then you can pay less.

COMMISSIONER MCALLISTER: Do you see any potential, this is Kevin as well, do you see any potential in -- so there's a bill that's in the legislature right now and I haven't gotten an update in the last few days but SB49 would Nancy Skinner's bill would sort of increase our authority to

focus on demand responsiveness and use devices. Okay. So and hopefully create a clear path to kind of get around federal preemption on the efficiency side by, you know, quantifying some new functionality that isn't preempted. Right? So I think -- let's see how to phrase this.

Do you -- so if we had say every HVAC system that came into this state had demand responsive responsibility incorporated it in from the get-go. What do you think Edison could do with that? Like, if you there was -- you knew you were going to have 100,000 of these units just rolling out over the next few years.

MS. WOOD: Uh-huh.

COMMISSIONER MCALLISTER: You know, how would that help your program?

MS. WOOD: Well, we would definitely hire Carmen to do some analytics for us to make sure we targeted users that we could get load shift from.

Yeah, I'd have to give that some thought. I mean, really, you do. You would, you know, we wouldn't necessarily ask -- well maybe we would. I don't know. I'd -- I'll have to give that some thought. Analytics, for sure, we would want to know where we're deploying these things. How we get -- it's a great -- it's a great thing to think about having the ability to do that. It's just have it there, it's already ready, it's load shift ready. Right.

So that's -- that's a great thing to think about. How we would get customers to adopt and allow us to load shift. I'd have to think about it, I don't have a good answer for you right now.

COMMISSIONER MCALLISTER: I mean, we've had this chicken and egg kind of problem, right, where we want to do more demand response but there has to be some value that somebody can go sell. Right? And it's much easier for him to go sell it if they had this ready, you know, population of potential participants.

MS. WOOD: It's a dream, yeah.

COMMISSIONER MCALLISTER: And so I guess, you know, when we get sort of rates that are maybe more aggressively TOU or real time, then we'd have the canvas right there to paint on.

MS. WOOD: Yeah, yeah.

COMMISSIONER MCALLISTER: So anyway, that's kind of the vision and it would be good to have people's thoughts about how it would -- how that could roll out in practice.

MS. RANDOLPH: The other interesting thing is sort of making sure that as these opportunities become available that they're adjustable in terms of when as we are seeing the changing before our very eyes, just sort of making sure that the products are either controllable by someone on, you know, that's not the customer or, you know, a situation where

you're not dependent on what we told you we wanted to do this kind of behavior a year ago but now we actually want you to do that kind of behavior.

And we're already kind of seeing that with the -- like the batteries in people's homes, they're not really using them the way we would like them to use them. And so sort of -- building in that flexibility I think is really important.

MR. HUNGERFORD: I think we have a few more minutes and so I'm going to ask one more question of the panel and then ask the dais to jump in.

COMMISSIONER MCALLISTER: Hey, David, I just want to remind people if you do want to make a public comment at the end, fill out a blue card. I don't know if we were totally clear about that. I think Heather might have said it at the beginning but I only got a couple of blue cards so please do fill one out if you want to talk.

MR. HUNGERFORD: Okay. And I'm going to try to focus this on action and say what action should we begin taking now including research and development policy, rate design, infrastructure investment, and potentially load management regulation to anticipated meet flow -- load flexibility needs as we continue on the path towards decarbonization?

Still taking notes? Do you want me to review?

I can. What action should we begin taking now to --

including R&D, policy, rate design, infrastructure investment, load management standards to meet the flexibility needs as we continue down the path towards decarbonization. When we're not going to have wind blowing or sun shining some of the time.

MS. BEST: So I would reemphasize my points. We need to go foot to the floor on a common valuation structure that can help reconcile the value across the different resources so they can all come to the table as together.

The other one is meter everything. I think there's -- it's a no regret strategy to just be quantifying changes in consumption across the state using that for the load forecast, using it for targeting, using it for integrating with benchmarking and other analytics that are going to be really valuable to tell the story of where the biggest bang for the buck is going to come from.

