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CALIFORNIA ENERGY COMMISSION

In the matter of:

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IEPR COMMISSIONER WORKSHOP

RE: BUILDING DECARBONIZATION:

NATIONAL, REGIONAL, AND CALIFORNIA ACTIVITIES

REMOTE VIA ZOOM

TUESDAY, MAY 25, 2021

2:00 P.M. Session 2: California Activities

Reported by:

E. Hicks

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AGENDA

P R O C E E D I N G S

2:00 P.M.

TUESDAY, MAY 25, 2021

MS. RAITT: All right. Well, as people are joining us, good afternoon. Welcome to the Session 2 of today's Workshop on Building Decarbonization - National, Regional, and California Activities.

I'm Heather Raitt, the Program Manager for the Integrated Energy Policy Report, which we refer to as the IEPR. Today's workshop is being held remotely consistent with Executive Orders N-2520 and N-2920, and the recommendations from the California Department of Public Health to encourage physical distancing to slow the spread of COVID-19.

To follow along with today's discussion, the workshop schedule and presentations are available on our website, on the Energy Commission's website. And just be aware that our IEPR workshops are recorded, and both a recording and written transcript will be linked to the Energy Commission's website.

Attendees have the opportunity to participate today in a few different ways. You could ask questions or upvote questions submitted

by others through the Zoom Q&A feature. You can also make comments during the Public Comment period at the end of the afternoon. Please note that we will not be responding to questions during the Public Comment period.

Also, written comments are welcome, and the information for doing so is on the meeting notice, and written comments are due on June 8th.

With that, I'll turn it over to Commissioner McAllister. Thank you.

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

Thanks everyone for being with us again this afternoon. We probably have some repeat folks, so thanks for sticking it out all day. This is terrific.

This morning we had a really excellent group of speakers giving us some broad understanding of what's happening beyond California's borders, in Washington, D.C., where there is a huge number of activities happening, and likely some legislation of one flavor or another will make it through. I think it's likely that we'll have some resources in addition to our state resources. But, you know, fingers

crossed on all that.

And joining on dais by three fellow Commissioners, two here at the Energy Commissioner -- at the Energy Commission, and one at the CPUC. So thanks for being with us, Commissioners Gunda and Monahan. And on the CPUC, Commissioner Rechtschaffen, I see that you're here.

So, in the afternoon -- so that right now we're going to start on the California perspective, and with focusing on the CEC's activities, and then look more broadly across California. So really, really happy that we're able to kind of show the world what we're doing at the Energy Commission, but then also in the second panel, take a broader perspective and look more broadly across, including the activities of the PUC, but also in a range of stakeholders.

So really happy to be starting the afternoon. So looking forward to presentations. And without further ado, I think rather than repeat my exultations from the morning, I think I'll just -- we all know how important now really the conversation is, and how much some of the challenges, but also much of the innovation

that's happening, both in California and beyond. So I think it's really a good moment to take stock, and take a longer-term vision about where we want to head here in California.

So, with that, I'll pass the microphone perhaps to Commissioner Monahan, if you want to make some -- what would be for you opening comments.

COMMISSIONER MONAHAN: Yes, happy to. Thanks, Commissioner McAllister.

Well, I'm excited for this conversation. This is a learning experience for me, and I do think though on the transportation side for a long time we were, we were just really struggling with solutions. And now we're seeing a whole global momentum flowing toward a solution set for transportation.

And I know in the building side it's also happening, perhaps a step behind transportation, but that gives me just a lot of optimism generally that we can develop the solutions, both behaviorally and technologically to get to our goals. So looking forward to learning a lot this afternoon. Thank you.

COMMISSIONER MCALLISTER: Thanks.

Commissioner Gunda, would you like to make any opening remarks?

COMMISSIONER GUNDA: I'm going to use the brief moment of silence in the construction behind me. Yes, Commissioner, it was an excellent morning session. Thank you for hosting this, and look forward to the conversation. And welcome, Commissioner Monahan, to the dais.

COMMISSIONER MCALLISTER: Yes.

Commissioner Rechtschaffen, would you like to open us up?

COMMISSIONER RECHTSCHAFFEN: I would like to thank you for letting me rent a room at the CEC since this is my third CEC panel in electrification and decarbonization in the past three days. But it's a pleasure to be here, and it highlights how close our working relationship is. I'm very grateful for the CEC's leadership and ongoing collaboration in this area. Our work is always informed by the analysis in the IEPR and other CEC evaluations. So I'm happy to be able to attend the workshop.

I was able to join part of this morning's workshop. It's fascinating to hear what other leading jurisdictions are doing, and to see how

close and -- the challenges they face are to what we're facing. We're all in this together. We're searching for new, innovative solutions, and we have a lot to learn. And I benefitted greatly from hearing the exchange of the ideas. So I look forward to this afternoon's workshop.

MS. RAITT: Great. I guess I can --

COMMISSIONER MCALLISTER: Sorry. I was muted. Had to happen once.

Yes. But thanks, thanks a lot everyone for being with us. And I think we'll move on.

Heather, do you want to start the first panel?

MS. RAITT: Sure. I'll go ahead. And our first panel is -- I'll go ahead introduce everybody. It's on CEC's Building Decarbonation Activities. And so we have a suite of staff from the Energy Commission to talk about our programs.

