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STATE of CALIFORNIA

CALIFORNIA ENERGY COMMISSION

In the matter of,	)	
	)	Docket No. 21-IEPR-06
2021 Integrated Energy Policy	)	
Report (2021 IEPR)	)	Re: Energy Efficiency:
	)	The Role of Energy
	)	Efficiency in Building
_____	)	Decarbonization

IEPR COMMISSIONER WORKSHOP ON THE

ROLE OF ENERGY EFFICIENCY IN BUILDING DECARBONIZATION

REMOTE ACCESS ONLY

TUESDAY, AUGUST 24, 2021

SESSION 1 OF 2: The Importance of Energy Efficiency

9:30 A.M.

Reported By:
Elise Hicks

APPEARANCES

Commissioners Present

J. Andrew McAllister, 2021 IEPR Lead Commissioner

Patty Monahan, CEC Commissioner

Siva Gunda, CEC Commissioner

Clifford Rechtschaffen, CPUC Commissioner

Darcie L. Houck, CPUC Commissioner

Also Present

Jessica Granderson, White House Council on Environmental Quality, Executive Office of the President

IEPR Team

Heather Raitt, CEC, Assistant Executive Director, Policy Development

Raquel Kravitz, CEC, Host

Denise Costa, CEC

Stephanie Bailey, CEC

Staff Present

RoseMary Avalos, Public Advisor's Office

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APPEARANCES

Panelists Panel 1

Ken Rider, CEC, Moderator Panel 1

Steve Nadel, American Council for an Energy-Efficient Economy (ACEEE)

Pierre Delforge, Natural Resources Defense Council (NRDC)

Geof Syphers, Sonoma Clean Power

David Jacot, Los Angeles Department of Water and Power (LADWP)

APPEARANCES

Panelists Panel 2

Jessica Allison, CPUC, Moderator Panel 2

Coby Rudolph, CPUC

Ingrid Neumann, CEC

Eric Cutter, Energy & Environment Economics (E3)

Public Comment

Sean Soni, SoCalGas

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P R O C E E D I N G S

AUGUST 24, 2021 9:30 A.M.

MS. RAITT: All right. Well, good morning everybody and welcome to today's 2021 IEPR Commissioner Workshop on the Role of Energy Efficiency and Decarbonization.

I'm Heather Raitt, the Program Manager for the Integrated Energy Policy Report, or the IEPR for short.

This workshop is being held remotely, consistent with Executive Order N-08-21, to continue to help California respond to, recover from, and mitigate the impacts of the COVID-19 pandemic.

The public can participate in the workshop consistent with the direction in the executive order.

Today's workshop has a morning and afternoon session, with different log-ins for each.

To follow along, the schedule and slide decks are being posted on the Energy Commission's website. They're not there now, but they will be there shortly.

All IEPR workshops are recorded and a recording will be linked with CEC's website shortly following the workshop. And then, a written transcript will be available in about a month.

Attendees have the opportunity to participate today in a few different ways. For those joining

through the online Zoom platform, the Q&A feature is available for you to submit questions. You may also up vote a question submitted by someone else. To do that, click the thumbs up icon. Questions with the most up votes are moved to the top of the queue.

We'll reserve a few minutes near the end of the panels to take questions, but likely will not have time to address all the questions submitted.

Alternatively, attendees may make comments during the public comment period at the end of the morning and we'll have another one in at the end of the afternoon session. Please note that we will not be responding to questions during the public comment period.

Written comments are also welcome and instructions for doing so are in the workshop notice, and written comments are due on September 7th.

And with that, I'll turn it over to Commissioner Andrew McAllister for opening remarks. Thank you.

COMMISSIONER MCALLISTER: Okay, thank you very much, Heather.

I want to thank everyone for attending. This is going to be a great day, I've really been looking forward to this. And I want to thank Heather and your team, just for just all the competence and, you know,

just volunteerism, and professionalism, and just excitement that you bring to all of the IEPR topics, and certainly the ones this year, you know, your team just really shines. It's amazing, you make it look easy and we all know that it's just not easy. It's actually really challenging sometimes to put these high quality workshops together. So, thank you.

And also to Division staff, in the Efficiency Division for this day today, and there's another workshop on Thursday. So, today we're looking at energy efficiency, specifically, and I'll make a few comments to sort of locate that topic in the grander scheme of things.

On Thursday we're having a workshop, just so that everyone here knows, on Embodied Carbon in the morning, and then HFCs, hydrofluorocarbons, in the afternoon. Those are two really key elements for our carbon transition, our global warming gas reduction. You know, embodied carbon is important, just an expansion of the discussion really into that area, which is taking on more salience. And then HFCs, you know, much of the topic today, the conversation today will be on the proliferation of heat pumps, and so HFCs come along with that and we really need a strategy in reduction, to reduce. So, we're going to talk about

that on Thursday.

And then, on the 10th of September, we're going to have a workshop on Existing Buildings and Quality Installations. So, the existing buildings are obviously a really huge topic that will definitely come up today. But, you know, really we're going to dig in on the 10th and looking at how we get high quality installations.

So, that's sort of the trajectory of the next few IEPR workshops on building decarbonization.

I'll note for everyone's attention, as well, tomorrow there is a hearing in the Assembly, Utilities, and Commerce Committee, Assemblyman Chris Holden's Committee, on existing buildings, decarbonizing the existing building stock in California. So, tomorrow afternoon look out for that. And that will be streamed on YouTube, I think, or on the channel, on the Assembly's channel.

So, with that we have huge challenges ahead of us in our transition to a carbon-free economy. We also, luckily, have a lot of great technologies, a lot of great programmatic solutions and policies that really are nudging us ever more strongly in that direction.

And, you know, we're doing a lot in California to transition to a clean energy economy and a carbon-free economy.

I'm really happy to be joined by several of the Commissioners, both in our Commission, at the Energy Commission, and also the Public Utilities Commission that are leading various aspects of that transition. And I believe we have Commissioners Gunda from the Energy Commission and Commissioner Houck from the PUC.

Have any of the other Commissioners on this list here joined us, Heather? Commissioner Monahan or Rechtschaffen?

MS. RAITT: Not yet. They may be joining later.

COMMISSIONER MCALLISTER: Not yet, okay. Okay, great. So, hopefully, they'll have a chance to join us as well.

You know, so we're doing a lot to transition our economy. We're also -- you know, we're facing incredible challenges. Everyone who's listening in and certainly all of those of us on the dais, and on the staff of the Commissions, just I think feel a palpable and increasing sense of urgency to get it done. You know, to really try to lead to the best of our abilities in our particular areas of responsibility and oversight to, you know, really face this challenge. We're in a moment where there's an incredible amount of creativity coming to this space. And that's in response to the just spectacular urgency that we have. You know, the

heat waves, the fires, the droughts, all of these resources that over the -- you know, over the -- in our lifetimes we've really taken for granted.

And we have to question it all and we have to really plan in new ways. We have to come up with solutions that allow us to embrace this breadth of uncertainty that we're facing really every year, it seems, increasingly. You know, just at every scale, really. You know, globally, nationally, regionally across the west, at the state level here in California, and down to the county, and city, and locality. You know, neighborhood and community levels.

And then all the way down, you know, if you think about the challenges that individual families and residents face. We just have an overlapping set of concerns that all of us face every day at different levels, and sometimes it's hard to kind of keep our heads around it.

And I think the one constant in energy policies throughout the course of my lifetime has been energy efficiency. You know, doing more -- doing, you know, at least as much, but really doing more as our economy grows with less. You know, our per capita energy consumption has remained roughly constant as our, you know, as our economic activity has grown, as our economy

has grown and flourished.

And so, energy efficiency really was a driving force behind the formation of the Energy Commission in the first place, in the 1970s. Building standards, appliance efficiency standards and that has remained, really, the constant I think, the -- a core component, a core part of the identity of California in the clean energy sphere.

So, many of you know we adopted the new building standards for 2022 and are pushing those over, now, to the Building Standards Commission so that they can approve the whole building standards update in December. And that was a big step forward in terms of our pivoting our buildings to a low carbon and clean energy future.

So, the focus of the building standards is largely new construction. So, again, the existing buildings are really key. That was a huge step forward and I think, you know, we'll sort of continue that conversation today in the context of energy efficiency specifically.

So, we have two statutory -- I'll just set up this conversation, just for everyone's kind edification here. The reason we titled this workshop the Role of Energy Efficiency in Building Decarbonization is that we really have two statutory goals that are complementary,

but they're not actually the same thing.

Over time, you know, we've had increasing efficiency aspirations and so the SB 350 doubling of energy efficiency goal is one that we've assessed a couple of times now. We've done a lot of analysis on the electricity side, on the gas side, and we've sort of projected forward where we think we're going, how many resources will be necessary to kind of get to a doubling.

And so, we've, you know, been planning for this doubling of efficiency savings, trying to figure out what that would take.

In the meantime, you know, more recently we have carbon-based goals for the transition of our energy economy, so that's a decarbonization goal. And SB 100, I think is the most sort of salient definition of what that means. And then, we also have the executive order that is economy-wide decarbonization by 2045.

So, energy and carbon, as we transition to decarbonized energy systems, energy efficiency and decarbonization, they kind of head in the same direction. You know, we're sort of sailing towards similar waypoints, but they're not exactly the same waypoint.

You know, as we decarbonize our electric system

and as we shift away from fossil gas to electricity, energy efficiency doesn't necessarily come along with every step of that path.

And so, part of the goal today is to kind of unpack that and understand, you know, where efficiency and decarbonization most -- have the most synergies. And certainly, we can call out heat pumps as an example of that, where they're inherently efficient, and they are electric and, therefore, piggy-back on the cleaning up of our electric grid.

But we really wanted to dig into that and sort of redefine the efficiency doubling goal in terms of carbon. So, we've shifted our metrics, the way we gauge cost effectiveness and energy efficiency more towards a source energy metric that aligns with carbon pretty well.

So, as we make that shift, we want to make sure that we're reflecting that in the SB 350 doubling goal, and doing it in a way that is sort of internally consistent.

So, a little bit of the conversation today, the framing of it is pretty California-specific because it really does respond to two statutes in California. But I think it's also helpful to really think about how we can both increase our energy efficiency which, you know,

decreases the overall scale of our clean energy problem. Right. If we decrease sort of the demand of energy, then the investments we have to meet that demand go down. I think we've seen that in the SB 100 analysis, that energy efficiency and even load flexibility as it comes alongside energy efficiency can actually decrease the unit cost of electricity. You know, the kilowatt-hour cost goes down at the margins with better efficiency and more flexibility.

So, all of these -- these are kind of new topics to some extent. The ability that we have to be flexible with our demand, with our loads is something that the digital economy really enables. And the technology costs are coming down to be able to automate and do communications and controls, you know, down to even the appliance level, certainly the building level.

So, we can leverage all these technologies to provide services to consumers and businesses in a way that does manage costs. That does not, you know, compromise the level of service in any way, but that does make it relevant and responsive to the grid needs as well and, therefore, it manages costs and increases reliability.

So, efficiency redefined can play a key role in this evolution. And I think we just -- today we want to

be -- we want to develop the tools and the language to be more specific about that, about that synergy.

And so with that, I think I want to thank everyone for kind of bearing with me on that background. And, you know, this is a fairly California-specific conversation in some ways, but I think it also is just really salient as we think about the scale of investment, and the direction of the investment we need to make in the electricity grid up and down the chain. You know, the smallest demand can sort of shake hands with the bulk power issues, you know, and everything in between.

And so, I think setting up our systems, our electric system and our energy systems generally to support that idea is something we can now do, and it's really going to benefit California over time.

We have a great set of panelists in the morning and the afternoon today. I'm really excited about this.

And with that, I think I'll cede the mic and invite Commissioner Gunda and Commissioner Houck to make some opening comments.

Thanks everyone, again, for being here.

COMMISSIONER GUNDA: Thank you, Commissioner McAllister. Good morning everybody. This is just a

wonderful opportunity to discuss another important thread of this year's IEPR, which is the building decarbonization.

I think I just want to begin by thanking Commissioner McAllister's leadership on this year's IEPR, but also his decade-long leadership in energy efficiency and, more broadly, the building decarbonization.

And I'm really appreciative, Commissioner McAllister, of the way you framed the discussion today, the evolving nature of efficiency and the confluence of what we are observing between the decarbonization goals and the broader efficiency goals, and how do they make sense as we move forward in a cohesive fashion that we don't leave any of them behind, but work together.

It's always an honor and a pleasure to share the dais with you, Commissioner McAllister, and also with the colleagues from CPUC. Thank you, Commissioner Houck for being here today.

I want to take this opportunity to thank Heather and her team, and the incredible amount of work that the Efficiency Division has been particularly doing this year with the recent adoption of the Building Code, as Commissioner McAllister noted, and their continued leadership in the building decarbonization work as a

whole.

I think we have some of the, you know, nation's foremost thought leaders in this Commission and I'm just appreciative of staff's diligence and integrity in pursuing these important goals.

As Commissioner McAllister noted, you know, California has a history of leading the nation in energy efficiency. You know, we as Californians use significantly less energy, about 31 percent lower than the national average, which is definitely an indication and close to the state's policies on standards and buildings, efficiency standards for buildings and appliances.

I think a couple of things I just want to quickly note and pass it back to Commissioner Houck. As I think through the lens of reliability and then the broader system decarbonization, whether it's electric grid or the natural gas system, I think it's important to note some of the decarbonization barriers we have, especially with the buildings.

As Commissioner McAllister noted, you know, 75 percent of the residential buildings that we have were built before 1990. And by 2030, fewer than 10 percent of residential buildings will have been built following 2019 codes or later.

So, that's a lot of old stock of buildings that we really need to think about how do we decarbonize that building stock and really make them a part of the solution.

And the importance of energy efficiency is noted everywhere. It still is one of the lowest hanging fruits I know to reduce the carbon footprint of the economy as a whole. And then buildings, you know, through direct and indirect sources still account for approximately a quarter of the GHG emissions.

So, it's a very important topic. It's a very meaty topic and a topic that requires all of us to work together.

So, I just want to be thankful for everybody's participation. To the panelists for your time to be here and share your knowledge and thinking on how we can move the state forward.

Thank you, Commissioner McAllister. With that I yield to Commissioner Houck.

CPUC COMMISSIONER HOUCK: Good morning and thank you for including me in today's IEPR workshop. This is a really important issue.

I want to also thank the CEC, in particular Commissioner McAllister, for your leadership on the building code standards, and the recent adoption that

you had mentioned. That is significant progress.

I think, you know, world leaders in California and that work is largely attributed to the Energy Commission and the work that you and the Efficiency Division are doing.

I also -- you know, I don't want to repeat the comments that you or Commissioner Gunda had made, but increasing efficiency, while we're looking at how to decarbonize, particularly existing buildings, is going to be critical in meeting our SB 100 goals.

And I also wholeheartedly agree there is a sense, of you know, urgency. We are facing climate impacts. And we also need to make sure while we're going forward with our energy efficiency goals and our decarbonization that we're not leaving the most vulnerable communities behind, who disproportionately are going to be living in existing buildings.

So, looking at opportunities and programs to decarbonize and electrify existing stock is going to be very important. And I'm excited to hear the conversations today.

And I am -- Commissioner Shiroma's our Lead Commissioner on Efficiency at the PUC and Commissioner Rechtschaffen is our Lead Commissioner on the Decarbonization proceeding. I am B-K'ed with both of

them in those areas, so I'm excited to be working with Commissioner McAllister and the Energy Commission on those issues, and my fellow Commissioners. And I look forward to hearing the presentations today. So again, thank you for including me on the dais this morning.

COMMISSIONER MCALLISTER: Thank you so much, Commissioners. And I'll just make one final note before we kick off. Another complementary sort of input to this conversation, we also adopted at the same business meeting earlier this month, with the Building Standards, was the Assembly Bill 3232 Report. And that was an assessment of the decarbonization kind of pathway for our existing buildings.