And then the last one is reinventing our goals and potential frame works so we can be focusing on consumption analytics that tie DR and EE together and other DERs as well. But maybe baby step with the DR EE goals and potential analysis that's more consumption based.

MR. GERKE: Feel like getting creative about ways to -- this sort of follows up on the comment that Commissioner Randolph made at the end of the previous question.

Getting creative about ways to give people incentives that are flexible in terms of what behavior do we want you to do at which time because that's going to change throughout the year seasonly and also it's going to change over time. And, you know, TOU rates are a great sort of first step at trying to get load shifting but the rate setting process is complicated and takes a long time. And generally is going to be behind the curve on that.

So finding ways to present people with an incentive to do the thing that you want them to do now, not the thing you wanted to do two years ago is going to be important and it's challenging. And just to plug the load shift working group report. Again, we spent a lot of time thinking about ways to do that.

One way is to try to integrate with the wholesale market which is so very real time, others are to try to create programs that are opt in that give people what would effectively be a time of use right that could change throughout the year that they could sort of choose to bring in as an additional incentive. It's not really a rate, but would act in that same way and actually lie to request behavior so people have the right technology to be that flexible.

MS. WOOD: I'm not sure I have a lot to add. I do love the idea of sort of DR ready or flexible ready loads,

especially the big loads. You know, I'll just say I never used to think that we should educate customers about the complicated energy economics but we're probably going to have to go there. You know, just a little bit make it simple because I agree with the even the TOU rates they are now caught up with the old duck curve but pretty soon it will be a different curve and so then they will be outdated again.

And people -- customers don't like real time surprises. So. You know, it just doesn't work. So, you know, try to -- try to go for, you know, storage as much as possible which lessens the impact of -- of flexible loads and educations for customers.

COMMISSIONER MCALLISTER: All right. I think we're probably out of time for this panel. Don't need see -- anybody have any questions? No? All right, great.

Thank you all so much, that was super interesting. Appreciate it.

All right. All right. Well, thank you for your responsiveness on the blue cards. Let's see. Okay. So I have a number, maybe six or seven blue cards now. And I'll just kind of go roughly in order.

Michael Boccadoro, is that it? From the Agricultural Energy Consumers. Hey, Michael, how are you?

MR. BOCCADORO: Thank you. Michael Boccadoro, behalf of the Ag Energy Consumers Association.

Just very narrow comment today on one specific issue. I think as the commissioners know that the Ag Energy Consumers and others are very supportive of biomethane capture and utilization in California. We're strong supporters of at least that version of renewable natural gas.

Its use is best in transportation. And so my point today in the staff's presentation, I think in Michaels Colvin's presentation references to using renewable natural gas as a replacement for fossil gas in the industrial sector, we don't view that as a viable option.

Renewable gas in California, biomethane in particular, is very expensive. Hydrogen's more expensive than that. Synthetic natural gas even more expensive than that at this stage. It's 5, 10, or 15 times more expensive than fossil gas. That's not an option in heavy duty industry that's utilizing a lot of fossil gas to produce heat. We have to compete.

When you look at the steel industry, the food processing industry, the glass industry, and other heavy users on the industrial side, if we can't compete, we won't be in the state. And so that's not a solution for us. We think there might be some other solutions, we're looking hard at solar thermal as a way to reduce our natural gas use. We're starting to look at solar -- or excuse me, carbon capture and sequestration. So continued use of gas with

capture on the back end through our systems. And so those appear to be much more economically viable as we move forward. They're not viable today, but they will be long before $10, $15, $30 natural gas or renewable natural gas.

So we just want to make sure that Commissioners are aware of that, that concern within the industrial sector.

Thank you.

COMMISSIONER MCALLISTER: Thank you.

Nehemiah Stone.

MR. STONE: Thank you for this opportunity. Nehemiah Stone with Stone Energy Associates.

I have a few comments. One is on timing. In looking at the most recent IBBB report, it's urgent that we move really fast. And I would recommend that it's better to make some small mistakes and fix those later than to wait and that'd be a bigger mistake.