We have Mike Sokol, who is the Deputy Director of the CEC's Efficiency Division. Ingrid Neumann is an Efficiency Lead Specialist at the Energy Commission's Energy Assessments Division. Virginia Lew is the Manager of the Energy Commission's Energy Efficiency Research Office. Natalie Lee is the Deputy Director of the

Renewable Energy Division. And Deana Carrillo is also available. She's the Office Manager of the Renewable Energy Division overseeing the launch of BUILD in -- of the BUILD Program.

So with that, go ahead, Mike.

MR. SOKOL: All right. Good afternoon. Can you see me and hear me? All right. Looks good.

Well, thanks for the introduction, and good afternoon, Commissioners, and everyone in attendance today. I am Mike Sokol with the Efficiency Division at the Energy Commission. And I'm going to provide an overview of some of the activities that the Efficiency Division, and kind of set the stage for the other Energy Commission activities, that we're taking on related to Building Decarbonatization.

And let me just say quickly before I jump in, I also appreciated a lot of the discussion this morning, particularly from the other states' programs that are tackling the same topic. A lot of commonalities that I think you'll see in some of the discussions this afternoon. And personally I'm looking forward to following up with some of those individuals to help inform

some of our activities here in California, and certainly feed into this IEPR.

Next slide, please.

So just to frame the discussion. There's a broad effort across California to decarbonize the State's economy. And really it's now more important than ever, given the unprecedented heatwaves and drought and wildfires that have gripped the State in recent years. And knowing that the need to address global greenhouse gas emissions is increasingly important. And California sort of leading by example and setting the stage.

Today we're going to narrowly focus a little more on the building sector, which you can see from the slide here, with residential and commercial buildings, it accounts for roughly 25-percent of the State's greenhouse gas emissions. And that accounts for fossil fuels consumed onsite and electricity demand. Also some consideration for refrigerant use for space cooling and refrigeration systems that we'll discuss in some detail.

And those of you that have tuned in to some of our recent workshops, for example the AB

3232 Building Decarbonization Assessment Workshop that was last Friday, we'll know there are sort of multiple ways that we've looked at for accounting for building GHG -- accounting for GHG emissions in buildings. And there's a lot more detail on our docket, and I'll provide some links later on to that effect.

Next slide.

So there's a whole bunch of legislation in recent years that really emphasizes the need to focus on strategies to reduce greenhouse gas emissions, underscored in recent years by the legislature with -- not just SB 32, which really looks economy-wide GHG reductions, but AB 3232 a few years ago, which directed the CEC in coordination with other agencies to assess the potential to reduce building greenhouse gas emissions 40-percent below 1990 levels by 2030. Again, I'll provide a link to more information on that a little later.

But supporting the, you know, portfolio strategy of Senate Bill 100, looking at 100-percent zero carbon resources for the electricity supply by 2045. And then a range of incentives, including SB 1477 that we'll hear more about this

afternoon, to get low emission building technology deployed into California's buildings.

In addition to that, there's a whole bunch of regulatory and other actions being taken, not only at the Energy Commission, but at the CPUC, that we'll hear more about today, California Air Resources Board at the local level, and at other agencies across the State, so really assess and get a handle on some of the strategies that can reduce building greenhouse gas emissions.

Next slide.

So, really zeroing in on 3232, the Building Decarbonization Assessment, this is a good starting point for the CEC's overview discussion because, again, it's a draft report that was just published, and we had a workshop last Friday on the topic in fact. And so lots of good information on the website to get in a lot more depth on some of the items discussed here.

But the report, as required by AB 3232, looks at CO2 equivalent costs per metric ton based on different strategies, looks pretty closely at space and water heating and reflecting cost-effectiveness as a key underlying

requirement for moving forward with new technologies in those realms. Really and emphasis on greenhouse gas emissions reduction and low-income and multifamily housing, in addition to high-rise buildings.

And a theme that you'll see reflected in some of my slides, and some of the slides of others, is really the need to focus on low-income and multifamily housing, and prioritize strategies that enable benefits for those customer groups. And also consider any potential negative, negative impacts that those customers are -- may face.

I mentioned a whole bunch of legislation up front. Another one that I could have easily, just as easily have highlighted is Senate Bill 350, which was just, you know, less than six years ago.

Five years ago there was a report that outlined a bunch of strategies and a bunch of needs unique to low-income communities and disadvantaged communities. That the themes are reflected throughout our program implementation as you'll see today.

And load management strategies -- sorry,

last slide.

Load management strategies are also considered within the realm of building decarbonization, as directed by AB 3232. So you're going to hear about some of the programs that are implementing load management approaches, and sort of re-envisioning the load flexibility landscape in the State of California later today, in addition to grid reliability impacts, which we know is an increasingly important topic as we continue to move towards 100-percent clean energy resources in the State.

Next slide.

So there's a range of specific variables and considerations that are mapped out through the AB 3232 report. I'll just kind of gloss over some of those here. Again, there's a lot more depth, but it will give a flavor of some of the topics that will come up through this workshop and beyond into this year's IEPR discussion.

Consideration of existing buildings, and particularly, you know, older buildings, some of the unique issues they face. New construction practices and the cost associated with new construction for different building types. I

mentioned some consideration of heat pumps specifically, and the low-global-warming-potential refrigerants that are going to be needed to support wide-spread deployment of heat pumps.