And I think that's an important input to this conversation. It does sort of highlight, assesses the various strategies to get -- the various pathways, the various strategies that we can pursue to decrease the emissions related to -- you know, from existing buildings.

And, you know, it highlights some of the challenges, certainly the opportunities and challenges. In particular, you know, we're getting a better idea of how many resources are going to be necessary to pump into our existing buildings over a sustained period of time. And it's in the billions of dollars per year, you

know, globally billions of dollars per year for the next 20 years, you know. And so, that's a lot of resources.

And to your point, Commissioner Houck, about the equity piece of this, we really need to frame that topic as channeling resources to, you know, the bottom third of residents of the state that really don't have disposable income, or sort of motivation, or ability to -- ability, really, more than -- more than anything to invest in those buildings. You know, they're renters. Even if they do own the building, they don't have disposable income to make that happen.

And so, our programmatic approaches really need to focus on, you know, first of all how the state can sort of make the framework appropriate, and provide resources, but also, you know, through a handshake with private sector resources to figure out what those business models could look like.

So, those are the topics that -- a little bit today, but also on the -- on September the 10th. And also tomorrow, hopefully, in the Assembly hearing we'll be starting to make some progress there. So, hopefully, you know, that challenge of the existing buildings, which both of you have rightly highlighted, you know, it really -- it really is a -- we have a very large, diverse state and understanding that building stock in

order to target programs to the opportunities for energy efficiency is an ongoing challenge, but one we're making progress on. The data environment is improving. You know, at the Commission -- at both Commissioners, really, we're working with much better, more robust, and more granular, certainly, information to understand the building stock and, therefore, design programs that can attack the right problems in a sustained way.

So, I'm very optimistic about that. And there are a whole ton of trends that we need to, you know, keep working together on. So, I'm really gratified to have both of you and your colleagues, Commissioner Shiroma and Rechtschaffen, also, and President Batjer. I mean, all the Commissioners at the PUC are committed to this and it's just super gratifying for all of you and your leadership to be engaged.

And I have to also recognize Commissioner Gunda for really your amazing ability to connect the dots here. You know, from the macro scale all about the reliability and the bulk power system, and reliability and that realm, with the system, you know, up and down. So, really, really appreciate your being here today to share with us.

So, with that I'll pass it back to Heather to get us started. We're lucky to have Jessica Granderson

kicking us off this morning.

COMMISSIONER MONAHAN: Commissioner McAllister, I know --

COMMISSIONER MCALLISTER: Oh, there she is. Hey.

COMMISSIONER MONAHAN: -- I am late to the party, but I just wanted to tell you that I am here.

COMMISSIONER MCALLISTER: Yeah. Well, please go ahead.

COMMISSIONER MONAHAN: I'm looking forward to today's workshop.

COMMISSIONER MCALLISTER: Great. Sorry about that. Did not see that you join. Thanks for being here, this is great.

Okay, so with that back to you, Heather, and kick us off with Jessica Granderson.

MS. RAITT: Great.

COMMISSIONER MCALLISTER: From the White House.

MS. RAITT: Okay. Super, thank you so much. Yes, I'm very pleased to introduce Jessica Granderson. She's the Director for Building Technology at the White House Council on Environmental Quality, in the Executive Office of the President.

So, we're very pleased to have you here, Jessica, go ahead.

MS. GRANDERSON: Thank you, Heather. Good morning. Thank you, Commissioners, for having me. It's really a pleasure to kick things off with you today.

I am currently working at the White House Council on Environmental Quality, on the Building Emissions and Community Resilience Team, on leave from my position at Berkeley Lab.

It's a privilege to be working for the Biden/Harris administration as we all collectively seize the moment in front of us to meet the challenges of climate change and environmental justice.

And I'm glad for the opportunity to address you all today, recognizing the nation-leading work that California continues to do. We're a ground zero for climate-driven disasters, but also for innovation in the policy, technology, and programs that are confronting those challenges head on.

So, I want to tee up four areas that are front and center in pretty much any conversation about building sector decarbonization, and share with you relevant activity at the federal level and its relationship to work here in California.

So, we'll talk some about equity, decarbonization of electricity supply, electrification, and efficiency.

President Biden has made historic commitments to use every lever at his disposal to advance environmental justice and spur economic opportunity for disadvantaged communities.

And the new Justice 40 initiative is core to that commitment. It gives us a mechanism to ensure that our federal agencies do the work with state and local communities, so that we can deliver at least 40 percent of the benefits from our federal investments in climate and in clean energy back to our disadvantaged communities.

Just last month the administration's Office of Management and Budget, Counsel on Environmental Quality, and Office of Domestic Climate Policy issued implementation guidance for agencies, launched the Justice 40 pilot program, and introduced accountability and transparency tools to support agencies in their success.

As equity is centered in the executive agenda, it's also prioritized in California's current activities and future plans. We know that it's more important than ever to ensure that our most vulnerable, our black and brown, and frontline communities do not continue to bear the brunt of climate change. And that they be fully engaged in the design and implementation of our

solutions to adapt and mitigate the impacts.

Building electrification, for example, is going to really require a doubling down of attention to ensure that our intentions are truly realized in people's lived experience. And California, like in so many things, has a great leadership role to embrace here.

So, how are we going to decarbonize the building sector in California, but also nationwide? One of the most important drivers, of course, is going to be decarbonization of electricity generation. It's how we will get at those indirect, scope-to-emissions that we attribute to the use of electricity in our buildings.

Now, over the last decade and some, the emissions intensity of California's electricity sector has decreased dramatically. And that's really due to policies, like our renewable portfolio standard, emissions performance standards, and a host of other factors.

And California's RPS requirements will only escalate to 60 percent in 2030, and 100 percent renewable and zero carbon resources by 2045.

This carbon-free electricity goal mirrors those being pursued at the federal level by the administration, where we're targeting an 80 percent carbon-free electricity supply by 2030 and 100 percent

nationwide by 2035.

As we continue to drive that grid side decarbonization, electrification of our demand side loads is going to become more and more important to bringing home full decarbonization of the building sector. It's how we're going to get at those direct, onsite, scope one emissions.

So, two critical issues that we know we'll face in any aggressive electrification scenario. One, the cost to retrofit existing buildings. And, second, technology availability. For example, heat pumps for large commercial and for cold climate applications.

To address these challenges we'll need a coordinated complement of activities that target financing, retrofit interventions, market transformation, and technology development.

And finally, efficiency. This is our tried and true strategy that's brought us extraordinary consumer, system, and greenhouse gas benefits for decades. And it's going to remain critical to our success in decarbonization. Our building energy codes will continue to ratchet. And they can be used to push broader adoption of heat pump space and water heating. California is already leading in this regard.

Efficiency will continue to play a role in

controlling demand in the face of that growth of electric loads from electrification with material benefits to customer costs, system costs, and reliability. And that's particularly true when paired with load flexibility.

And then, those same co-benefits of comfort, health, and productivity that we've always looked to will still be delivered, even as they remain somewhat difficult to quantify and appropriately value.

Now, just as a sidebar, for those of you who know me, you know that I'm always interested in how we're measuring and quantifying the performance and the impacts of our building improvement efforts. And as decarbonization comes into play as a, if not the primary indicator of success, it's going to be essential for us to constantly evolve how we're thinking about cost-benefit and evaluation constructs, and how we're thinking about value streams and metrics.

Now, we're like simultaneously looking to understand customer, and energy, and emissions impacts at multiple levels of resolution, with all sorts of implications for data acquisition, modeling, and longitudinal tracking. And that's going to be really fun to unpack, but also pretty thorny to figure out in the face of this constant urgency to act now.

California is already doing so much to advance equity and building decarbonization. And I want to talk about a few administration priorities that can be brought to bear in either amplifying those efforts or enabling others to do similarly.

The president's Build Back Better Agenda will invest in our communities and expand access to affordable housing by building, preserving, and retrofitting more than 2 million homes and commercial buildings.

In support of that agenda, the bi-partisan infrastructure bill that has passed the Senate and is now going to the House contains several items of note. The first being three and a half billion dollars in funding for the Weatherization Assistance Program.

Another billion plus for Energy Efficiency Conservation Block Grants, and grants to our nation's public schools.

That follows with another half billion or so for grants to capitalize State Revolving Loan funds, and for energy and resilience code implementation across the country.

There's also a $40 million allocation to train energy audits as a down payment on the massive workforce investments that we know we're going to need to meet our

sector-wide goals.

There's also a couple efforts that we're pursuing within the Building Emissions and Community Resilience Portfolio at the CEQ that I want to be sure to mention. And first is building performance standards.

We see BPS as truly transformative policy that allows us to move from new construction and major renovation to be able to address existing buildings. They're as-operated-performance across the 50 plus years of their lifecycle, nationally 75 percent of our 2050 stock is already built and in operation. So, we know how important these kinds of levers will be.

We were proud to announce earlier this summer the first ever building performance standards for the federal stock, and the interagency work to develop that standard has begun with representatives from the GSA, VA, Department of Energy, EPA, and Department of Defense.

And we're first looking internally to ensure that the federal government leads by example. But we're also exploring how we can partner with state and local governments to accelerate the uptake of building performance standards nationally.

I was really happy to see there's a session on

this later today. And to note that Chula Vista is one of the nation's earliest adopters of this kind of policy and there's certainly potential for further uptake in California.

Second, we're making sure that we lean very heavily into advancing building energy codes nationally and for federal programs, improving the performance of new and affordable housing. In July, the Department of Energy released final determinations for ASHRAE 90.1 2019, and the IECC 2021.

That was followed in July by HUD sharing with stakeholders that they had begun the process of developing a proposed determination in consideration of those new codes for the HUD and USDA covered programs.

And just now, in August, DOE posted a pre-publication Federal Register supplemental notice for a proposed rule to establish energy conservation standards for manufactured housing.

Third, we've launched a full portfolio of interagency work targeting coordinated federal action on resilience. That's coastal resilience, flood, wildfire, extreme heat, and drought. Of this collection, the most related to building decarbonization is our work in extreme heat.

For example, just a couple weeks ago we held a

stakeholder meeting on the intersection of buildings, extreme heat, equity, and decarbonization. And the objective was to inspire replication of innovative urban heat mitigation strategies at the municipal level, while also giving our federal agencies an opportunity to hear directly from those implementing these solutions so they can better inform meaningful federal action.

So, in closing, I really want to emphasize that it doesn't really matter where you look these days. It could be the new IPCC Report, our enduring drought conditions, you know, the fires and heat waves that we're living through. The urgency that we're all feeling to act aggressively, quickly, and with a laser-focused intention has never been greater.

And personally, I'm continuously encouraged by the response and the redoubling of efforts that we're seeing across the country from the federal, to the state, and local level, and back again. California's ongoing leadership and partnership is so critical to meeting our national goals, as well.

And I'm really looking forward to today's sessions. And thank you for your attention this morning.

COMMISSIONER MCALLISTER: Thank you very much, Jessica. We really appreciate your being here and your

really taking the time from LBL up to the federal level, and just bringing all your expertise to that, to the CEQ and the administration is just such a -- such a wonderful -- you know, it's in tune with the great appointments that the administration has made really across the board in this space.

But really thank you for stepping up and, you know, just rolling up your sleeves and getting to work with us. And we really look forward to having increasing collaboration with you and the team there going forward.

And really happy to hear about the manufactured housing initiative and really, also, looking forward to working with you on metrics, and some of the data issues as well. So, thanks for being here.

I would love to be able to ask you more questions, but I think we're already about seven minutes overtime. If you have a chance to listen in and maybe even take a few questions after the first panel, that would be great. And we understood if you don't but --

MS. GRANDERSON: Thank you, Andrew.

COMMISSIONER MCALLISTER: Sure. Okay, well thanks for being here with us, appreciate that.

Okay, Heather, back to you.

MS. RAITT: Sure.

COMMISSIONER MCALLISTER: And moving on with Ken Rider and the first panel. So, thanks a lot.

MS. RAITT: All right. Super, yeah. So, yes we'll just continue the conversation with Ken Rider on the first panel, on Energy Efficiency and a Decarbonized Future. And Ken is the Chief Policy Advisor to Chair Hochschild at the Energy Commission.

So, go ahead, Ken.

MR. RIDER: Yeah, good morning everyone. Yeah, I'm the moderator for the first panel of today's workshop, which has the very exciting title of The Role of Energy Efficiency in a Decarbonized Future.

One of the first things I learned working at the Energy Commission is that energy efficiency is the cleanest and cheapest way to meet our energy needs. And that remains true today.

But however, you know, an ever-increasing focus on greenhouse gas reduction has implications to the strategic deployment of energy efficiency. While energy efficiency can reduce greenhouse gases directly, it also has an important role of bringing the decarbonization of the grid, buildings, and industry within manageable parameters. In other words, energy efficiency makes our challenges smaller in size and, therefore, easier to overcome.

Next slide, please. To illustrate this principle, I put together a chart of different resource mixes in 2030 and 2050 using E3's Pathway Model. The Y-axis for the chart there is the capacity of California in gigawatts. In both 2030 and 2050 there are two scenarios plotted.

One is named CEC 2050, which was a core scenario used in the work that CEC funded and has very aggressive energy efficiency embedded.

And the other is called CEC 2050 1 x AAEE, which stands for additional achievable energy efficiency. And that scenario has less energy efficiency.

And you can see that the difference between those amounts of efficiency results in very different amounts of needed capacity. The 2030 scenario here is showing a difference of 15 gigawatts of capacity and the 2050 scenario shows a difference of 45 gigawatts of capacity, or roughly 15 percent difference in each case.

Now, to put that into context, you know, a rule of thumb for capacity, you can assume about $1 billion cost per gigawatt. And so, you can imagine there that we're talking on a scale of $15 billion in 2030 and $45 billion in 2050, not including transmission and other costs. So, that's a lot of avoided capital cost.

Now, this is just one tool and one set of

analyses, and there have been others that have followed since Pathways, but it's demonstrative of two important things. Even if all the greenhouse gases were gone from the electricity grid, energy efficiency can reduce capital costs and raise the affordability of the grid. It can also still provide impressive environmental benefits by avoiding unnecessary power plants. Next slide.

This chart also shows why energy efficiency needs to be considered first in order to gain maximum benefit. If we follow the red or upper pathway and focus on building, let's say, the 15-gigawatt larger system from the previous slide, and then as a secondary effort to reduce demand, we end up with an overbuilt system and miss-timed the opportunity to save capital costs.

Conversely, benefits can be maximized by focusing on deploying energy efficiency and demand reduction first, and then building the capacity for what remains.

While this is already recognized in the loading order, its importance is even greater with a grid that is comprised mostly of fixed cost assets like solar PV plants, instead of more variable cost resources like natural gas power plants.

This balancing act is actually one of the original tasks given to the Energy Commission, where we used the demand forecast to balance the need of new resources in light of demand reduction programs like energy efficiency. The next slide, please.

A similar principle applies to building and industrial decarbonization. Take, for example, a home that carbonizes its HVAC system, its heating and cooling, in one year, and then chooses to upgrade its insulation the next year, as illustrated by the red upper pathway.

Just as in the grid example, that pathway leads to unnecessary costs and worse environmental outcomes. That's because upgrading the insulation first allows for smaller capacity heating and cooling equipment to be installed, saving both money and lowering the amount of refrigerant needed. Again, the differences in costs and benefits points to the importance of considering efficiency first. The next slide, please.

Efficiency is also a cornerstone strategy to building decarbonization. This graphic comes from the Energy Commission's recently adopted California Building Decarbonization Assessment, conducting for AB 3232.

The assessment used efficient heat pump electric equipment as a basis for its electrification pathways to

building decarbonization. What this chart shows is that even with the more efficient equipment set significant energy and bill cost savings can be achieved by pushing energy efficiency further by using the best technologies that we have.