And also in terms of timing, one of the things I didn't hear at all today was about resiliency. And particular with the low-income community, the resiliency of the energy structure is really important. Microgrids might help with that.

The second thing I wanted to say is that benchmarking won't tell you what you think you want to know about multifamily. When you take a look at the difference between the energy use and these different buildings, you're really

not going to know how much of that is because this one has two elevators or because this one is full of small apartments and this one has a few -- has fewer large apartments. So be careful about relying too much on what you see from the benchmarking. It's a broad brush, it'll give you some information, but there's an awful lot it doesn't say.

Also, one of the things that Carmen mentioned was that you should focus on the -- on where the biggest -- you're going to get the biggest bang for the buck and avoid where you're going to get the negative savers. One of the things I want to point out is a lot of the quote "negative savers" -- a lot of the negative savers are low-income households. Could not afford the energy efficiency, could not afford the comfort level that they should be able to afford. And once you fix their buildings, they're going to -- they're going to take back some of that. That doesn't mean you shouldn't focus on them.

Fourth, I would like to recommend that that 30 percent for low-income household is a bottom, not -- not a target and that you actually may -- you may find it more cost effective to invest 70 percent or more on a low income because the higher income households will do it themselves once the market has changed and the market will be changed with that much investment on -- on low income.

And then finally, the coordination that I'm seeing

between CARB and the Energy Commission and the PUC and ISO is great but it doesn't go far enough. If you really want to make a difference, the biggest investment in affordable housing comes through LIHTC and from HCD. And they need to be at the table. You need to be working very closely with them. They produce -- they fund the production of an awful lot of multifamily housing. And at this point, they don't have the same recognition you do of the importance of energy efficiency and decarbonization. And they need to hear from you how important it is since they are such a large sector.

Thank you.

COMMISSIONER MCALLISTER: Thanks a lot.

Deanna Haines.

MS. HAINES: Hi. Deanna Haines with SoCal Gas.

Wanted to address a couple of the issues that we're talking about today. One of them had to do with the public health concerns and indoor air quality. I raised this issue at the CPUC workshop last month.

And there's a study out by the University of Texas that is looking at indoor air quality, and they found that toasters are pretty -- pretty -- pretty bad in terms of the indoor air quality, depending on how you list your toast, you know. If you like it a golden brown, that's better. If you like it a little bit more burnt, that's worse. But they can emit up to three to four thousand parts per million of

particulate matter.

And it's -- it's something that surprised the -- the key thing is that the active cooking is actually what is creating a lot of the indoor air quality problems and inadequate ventilation in the home.

And this is consistent with the California Energy Commission's own research. You guys just had a look at with Lawrence Livermore Berkeley Labs a look at the efficacy of the codes around mechanical ventilation in the home and found that this latest study showed that there's overall, you know, lower emissions in the indoor quality with the new codes around mechanical ventilation.

And the new homes that they tested were learning mainly natural homes. And that they improved over the last study which was mainly electric ranges. And so he air quality in the home has improved dramatically from ten years ago when they first did the study and it's mainly because the mechanical ventilation aspect.

So I just want to put that out there that we have to be careful about, you know, what we say. We need to look at the research about indoor air quality and pay attention to the facts before we jump to conclusions around that.

The other issue I wanted to raise was that Guido had talked about this new GAPL study that showed a seasonal variation with natural gas consumption. GTI is talking to

the author of that study. It looks like they didn't consider a natural phenomena that happens between the summer and the winter where in the summer there's a natural methane sink that occurs because of the higher temperature and the hydroxyl radical. I don't want to be too, you know, technical here. But it oxidizes the methane much more in the summer, that's why you see less methane in the atmosphere in the summer versus the winter.

So there could be some, you know, real, you know, plausible explanation. It's not a foregone conclusion that this is related to natural gas consumption.

COMMISSIONER MCALLISTER: You're at three minutes. Maybe you could submit the rest of your comments.

MS. HAINES: Okay. Thank you very much.