And some onsite issues, such as electric panel upgrades and other costs that should be factored in as we look at what it's going take to really decarbonize the State's buildings. Internet access is also there. That's important from a consideration of participation in certain programs, enabling load flexibility features, and also some equity considerations as well.

Next slide.

I'm going to avoid going into the depths here, but really a range of variables from the customer side as well. It's very important. And in the CEC's programs we reflect the customer-centric perspective. And so really just mapping out the range of considerations that we need to have an eye on, you know, including changes to how customers and building occupants go about their lives. Certainly focusing on cost-effectiveness, and the need for any standards that result in programs to be cost-effective.

And convey and properly account for costs and benefits attributable to individual customers.

Next slide.

And so I'm just going to -- I'm going to wrap up a few mores slides here. But seven broad strategies you're going to hear about today that are reflected in our 3232 Building Decarbonization Analysis, and in some of the programs you're going to hear about today.

Building end-use electrification for specific end uses, certainly accounting for cost-effectiveness and technology performance and availability, and being considerate of each climate zone and the unique regions that state has.

Decarbonizing the electricity generation system. So Senate Bill 100 and the move toward zero carbon resources.

Energy efficiency, both on the electricity and gas side, are just as important now as they have ever been in making sure that we're able to, you know, make the biggest impact with the kilowatt hours that we do need to consume.

I mentioned refrigerant conversion.

There's some discussion of that, and a lot of that's happening in the California Air Resources Board realm, but certainly something we're paying attention to.

And the growth of distributed energy resources, including behind-the-meter generation, and the need to, you know, account for the self-utilization of that generation, and also ensure there's sort of minimal impact to the grid.

Some efforts to decarbonize the gas system and pay attention to emerging technologies there and opportunities. And the new realm of demand flexibility, and really taking a close look at what role the demand side can play in supporting this transition to 100-percent clean energy, while maintaining grid reliability and supporting building decarbonization.

Next slide.

I mentioned SB 100. I won't dwell on this, but we're marching towards 100-percent clean energy, zero carbon resources by 2045. Senate Bill 100 has a plan that's mapping that out. There's a link on the slide, and as of 2019, we're well on our way with over 63-percent of resources already zero carbon.

Next slide.

So I mentioned, you know, a broad suite of strategies, and there's various ways those are being implemented at the CEC today. One of those is the proposed 2022 Energy Code Update that is currently in an open-comment period. And there's really, the considerations of that effort reflect a lot of what I've talked about.

But increasing energy efficiency with a clear emphasis on cost-effective measures, considering climate zones, while contributing and shifting to support the greenhouse gas reduction goals that we've talked about, while removing barriers and enabling pathways for all-electric buildings, and considering impacts to the electricity grid and grid reliability in that process.

Which includes building upon the 2019 building standards that established the first in the nation low-rise residential rooftop photovoltaics requirement, and looking more closely at the non-residential equivalent.

Also providing tools for local governments who want to extend beyond the minimum statewide standard for local reach codes.

Next slide.

Four main themes throughout the 2022 proposed Standards Update. The shift towards electric heat pumps, four specific end uses where it is feasible and beneficial and cost-effective. Looking at electric-ready requirements for buildings. I mentioned the non-residential solar and batteries proposal that's in there as well. And improving indoor air quality by updating the ventilation standards included in the code.

Next slide.

Those of you that have attended any business meetings this year will know that there's been a lot of action on the local front to support local reach code adoption that extend beyond the statewide building energy efficiency standards.

We now have over 48 local jurisdictions that have adopted -- forty local jurisdictions that have adopted over 48 local energy ordinances. A lot of those connect -- extending beyond to support building decarbonization themes. And now one in three Californians actually lives in a community with an energy code beyond the statewide standard.

Next slide.

I'm going to avoid dwelling on this slide, but it really just highlights the need for us to account for load flexibility. And the opportunities where you look at the green highlight here, is times of low emissions on the grid, typically aligning with peak solar production and renewable availability. And then as we get into the evening, and even in the mornings, there's increased carbon on the grid and increased GHG in grid electricity.

And so making sure that there's the ability to schedule, shift, and curtail load to align with those times of low emissions.

Next slide.

Again, another very dense slide, but the key gist of this is that we're looking with the CEC's load management standards. Updating those standards to reflect the need to convey rate information from utilities that are time-dependent out to customers, out to devices, to enable those devices and appliances to respond accordingly to times of low prices and times of low greenhouse gas emissions.

And this is really a complex landscape

that we're hoping to help make sure to provide clarity to and provide new ways to communicate those prices to devices.

Next slide.

Senate Bill 49 is the other side of the load flexibility equation, where the CEC is building out new standards to support flexible demand in appliances as a result of SB 49 that passed a couple years ago. And really we're just getting our bearings with the staff proposal coming shortly that considers the range of potential for load shift of those appliances, while also considering technology readiness and other factors.

But here I've listed some of the statutory requirements we have to address, including making sure that cybersecurity is right up front in that conversation, and that any standards are ultimately open-source and user-friendly.

Next slide.

And as I mentioned, there really is a commitment throughout these programs to prioritize and invest in consumer-centric approaches, particularly low-income customers and

disadvantaged communities. And there's a range of ways that we are doing that, including committing to the principles of inclusion, diversity, equity, and access.