In this specific analysis conducted using the aggressive electrification scenario, efficiency could avoid 19 percent of the additional electricity needed and reduce bills by $2.2 billion annually.

Therefore, energy efficiency opportunities remain large in the effort to decarbonize and key to keeping costs low.

And with that, let's move on to our panelists. Each will give some initial remarks and then we'll move on to discussion.

I would like to introduce our first panelist, Steven Nadel, Executive Director of the American Council for an Energy Efficient Economy.

Go ahead, take it away Steve.

MR. NADEL: Okay, thanks Ken. Thanks Commissioners. I look forward to the discussion here.

And if you can just go to the next slide and we'll be brief here with the opening remarks.

I think a lot of you know ACEEE. We're a 40-

year old organization that does research, education, and program policy, technical assistance, and advocacy. Ne next slide.

A couple of years ago we did a study looking, and this is national, not just California, and we found that energy efficiency can get us halfway to decarbonization. That worked out to be 50 percent reduction in energy use and also 50 percent reduction in greenhouse gas emission. Next slide.

And here you could see how those savings are split out. I'm going to particularly point out the blue, what are the building blocks. It's zero energy in commercial buildings, zero energy new homes. You could substitute zero carbon instead of energy, if you want. Smart buildings and homes. Building retrofits as well as home retrofits, and then electrification. But all of these things act in tandem, together. It's about a quarter of the savings. Oh, and the purple is appliance and equipment efficiency standards, most of which is in buildings, but some of which is industry as well. So together that's more than like a third of the savings, greenhouse gas savings that can come from efficiency. Next.

One of the reasons to do efficiency is that it is generally cheaper. On the far left shows energy

efficiency, the average cost from our most recent study. And LBL did a very similar study and came up with a very similar figure. It works out to about 2.4 cents levelized per kilowatt hour. Even renewables, generally a little bit more expensive, obviously the other sources have even more. But efficiency tends to be low cost and this doesn't even include the cost of storage for a lot of the renewables. The next one.

As Ken pointed out, efficiency reduces the size of systems, reducing costs. Next slide.

And in California, peak demand is expected to increase both summer and winter, and efficiency can help reduce those costs, the amount of power that needs to be built, as Ken pointed out.

Skip the next slide and go to the slide after that. And I'd also point out that efficiency really helps with personal comfort, whether it's reducing radiation from people, which depends on the temperatures of surrounding surfaces. Think insulated walls, rather than un-insulated walls. Convection and air motion, think infiltration, as well as evaporation, think humidity control. So, these are things that should be addressed, that efficiency can address.

Final slide. So, my conclusion for now is that efficiency and renewables are like peanut butter and

jelly, it's hard to do one without the other.

And with that, I'm happy to hear the other people and look forward to the discussion in terms of I can add a few things on both the federal reconciliation package, as well as some thought from our research about areas that California can pursue. So, thank you.

MR. RIDER: Thank you, Steve, good points.

And next we will hear from our next panelist. Pierre Delforge, Senior Scientist at the Natural Resources Defense Council. Welcome Pierre.

MR. DELFORGE: Thank you, Ken. Good morning Commissioners, good morning staff, and everybody. So, I'm Pierre Delforge, at the NRDC, Natural Resources Defense Council, where we focus on mitigating the climate crisis and safeguarding a future that is clean, equitable, healthy, and prosperous for all people.

So, energy -- so, NRDC has a long legacy in energy efficiency. My colleagues have been roaming the halls of CEC and CPUC for decades. And I stand proudly in that tradition.

But energy efficiency also needs to evolve to meet the moment, and in particular two of the main crises that we are facing today, the climate crisis and the racial and social equity and justice crisis.

So, on climate we need to -- you know, our goal

is to get to zero emissions and that means that we need not just to consume less energy -- by the way what -- can you please move to the next slide? I only have one slide, so might as well show you. Thank you.

So, to meet the climate crisis we need to evolve from, you know -- energy efficiency is still fundamental and we need to continue to deploy it as, you know, smartly and strategically. But we also need to use clean energy with electrification being the primary solution to do that. And we need to do it in a way that enhances and supports the grid decarbonization, so using energy at the right time.

Energy efficiency also needs to help meet the equity and justice crisis because, not just -- mostly because of equity's sake, right, it's just the right thing to do to ensure that the benefits of energy efficiency are accessible to all. But also because, you know, low- and medium-income households make up 43 percent of all U.S. households, and we cannot decarbonize and meet our decarbonization goals without focusing, you know, on this sector.

The underserved communities are the ones who need energy efficiency the most, and they also are the ones who are the least able to afford it, and who are the most at risk of being left behind.

So, it is critical that our energy efficiency policies focus on addressing this sector in order to be able to scale to the level that we need it.

So, this framework informs NRDC's priorities for energy efficiency and building decarbonization. I know I'm short of time, so I'm not going to cover those priorities in this opening statement, but would love to, you know, mention and discuss them in our discussion. And two aspects in particular. One is market transformation and the other one is about retrofitting affordable housing.

So, with this I'm going to pause here and look forward to the discussion.

MR. RIDER: Thank you so much, Pierre.

Our next panelist is Geof Syphers. He's the CEO of Sonoma Clean Power. Geof, go ahead and unmute and tell us about --

MR. SYPHERS: Good morning and thank you, Ken, and thank you Commissioners. Many of you already know Sonoma Clean Power. We're a public power CCA, serving Sonoma and Mendocino counties.

And for today I'll spotlight the Advanced Energy Center we've recently built and in a partnership with the Energy Commission to provide zero interest on-bill financing for people making the transition to super

efficient appliances, and away from burning fossil methane.

And think after our first hundred retrofit projects in the last couple of months, we're starting to learn about what's working with that transition. So, I'll share some of those highlights.

First, we're learning that we really do need the pair deep energy efficiency to make decarbonization affordable. You're going to hear that theme a lot, I'm sure. Simple appliance changes are the easy part. But that overall efficiency package on buildings is often needed to avoid having to upgrade an electrical panel, or even a neighborhood transformer.

And those avoided costs, we're finding, can be significantly larger than all other costs on the project, and so we really need to take those into account.

Second, we're learning that induction cooking is a surprisingly effective way to get into efficiency and decarbonization. By encouraging people and engaging them on how they cook, it opens a dialogue about water heating, and space conditioning, and electric cars, and everything.

So, I'd highlight we check out portable induction kitchen burners, and that is amazingly

effective at getting people to actually upgrade to cooking with induction.

Third, we're learning that home retrofits are a really good time to add demand response capabilities. And I know we're mainly talking about efficiency in this forum, but we need to be cautious not to end up hardening demand. That's that dangerous place our water districts are in right now by having promoted water-efficient toilets and irrigation, only to watch cities issue new building permits, and bring usage back up to previous levels. And so now, they're finding it harder and harder to conserve during a drought because the demand is hardened.

And that kind of demand hardening can also happen with electric energy. And so, creating that kind of flexibility with dispatchable controls, and phone apps that allow us to pay customers to change their usage patterns, all of that becomes incredibly valuable.

And one immediate advance we can make to address summer capacity issues would be to integrate into our grid-savvy demand response program all the devices that other providers have incentivized in our territory, like PG&E, which are currently uncontrolled. And we just need that data to list those devices and start dispatching them for flex alerts.

And I think, lastly, cities are really looking to use deep efficiency to upgrade neighborhoods to all-electric buildings. And they've identified the potential avoided cost of gas line infrastructure repairs as a financial means to that transition, but have been stymied by a lack of data from the IOUs about the gas infrastructure costs and conditions.

And so, having good access to that gas cost data will be incredibly valuable in achieving affordable transition.

Thanks.

MR. RIDER: Thank you, Geof. That's great.

Now, our next panelist is David Jacot. He's the Director of Efficiency Solutions for the Los Angeles Department of Water and Power. Take it away, David.

MR. JACOT: All right, Ken, thanks so much, and thanks Commissioners. It's a pleasure to be here.

So, Geof comes from the CCA world. I come from the still vertically integrated municipal world, so it's interesting to see the perspectives. But I'm very heartened by all the discussion thus far and I won't spend a lot of time preaching to the choir on the value of energy efficiency, except how we're operationalizing it here at DWP. The next slide, please.

So, we've partnered with NREL to study how to

make the entire grid decarbonized by 2035, and we came up with a very detailed scenario analysis that shows it's feasible. But it also has a wide range of costs, between $50 and $80 billion. Obviously, we want to be at the lower end of that, as opposed to the higher end. How do we get there? Energy efficiency is how we get there.

Distributed energy resources, and energy efficiency in particular make everything smaller. We've heard that already, but I'll say it again.

The other key is that we need electrification to get more revenue kilowatt hours to spread these costs across. So, it's a twofold strategy here where electrification, transportation and buildings, transportation is really the largest opportunity, but buildings are significant as well, props up our revenue. So, it gives us more kWhs to spread the fixed cost across, and energy efficiency makes those fixed costs smaller. Next slide, please.

So, I won't belabor this one, except to point out the green lines. The green lines are what matter on this slide. This was the scenario analysis of the potential rate impacts from the LA100 Study, the ten different pathways we looked at. The green lines are the important ones.

The bottom green line, that's the cheapest, that's the least rate impact and that is our complete decarbonization of the grid by 2035, with a high level of electrification revenue.

The top line, the top green line is the same thing with low electrification. And so, it's dramatically different. We see us topping out around 25 cents a kilowatt hour out by 2045, with the optimal scenario. And if we don't have the electrification we need for the revenue, the rates go through the roof and they go through the roof quickly.

So, it's two sides of the same coin here again. We need the electrification to bring the revenue and we need the energy efficiency to reduce the infrastructure, the infrastructure needs.

One other point I'd make, and we can elaborate more on this in the discussion, is that I see the time sensitivity of energy efficiency going down somewhat as we have more, and more, and more storage, both distributed and utility-scale storage.

Energy efficiency in the afternoon will become important again because we'll want to save as much of that renewable generation to get through the night. And energy efficiency at 4:00 in the morning will be important again so we don't need so much storage to get

through the night. So, I actually think the time pressure on energy efficiency is going to decline as we get more and more storage on the system.

Thank you.

MR. RIDER: That's great. Thank you for the presentation.

So, we'll move on to panel discussion. I have a few questions and so we'll start with Steve: Can you tell us more about ACEEE's priorities for energy efficiency and building decarbonization at the national and state level?

MR. NADEL: Sure. So, we are particularly working at the moment on the federal level because there is so much opportunity. Maybe later I can talk a little bit about some of the things that are very much in play. But we are looking at what can we do in the bipartisan infrastructure bill and the reconciliation bill to dramatically scale up funding for buildings, retrofits, also the tax credits for new and existing buildings. There's also a lot we're doing on industry and transportation and that's kind of beyond the focus here.

But at the state level we are working on how to get more states to adopt appliance efficiency standards, following the lead of California. How to get states to move towards zero net energy codes. And I say zero net

energy because most states that's the data they have. Zero net carbon is absolutely fine. I think eventually a lot of states will do that, but most of them don't have the data.

And then just in general, support energy efficiency programs, particularly as Jessica pointed out. Retrofits, if we're going to decarbonize we really have to do a much better job on our retrofits and what we can do with our homes -- with our multifamily buildings, with the commercial buildings. Those latter two I particularly point out the opportunity when existing buildings need to go through major renovations, typically every 20 years, and have you do a deep retrofit there.

So, that's a summary of some high points, and why don't I stop there.

MR. RIDER: Thank you very much, Steve.

I'd like to ask Pierre: What are -- can you build on and what are some of NRDC's priorities for the equitable building decarbonization you mentioned?

MR. DELFORGE: So, thank you, Ken. I mentioned to major priorities. When is market transformation and the other one is affordable housing retrofits. The market transformation is critical to get the decarbonization technology solutions that we need to be

affordable and available so that they can scale at, you know, the pace and scale that we need.

We've been doing a lot of work and there's still some to do on removing regulatory barriers, like three-pong test, and some of the building code barriers that were removed back in the previous code cycle, in 2019. There's still a few, like line extension allowances and, you know, cost effectiveness metrics, and others that are stymieing the level of funding that we are able to put out there. AB 3232, the report that the Energy Commission put out recently makes it clear that the longer the wait, the more expensive it is going to be to decarbonize buildings because we're going to have to have more early replacements versus replacement on burn out.

So, the sooner we invest and the more we invest now, the easier and the cheaper it's going to be to decarbonize buildings. So, really need to scale up the investments in energy efficiency and decarbonization, and look at vehicles like the TECH Program, the SGIP Program that are being rolled out or soon to be rolled out, and look at how these vehicles can be used to really scale investments in market transformation.

And this is a quick, last point to the other part of our priority is around affordable housing

retrofits. So, market transformation is important, but for those, you know, communities who cannot participate in markets, others who are renters, or who just don't have the means to, you know, install new systems we really need to have policies that fund retrofits of particularly affordable housing. And we're looking at programs like the Low-Income Weatherization Program, the Energy Assistance -- the Energy Savings Assistance Program to be key vehicles to help those communities transition off the gas system, so they are not left behind on the system as it is, you know, other customers transition away and volume reduces, and costs increase.

MR. RIDER: Thank you, Pierre.

A question for -- maybe we'll do Geof and then David. You know, as folks with customers, can you tell us a little bit more about your plans to connect your customers to efficiency in these decarbonization opportunities.

MR. SYPHERS: Sure. Well, you know, I think our construction of the Advanced Energy Center is a great experiment and so far, so good, despite that it is a physical storefront during COVID. We're actually getting about 20 people a day dropping in, and many more online.

And I think having that kind of tactile

experience where people can see what we're talking about, trying out cooking with induction, literally look at what a heat pump water heater is and how normal it looks compared to a regular water heater, that takes a lot of the mystery out of things. And I think that's really critical.

And I wanted to pick up on something that David just mentioned about time of efficiency not being so important. I think that's right generally. But one of the things we're finding in working with customers on going either off-grid or building a 100-percent renewable microgrid is that winter efficiency is the cost driver, because that is anti-correlated with solar output.

And so one of the things, if we're scaling up these little projects to thinking about the big grid, we're going to have to start caring about the wintertime efficiency because that's what drives the cost of storage, and much more than summertime.

And so, there might be a seasonal efficiency more than a time-of-day efficiency, so I wanted to pick up on that.

MR. RIDER: Good point. David?

MR. JACOT: Yeah, I think that's a great point. You know we talk all the time about the intermittency of

renewable generation and we usually think in diurnal terms, but seasonal is every bit as important, if not more so, especially when we're looking at having to store for a week or two weeks of cloudy weather. So, absolutely that's a consideration.

A couple of thoughts. I'm going to be a little bit contrarian here and highlight something that, you know, I showed on the rate graph earlier.

If you recall from the upper green line on the rate graph, we need massive -- we need massive electrification revenue coming onboard in the next three to five years. Buildings are very important, but the churn rate on buildings and the major renovations that Steve mentioned, we're not necessarily going to be able to count on building electrification to give us what we need in terms of a revenue bump to make the 2035 target.

Transportation electrification is where our largest focus is. It's already economical for the customer. We don't have questions about what the energy burden -- you know, what direction the energy burden goes in pre- and post-electrification. Products are available, with the challenge is simply getting the market awareness and the chargers out there.

Building electrification is much more complicated. You know, we all agree it needs to happen,

it needs to happen aggressively. We don't think building electrification's going to happen fast enough to give us that revenue bump we need. And so, transportation electrification is a huge, huge push since it's already economical and there's no questions on the energy burden.

That said, what are we doing on the electrification side, the building electrification side? And we are in the process of launching what we call the Comprehensive Affordable Multifamily Retrofits Program, which is -- basically, it's our take on the state's LIWP program, the Low-Income Weatherization Program that's run by California CSD, Community Services Department.