COMMISSIONER MCALLISTER: Thank you very much.

Pierre Delforge.

MR. DELFORGE: Thank you. Pierre Delforge with NRDC. I'll just provide a brief comment with some detail comments in writing but I wanted to provide one comment ahead of time.

First I'd like to commend Commission -- the Commission's staff for the breadth and depth of the discussion today. It was really very useful and I think, you know -- well, very useful to be able to have a discussion ahead of our comments so I'll leave it there.

The comment I wanted to provide is around AB 3232,

the Friedman Bill that you mentioned. And it seems to me that I'd like to suggest that there was a scoping memo released very quickly as an opportunity for public comments and input similar to what was done with SB 1477. There's a lot of different aspects to this bill that would benefit from having early input so that if there are no data gaps or no analysis that need to be performed, we have time and stakeholders and the Commissions have time to initiate and perform these data collection or analysis in time for satisfactory completion of this study.

I'm encouraged with the workshop and the baseline issue, I think it's an important issue but there are other issues --

(Interruption in Comment)

COMMISSIONER MCALLISTER: I think we're being hacked by the Spanish.

Sorry, Pierre.

MR. DELFORGE: So anyway, I was --

COMMISSIONER MCALLISTER: Thanks a lot, sorry about that. Don Quixote, that could have gone on for a while.

Go ahead.

MR. DELFORGE: I was nearly done. I just wanted to make a point that baseline is one important issue and all the issues in terms of the approach, the modeling, the data, that would be beneficial to discuss before we launch into the

study.

Thank you.

COMMISSIONER MCALLISTER: Thanks a lot.

Lauren Cullum.

MS. CULLUM: Hi, I'm Lauren Cullum on behalf of Sierra Club California.

Thank you to CEC, staff and Commissioners and stakeholders for this timely and important workshop. We appreciate the update on AB 3232 and recognize that charting the path to a 40 percent reduction in the building sector is a significant scope of research.

Given the limited number of years we have to clean up the building sector, we urge CEC to set an earlier deadline than mandated by the legislation for completing the study. Ideally with the final report by the second quarter in 2020.

E3's research and several other study's fine but the longer we wait to decarbonize buildings, the more costly it will be for California and rate payers. Legislatures, the governor's office, and agencies are waiting on the CEC's assessment to establish needed building decarbonization mandates, policies, and programs.

I the CEC completes the report in 2021, this could delay legislative and agency action making it more challenging the needed reductions by 2040. The experts in the room today plus many others are eager to work with the

CEC staff to complete the feasibility assessment for AB 3232.

We also appreciate the considerable amount of work and good thinking that went into the Energy Efficiency Action Plan -- and this -- the Energy Efficiency Action Plan and this opportunity to weigh in.

We agree with the -- Commissioner McAllister's comment earlier to include a high energy efficiency decarb sensitivity analysis and the policies needed to achieve that pathway. The EE action plan shows that while we can achieve SB 350's doubling in energy efficiency, this achieves less than half of the greenhouse gas reductions needed by 2030. This is a noteworthy finding that requires our attention. While there are many important recommendations in the report, we feel the report should have a more precise focus on actions the CEC has the authority to take, specifically on new construction.

The main role CEC can have in building decarbonization is to stop making our gas problem worse. California builds over 70,000 new units a year. A third of the buildings that will be standing in 2045 will be built between now and then. The CEC needs to use existing authority and modify the state's building code to favor or require all electric construction that can achieve zero emissions as the grid moves toward 100 percent carbon-free electricity.

This is the time to modify Title 24 2022 code and the 2019 ACM to be aligned with our climate goals and the energy efficiency goals in SB 350.

We've heard today about the significant barriers in reaching renters and low income. All the more reason to make sure every new multifamily building is built with the climate, energy efficiency, affordability, health and safety in mind.

Lastly while we understand the building -- the benefits of listing some new recommendations, we think it would be advantageous to highlight the top one to two action items per agency to ensure the agency's focus on mission critical policy or forms. It will move the market, accelerate decarbonization and prioritize low-income residents. We encourage tracking all these action items, not just the low-income action items.