Collaborating and discussing any plans and proceedings with the Disadvantaged Communities Advisory Group, formed by Senate Bill 350 in coordination with the Public Utilities Commission.

Consulting with tribes and also partnering with local communities and community-based organizations across the State, to make sure we understand and are reflecting the priorities as experienced by locals and by building occupants.

Next slide.

And I will go ahead and stop here. I think I went a little over time, but happy to answer any questions that anyone has.

MS. RAITT: Thanks, Mike. I think we're going to try to hold questions until the end.

So, Ingrid, if you'd like to go ahead and begin.

MS. NEUMANN: Yes. Thank you for the opportunity to present the analysis efforts of

the Energy Assessments Division in support of Building Decarbonization.

First we would like to share some recently completed work in support of the AB 3232 California Building Decarbonization Assessment. This piece of legislation asked us to assess the potential for the State to reduce the emissions of greenhouse gases in the State's residential and commercial building stock by at least 40-percent below 1990 levels by January 1st, 2030.

The AB 3232 analysis in informational, and explores one or more scenarios independently within numerous possible decarbonization strategies. Our team's goal was to investigate which scenarios could meet or exceed the 40-percent GHG reduction goal.

So on this slide you can see our analysis. We first had to define the scope. So, we had to set a 1990 GHG emission baseline to determine the 40-percent GHG reduction goal for 2030. Here we're showing a system-wide baseline, which includes emissions from the electric generation system, fossil gas, as well as non-fossil gas consumption, fossil gas leakage, stock as well as incremental heat pump HFC leakage, all

added together.

The cumulative total of these emissions in 1990 is shown the left-most column, and it yields 124.1 million metric tons of carbon dioxide equivalent. This means the 40-percent reduction target shown in the red dotted horizontal line is 74.4 MM tons.

The second column from the left shows emissions from the CARB inventory in 2018, and the following third column shows where we are in 2020 when we started this analysis. Then the fourth column from the left shows where we're projected to be in our business-as-usual case in 2030.

In order to figure out what that business as usual or 2030 baseline case would look like, staff relied on the 2019 Integrated Energy Policy Report, California Energy Demand Forecast, to establish the reference baseline, or our business-as-usual assumption of 2030 GHG emissions.

This business-as-usual case includes many building decarbonization efforts, including energy efficiency, PV, SB 100 RPS compliance, as well as traditional, non-event-base load

management programs.

The business-as-usual forecast for 2030 projects us to be at 79.9 MM ton carbon dioxide equivalent. That means we would need to reduce emissions by an additional 5.5 MM tons to meet that 40-percent reduction.

Next slide, please. Sorry. I got ahead of myself. Not next slide. If we could go back.

So we define one or more scenarios to analyze with the broad building decarbonization strategies, which are discussed in the AB 3232 report.

First was building end-use electrification, and we're showing four scenarios here in the middle cluster on this chart. And then include a broad range and combination of electrification for new construction, as well as appliance burnouts and early replacement of appliances in existing buildings.

Second, we looked at decarbonizing the electric system by accelerating the RPS from the 60-percent required in 2030 by SB 100, up to 70-percent.

Next we looked at energy efficiency, both on the gas and the electric side. So these were

additional, aggressive incremental efforts that go above and beyond our business-as-usual forecasts. As far as distributed generation and storage, we looked specifically at the scenario of behind-the-meter rooftop PV. So a high penetration of that, rather than the middle penetration considered in our business-as-usual case.

And lastly we looked at decarbonizing the gas system by substituting 20-percent of fossil gas throughput with renewable gas by 2030.

Next slide, please.

We have a lot of plans for future work, some of which has started. EAD plans to expand on our technical capabilities for energy efficiency tracking and scenario projections, such as for the SB 350 tracking we do, and our additional achievable energy efficiency forecast.

We will incorporate new data, such as from utility and other incentive programs to update historical savings, as well as improve our projections. Add new energy efficiency program savings, incorporate updates to codes and standards, such as Michael just mentioned for Title 24. Consider overlap in customer segments

being targeted by different programs, as well as consider market-based activities that may result in energy efficiency savings that are not being captured elsewhere as of yet.

Next slide, please.

EAD also plans to expand on our technical capabilities for electrification scenarios, so we can move from a what-if analysis, such as used to support AB 3232, to more projections.

We will further disaggregate low-income single family and low-income multifamily as separate residential sectors, so we can look at equity closer. We will incorporate new data, such as from utility and on-ground incentive programs, as well as incorporate electrification resulting from the local ordinances. And that from the proposed 2022 Title 24 updates, which encourage electrification, we will incorporate more diversity in space heating and cooling load profiles, as well as explore additional end uses and fossil fuels for electric technology substitution.

Lastly, we will explore various contributions to building electrification so that we can use that as a load modifier to our IEPR

Forecast.

Last slide, please.

Lastly, we are growing our economy-wide analytical capacity. New tools are being developed in support of policy development towards California's mid-century climate goals. These long-term demand scenarios will be designed to complement the traditional 10-year forecast and -- gas and electricity demand forecast, used for energy planning and procurement purposes currently, and may help inform future policy decisions.

Thank you, and that concludes my presentation on EAD's Decarbonization Activities.