And it is going to have a heavy focus on building decarbonization. In fact, that's how the rebate structure is phrased. It's that, it's in terms of GHG reduction.

So, deep energy efficiency combined with building electrification, combined with onsite renewable storage, and that's -- renewable generation, with storage, EVs and demand flexibility to be built in subsequently.

So, the beauty of it is you get the deep energy efficiency, which makes the bill go down, and electrify which may make the bill go up, but then you offset that

with the onsite generation which, again, then makes the bill go down.

So, overall the energy burden is less but it combines those three in that order. Deep energy efficiency first, electrification second, onsite renewable generation third.

And then, like I said, we plan to build in -- as we get to having a standard around battery storage systems, we'll add that in, and we can add in other modules, if you will, as well. And we hope to get that launched here in the next few months.

MR. RIDER: So, just to follow up really quickly with you, would you say that the transportation electrification is key to being able to drive up the rate of investment in efficiency in buildings and whatnot, just off of the available revenue stream?

MR. JACOT: No, we're fine in funding, you know, in terms of building electrification. The revenue bumps we anticipate and need from transportation electrification are going to be primarily invested in achieving the SB 100 targets by 2035. So, the utility scale investments we have to make, there will be -- you know, there will be funding support for distributed energy resources as well. But of that $50 to $80 billion estimate for what it's going to take to get to a

100 percent decarbonized grid by 2035, the vast majority of that is going to be for infrastructure investment.

MR. RIDER: Great. We've got a little bit more time, so I'm going to give you each an opportunity to take another bite of the apple here and then we'll move on to the Commissioner comments and questions.

So, you know, just each of you highlight one additional key aspect of energy efficiency or, perhaps, how it connects to decarbonization. And we'll go in the order that we did the presentations, so start with you, Steve.

MR. NADEL: Okay. I'm going to say if -- well, you can go to my last slide on federal opportunities. I think that is worth showing. And while you are pulling that up, I will note building performance standards are also very important. I know L.A. and San Francisco are working on them, and quite a few jurisdictions. So, I'd encourage California to think about that statewide.

But do you have that slide? So, this is our best estimate of what's in play for reconciliation and these are things that should very much help California with their building decarbonization efforts.

More money for the Weatherization Assistance Program, exactly how much is unclear. But Pierre mentioned that.

There's very likely to be a new Hope for Homes Residential Retrofit Program, incentives for retrofits to help complement Retrofit California. There's going to be very likely incentives for heat pumps and other electrification measures. Probably some money for affordable multifamily retrofits. And then various tax incentives will be updated, typically adding higher tiers and more money.

So, it's all very unclear. As we speak, the House is voting on the budget. But over the next month to two months, the details will become clear. But we are talking on the order of $100 billion across all these items, plus or minus a few 10 billion, we'll say.

MR. RIDER: Thank you, Steve. About one minute each and we'll continue on with Pierre. You're muted, Pierre.

MR. DELFORGE: All right, with that I want to second Steve's point that we need to be ready and smart about the infrastructure money that is, hopefully, coming down the pike soon. And how do we spend this smartly to help our decarbonization objectives?

So, you know, we have a good idea with the AB 3232 Report on what are the key challenges and what are the key sectors where it needs to be spent. And, you know, as I outlined early on, I think we have market

transformation opportunities. We have, you know, retrofit opportunities.

I want to highlight the LIWP, or Low-Income Weatherization Program, again, which is I think a very good example. And David mentioned the L.A. version of that, which is a Cap and Trade funded program, which is GHG focused. So, greenhouse gas emissions focused. And has had very good results at retrofitting affordable housing in a way that reduces emissions and occupancy build very significantly because it's complete flexibility in how that funding is allocated between energy efficiency, electrification, and onsite generation. And that's a good formula which I think we should look at in terms of our scaling affordable housing retrofits.

MR. RIDER: Great. Geof, your turn.

MR. SYPHERS: Two things quickly. One is domestic hot water in a heat pump form is turning out to be one of the most flexible dispatchable loads that we've ever found. Twenty-four hours a day it's either running or not. And statistically across just a few thousand, we have a resource with a high degree of confidence of being able to ramp it up or down. So, that up or down is so much more valuable than just ramping down. And so, that's one lesson.

The other is we're definitely wanting to find that secret sauce about avoided costs for gas line repairs. We've got a number of cities really trying to figure out how to trim the gas line system by fully electrifying neighborhoods or blocks. And we're finding the partners that are most engaged with us, in addition to the city staff, are long-time housing owner-developers. They have a history of product that is already either all electric or it is in need of upgrades. And they are wonderful to work with.

And so, where I thought we'd have the most challenge, we're actually having the most progress in terms of partnering with low-income housing developers to say how can we go after joint funding, do whole blocks or whole projects together.

And I'm really encouraged because I think all of us have put our finger on the structural problem that can happen by accident, which is all the rich people do these retrofits, and then all the stranded costs of the gas system get borne by the poorest people in California. And that could still happen if we don't do this right.

And so, I'd encourage others to maybe start reaching out to those long-time developers and then tackle the rental market next, which is a harder market.

The one-off rental market in the private sector is going to be much more challenging, but we're finding at least a foothold there.

MR. RIDER: Excellent. Thanks, Geof.

And now from you, David.

MR. JACOT: Thank you, Ken. Just a couple of points I wanted to make on the equity front. One is -- and I don't want people to take away from this that DWP is in this massive load building stage. Yes, we are from the electrification standpoint and those increased revenues. But we're very conscious of what the bottom line energy burden impact is to the customer.

We know that gasoline, when you convert from a gasoline car to an electric car, the equivalent cost per gallon is about a dollar fifty to two dollars, as opposed to the four dollars plus we see. So, we know that's a winner for customers. It's a winner for us and it's a winner for customers.

It gets a little trickier with building electrification. That's why we're building the onsite solar into the CAMR program I mentioned.

The other piece, and which is hugely important, especially to us, as a major department in the City of Los Angeles, is the job creation aspect of these programs, skilled job creation.

Our version of LIWP is going to include what I kind of think is a fairly revolutionary requirement. A customer, in order to receive the rebate must hire a contractor who pays prevailing wage, and complies with skilled and trained workforce requirements if the project is large enough.

And we have very generously upgraded our incentives based on initial estimates of what kind of cost adder that's going to have.

We really want to promote not just job creation through energy efficiency, but skilled job creation, good jobs, long-lasting jobs. So, we want to grow that ecosystem at the same time that we're making major inroads into affordable housing, deep energy efficiency, and electrification.

MR. RIDER: Thank you, David. Well, thanks, and thank you for our all our panelists for the great discussion.

We now turn to Commissioner McAllister and the dais for questions and comments, after which we'll take Q&A from Zoom.

COMMISSIONER MCALLISTER: Great. Thanks a lot, Ken, great job. And really want to -- we could spend all day with just with you four, with you five, and you four panelists, you particularly. And I just want to

thank you all again for your thought leadership and for being here today.

So, I want to recognize, first of all, that Commissioner Rechtschaffen has joined us. Commissioner Gunda did have to drop.

But really, I think the presence of two, you know, of the primary PUC Commissioners on this set of issues. It's just a testament to the fact, one how important it is, two I think how closely the commissions are collaborating on these issues.

And clearly, you know, many of the points you brought up, some of them are kind of more with the PUC and others more with the Energy Commission, and I think it's a great opportunity for us to sort of, you know, get and remain on the same page, and sort of strategize together to leverage our respective authorities. And so, I think that's really, really promising.

So, there's so many synergies here and I think particularly I want to -- just a couple of comments about those common themes here.

You know, number one the importance of low income. Everybody so far as brought that up. I think we have to -- it's absolutely true that the 40 percent or so we have to focus on early, and primarily, and in a sustained way. And it's really great to hear, you know,

Geof, Pierre, Steve, and David, all four of you mentioned that, that you're having some success there.

And one takeaway already I think we can say is that the LIWP program, as an example of true integration, is something that we need to look for ways to fund more deeply and more robustly, and replicate. So, it's great to see those successes, really, in the low income.

Also, the various aspects of electrification. Geof, you brought up sort of induction as a gateway, a gateway drug to electrification, which is really great. It sort of flips the conventional wisdom and I think that shows that has a lot of promise. So, thanks for sort of your point there, as well as the robustness of load flexibility in water heating. Because I think that's also a little bit counter intuitive, so we're looking forward to digging into that.

So, I don't want to take up too much time because I know that my other -- my fellow Commissioners here are going to have some great questions.

I guess one question I had is that -- so, some of you, most of you mentioned data of some form or another. And I want to kind of invite, maybe particularly Geof in terms of the data sort of interface that's seen between you and the utility, in your

particular case.

But, you know, data as a tool to target programs and funding in an intelligent way and figure out, you know, that there's a longer term sort of how do we leverage state funding in our own particular ecosystem to get private capital to come to this sector. So, that's a little bit of a secondary question.

But in terms of information, data that can help us target our policies, I'm interested in understanding anything we can do at the state to help kind of nurture that discussion and solve any barriers that might exist. So, that's number one.

And then my second question has to do with automation. How critical do you think automation is for really sort of checking all these boxes, particularly efficiency and flexibility at the same time. So, number one is data and number two is automation.

MR. SYPHERS: Thank you, Commissioner. I think one piece of data that would be immensely valuable for all IOUs to share with their participating CCAs in territories would be information about which customers have engaged in which utility programs, and purchased devices or smart controls as part of a utility program.

We have, you know, several thousand resources under our dispatch now that we've directly incentivized

ourselves. But the utilities have a number of resources that have been incentivized that are not being dispatched. And those are also our customers. So, they're distribution customers of the IOU, but they're power generation customers of ours.

And so, we have the ability to roll those resources into our demand response program immediately if we know which customer has them. And so, that's an example of a data sharing that could immediately bring, probably in our territory in the neighborhood of 5 to 10 thousand resources in instantly, into being dispatchable for summer capacity, and other reasons.

And I think your question on automated dispatch versus other kinds of flexibility, it's all of the above, right. There are some resources that just lend themselves to automated dispatch, like electric vehicle charging, heat pump water heaters, smart thermostats. Those all lend themselves to automated dispatch.

But lots of people don't want automated dispatch. They'd rather have a behavioral program where they're being asked a question on an app, or being incentivized as with a text message.

And I think you reach two different segments by having, by offering both. So, we do. We actually have both sides of that. And I think -- I don't see any

reason not to because the cost of having both is -- there's no additional cost, really, other than building out an app that does behavior components.

I think the phone call to a giant industrial partner is still a way that the utilities run demand response. I think that's getting pretty antiquated, but I think it can work, but you better have a pretty big customer to warrant the value of that phone call.

And so, I think we got to get past that, and we can. The technology's out there to do that in a more automated way and have customers elect, you know, when they allow that kind of dispatch to happen.

COMMISSIONER MCALLISTER: Thanks very much. I'd point out the load management standards in the appliance -- the flexible demand appliance standards that we're developing to help really enable that automation and really top to bottom, you know, have that ecosystem really fleshed out over the next couple of years, few years.

Anybody else want to -- please, I would invite everyone else to comment on these two issues.

MR. JACOT: This is David. Thanks Commissioner. I would just offer up that we also see it as an all of the above. You know, we're a vertically integrated utility. We recognize that we have hot spots in the

distribution system, overloaded circuits, so we have our own data on all the -- frankly, it's not electric. We don't have any policy or structural issues to it, and in a lot of cases we just don't have very good data on our own system.

But where we do, we know our congested lines and we're actively targeting specifically those congested feeders on a pilot basis for distributed energy resource program, anything that we think will help. We can take a look at what the primary customer load is on those circuits and target programs specifically.

One word of caution on that approach, you know, economists would love to say, well, that's your highest value so you should invest in those there in terms of your rebate levels. The problem is those congested circuits are usually the rich ones. And so, we get into very -- quickly we get in an optical situation of where, oh, you're going to pay the rich people twice as much to do what they should already be doing, they're the ones causing the problem. So, that's something, you know, we have to be conscious of.

So, basically the way we do it is we don't increase the incentives, per se, but we try and increase the awareness in those particular areas to buy us some capacity through DERs on those congested feeders.

MR. DELFORGE: Can I just add a comment on the automation question? I think automation and seeing demand flexibility as a default, like an opt-out more than an opt-in is critical for scale. You know, when you have opt-in you get, you know, 5, 10 percent participation. And what we really need is, you know, people have a smart heat pump water heater which is going to save them money, that is installed to be, you know, flexible and grid responsive. Then, they don't have a reason to opt out. They can if they want, but why would they because it saves them money, there's the same hot water they need.

And if we want to achieve the grid flexibility potential that we need, we need to be more of a, you know, default opt-out system.

And I want to recognize all the work that the CEC and CPUC are doing on scaling and enabling grid flexibility, as Commissioner McAllister mentioned, on SB 49, the load management standards, the Joint Appendix 13 for the Building Code, and the Self Generation Incentive Program which is now leveraging those standards and specifications to the market, but we're really just at the beginning, we are providing the specs and infrastructure. We need to continue to provide the funding that is going to help this market transform.

But we do think that's got a major role to play in, you know, helping decarbonize buildings.

COMMISSIONER MCALLISTER: Anyone else? Steve, did you want to comment on either of these issues before we go to other Commissioners?

MR. NADEL: No.

COMMISSIONER MCALLISTER: Okay.

MR. NADEL: I'll let the other Commissioners comment.

COMMISSIONER MCALLISTER: Well, thanks. And I wanted to thank you, Steve, for all of your work on the infrastructure front and, you know, the two primary bills, the infrastructure bill and the reconciliation topics, and just that's a -- I've been somewhat engaged on that through NASEO, as you know, and really there's nothing like being in the trenches like you are. So, thanks for all your advocacy there. I think it's going to make a huge difference for California and all the other states. So, thank you.

MR. NADEL: Make hay while the sun shines.

COMMISSIONER MCALLISTER: Yeah, fingers crossed.

All right, so other of my colleagues, I'll invite any of you, all of you to ask your questions, which I'm sure you have.

COMMISSIONER MONAHAN: I have a question, but I

want to make sure, Commissioner Houck if you have a question, you can go before me.

CPUC COMMISSIONER HOUCK: No, go ahead.

COMMISSIONER MONAHAN: Well, I wonder could you -- could somebody show Steve's slide on the allocation of efficiency savings? It's that pie chart. I just wanted to comment for a minute on the fact that efficiency, the definition of efficiency has changed a lot over time. And I know Steve is really close to this, I'm sure others on this panel are as well.

But I was really struck by how, you know, half of the allocation is transportation and it's efficiency in the old definition, I would say of efficiency, not the new definition of efficiency which is that EVs are much more efficient than ICE engines, just on an energy basis.

And we've seen the definition of efficiency change on the building side, right? Where building electrification and fuel switching is now part of an efficiency solution. And just a comment about how I think it's perhaps time to think about that on the transportation side.

Because a lot of the efficiency savings, when we think about a move to zero, we're talking electrification of almost everything. And kind of I

don't want to say wasting money on ICE engines, you know, on improvements to engines, but a lot of the -- you know, if you spend a lot of time and money on just efficiency, you don't get to zero and you waste money on solutions where you need to maybe focus more on the zero carbon or, you know, electric vehicle, zero emission vehicle investments.

So, just maybe a comment about how we really have seen a shift on the building side, it's probably time to think about that same migration on the transportation electrification side.

And one more question for the panel, and I guess we can get rid of this allocation of efficiency standard. So, what we've seen in California is really that solar pays for decarbonization strategies on the building side. We're seeing a lot of -- and Commissioner Houck is very close to this but, you know, sensitivity on our rates and especially for low-income families. And if you just electrify without adding solar, at least that's what the analysis indicates in California, you're going to be paying more money, or you could potentially be paying more money for that lower carbon, more efficient solution.

And I wonder if you could, if panelists could just comment on that and whether you see some out for

California besides this marrying of solar plus building decarb.