We'll be providing more detailed recommendations in written comments.

Thank you.

COMMISSIONER MCALLISTER: Thank you.

George Nesbitt.

MR. NESBITT: George Nesbitt, I'm a HERS Rater.

You wanted a bold vision doubling our energy efficiency goals, doesn't cut it. It doesn't get us there. We know we need much deeper reductions. And we know that

even in new construction, the difference between well-designed, well-built commissioned buildings and not has significant differences in energy consumption.

We know how to greatly reduce energy use in existing buildings. It's harder, it's more expensive, depends on how far you want to go. We know how to do it. And every day it's being done. It's just that we are not achieving as much as we could.

So anyway, I think that's all I'll say today.

COMMISSIONER MCALLISTER: Thanks, George.

So final blue card, Greg Sutliff.

MR. SUTLIFF: Hello. Want to also say thank you to the staff and to the Commissioners for making this possible for all of us. The exchange of information here today is fantastic and kind of pulls a lot of different, stakeholders and the process together in one room to listen to each other.

One of the things that I really wanted to emphasize was to not lose track of energy efficiency too quickly. This is an apropos comment you made before which was simply to say, you know, decarb is the solution to our -- our -- the problems that we face. I know that I'm probably speaking to the choir in terms of exhorting everyone to not -- not lose track of energy efficiency but energy efficiency really does deliver immediate benefits to every single stakeholder that's involved in that process, whether it's the contractor that

creates jobs for energy efficiency, whether it's the homeowner or the building occupant that obtains the benefit of reduced heating, cooling costs, dramatically improved indoor air quality which was something I was really happy to hear everybody talk about was the -- was the indoor, the IAQ benefits to the building occupants themselves.

This comes not just from the reduction of using greenhouse gases -- or excuse me, using fossil fuels for heating and cooling but also from the air sealing that the thermal boundary, the home which prevents that infiltration of particulate matter in VOCs, from the attic, and the from the outdoor air. So the outdoor air quality.

So the benefits for energy efficiency accrue to so many different stakeholders. Most importantly and within this context, the state in driving down greenhouse gas production. And that's where this issue of scale really can be addressed at the -- at this level. We can incent homeowners on an individual level to make energy efficiency improvements to decarb their homes, but until we start doing these things in the hundreds of thousands and the literally millions of single family homes in other buildings, existing buildings. In the state, we're not really, we're just achieving small incremental gains that are difficult to track and have a -- and can't be easily quantified.

So regulatory changes at this level is where we're

really going to achieve the energy efficiency gains that benefit the existing building owners and stakeholders and also create a building stock that going forward that are going to hit our 2050 emission goals or requirements.

I'd like to thank Commissioner McAllister and Bryan Early for their help with a couple of projects that we've been working on in the Coachella Valley through the AqMB which was a -- we've had several different phases of the projects that are going on but we did 2100 homes in a retrofit that has generated significant data in terms of what simple energy efficiency tasks can do for the overall energy consumption for those sites.

So thank you for that, really appreciate it and I hope to see some more information coming up from those studies.

Thanks.

COMMISSIONER MCALLISTER: Thanks a lot. Anybody else want to take the opportunity to speak, make public comment? That's all of the blue cards that I've got.

So we're going to hit 4:00. I know Commissioner Randolph has to go. So I want to just give us on the dais an opportunity to make any wrap up comments that you might want to make and then we'll go over the details of comments and those sorts of things and then we'll wrap it up.

So Edie.

MS. CHANG: Well, I want to thank you again for inviting CARB to participate and thank everyone who participated, the panelists and all of the folks who came. This is a really interesting discussion, got much more in-depth than we usually do in the Air Resources Board. But, you know, from our perspective buildings we saw a slide earlier, they're about a quarter of the greenhouse gas emissions and it's critical that we make progress in this area if we're going to meet our long-term greenhouse gas goals and I think this is -- it's a really good robust discussion that I think helps inform the IEPR and will help us move forward on it.