MS. RAITT: Thank you, Ingrid.

Go ahead, Virginia.

MS. LEW: Hi. Good afternoon everybody. I'm going to give you a overview of some of the research and development activities that we are focusing on here at the Energy Commission.

Next slide, please.

The CEC's R&D Program focuses on innovations in areas like energy efficiency, energy generation, storage, grid resiliency, renewable integration, and low-carbon

transportation, to bring breakthroughs from the lab to the marketplace, and these investments are organized around the areas shown here.

For building decarbonization, the focus is on investing in new energy technologies to improve affordability, health and comfort of California residential and commercial buildings.

Next slide, please.

The CEC has two main research and development funding programs. The Electric Program Investment Charge, or EPIC, focuses on research that benefits electric ratepayers. The Natural Gas Research and Development Program focuses on projects that benefit natural gas ratepayers. But both programs provide funding through competitive solicitations to invest in technologies and strategies to catalyze change and accelerate achievements of our state policy goals.

Next slide, please.

Our research also focuses on supporting under-resourced communities by increasing their access to clean energy technologies that can lower their energy burdens, address some of the challenges and reduce their costs.

Underresourced communities include disadvantaged communities, low-income communities and Native American tribes. The map on the right shows the locations of all of our EPIC projects that have been benefited these communities.

Next slide, please.

Electrifying HVAC and water heating systems with high-efficiency units is a critical strategy for decarbonizing our buildings. Our research has focused on developing advanced heat pumps that integrates the best available energy efficient technologies into one unit.

Retrofitting multifamily buildings could be difficult, costly, and very disruptive to tenants. We are working on developing integrated mechanical modules that includes the HVAC and hot water heating units, controls, and monitoring systems all within one module. And then these modules can be mass produced and then installed.

And lastly, we are working also on low global warming heat pumps that can be plugged into 120 volt outlets, thus eliminating the need for panel upgrades.

This unit by Treau incorporates a low-cost polymer heat exchanger that can reduce

energy use by 33-percent for cooling, and 70-percent for heating. These units can be easily installed in a window, but unlike a window air conditioner, you can still open and close the window for ventilation.

Next slide, please.

Building envelope retrofits are critical to improving energy efficiency and reducing energy costs for residents, but are rarely included in renovations because they are costly. Multifamily buildings are especially challenging to retrofit.

We have a research project that is focused on using prefabricated exterior envelope panels that could be placed directly over the exterior facade of the building. These exterior panels will be manufactured offsite, brought to the building site, and then they could be installed in less than one week in a building.

Windows are the poorest thermal performing envelope system. We have a couple of examples of some of our window research here. The one in the middle shows the demonstration that we will be doing on thin glass triple-paned windows, that could be used in multifamily or

single family homes. And these window units have the same size and weight as a double paned window, but with a thermal performance of a triple paned window.

And then the picture on the right, a project with Ubiquitous, shows another possible solution where we could embed PV directly into the windows, while still letting in visible light.

This project will commercialize the transparent coating that can be applied directly to the glass windowpanes to generate electricity, and simultaneously provide high energy efficiency, with the potential to reduce HVAC heating and cooling demand by up to 30-percent.

Next slide, please.

Among commercial buildings, hospitals are the most energy-intensive facilities in California. One way to control moisture in large buildings is to use a chiller to first cool down the air to dehumidify the air, and then use natural gas to reheat it back up to the desired temperature. The goal of this project is to reduce or eliminate natural gas use for reheat, while also reducing the cooling load.

We are also in the process of preparing a decarbonizing healthcare guidebook, to provide healthcare facilities with a clear path to decarbonizing their buildings. This guidebook will be interactive, and you can get more information at this link.

Next slide, please.

Our research program also sponsors a two-phase design-build competition known the EPIC Challenge. In the first phase recipients plan and design advanced energy communities, and in the second phase these recipients compete for funding for the full buildout of the project.

We have two projects that we're highlighting here, the Basset-Avocado Heights Project in Southern California will demonstrate how locally produced renewable and affordable energy can benefit residents.

And the project on the right is with Richmond Advanced Energy Community Project, and that will focus on redeveloping blighted homes to zero net carbon ready.

Next slide, please.

Demand flexibility will be critical for supporting the grid and transitioning to a

carbon-free energy system. Demand flexibility is promising for reducing GHG emission in buildings, with a potential of shifting electric loads to benefit the grid.

The CEC recently funded the California Load Flexibility Hub with Lawrence Berkeley National Lab for the purpose of increasing the use and market adoption of advanced interoperable, flexible demand technologies and strategies as grid resources.

Next slide, please.

We've also created a free network -- networking platform that enables subscribers to connect with potential project partners, search for funding opportunities, and message members directly. This is a great way to connect and build strategic partnerships. And you can sign up for the link that's given on this slide.

Next slide, please.

So we're in the process of developing our next EPIC Investment Plan. We will have a series of workshops in June and July to get stakeholder input, and potential topics are shown here. And so I encourage you, if you're interested, to please sign up and be notified and participate in

our workshops.

So, next slide, please.

And that concludes my presentation. Thank you very much.

MS. RAITT: Thank you, Virginia. This is Heather.

Natalie Lee, are you available?

MS. LEE: I am. Thank you.

MS. RAITT: Great.