MR. JACOT: I'd be happy to comment on that. Yeah, we see the same thing and that's why, you know, we're building solar into the Building Electrification Program, along with the energy efficiency.

But one thing that I think we're going to have to start focusing on more and more in this state is getting distributed storage out to every application that already has distributed solar. You know, the economics are working for the customers now because we're still on some residual net metering capacity. And, you know, we do have the over supply issue. We need to be storing it. We need utility scale storage, but we also need our customers to have onsite storage.

That will increase their costs because that's more infrastructure, but that's really where it's going to bring value to the utility. And because it brings value to us, obviously we'll cover a good portion of that through rebates, we'll be able to internalize that and support, you know, a good chunk of that cost.

But absolutely that's going to be a big part of this, making this work.

MR. SYPHERS: Can I add to that, that this really depends on location and it also depends on the

existing conditions of our region. So, for example, Sonoma County, one of the counties we serve, almost 35 percent of our peak is met by customer generation of solar. And what that means is marginal solar, we have to handle it at the distribution level and not send it up to the transmission level. And that's difficult in spring. That's actually quite challenging in spring. And what that does, if we don't handle it locally, is it actually creates a cost on all customers because the wholesale value of that net-metered flow is often negative, or it's certainly negative relative to fixed price contracts that we have for wholesale power.

And so, it's really driving us to kind of work with customers on sizing solar to meet their needs alone, and really deemphasizing netting. And this is a meta issue because it's not just the customer side, this is whole utility scale issues. So, we've built a portfolio where we're attempting and have for seven years, achieved the ability to not net into the wholesale market almost ever. So, we have a portfolio that tries to not produce more energy in real time than our customers are consuming, even though that's allowed by all the regulation.

And so, there is this kind of issue of kind of right-sizing solar. And, obviously, in hot markets,

when you're dealing with air conditioning the first thing we say is like focus on the efficiency, like get a mini split to replace that old air conditioner, and then size your solar to meet it.

And so, solar is like this incredibly important tool, but it needs to be applied surgically so that we're not like adding cost to the system unnecessarily.

And so, local storage is going to matter, and tons of cooling efficiency is going to matter I think even more so than the marginal solar.

MR. NADEL: I just want to add a couple of comments here.

MR. RIDER: Go ahead, Steve.

MR. NADEL: Yes. Regarding solar, solar makes a lot of sense particularly for those homes and buildings that have solar access, not everybody does. Nationwide, NREL has estimated maybe half the buildings have solar access, half do not. I'm guessing it's a bit higher in California, but recognize it's not a simple solution.

And then, to go back to your comment about transportation efficiency, Commissioner Monahan, our analysis does include electrification wherever it's more efficient. Electrification which is, you know, 95 percent plus, we have concluded. So, a lot of those transportation savings are actually from EVs, but we

also look to having an as efficient an ICE vehicle as possible, until we convert everything to EVs.

COMMISSIONER MONAHAN: Well, that's exactly --

MR. NADEL: One, you get the savings in the near term --

COMMISSIONER MONAHAN: You might want to break it out so you could tell, just like you do with buildings, you know, what's the EV piece, what's the efficiency piece.

MR. NADEL: Yeah, we probably could. There are underlying assumptions there, yes.

MR. DELFORGE: If I can comment on the energy cost of electrification and the use of solar, first I think the question of energy cost is nuanced. It really depends on the local rates and which rates are used. If you take a default rate, it might not be cost effective or, you know, depending on the situation. But if you take an electrification rate, like Edison has an electrification rate, PG&E's designing one, those can be cost effective.

And particularly, also installing efficient heat pumps, not just the minimum efficiency but, you know, efficient space conditioning heat pumps or heat pump water heater changes the economics. So, it's not just about the storage, it's definitely one way of making it

cost effective, but choosing efficient equipment, packaging it with energy efficiency in the home, rate design or rate reform is going to be critical to make electrification affordable at scale.

So, I think we have a lot of different tools in the toolkit to make electrification affordable, both from a, you know, first cost and from an operating cost perspective.

MR. RIDER: If I could just build on what Pierre just said, you know, the CPUC's avoided cost calculator gives an idea of what the marginal cost of electricity is. And I think it was something around 12 -- they keep -- there's a few versions of it, but one I saw was around 12 cents per kilowatt hour, which is certainly a lot less than what current rates are. So, you know, there are ways, you know, if electrification customers can see some rates that are closer to that marginal cost you could see, you know, an improvement in the economics for electrification.

MR. JACOT: Yeah, I would add in regards to my earlier comments about, you know, how we anticipate electrification revenues helping us manage the transition by 2035.

Pierre's point's exactly raise why we're looking to transportation to be more of the big ticket revenue

stream than building electrification because we don't need to subsidize or do an electrification rate for transportation. The economics already work for the end user. In fact we could raise rates it will still work.

But on the building side, that's where of gets a little trickier.

So, we are doing some preliminary analysis on electrification rates. But just remember that kind of swims crosswise against what we're trying to do from a revenue standpoint to drive this transition.

COMMISSIONER MCALLISTER: So, I would just add that, you know, the difference between the avoided cost and the rate itself, really does vary widely across the state. So, if you're talking DWP or SMUD, they're closer. In the investor-owned utilities, they tend to be quite a bit different. And so, that NEM incentive really does depend on where you're located, which service territory.

And I do want to pivot now and invite Commissioners Houck and Rechtschaffen to ask questions, just to make sure we have enough time to give them an opportunity.

COMMISSIONER RECHTSCHAFFEN: Go ahead, Commissioner Houck.

COMMISSIONER HOUCK: Oh, thank you, Commissioner

Rechtschaffen.

I appreciate the conversation. I know we only have a couple of minutes left. I don't know if you want to touch on how distribution grid planning relates to some of the issues that we've talked about and what we may need to be looking at in reenvisioning the distribution side of the grid planning.

MR. SYPHERS: I think it's a giant question. And so, obviously, some of the drivers of distribution infrastructure aren't just, you know, building electrification which when paired with really deep efficiency can have a medium-sized impact. But it takes us back to transportation because that's an entirely new load and it's a really major load.

And what we're seeing is with trucks, busses, delivery vans, those kind of uses, the rate of charging is high enough that the local impact can be pretty significant. So, if you're looking at fleet areas, or municipal bus fleets, or school districts, you may be seeing localized increases in load that are in the megawatt to 10 megawatt scale for charging.

And so, timing that becomes incredibly important. And so, from an infrastructure standpoint it may still require reconductoring, or new transformers, and it probably will in many cases.

But I think -- I think what I would say as a general answer, to be quick, is keep your eye on transportation as the major driver for distribution grid changes, and buildings as a medium to small driver. I think that would be my takeaway.

MR. JACOT: Yeah, just to put it in perspective and I'll leave it at this. But we generally retail about 24,000 gigawatt hours a year. We estimate transportation's going to take that up, it's going to double that up to about 48 to 50, and then buildings another 50 percent of our current load on top of that, another 12 on top of that. So, we're looking at about 60 to 62 thousand gigawatt hours a year retail versus the -- under a full electrification of buildings and transportation scenario versus the 24,000 we retail now.

Now, granted we need as much energy efficiency as possible to bring that number down, but it does kind of put into perspective, some pretty sobering numbers. We're looking at, you know, your average truck stop electrified into a charging station, high speed charging, a 20 megawatt point load. Just massive, massive challenges.

MR. SYPHERS: And I would just add I agree that as I understand the data in California, because the peaks are generally summer, building electrification

will have less of an impact on peak. But a local area, places like Tahoe and Squaw Valley, you probably will get winter peaks and electrification can have a real big impact there. So, something for PG&E and Edison to pay attention to.

COMMISSIONER MCALLISTER: Great. Commissioner Houck, did you have any follow-up questions before I move to Commissioner Rechtschaffen?

CPUC COMMISSIONER HOUCK: No, no, you can go ahead.

COMMISSIONER MCALLISTER: Okay. Great. Well, thanks so much, really appreciate that.

Commissioner Rechtschaffen, would you like to ask any questions?

CPUC COMMISSIONER RECHTSCHAFFEN: I have one question of Geof. Unfortunately, I lost service for part of your presentation. I'm wondering if you have any one or two lessons for the PUC from your Zero Interest On-Bill Financing pilot that you started. Does that require a showing of bill neutrality, or what -- anything else, any concrete advice you can give us as we consider low-cost financing options for electrification?

MR. SYPHERS: Well, one takeaway is the -- this isn't an easy problem to solve. But the bill presentation, you know, what's written on a bill is so

intensely regulated that actually explaining what the charges are, you know, to the customer over time is a challenge. Because when they take out the financing and they sign their agreement, and so forth, but then those charges show up on a bill.

And that sounds like this very administrative thing that's easy to solve, but we've hit a brick wall with that. It's really difficult to get the IOUs to want to talk about how we're discussing those charges on the bill.

So, we've made some progress and, of course, the charges are on the bill and the money is being collected, but it is -- that's one challenge.

Another lesson, though, is that the practice of on-bill financing, just as we saw with PACE financing, there's an analog there, really does force us to work with a customer to ensure that they have overall savings. And there was a public comment on this. Tom Paine wrote into the chat.

If you do nothing and you essentially allow a customer to pick and choose their retrofit, and then finance it on the bill, there is a chance that their energy bill goes up despite the fact that they're buying some more energy-efficient equipment because they may use it more often, for example.

If they only have heat today and they're adding a heat pump, and now they have cooling in the summer and they never had that before, we saw this in the Pacific Northwest with the heat wave, suddenly there's air conditioning in houses that have never had air conditioning before. That can be an issue. And so, the bills can go up.

So, what it's forcing is having that detailed conversation with customers. And that's a good thing because it means that we're talking about their overall picture. You know, we're pulling up their energy use, we're looking at their bills together, we're thinking about the retrofit and we're walking them through it, really hand-holding them.

And I think that is time consuming, but I think it's an essential part of getting on-bill financing to work in terms of being neutral at worst on your electric bill. And really, we're aiming to be a net cost savings, even with the financed project.

COMMISSIONER RECHTSCHAFFEN: Thank you.

COMMISSIONER MCALLISTER: Okay. Well, thank you, both of you. We could go on all day with this conversation and I have a ton of questions that I'm not going to ask here.

And I'm going to take the opportunity to pivot

to the Zoom Q&A. And in particular, Jim, I want to, one, say that in terms of program integration, focus on low income, disadvantaged communities, and kind of trying to do deep efficiency at the same time we promote electrification. We do have an interesting input from Bruce Ray later in the day, not to put him too much on the spot. But the first panel of the afternoon, an interesting kind of program model there as we talk about different program approaches for doing, you know, a program that they've been doing in South Coast that could provide a platform for a further discussion on that topic. So, I want to just note that.

And then, Jim Lutz asked the question and I just wanted to invite that question to start off, about community level engagement. This is one of the questions I had for the panelists as well.

You know, the state is not a community present, you know, organization as a rule. And CBOs, we've heard this over and over again in our track on building decarbonization in this IEPR cycle that there's got to be sort of, you know, hands and feet on the ground, you know, touch with consumers.

You know, Geof, you just mentioned something along those lines and David, I think you did, too.

You know, what are -- I would just invite any

and all of you to comment on what potential kind of program models to get resources on the ground to help that customer interaction or that resident interaction, particularly in disadvantaged communities. You know, what sort of model? Now, the CCA would be one, but there are others.

What approaches do you think will be most effective to really get those resources on the ground at the community level to help this transition take place?

MR. JACOT: I'm happy to start. We have a very extensive network of community-based organizations that we give grants to around various -- you know, the promotion of conservation, you know, we're the water utility as well. So, power and water conservation and efficiency. That's a good way. We have about 25, I want to say, of these grants citywide, both at the council level, at the district level, as well as at the overall city level.

That's a good grass roots army I kind of think of it as. They have connections and networks that we can only dream about, so we leverage them directly. That's one way.

Another way is, as we look to launch the CAMR Program in particular, the Comprehensive Affordable Multifamily Retrofit, we will be conducting a lot of

outreach through a very established industry partner, CHPC, California Housing Partnership Collaborative, I think. And they have a lot of industry connections to affordable housing owners, developers, and managers.

So, those are a couple things we're thinking about. There are certainly lots of other valid ways to address that.

COMMISSIONER MCALLISTER: Thanks very much. Anybody else want to comment briefly on that before we move to the next panel?

MR. SYPHERS: Just real briefly, I think something I would add is we've reoriented some of our staff to working with CBOs in a new way. And that is we started to ask the question what do you need or what are you working on?, instead of how can you help us. And it changes the equation to being a partner. And some of the answers we get, we try and find other governmental entities who are partners of ours to help them with.

But sometimes that VENN diagram overlaps. So, we heard in Rosalind, one of our DAC communities, that there's a profound lack of access to broadband internet. And one of the things we started to realize is, hey, broadband, rights of way, CPUC regulation, PG&E's involved. We happen to know a lot of these players.

So, let's start talking about this issue. And then, that gets us into a conversation about everything else because now we're helping them on something they need.

And I'd encourage other power providers to start thinking that way. It's super time consuming, but it is -- it's becoming a really effective tool.

COMMISSIONER MCALLISTER: Yeah, in other parts of the country the co-ops actually do a lot of those kinds of services as well, so that could be a model we look to a little bit.

Did Pierre or Steve, did you want to comment briefly on this before we move on?

MR. NADEL: I will add a brief comment. I totally agree with David. If you're trying to reach diverse communities, work with the community organizations.

Another good avenue is work with some of the churches in those areas. They tend to be a lot of the leaders. I don't mean the mega churches, but often the storefront churches, they tend to be very well connected.

MR. DELFORGE: I'm going to let this stand, I don't have anything to add. I think these are good comments.

COMMISSIONER MCALLISTER: Okay, thanks a lot,

Pierre.

So, I think we've touched on the other two questions that are in the chat. And in the interest of time, maybe we can answer those in written form there, in the chat itself, and move on to the next panel.

I want to thank you. Well, how about I pass it back to Ken to just wrap us up and then move us on to the next panel. Thank you all for being here, this was fantastic.

MR. RIDER: Yeah, I'll just wrap up by saying again, just seconding that thank you to everyone here on the panel. And we'll move on to Heather I think, who will transition us to panel 2. But thank you everyone, again.

MS. RAITT: Great. Well, thank you again, Steve, and Pierre, and Geof, and David. I think that was a great discussion. And thank you, Ken, so much for moderating that.

So, our next panel is on -- presentations on Metrics for Transitioning Between Efficiency and Emissions.

So, our first presenter is Jessica Allison. And she is a Senior Energy Analyst at the CPUC. So, go ahead, Jessica.

MS. ALLISON: Hello. Thank you for the

introduction. Can everyone hear me okay?

MS. RAITT: Yes, that's great.

MS. ALLISON: Great. All right, so as was said, my name is Jessica Allison and I work for the California Public Utilities Commission. I'm the Cost-Effectiveness Lead in the Energy Efficiency Branch. And today I'm going to be just discussing the metrics that we use to assess the Energy Efficiency Portfolio, and then also the structure of the portfolio and how that relates to GHG emissions.

The next slide, please. So, just a quick overview of the presentation. I'm going to start with a discussion of portfolio segmentation, and that's just describing how the portfolio is structured and what strategies we use to assess the portfolio in those different segments.

From there, I'll go onto a very high level discussion of cost effectiveness and how GHGs fit into that discussion.

And then, next, I'll discuss our goals metric and how that metric is transitioning from an energy savings metric to a new total system benefit metric.

And then finally, I'll close the conversation with just a discussion about how to maximize total system benefit and what some of the things that is

targeted by that new metric. Next slide.

So, to give an overview of the energy efficiency portfolio, in the past we had a single portfolio that was assessed cumulatively. So, all the different types of programs were lumped together and they were assessed using a combination of a goals metric, and then a cost effectiveness metric.