So thank you.

MS. RANDOLPH: And I just want to thank all of the presenters and appreciate the comment about sort of widening our scope of interagency interaction beyond just, you know, he energy agencies, environmental agencies and thinking about ways that we can reach out and pull some of the other sectors into some of this big picture policymaking as we look beyond just our current programs and thinking how we could scale up this effort to increase our goals.

And also continuing to think about the best ways to interact with local governments. We're doing all -- trying to do that as much as possible in the building decarb proceeding and we want to increase that effort as well.

So thanks everyone for their participation today.

MS. MONAHAN: Yes, well, I don't want to just repeat what you guys said. This was such a meaty conversation, or if we're vegetarians, I don't know filled with leafy conversation.

MS. RANDOLPH: It's a quinoa.

MS. MONAHAN: Arugula. And I just thought the discussion around, you know, what is our goal? Is it efficiency, is it decarbonization? How do these work together? What are the distinctions? Was just fascinating and I think that's where we're going. And this idea of fuel switching efficiency? What does that mean? I mean, we're wrestling with big questions that I think, you know, California's really at the cutting edge of evaluating these. And so I've just appreciated the depth of conversation. And now I'm very curious about what a DER ready device looks like and how do we make sure again as we electrify transportation we're trying to figure out the smarts be on the car or should they be on the charging device? How does this work? How do we aggregate? You know, we need to think big about making sure that we have this ready set of DER ready devices that are consumer friendly. Because a lot of them, it's hard as a consumer to figure out what to do.

So, yeah, thanks everybody, thanks to staff, thanks to all the presenters, thanks to everybody who came and who

was here all day listening in. It was really great conversation.

COMMISSIONER MCALLISTER: All right. Well, thanks to my colleagues on the dais for sticking around all day and really all of you in the audience for being here till the bitter end.

You know, we didn't talk about jobs a whole a lot today. And, you know, I think it brought up in the comments a little bit. You know, there's this report that happens every year called the U.S. Energy and Employment Report. And last year's report showed that in California -- it's a nationwide report but in -- it includes fossil and, you know, kind of all the energy sectors but it showed that clean energy in California basically produces about 400,000 jobs. And of those about 300,000 or so, a little more are energy efficiency.

So as this definition of energy efficiency more becomes, you know, kind of more inclusive of low flexible and all these technologies we're talking about, transportation, install, you know, we're including that in the next update. You know we've got to really focus on transportation, the clean transportation sector.

You know, imagine -- in California imagine tripling that to over a million. I mean, and having a lot of those jobs be in the communities that, you know, the low-income

communities and the disadvantaged communities that -- where the jobs, where the projects need to happen. Well, the jobs can be right there in those communities. So just think about the positive synergy to that to our economy and just our sense of equity in the state. You know, that -- that is almost, that is really a crisis. I mean, I think we talked to the climate crisis, but there's a -- there's an equity crisis.

And so I think, you know, we need to really think holistically about this, you know, I think far beyond what we're accustomed to.

So in any case, I want to thank all you for coming and looking forward to your comments. I think we -- it was very, you know, I'll call substantive and but I think we really only scratched the surface in a lot of ways and we've got to keep going with this conversation and totally agree that we need to pull in the other agencies that have, you know, fingers on this.

So with that, I'm really looking forward to your comments. Heather -- yeah, here we go, September 10th their due. And thank you all for coming.

Anything to add, Heather? All right. Thanks everybody, we are adjourned.

(Thereupon, the Hearing was adjourned at 4:03 p.m.

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

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IN WITNESS WHEREOF, I have hereunto set my hand this 4th day of November, 2019.

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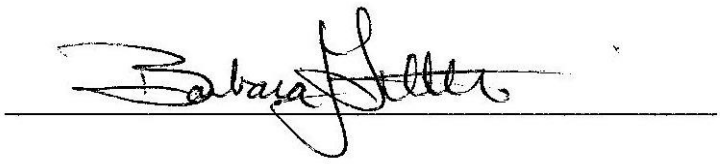

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