MS. LEE: Thank you, Heather. And thank you for your patience with me and in joining late today.

Good afternoon, Commissioners and workshop attendees. It's a pleasure to be here. I'm Natalie Lee, Deputy Director for Renewable Energy at the Energy Commission. And I'm here today to provide just a brief overview of one of the programs we implement, the Building Initiative for Low-Emission Development, more commonly referred to as the BUILD Program.

I am joined today by the Manager for the Program, Deana Carrillo. She and I will be available for questions following the presentation.

Next slide, please.

This slide presents just some of the framework requirements for the program. It's important to note that at this point in time we have some of our requirements set by statute and by CPUC decision, but we are still on the -- in the process to establish program guidelines. But what we can provide, again, for the framework here, is from Senate Bill 1477, which was passed in 2018, and authorized the BUILD Program, as well as the technology and equipment for clean heating, or TECH Initiative.

The BUILD Program was established to encourage the adoption of near-zero emission technologies in new residential buildings, and does so through the award of financial incentives and the provision of technical assistance.

The legislation set targets for participation by low-income communities, and further required that in low-income communities that participation in BUILD not result in a higher utility cost for the tenants.

In addition to the statutory requirements, the CPUC undertook a rulemaking on building decarbonization, which in part established additional provisions for the BUILD

Program. And through decision 20-03027 in early 2020, designated the CEC as the program administrator, and established a budget for the BUILD Program as $80,000,000, with $60,000,000 identified specifically for financial incentives, and additional funds for technical assistance.

The decision further identified that the program, at least initially, award all funds for low-income housing projects and requires eligible projects to be all electric.

The CPUC decision also required the CEC to develop an implementation plan, and -- for approval by the CPUC, that was developed through a public process, and was very recently approved. The implementation plan essentially serves as a framing documents to support the development of program guidelines. And as I mentioned, that's still in process. We anticipate issuing draft program guidelines later this summer, and holding public workshops to solicit public input on the proposed design, and to develop that final program design.

As noted on this slide, SB 1477 did also provide a definition for income eligibility. And you can read the slide. I don't need to do that

for you. But it does effectively rely on existing Public Utilities Code -- apologies for the minor typo on this slide, and other code sections that are commonly used in low-income programs for our definitions for BUILD eligibility.

Next slide, please.

The scope of technical assistance provided by the BUILD Program -- excuse me. A little glitch in my system. Hopefully you can all hear me -- is a -- it's a critical part of supporting the adoption of the technologies. As mentioned by Mike early in the -- his presentation, there are a number of barriers and challenges to overcome.

And the design of this program recognizes that technical assistance can address many of these challenges, and support a number of the affected populations from the design and modeling of new buildings through the necessary analysis and approval phase, and into construction, installation of equipment, and even operation. And we hope that our technical assistance provider can address a large range of these challenges.

We are currently soliciting for the technical service -- technical assistance service provider. EFP is on the street right now. As a matter of fact, the workshop for potential bidders was held this morning very successfully.

And we will be posting the recording from that pre-bid conference for any parties who weren't able to attend due to the conflict with this workshop. The deadline for submitting proposals is June 14th. The deadline for submitting any questions for clarification is tomorrow.

But within that technical assistance contract, we don't have the contractor yet, and we hope that party will help us to refine the scope of work, but generally speaking, we have identified the areas that the contractor will work in, and that will be as demonstrated here, the project design. How that technical assistance can help us to overcome technical challenges, permitting assistance, supporting developers, supporting the architect and energy consultant roles, and applying for incentives, the financial incentives under the BUILD Program.

Next slide, please.

Moving into our preliminary discussion of the program design, this is consistent with what you'll see in the implementation plan. And this is specific to the award of incentives. Again, I want to restate that the program is still in a planning stage, and there is a lot of opportunity to still have input into this incentive design.

But consistent with the implementation plan, we have proposed a program consistent with the statute, and which incentives are based on GHG performance of the overall buildings. The assessment of GHG benefits is based on -- or is analyzed with a baseline of a 2019 mixed-fuel building that is compliant with energy efficiency requirements.

As I mentioned, to be eligible for BUILD incentives, buildings are required to be all electric. And based on that we anticipate space conditioning, water heating, heat pump technologies generally, but are also looking at highly efficient building design elements to demonstrate further efficiency, and this will assist in meeting the requirement for tenant bill savings, or at least no negative bill impact.

We are also looking at potentially adding

kicker incentives that are technology specific to base awards. And, again, these are just some early proposals demonstrated in implementation plan of a range of possible technologies that could be eligible for additional kicker incentives. Generally, these are -- we see these as technologies that are either necessary to realize the full benefits of the base technologies, or that are really required due to the shift to all electric.

Next slide, please.

And this is where we're at in our development timeline. We're definitely not at the finish line here. There's lots of opportunities still for engagement, but we have had a lot of public input to date through the CPUC's processes, as well as the CEC's processes.

We do hope to issue some draft guidelines this summer. We will be looking for continued engagement, and really seek your involvement in helping us with this program design, to make sure it's practical, and that we have a good subscription at this key, critical timeframe for adopting new technologies.

And with that, I will just share some

contact information. And again, I'll stay available for questions, as will Deana Carrillo, our Program Manager.

COMMISSIONER MCALLISTER: Great. Thanks.