But starting in 2024, we're going to be transitioning to a new strategy that divides the portfolio into three segments based on the primary purpose of the programs in those segments.

So, the first segment is the primary resource acquisition segment. So, these are programs that have a primary purpose of, and a short-term ability to, deliver cost-effective avoided cost benefits to the electricity and natural gas systems.

So, what I mean by short-term is really the lifecycle of the portfolio, which in this case is four years. So, we're not talking about short-term savings that only last a year, but the idea here is that these savings will be measurable and potentially cost effective in a four-year period.

The second segment is a market support segment and these programs have a primary purpose of supporting the long-term success of the energy efficiency market.

And there's a lot of different activities that can fit into this bucket, including the training of contractors, educating customers, building partnerships, and then also moving technologies that are not currently cost effective towards greater cost effectiveness.

And what that looks like depends on the nature of the program. But this is an opportunity maybe to focus on types of programs that are new, or that aren't typically cost effective.

I mean an example that hits on the GHG conversation might be a program that targets refrigerants specifically, rather than just technologies that are only cost effective, which is the focus of the primary resource acquisition segment.

And then the third, and very important segment, is the equity segment. So, these are programs that have a primary purpose of providing energy efficiency to hard-to-reach or underserved customers in disadvantaged communities in advancement of the Commission's Environmental and Social Justice Action plan.

So, technologies which are cost effective to the general population may be harder to deliver to different populations, and this segment is an opportunity to reach those customers that may be left out of both traditional

energy efficiency and then also ESA. And again, there's -- again, there's a lot of different types of programs that can fit into that bucket. Next slide, please.

Here, we have a kind of a unique strategy. We have different assessment based on the type of program. So, for the primary resource acquisition segment we're going to continue to have a cost effectiveness ratio of 1-to-1. So, that would be a TRC of 1 for this segment. And that structure is familiar to what we currently do in the energy efficiency portfolio with our TRC targets.

But rather than having that TRC target include all the programs that have different functions, we're going to have a different strategy for the equity and market support bucket. So, for those segments we're going to have a budget cap of 30 percent, so it must not exceed the 30 percent of the total budget. And then, we will use achievement metrics to assess the success of those programs, rather than focusing just on whether or not they're cost effective.

And as we've done in the past, the portfolio must collectively achieve its total system benefit goals. So, we'll set a total system benefit goal that will apply to the full portfolio, but within that portfolio the segments will be assessed a little bit differently based on the primary purpose of the program.

Next slide.

For the resource segment cost effectiveness, we'll still be applying a cost effectiveness screen, as I mentioned before.

And at the CPUC, the total resource cost test is the -- still the primary test for determining cost effectiveness of an energy efficiency measure.

And we wanted to show this slide just to discuss what goes into cost effectiveness and also to understand how that relates to GHGs, because those things are connected.

So, for the benefits portion of the TRC ratio, you see that it's all of the avoided costs combined, and then you apply the net to gross ratio. And that net to gross ratio determines or, I guess, represents how many customers in that program might be free riders and how many are actually moved to adopt these technologies by the program itself.

And the costs of the TRC ratio include all of the program administrator costs to run the program, plus the incentives that are paid to the free riders, so these are people who would have installed the technologies anyway, and then plus the net participant costs. So, that's the cost to the actual customer, in either purchasing or installing the equipment minus

whatever incentives they received.

And you'll note here that incentives to the non-free riders aren't including in either a benefit or a cost because they actually canceled out. It's included in both places, so that's considered neither a cost or a benefit.

And in terms of what we consider as benefits in the TRC ratio, those are all of the avoided costs recognized by the Energy Efficiency Branch in the CPUC. So, that includes the energy costs, transmission, distribution, capacity, ancillary services, and then GHGs, including our new refrigerant and high-GWP gas avoided costs.

Plus, and this is specific to just the Energy Efficiency Branch currently, the avoided gas infrastructure costs for programs that are all-electric new construction. So, those all-electric new construction programs can include the avoided gas infrastructure costs as a benefit, which is helpful for encouraging, you know, lower GHG-emission residential buildings.

And here, in the TRC, we include the GHG benefit as an additional incentive to focus on the programs that do reduce the greenhouse gas emissions. Next slide.

So, one of the reasons the TRC is the primary

test at the CPUC is because it includes the broadest range of perspectives. So, that means that both the costs and the benefits to the utility and to the customers, who are installing the technologies, are included in this equation, as mentioned before.

And here you see just a little table that has the utility, and the customer, and costs, and benefits. So, you'll see to the utility the primary benefits are the avoided costs. So, those are the costs that installing this technology allows them to basically not pay in supporting our energy grid.

The costs from the utility perspective are the customer incentives generally, including the incentives that are paid to the free riders. And then, finally, the costs to run the program itself. So, that's all of the labor that goes into designing and managing the program.

And then on the customer side you'll see that our benefits are the customer incentives, so those are the incentives paid to the customer, as well as their costs, so the net participant costs. So, that's the difference between the technology costs, and its installation, and then whatever incentive they received. Next slide.

So, a new thing at the CPUC Energy Efficiency is

our new Total System Benefit Metric. So that benefit, rather than focusing on just kilowatts, kilowatt hours, and therms, we're going to be actually setting our goals in a dollar value. So, that will be, in dollars, the lifecycle avoided costs of the energy efficiency activities on an annual basis.

And this metric will be outputted from the Potential and Goals Study, which my colleague, Coby, will be discussing in just a moment. Next slide.

So, in order to maximize total system benefit, you see that we're encouraged to pursue savings that deliver high avoided costs to the grid and that can include programs that have a high GHG benefit.

And typically, the higher kilowatt measures deliver higher benefits, but that's not always the case. In this table you see that the agricultural clean water pump actually delivers the highest savings in terms of kilowatt hours, but its benefit per kilowatt hour is the lowest. And then you see that the fan controller has the lowest kilowatt hour, but then the highest benefit.

So, this suggests that this fan controller measure probably has high avoided cost values in either capacity, or GHG, or other avoided costs that make it particularly beneficial.

The next slide. And if you're interested in

getting more information on total system benefit, our Total System Benefit Guidance document is available for public comment and review on our public documents area through August 26th. And we intend to update the guidance document after the release of the Potential and Goals Decision, which Coby will discuss. And then, we'll update the document and really release it to the service list.

Thank you, I appreciate your time.

MS. RAITT: Great. Thank you so much, Jessica.

So, Coby Rudolph is next and he is the Senior Regulatory Analyst also at the CPUC. Thank you. Go ahead, Coby.

MR. RUDOLPH: Thanks Heather. Can you hear me okay? Audio check?

MS. RAITT: Yes, go ahead.

MR. RUDOLPH: Okay, great. You can go to the next slide. So, I'm going to talk through our CPUC 2021 Energy Efficiency Potential and Goals work. And here are just a couple items that we'll look at.

What's the Potential and Goals process? How does the goalsetting work happen? We'll look at key updates to the work that we've done this cycle. And then, get into the goals themselves and how they look in our new goals metric total system benefit. You can go

to the next slide.

So, how do we get CPUC to adopt energy efficiency goals? Well, every couple of years we conduct an Energy Efficiency Potential and Goals Study. And it forecasts a number of scenarios of cost effective, achievable savings.

So, you look at the kind of flow chart on the bottom here, what you see is that state policy requires us to pursue all cost effective, achievable energy efficiency. And that's where our Potential and Goals Study comes in to forecast what that cost effective achievable savings is.

Now, currently, we then take the forecast for each scenario and produce a number of different outputs, and our current goals are expressed in first year savings, kilowatt hours, kilowatts, and therms.

And then, those goals -- those goals, those study outputs then become requirements for IOUs and program administrators to achieve in their energy efficiency portfolios.

Starting in 2024, we are -- as Jessica mentioned, we're shifting that goals metric from first year savings to total system benefit, TSB, expressed in dollars. So, the Potential and Goals Study outputs both kinds of metrics, the first year savings and the total

system benefit.

And starting in 2024, it's that total system benefit that the utilities will then be taking and using as their requirement for what they need to achieve in their energy efficiency portfolios. You can move to the next slide.

We conduct the Energy Efficiency Potential and Goals Study in a couple of different phases. We start with analysis of technical potential. What's the entire amount of savings available each year if we were to upgrade every building in the state to its highest technical level of efficiency?

Then we apply an -- what we call an economic screen to each measure in our study. Where we basically run it against our cost effectiveness tests at various thresholds and to see what comes out as cost effective according to our cost effectiveness test policy.

Then for those measures in a given scenario that do pass a cost effectiveness screen, we take them forward and model their customer adoption. How much do we expect could actually be achievable through energy efficiency portfolios? And that's our achievable potential. Next slide.

Some of the things that we've worked hard on this study to improve our work, one is fuel substitution

forecasting. As many of you know, a fuel substitution decision that came out a couple of years ago that now allows a number -- more fuel substitution measures to be implemented in our energy efficiency portfolios. And so, we needed to work to incorporate those fuel substitution measures into our forecasting.

We conducted some sensitivities for COVID impacts, and also the impact of combining energy efficiency and demand response measures together, both on cost effectiveness and on customer adoption.

We ran an alternative scenario analysis where instead of using cost effectiveness, we assessed how energy efficiency measures, what performance they were, if they were competed against other kinds of resources in our IRP directly.

We conducted a few market studies to look at different factors for customer adoption, things other than just economic attractiveness. So, other than just dollars and cents, and how they impact the way that customers think about whether they're going to buy or adopt an energy efficiency measure.

And then, did a deeper dive into some industrial/ag subsectors to get a better understanding of what's there in terms of energy efficiency potential.

We worked on our Total System Benefit output

metric, especially as we head into 2024 when it will be the compliance metric for our energy efficiency portfolios. And we did the analysis using two different versions of the CPUC Avoided Cost Calculator, the 2020 vintage and the most recently adopted 2021 Avoided Cost Calculator. Next slide.

On that avoided cost piece, the Potential and Goals Study uses our Avoided Cost Calculator to calculate that cost effectiveness and total system benefit. It's the benefit side of our cost effectiveness calculation, as Jessica mentioned.

And a spring decision instructed our IOUs to keep using the 2020 adopted avoided costs for the next couple of years, 2022 and 2023.

Meanwhile, we published our Potential and Goals Study in the spring, using those 2020 adopted avoided cost values. And then, our 2021 avoided cost was adopted a little later in the spring, and actually maybe even the early summer.

So, what we have here are both vintages of avoided costs. And our proposed goals, as outlined in a proposed decision issued last Friday, actually used both versions of the Avoided Cost Calculator. They based the 2022 and 2023 goals on 2020 adopted avoided costs. And then, goals for 2024 and beyond, through 2032 are based

on the 2021 Avoided Cost Calculator values. Next slide.

So, here's what we see using our 2020 Avoided Cost Calculator. You can see that the -- I know it's a little small on the screen. We go from gigawatt hours, first year gigawatt hour savings on the left to first year therm savings in the middle, and then total system benefit in dollars, in millions of dollars on the right-hand side. The dotted line is the goal that we set in the previous version of our Potential Study 2019. So, you can see how they compare.

Now, on the left side what we see is a reduction in energy efficiency, in particular energy efficiency equipment savings, versus our last study. And then also, the impact of fuel substitution, that increased electric supply which brings the net gigawatt hour savings down. So, both of those are reflected in that left-hand graph.

On the other hand, the middle chart of gas savings is where you see the impact of fuel substitution coming in, that gas savings from fuel substitution pushing the numbers up.

And then, total system benefit reflects both the electric and gas systems. And so, you can see kind of how that -- what that looks like in dollar form over time. Next slide.

The same structure here with our 2021 avoided cost-based results. With our 2021 avoided costs, you do see lower electric equipment savings because the electric avoided costs decline in our 2021 vintage. And then also, a bit lower gas savings from energy efficiency equipment, but then slightly larger impacts from fuel substitutions because more fuel substitution measures become cost effective in the 2021 avoided costs.

The next slide. Here we dive a little bit more deeply into fuel substitution in particular. And you can see where the fuel substitution savings is coming from. It's mostly in residential and mostly in water heating. What we find is that more water heating savings passes our cost effectiveness screens than space conditioning. Next slide.

And I know there are a lot of numbers on here, but this is just kind of to give you a sense of how we're transitioning from those first year savings goals into our total system benefit goals that Jessica walked through, the ones that include the avoided costs from energy savings, demand, and then also greenhouse gas compliance costs.

And you can see that the goals for 2022 are based on the single fuel savings, so gigawatt hours,

megawatts, and therms. And then, when we move into total system benefit, they're reflected in dollar form and broken out by savings type as well. Next slide.

So, our proposed decision to adopt new energy efficiency goals was issued last Friday. Comments are due in early September, mid-September, and then reply comments shortly after that. We do expect that the Commission will vote on a final decision to adopt goals a bit after that, possibly at the Commission's September 23rd voting meeting.

And I believe that's my last slide. And thank you so much, look forward to the Q&A.

MS. RAITT: Great. Thank you, Coby.

So, next we have Ingrid Neumann, who is the Efficiency Lead Specialist at the -- in the Energy Assessments Division of the Energy Commission. So, go ahead, Ingrid.

MS. NEUMANN: Thank you for the kind introduction. Hello Commissioners and stakeholders. I'm here today to present on some considerations as we plan on refreshing our SB 350 tracking and projections for the 2021 IEPR. Next slide, please.

SB 350 establishes an aspirational goal for the state to double statewide energy efficiency savings in electricity and natural gas end uses by January 1st,

2030.

This may include fuel substitution or building electrification if net GHG reductions are realized. Of course, all efforts must be cost effective and not adversely impact public health and safety.

The next slide, please. So, here is a diagram of our high-level analytical process flow. We combine and calculate the cumulate energy savings from each of the data streams on the left-hand side. The asterisks, or the starred ones, are coming from the CPUC's Potential and Goals Study, which Coby just presented to us.

We include historical and projected IOU and POU program savings, as well as codes and standards, and other beyond-utility incentive programs.

We report out gas savings in mm therms and electricity savings in gigawatt hours, as well as their combined energy saved in quad Btus. Lastly, we also quantify GHG emissions saved. Next slide, please.

This is a diagram from our first report in 2017, where we set the SB 350 doubling goals and made the first set of projections. The black solid line is marked in very small script. The SB 350 doubling goal and then the colorful wedges of the buildup, all the different contributions towards meeting that goal, as

was anticipated at that time.

As programs evolve and as evaluation and measurement data comes in, we update those projections every two years. Next slide, please.

So, the first goals did not -- or the first projections did not meet the doubling goal. And various recommendations were made in the report to explore additional savings. All of those recommendations were included in our 2019 analysis, published online as part of our California Energy Efficiency Action Plan. Next slide, please.

As part of the process in 2019, we created and built the EE Data Aggregation Tool to support SB 350 tracking and projection efforts. This allowed us to do the work in-house, where we would collect the savings and report the energy savings and GHG reductions. We can do this by utility service area, sector, and end use.

We also separately quantify disadvantaged community and low-income impacts. Next slide, please.

This shows the results from 2019 in two scenarios. The reference scenario or business as usual type scenario, doesn't meet the SB 350 goals. You'll see that it falls short.

Many programs were only funded for a few years,

so we couldn't project those out further, as we had maybe done so in 2017.

Then, the program -- if the program wasn't funded anymore, these savings would decay over time because we're looking at cumulative savings here.

In the aggressive scenario, we took a very optimistic, achievable potential view of what the savings could look like if those enhanced code compliance rates were realized, additional codes and standards measures came to fruition, as well as increased funding in our participation penetrations for financing and incentive programs. We also added potential new programs needed to meet those goals.

Of course, as we move forward EM&V would be required to confirm that those savings are actually occurring. Next slide, please.

For the 2021 IEPR cycle, we are working on enhancing our technical capabilities for energy efficiency tracking and projections. We've been incorporating new data from all sources, as well as incorporating new saving sources as programs come online, and updating our current sources.