MS. RAITT: Thank you, Natalie.

Go ahead.

COMMISSIONER MCALLISTER: Great. Yes, thanks. Thanks, Natalie and everyone. That was I have to say, you covered a lot of ground and did a great job. We're just a little bit over time.

I did want to give my colleagues on the dais -- since I oversee this, I don't really feel the need to ask questions myself, but I would invite Commissioners Gunda, Monahan and or Rechtschaffen, if they have questions for the Commission staff, to Mike, Ingrid, Virginia, and Natalie or Deana, then go ahead.

COMMISSIONER RECHTSCHAFFEN: No questions from me, Commissioner McAllister.

COMMISSIONER MCALLISTER: All right.

COMMISSIONER GUNDA: Yeah. None from me either, Commissioner McAllister.

COMMISSIONER MONAHAN: Okay. I have one question, just one though.

COMMISSIONER MCALLISTER: All right.

COMMISSIONER MONAHAN: Just one. And because transportation is what I know the best, that's why I always come back to. So, sorry.

But I'm just thinking about the Ford F-150 electric version, the Lightning, which I can't wait to test drive. It will be fun. And it's the first vehicle that really is, is advertising this vehicle to building -- vehicle-to-home technology. And it's even -- you could even, you know, access it. And it's much more powerful, even though they haven't released the stats on it, but it seems maybe 10 times more powerful than the Powerwall.

So on the storage guide -- and maybe this is more of a question than more of a comment, because I don't know if anybody's thought about this. But this idea about how do we integrate that type of, you know, battery on wheels into our strategy for building decarb? Like what's our -- and I think it's just food for thought for this group and others, because we want to create those incentives. I think if there is a way to optimize that battery in the vehicle to provide that storage capability, and provide energy back

when needed, not just during times when the power is out, it just seems like that's an opportunity that we should really be thinking about how to capitalize on.

COMMISSIONER MCALLISTER: That's a great point. I mean, you get a hearty, you know, a hearty second -- second that from me. I don't know if anybody on the Commission -- I mean, I know that some of the -- well, certainly we're thinking about this in all of these decarbonization contexts, but I wonder if any of the panelists have anything specific that we've got going on. Maybe Virginia or -- well, maybe in RD&D is maybe the most likely.

MS. LEE: Well, I think while Virginia is joining, this is Natalie, and I'll just mention that we have -- first of all, thank you for the comment, Commissioner. And it's well taken. And we definitely will take that back into the BUILD Program design for, you know, some thought and creative design considerations.

We were very successful in the renewable energy for ag program in finding a way to, you know, serve multiple purposes and to reward those projects that looked at comprehensive designs and

included EV charging infrastructure with the integration of renewable energy technologies.

So, I feel like there's going to be an opportunity, I just really appreciate you, you know, bringing up that thought and that thinking to the top of our minds.

MS. LEW: Yeah. So I also will take that back to our group here. We've done projects associated with vehicle -- building-to-grid type of opportunities. And so I think this a potential opportunity.

I know that I -- I heard kind of anecdotal stories on the Texas, you know, electrical power failure earlier this year, and some of the people that had electric vehicles, Teslas, they actually used it to power their houses when, you know, the power was out.

So I think there's an opportunity here, you know, I think the F-150, the price point is supposed to be cheaper than others. And so I think there's definitely an opportunity. So I'll take it back to our group and we'll discuss it, and see whether we can include something in our future research activities. Thank you.

MS. RAITT: Great. Thank you.

MR. SOKOL: I think if I may just add quickly, too, in the context of the efficiency standards that we set. I think it's a really good question, and it's something that we certainly don't have a firm grasp on at this point, but know that it is a priority and are starting to, you know, gather knowledge and consider what are -- you know, how could we approach something like that.

And particularly through the appliance standards side, as we look at load flexibility and the need for flexible appliances and what -- you know, EV charging infrastructure versus the vehicles themselves could do -- what functions could be provided.

It's something that we're collaborating with staff in Fuels and Transportation Division, other divisions, to really beef up our knowledge and kind of map out what some of that roadmap could look like. So great question.

COMMISSIONER MCALLISTER: So thanks to the three of you. I wanted to just chime in. Mike, I wanted to make that point as well. So, thank you. But the ecosystem -- well, right now as we speak there's a, you know, demand response

or a load flexibility workshop over at the CPUC. And that forum is also very relevant to that question.

And certainly rate making is a place where, you know, daily kind of demand response and charging habits, habits can affect the load shape in a positive way. And then, you know, also you can potentially use that kind of an approach to incentivize people to plug in for grid benefit.

The platform for that, you know, the load management standards could be very relevant for that in our SB 49, as Mike said, appliance flexibility. You know, we could maybe treat cars as an appliance. And so, obviously that's a big group of vocal stakeholders, as you know better than anybody here. But I think if there is a path to success, you know, we might try to get some good conversation going and we -- so.

COMMISSIONER MONAHAN: Of course. Thank you. Yeah, I mean, what makes this really a game changer is to potentially to -- this is the first vehicle that can give power back. It's the first one in the United States. I mean, theoretically, the Nissan Leaf could do it, but we didn't ever

have the technological capacity to do it. But this one, Ford is advertising this.