We have considered overlap in customer segments that are being targeted by different, but similar, programs. And we have considered market-based

activities that may result in energy efficiency savings that aren't already being captured elsewhere. Next slide, please.

Of course, SB 350 exists in the broader policy context of building decarbonization and other policy goals, such as SB 100 and AB 3232.

As part of our work to support AB 322 analysis, recently published in the California Buildings Decarbonization Assessment, we developed the Fuel Substitution Scenario Analysis Tool, known as FSSAT. Next slide.

For the 2021 IEPR, we have been expanding on our technical capabilities for electrification scenarios from the more "what if" analysis that existed in the apps that were used in support of AB 3232, to projections based on current and future program activity.

We have also been incorporating electrification resulting from local ordinances, as well as the recently adopted 2022 Title 24 Updates encouraging building electrification. Next slide, please.

The AB 3232 analysis was informational and explored the potential for the state to reduce emissions of greenhouse gases in the state's residential and commercial building stock by at least 40 percent below

1990 levels, also by January 1st, 2030. That was explored using one or more scenarios within numerous possible decarbonization strategies.

For the electrification scenarios, next slide please, we quantified the net GHG reductions by including gas combustion which, of course, would be reduced when electric appliances replace gas appliances.

Since, however, electric appliances do add an incremental amount of electricity, the emissions from the generation of said electricity are included, as are the HFC leakage values from refrigerants commonly used in heat pump technologies used to electrify space and water heating. Next slide.

This is a diagram taken from our AB 3232 work. And the red, horizontal solid line is a systemwide emissions target that AB 3232 seeks to meet or exceed.

As you can see, the green columns or electrification impacts are much greater than the red gas energy efficiency, or purple electric energy efficiency impact.

So, does this mean that electrification can save the day and allow us to exceed our SB 350 goals? So, if we look at this very simplistically on the next slide, then what we're showing here is we're taking our data from 2019 and we've removed the small amount of existing

fuel substitution assumptions that were included there for both the business as usual reference scenario, and the aggressive scenario, and added in the minimum "what if we met AB 3232 goal?"

So, you can see that the red line, which is the reference scenario, still fall short of the goal, the SB 350 goal. And the green line, the aggressive scenario, just meets it. But the question really is how feasible this is. We're looking at a combined goal of electric and gas energy efficiency, and we need to remember that both this aggressive scenario for 2019 SB 350 and the AB 3232 compliance scenarios are based on an achievable potential, not a programmatic business as usual potential. Next slide, please.

So, we further looked into gas consumption and how much gas would be saved with energy efficiency, would be saved by the doubling goal, and could be displaced by electrification efforts quantified in AB 3232.

And we found that, of course, gas and electrification do compete physically, as well as for program funding, but if we combine certain scenarios of energy, of gas energy efficiency and electrification scenarios, we could come into a sphere where we got non-physical results. Meaning that we would potentially

look at displacing more than 100 percent of gas consumption, which is not possible.

This means that we need to be very careful about which energy efficiency and fuel substitution or electrification scenarios we combine in our analysis for 2021. Next slide, please.

So, we are working with our contractor, Guidehouse, on incorporating more program-oriented inputs in our improved Energy Efficiency and Fuel Substitution Analysis Tool for use in the 2021 IEPR. Next slide, please.

This is a list of the programmatic elements we've identified and are currently incorporating in our electrification projections. This includes all of the fuel substitution that is included in the Potential and Goals, in the proposed decision. And last slide.

Once our data collection and analysis is complete, we can aspire to understand what the difference is between an aggressive 2021 SB 350 scenario, including electrification, and a reference SB 350 scenario including electrification. Last slide, please.

Our goal for the 2021 IEPR is to shed more light on the difference between our business as usual track and the track we prefer to be on, which meets

California's energy and GHG goals. Thank you.

MR. CUTTER: All right. Hello, should I just jump right in? All right, I am Eric Cutter.

COMMISSIONER MCALLISTER: Yeah, please go ahead. Sorry about that.

MS. RAITT: I'm sorry. Yes, this is Heather. Please go ahead, Eric, thank you so much.

MR. CUTTER: Okay. Thank you, Commissioner McAllister and the CEC for inviting E3 to present on this panel. We offer -- I'm Eric Cutter, a Director in Distributed Energy Resources. We bring, you know, I don't know, a good perspective in that we have been supporting the CEC on the Title 24 Building Standards that were just approved, as well as the CPUC on the Avoided Cost update that Jessica mentioned.

So, if we go to the next slide. We'll jump one more. So, stepping up there are two questions that are causing some cognitive dissonance, you know, as we think about electrification and energy efficiency in a decarbonized world. And one is our avoided costs are getting cheaper and cheaper. That's reflecting lower cost renewables on the grid. And a lower carbon, increasingly clean grid.

So, one question is what is the role of energy efficiency in saving carbon, if our grid is getting

cleaner?

And the other is what is the role -- how do we think about these two things together? On the one hand we're saving energy, on the other hand we're electrifying and increasing energy. Can't you give me a framework or a metric to kind of think about all these things in one place? And so, that's what I'm going to dig into in a little more detail in this presentation.

Next slide. So, the first question is can we add up and compare the savings of electrification and energy efficiency and kind of put them in the same bucket? And the short answer is yes.

The useful way to do that is what was -- in this last cycle of the TDV for the Building Standards, we developed, we the CEC, and E3, and all the stakeholders, the source energy metric. And that does two things. One, it moves from looking at the savings, you know, just at the building to looking at the savings upstream. So, we're going upstream to the source energy and taking into account the fossil fuel burning at the source on the electric grid, or on the natural gas side, and how that's -- the relative contribution to our GHG and GHG savings.

And two, it's looking over the long term. We want to not just -- we want to look forward and reflect

that our planning is going to have lower and lower carbon on the electric grid.

This example here is narrowed down for a simple proof of concept looking at just the residential building sector. On the right-hand side, looking at the spreadsheets from the SB 350 Study that was just presented, showing if we add up the source energy of the electric savings and the gas savings, put that on an equivalent basis, we're getting about half way to the target.

On the left-hand side, doing a similar measure for an electrification portfolio that E3 did for a study with SCE, SMUD, and LADWP. And what was interesting is it comes out fairly similar. So, it's on a comparable scale, electrification and energy efficiency portfolio in terms of adding up your source energy impacts. And right now, you know, neither are getting quite as close as we would like them to, to this doubling goal. Next slide.

That was a short-term look. Looking over the long term, this is looking at that electrification portfolio. You do see, if I just straight line that doubling of energy efficiency goal, with electrification we're really, really emphasizing a lot of gas savings, you know, after 2030.

By this metric, if we're again looking at the source energy metric, you are starting to achieve your doubling goal.

So, the main point here is we can use this source energy metric and add up totals in a way that reflects the decarbonization of the grid to show, compare, and maybe stack up in the same bucket your savings and your energy value of electrification, and energy efficiency. And maybe the two together can add up to -- get to our doubling goal. Next slide. We'll jump one more.

So, obviously, adding up the energy is not, on its own, sufficient. And it is really hard to overstate the different planning perspective we're in with respect to energy efficiency and electrification.

So, historically we've simply added up how much marginal energy savings, and add up that value and the emissions, assuming fossil fuel's on the margin.

What's really flipped the planning on its head is we're now planning to meet a GHG target. And our planning paradigm is we are going to meet that GHG target. So, in a fundamental sense, energy efficiency is not saving greenhouse gases. Which it is, obviously. But what we're saying in our planning paradigm, we're going to meet that target one way or another.

So, the real way we put all these in one basket and reflect the value of energy efficiency compared to electrification, compared to renewables is in how do they help us achieve that target at a lower cost to ratepayers? Next slide.

And that gets us to where Jessica led us off, on really valuing the system value as opposed to just adding up the therms, kilowatt hours, or tons. And so, that is adding -- taking us -- like adding a step. I just described the source energy metric. We're reflecting the value of the time on the grid. You're going to get more savings if you're saving on peak than in the middle of the day. We're also reflecting that the energy -- or, sorry, the carbon intensity of the grid is going down over time.

And then our planning is assuming as we -- each year we're going to be adjusting our portfolio to meet that target. And energy efficiency is going to help us do that at a lower cost. Next slide. Let me actually jump two more slides.

I want to illustrate this concept using a recent study, recent results from our CPUC IRP planning. And the most apples-to-apples, kind of clear example of this is actually using electric vehicles.

So, in the Integrated Resource Plan modeling,

we're modeling least cost portfolios to meet the GHG target, the reliability targets under different assumptions.

So, here are three plans we can compare. Meeting a 38 million metric ton target. There is a base case forecast from the latest IEPR that has, don't quote me, but it's roughly 4 million electric vehicles by 2030. And then, we modeled two high EV scenarios that get us to the 8 million EVs by 2030 goal. And we used two cases with those, one with managed charging and one with unmanaged charging.

And you can see on the right your unmanaged charging has more charging on peak, less charging in the off peak, and less charging in the middle of the day when we have excess solar. So, how does that all add up to our total system value? Next slide.

We can look at the incremental cost of serving that EV load and with an unmanaged load shape. So, we're not able to manage a lot of what's happening on peak. The costs from a system perspective to serve that load are $600 million at a levelized cost of about $60 a megawatt hour.

If, instead, we are able to do load management or vehicle/grid integration, that reduces that cost of serving that load by half to about $3 million, or a

levelized cost of $30 a megawatt hour.

I want to emphasize this is just the system perspective. It doesn't include all the avoided cost categories of distribution and other things.

So, what's causing that cost that's reflected in this modeling is the unmanaged load shape is requiring us, the State of California, to build an additional 89 megawatts of solar and 327 megawatts of energy storage by 2030.

So, you can think of energy efficiency in the reverse. If we're able to save energy at kind of a flat load shape, maybe we're saving $300 million. If we're able to target that energy efficiency or its flexible, then we can save even more. And it's reflected in this planning value to meet our low GHG target.

And I will stop there and let us get into questions.

MS. RAITT: Thank you, Eric. Commissioner, did you have any questions for Eric, or for the other panelists?

COMMISSIONER MCALLISTER: Yeah, and can you hear me okay? It looks like, so --

MS. RAITT: Yeah.

COMMISSIONER MCALLISTER: Great. Thanks. Thanks to all the presenters. Eric, that was great.

And Ingrid, Coby, and Jessica, really appreciate your time and attention to these issues.

And, you know, this is highly technical and a little bit inside baseball just because it's -- you know, we're talking in, really, California's language about how we do and assess energy efficiency and decarbonization. And so, you know, just recognize it's not the most accessible conversation to folks who aren't, you know, kinda doing this sort of thing every day.

But with that said, I think it's super important because this is what -- you know, these fundamentals, it's really what our program funding, and evaluation, you know, and directionality really is determined, you know, on. So, really appreciate your day-to-day work on this because it's super important.

I guess I wanted to -- so, it's interesting that, you know, we've talked about -- so, the example that sort of has come up repeatedly already today that is sort of the clearest, I guess the clearest sort of case study of how efficiency and decarbonization, you know, do or don't sort of overlap and also, how they operate relative to system issues has been EVs. It's been the transportation sector, not necessarily the buildings. And so it's bigger and maybe it's a little

bit simpler to think about.

I wonder, you know, how can we sort of make buildings -- you know, Eric to your example, you know, buildings also are a source of increasing load, alongside transportation. And in, I think in practice and certainly in theory they should be able to produce downward rate pressure.

And maybe, I guess I'm looking for some comments or some ideas on sort of how we can make sure that happens. You know, sort of as you said, you know, we're moving from -- as you said, Eric, you know, we're moving from a kind of really operational savings paradigm in energy efficiency to, really, an infrastructure savings paradigm.

So, you know, how can we help that downward pressure actually take place? You know, what are the optimal programs we can do to actually make sure that those infrastructure savings are realized? And therefore, you know, 20 years down the road we're actually having a conversation about a lower, you know, a smaller rate base than might have otherwise been the case.

MR. CUTTER: I can jump in and offer one thought is what we are doing is really making sure that the avoided costs that are used to value all the distributed

resources, including energy efficiency, are accurately reflecting those cost savings at the system level.

And you've seen -- so, we just updated the avoided costs for 2021 and came in for some criticism that hey, you know, energy efficiency is less valuable than it was in 2020. And that's true.

On the other hand, electrification is more valuable. And also on the other hand, the timing is more valuable. So, the avoided costs are showing better value for being able to shift your load during certain times of day. So, we want to keep that process going, even as it, you know, may upset the apple cart a little bit for some existing programs, but it helps us focus our ratepayer dollars on the ones that are best, or provide the most value going forward.

COMMISSIONER MCALLISTER: So, I guess just to paraphrase, we can make sure that our programs -- I like your sort of promote electrification differentially and alongside that, also emphasize flexibility in order to maximize that system benefit.

MR. CUTTER: Uh-hum.

COMMISSIONER MCALLISTER: Great. Anybody else?

MS. ALLISON: Something that I think comes up a lot in the context of fuel substitution is just making sure, firstly, that you're targeting customers, at least

in the early stages, that can really most benefit from this type of switch.

So, an example, if you're focusing on customers who are trying to install heat pumps, having people who already have the air conditioner is a really great place to start. And I think that's something that's been said in the past. Because if they have that load already, by switching to a heat pump you can actually achieve energy efficiency savings and building decarbonization, which I think is a really great strategy, especially when we're trying to get the technology to a place where it really optimizes the GHG reductions, and also can save people money on their bill.

And that kind of segues into the second piece that comes up for fuel substitution is making sure that when we're creating these incentive programs we're not just saying if it's an electric technology, it's the way to go. I mean you have to say that electrification is our goal, but then focusing on technologies that are really high efficient in themselves. So that they're not just electric, they're high efficient electric I think is a really important piece.

And then, this doesn't reflect so much in bill savings, but the refrigerant impact of the heat pumps I think is really important, too. So, when you are

encouraging the switch, I think what you're switching to should be a focus in addition to the fact that it's an electric technology.

MR. CUTTER: Oh, Coby, you're muted.

COMMISSIONER MCALLISTER: Oh, I'm sorry, I'll highlight that the 3232 Report actually also did focus on the HFC, on the refrigerants issue as a key kind of input to make sure that we do -- you know, as something that's also necessary, but not quite sufficient to get us to our 40 percent reduction goal by 2030.

So, Coby or anybody, did you have anything to say about that?

MR. RUDOLPH: Yeah, just that, you know, building off of Jessica and also Eric, I think that's where we see our total system benefit metric coming in as kind of like a great equalizer. Because with all these different things going on at the same time, refrigerants, move it fuel substitution to, you know, move off of greenhouse gases that are emitted in the building.

Savings on the electric side, they're just difficult to deal with in isolation. And when you're trying to throw a bunch of different requirements onto a program or an energy efficiency portfolio, I think it makes it, you know, really complicated and confusing to

administer. So, that's where we kind of see our Total System Benefit metric coming in, providing a nice price signal to say just, you know, here's the dollar value, go after it. Whether it's from fuel substitution, building electrification or, you know, from energy efficiency directly on the electric or gas side.

COMMISSIONER MCALLISTER: Great, thanks for this. I mean we've had -- it's interesting and I know that staffs are working together across both Commissions, but in the development of the Building Code as we've heard from -- well, we've heard a couple times today already, including Ingrid, you know we did move towards this source energy metric in the Building Standards. Sort of we have a now binomial, which is one of the cost effectiveness, it's the time-dependent valuation which we've always used, we always have had that time component. And then, now layering on a source energy metric.

And so, I think we've been moving in similar directions and increasingly close together across both Commissions to embrace the new sort of requirements of investment that supports the grid and really maximizes the savings to the grid, and also tries to maximize them for the customer as well.

I think, now we heard this morning -- we heard

in the first panel that we are in this kind of strange, a little bit of a no man's land sort of as we move through this kind of where retail rates don't really reflect the avoided cost, you know, that well. And so, as we move towards a moment where that actually is the case, I think we're increasingly, I think, across Commissions targeting that same long term, which is great.

I want to just congratulate you guys on the system benefit metric and the avoided costs work that you've been doing because I think that's real fundamental.

Let's see, I guess Ingrid, did you want to comment on that at all or can we move on to other Commissioners?

MS. NEUMANN: I just wanted to agree that, yes, efficient electrification is absolutely the way to go. And I wanted to point out that one of the things we're doing to improve our analysis for SB 350, as well, is to actually have hourly GHG factors. So, that was something that we worked on in support of AB 3232 and we can incorporate that in our tools here, now. So, that kind of gives different value for at least the GHG component, depending on when that energy is being used, like Eric pointed out.

COMMISSIONER MCALLISTER: Perfect. And I keep bringing these other complementary initiatives up, but the flexible demand appliance standards with SB 49, and the load management standards that's really a web-based platform that enables, you know, pricing to really play out automatically and at low cost to the customer. And get -- enable load flexibility.

We're hopeful that those will really unlock many of the things we're talking about at scale, and at low cost, really enable the time dependency of load to come to fruition as we've been sort of targeting for a couple of decades now as a state. So, really, happy about all the progress jointly that we're making.

I want to just pass the microphone to any of my colleagues. Commissioner Houck, did you want to ask any questions?

COMMISSIONER HOUCK: I just wanted to make a comment that all of this work is just really, really critical and important, and I'm just very impressed with everything I've seen. And just really, again highlight the importance of efficiency, demand response, and load flexibility. Even with moving to electrification we still have supply chains that have carbon emissions that we can't lose sight of. So, the less energy we're using, the more we're able to move forward with those

emissions goals, even beyond the renewable sources that we're talking about, and there's also cost implications there as well.

So, we can't lose sight of those measures with efficiency, and load flexibility, and demand response even as we move to electrification.

So, I just wanted to say that I was very impressed with the presentations and all of the work that both agencies are doing.

COMMISSIONER MCALLISTER: Likewise. Very good. Thank you very much. Thanks for being here today.

Let's see, do we have anyone else? Are we the only two Commissioners that are still on for the morning? I know a couple had to drop off at noon.

COMMISSIONER HOUCK: I think so.

COMMISSIONER MCALLISTER: Yeah, I think we are.

With that, well, the timing's perfect. I think rather than ask more questions, which I could always do, we have two panels in the afternoon that are really going to dig into some of these issues. And the first one in the afternoon at 1:45 -- or, no, I'm sorry, we're going to start again at 1:30. And then the first panel there is on the program side of things, and impacts of different program initiatives, both from the agency perspective and one from the market, from South Coast,

South Coast AQMD.

And then the second panel in the afternoon is about building performance standards. And that came up this morning in the first panel. And I'm really excited to dig into that as a structure for motivating really deep and important retrofits on efficiency electrification and load flexibility going forward. That's sort of less, a little bit less prescriptive and more performance based. So, really looking forward to both of those this afternoon. So, encourage everyone to tune in again at 1:30.

With that, I think Ken can moderate the Zoom Q&A. I think we have a few questions.

MR. RIDER: Yes, we have a couple. There are two clarifying and one more substantive one. So, I'm going to start with the more substantive one.

Meghan Duff asked, from AEA, about -- so, she said: To your point about getting to the decarbonization target either way, by way of energy efficiency or clean renewable energy, how are the embodied emissions of a clean grid reconciled since they are avoided emissions via the energy efficiency, or reduced demand pathway?

And I just will note, before we get to the answer, we will have a workshop on embodied carbon in

the future, and encourage Meghan to attend that. But I think it does apply here to the metrics as we're trying to track credit for things.

So, I'll turn it to the panelists.

MS. NEUMANN: I can just say how we dealt with this in the AB 3232 report. I mean we did add in the incremental electricity added from electrification, or that 1-to-1 substitution of a gas appliance, or let's just say an electric appliance for an existing gas appliance, or simply having new construction start out that way.

So, of course, if you're adding that incremental load in, then if you were, you know, being more efficiency so you're adding a smaller load in, and if said load is coming from a cleaner system, that added GHG emission from electrification is very small compared to how much you're removing by removing that gas combustion. So, you always win out there.

MR. RUDOLPH: If the question is about embodied emissions in equipment manufacturing or other kinds of processes like that, I think I would just note that we -- at least as far as I know, in our CPUC energy efficiency cost effectiveness assessments, et cetera, I don't think we include those kinds of embodied emissions.

MS. ALLISON: We don't currently. And that's a good point in the equipment side that we do need to think about how some of these things are made. I mean I know for the refrigerant piece of that we have like an end-of-life factor. So, once it's, you know, no longer being used we do consider the refrigerants that continue to leak into the atmosphere.

And kind of on the other flip of it, as Ingrid mentioned, when we are thinking about increasing electrification we do try to consider like what the impact of that load is. So, I know that's a pretty big consideration in our avoided cost work that like as you're adding more electricity is that electricity going to be met with renewables, or with nonrenewables. And that is a piece that we focus on and try to forecast what that interplay might look like.

But there's always more work to be done. I mean in our current methodology we definitely don't capture all of those pieces. And I think that's part of the reason it's so good that we do frequent, especially avoided cost updates, because there's always an opportunity to push the methodology further and bring pieces like that in, if we don't consider it currently.

MR. RIDER: Well, I'm going to ask one of the clarifying questions.

COMMISSIONER MCALLISTER: Ken, can I --

MR. RIDER: Oh.

COMMISSIONER MCALLISTER: I just have a -- a question just came in and we didn't get a chance to discuss it at a previous panel, but it's about cooling as equity.

It's from Felicia Federico from UCLA. Maybe we can include that one before we get to the clarifying questions.

MR. RIDER: Sure.

COMMISSIONER MCALLISTER: Sorry to jump in there. Yeah, thank you.

MR. RIDER: I'll just read it out loud to the panelists: There was an earlier comment about starting with people who already have air conditioning, converting them to heat pumps because this will actually reduce loads. This clearly conflicts with EJ considerations since DACs, or disadvantaged communities, will have far more people without air conditioners currently, and these homes are unable to deal with the rising temperatures or outdoor air quality issues/wildfire impacts. How are you balancing these issues?

MS. ALLISON: Yeah, I think that's a great point, maybe I'll start there because I think that was

my comment. I do think, from a program design perspective, focusing on people with air conditioning is a good strategy. But that strategy should not be pursued like, you know, at the expense of people in the equity group. And I think that's really, really important.

And that's part of the reason we drove the segmentation change in the EE portfolio that we have these three buckets, and one of the buckets is the equity bucket. And the standards for assessing that is different than normal, just resource programs, in that we don't apply the cost effectiveness screen, and then the success metrics are different. So, that bucket and the reserved funding from that bucket, I think would be a really good place to focus on homes that don't have air conditioning. Because I agree that especially as the climate gets hotter and we see these 116 days that it is important to make sure people have what they need to be safe.

And one place where that can be considered is what we consider the baseline in energy efficiency, whether or not the baseline is to have no air conditioning or to include air conditioning. And as we continue to gather data on what people need to be comfortable, that information influences how we go about

assessing these programs.

So, I think my answer is two parts. The first part is that the equity needs to continue on a separate track to make sure people aren't getting left out. And then the second piece is to continually update our assumptions to make sure they're in line with what is actually happening in Californian homes.

MR. CUTTER: It bears emphasizing that electrification in buildings, more so right now that some of the other sectors, there are -- segmentation is important in finding the early wins that are cost effective now. It is important to kind of build the technical capability, and the workforce, and all that.

So, in some sense, obviously the equity needs to be considered. In some sense, having the larger homes with air conditioning go first, they're also helping build that workforce with the early applications that are more cost effective. So that the other measures for the smaller homes and such can be cost effective sooner.

MR. RIDER: Great, so I'll move on to some of these clarifying questions. This one's to Jessica. The question is: Is TRC greater than 1 or TRC greater than 1 is a filter of what is allowed before considering Total System Benefit goal?

MS. ALLISON: So, I maybe there might be two

parts to this question. If the part is -- if the question is whether you have to have a TRC of 1 to be included in that resource segment, the answer is no. There will be many measures and technologies that aren't cost effective that are included in that bucket. It's just a question of adding in other technologies that are more cost effective to even it out. So, cumulatively the portfolio is -- or the segment is cost effective. So, to that piece, no.

But then, if the question is about our goal setting process and if only measures that have above a 1.0 TRC is included in the goals, that's probably something that Coby can address in more detail. But what the TRC cutoff is in that Potential and Goals Study can vary from year to year, and it also varies from scenario to scenario.

Like, for example, we have a scenario that has like a 0.85 cutoff. So, it's not always 1. And the reason for that is if you're shooting for a target of a 1.0 per segment, you obviously have to include technologies that are higher and that are lower, or else you'll end up with -- if you only do the one cutoff, your ratio would be far above 1.

So, I guess no is the short answer, it's not like a threshold.

MR. RIDER: Thank you. One last clarifying question. This one is for Coby: Does this analysis incorporate data on actual and not modeled energy consumption before and after energy efficiency measure implementation?

MR. RUDOLPH: Not directly. It's based on our modeled savings, our modeled deemed savings. It's a forecast, right, so it's not an analysis of savings that's been achieved, it's a forecast of savings that will be achieved in the following, in the next 11 years.

But we do have a feedback loop in our evaluation cycle that, you know, where we look at existing programs, evaluate them, look at the consumption data in many cases, and then use that consumption data to update our future forecasts. So, yes, not directly.

And then, Jessica's correct that we use a variety of different measure level cost effectiveness screens in our Potential and Goals process. And that's really a methodological choice since our policy is that an entire portfolio or portfolio segment of resource programs needs to be cost effective. Every single measure does not need to pass the TRC.

MR. RIDER: Thanks, Coby. That concludes the Zoom Q&A.

COMMISSIONER MCALLISTER: Thanks Ken. I really

appreciate your being here all morning and helping usher the conversation along, really helpful.

So, let's move on, Heather, to public comment.

MS. RAITT: Thanks. And thanks again to the speakers.

COMMISSIONER MCALLISTER: Yes, thank you all, that was great.

MS. RAITT: Jessica, Coby, Ingrid and Eric.

So, yes, and then we can go on to public comment. Rosemary Avalos from the Public Advisor's Office is here to help with that. Go ahead, Rosemary.

MS. AVALOS: Thank you, Heather.

Commenters, please allow one person per organization make a comment. And comments are limited to three minutes per speaker.

I'll first call on folks using the raised hand feature. Sean Soni, your line is open. And you may need to unmute on your end. Please state and spell your name and affiliation for the record. Please go ahead.

MR. SONI: Okay, great. Good morning Commissioners, staff, and panelists. My name is Sean Soni, spelled S-E-A-N S-O-N-I. And I'm speaking on behalf of the Southern California Gas Company, also known as SoCalGas.

I wanted to take a moment to thank the panelists

for their insights during the morning session on the importance of energy efficiency. The workshop further emphasized the important role that utilities have on statewide energy efficiency programs.

SoCalGas operates the largest natural gas energy efficiency program in the country, from both the therm savings and GHG reduction perspective.

At SoCalGas we view energy efficiency as a partnership with our customers and this partnership actually has been tremendously successful. We're ahead of our commitment to achieve the aggressive energy efficiency goals set forth by SB 350. In fact, over the past five years our energy efficiency programs have achieved more than 228 million therms in energy savings, or 1.2 million metric tons of carbon dioxide reduced, equivalent to the natural gas consumption of approximately 145,000 households.

Now, energy affordability is a critical issue that the state must address. Currently, approximately 31 percent of our customers are eligible for Low-Income Energy Efficiency Programs, LIEE. This is a low cost opportunity for a homeowner or renter to lower their monthly natural gas bill. In fact, the average gas bill for qualified customers is approximately $31 per month.

Should SB 756 be signed into law, the number of

qualified customers would grow as it raises the eligibility requirements from 200 percent to 250 percent of the defined federal poverty levels.

SoCalGas supports this legislation and stands ready to serve the needs of these customers.

And even with these successes, we believe there are significantly more savings that can be achieved. That is why SoCalGas is excited to be working with the CPUC to increase the funding for energy efficiency and weatherization programs, especially those targeting low-income households.

Collectively, we must work together to identify broadened pathways to engage hard-to-reach customers to participate in energy efficiency programs.

And that is all. Thank you again for the opportunity to provide public comments. Thank you.

MS. AVALOS: Thank you, Sean.

Now, I'll call on folks on the phone. And a reminder, dial *9 to raise your hand and *6 to unmute. I'll give a few seconds for those that are on the phone to raise your hands.

Okay, seeing that there are no more raised hands, this will complete our public comment. I turn now to Commissioner McAllister.

COMMISSIONER MCALLISTER: Thank you very much,

Rosemary, really appreciate you and the rest of the Public Advisor's Office. You do a great job.

I wanted to first of all just thank all of our presenters from this morning. That last panel was fantastic, so thanks very much to Jessica, and Coby, and Ingrid, and Eric for that. That was a really kind of robust discussion. And lots of follow up. I want to really encourage -- I know this is happening, but I just want to continue to encourage and just be explicit about supporting, as I know all of my colleagues across both Commissions do, that really intensive staff interaction that really bears a lot of fruit. And we just want to encourage as much of that as possible.

And so, it's just you can hear in the tenor and just the alignment across the board here that we're thinking about the big issues and trying to do that in concert with our colleagues.

I don't want to make any summary comments because we're right at 12:30 and I think we've just heard so much content today, and lots of follow up on both the first and second panel.

And also want to, again, thank Jessica Granderson for making time to be with us.

The one thing that I'm trying to do as the lead on the IEPR this year is to take every opportunity to

not only across the Commissions, you know, improve communications, and just encourage collaboration, but also between California and the federal government, and other states. And that is going to bear tremendous fruit. And I think we're in conversations at the federal level at this critical time when there are big funding conversations going on and we're likely to, you know, get some number of billions or even tens of billions of dollars coming to the state in some form or another, based on the conversations that are happening now in the infrastructure bill and the reconciliation, including quite a bit of funding for -- as resources to the state that we can administer as we see fit across the commissions. And so, I'm cautiously optimistic about having more tools and more resources in our toolbox going forward here, in a couple of months or so.

And just want to thank again all the panelists, and Heather, and the Efficiency Division, the IEPR team and the Efficiency Division, as well as our colleagues at the CPUC, who I know have provided a lot of input to today's agenda.

And with that, I think I'll pass it over to Commissioner Houck to see if you have any wrap-up comments for the morning.

CPUC COMMISSIONER HOUCK: I just wanted to thank

everyone, the presenters and the participants, and I look forward to hearing more this afternoon. So, thank you again for including us in today's IEPR workshop.

COMMISSIONER MCALLISTER: Absolutely. We really appreciate your being with us today.

So, on the screen there are -- that is the information to make comments to the docket, on the Building Decarbonization track. We really look forward to getting everyone's written comments. It's just the lifeblood of our process. So, those for today are due on September 7th.

And please join us this afternoon. Information is right there. And then, also join us on Thursday for discussions about embodied carbon in the building sector and refrigerants, which have come up several times today. We're going to dig into that in the afternoon on Thursday.

All right, so we will see everyone here at 1:30. Back to you, Heather.

MS. RAITT: Great, thanks. So, yeah, just a reminder that as shown on the slides that we have a separate log in for this afternoon. So, hope to see everyone at 1:30. Thanks.

COMMISSIONER MCALLISTER: All right. Signing off for now. Thanks everyone.

(Thereupon, the Workshop was adjourned at 12:35 p.m.)

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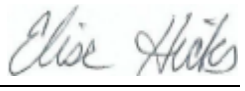

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