COMMISSIONER MCALLISTER: Yeah, I mean --

COMMISSIONER MONAHAN: They're trying to -- that's unique.

COMMISSIONER MCALLISTER: It's full of plugs, right? I mean, you can go plug anything you want in there, you know. So, very cool. So thanks for bringing that up.

COMMISSIONER GUNDA: Commissioner McAllister.

COMMISSIONER MCALLISTER: Yes, please.

COMMISSIONER GUNDA: I just wanted to kind of share one, share one specific thought on Commissioner Monahan's point. I think from just a numbers standpoint, I think the preliminary assessment was, you know, if we were to meet the Governor's Executive Order, we'll be hitting about 8,000,000 vehicles on the road, which could potentially contribute to about 480,000 megawatt hours of storage available, with kind of the fact that about 96- to 97-percent of the time vehicles are sitting idle. So, I mean, I think this is an incredible I think point, and hopefully we'll kind of continue to make progress on that end,

too. So, I thank you, Commissioner Monahan, for raising it specifically at the grid side, I mean, all ears on that one. Anything we can do.

COMMISSIONER MCALLISTER: It's funny, right, because we've been driving around these power plants on wheels, basically, and as you said, they sit idle. And now we have batteries on wheels, and they could really be a benefit.

And correct me, Commissioner Monahan, but the F-150 is the best-selling passenger vehicle in the nation for like the last 10 years, right?

COMMISSIONER MONAHAN: Best-selling series of Ford. So they have a number of F-150's --

COMMISSIONER MCALLISTER: Uh-huh. Yeah.

COMMISSIONER MONAHAN: -- but, yes, it's the best-selling series in America.

COMMISSIONER MCALLISTER: Wow. Yeah, so huge potential. All right. So we've -- we're somewhat over time, so I'm going to close it out there and ask Heather to get us on to the next panel, the second panel of the afternoon.

MS. RAITT: Great. Thank --

COMMISSIONER MCALLISTER: Thank you.

MS. RAITT: Thanks, Commissioners.

So I'll go ahead and introduce our panel on California's Building Decarbonization Activities. And the moderator for this panel is Gabriel Taylor. Gabriel is the Senior Engineer with the Energy Commission's Efficiency Division, focused on decarbonization and load flexibility.

Gabriel, go ahead.

MR. TAYLOR: Good afternoon. Thank you, Heather. Thank you, Commissioners, and thank you to all the attendees for joining us today. And thank you to my colleagues for that summary of the work done at the Energy Commission in building decarbonization.

We're now going to broaden our focus to the entire State, and to do that we have five panelists to speak on a diverse array of work. It's an incredible amount of work going on in California right now on building decarbonization.

First I'd like to welcome Kyle Krause, the Deputy Director for Codes and Standards at the California Department of Housing and Community Development.

Kyle?

MR. KRAUSE: Thank you, Gabe. I should be on now. Hopefully you can hear me. I'll say

I'll take that as a yes.

MR. TAYLOR: Yes, sir.

MR. KRAUSE: So, thank you for the introduction, and I just want to on behalf of HCD's Director, Gustavo Velasquez, I'm very happy to present an update on what HCD has been working on as related to the adoption of the 2022 CalGreen Code, which is effective January 1st of 2023.

So, we are a proposing agency, so we propose the adoption of building standards, and in this case we're talking about electric vehicle charging standards, which can be considered part of a larger building decarbonization effort. So, HCD worked collaboratively with the California Air Resources Board, CARB, and we anticipate working in additional areas of codes, such as building electrification in future rule-making cycles.

Also to point out, HCD recently updated our mission statement, and it now reads as follows, "promote safe, affordable homes and vibrant, inclusive, sustainable communities for all Californians."

So we've added the word "sustainable" to

our mission, and that's really key because we rely on this mission to endeavor to strike a balance between housing affordability and ensuring that we're addressing climate change and health and safety of Californians.

So, I would be remiss if I didn't thank our partners in this work that we have been working feverishly on this year, especially CARB staff, GO-Biz, the Governor's Office, the California Building Standards Commission, the State Legislature, building industry, and many of our other stakeholders for the valuable input that we received as we developed the proposal. And a special thanks to my team and our State Housing Law Program led by Emily Withers.

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So -- whoops, we went one too far. There should be an authority. Yeah. Thank you.

So, HCD, as I said, we're a proposing agency, and we derive our authority from the Health and Safety Code, both in State housing law and building standards law.

So, in building standards law there are specific statutory guidance for green building standards, which allows other State agencies to

propose -- or provide input to proposing agencies. And generally, the building standards that are proposed by HCD apply to newly-constructed residential buildings or additions of new conditioned space to existing residential buildings.

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So, again, we know that there's been several executive orders and legislation. Some of the executive orders have given us some really good guidance on where we need to head. You know, we're going to have millions of electric vehicles on the road very shortly, and we need chargers for those electric vehicles.

And with Governor Newsom's executive order that will require 100-percent of passenger cars and light trucks to be electric vehicles or zero-emission vehicles by 2035, time is of the essence.

There was legislation in 2019 that was vetoed by the Governor, but in that veto message Governor Newsom directed HCD to propose mandatory EV charging provisions in existing multifamily buildings. However, HCD was not able to get that work complete due to the intervening code

adoption cycle timeline. We have included some efforts in this most recent, the current triennial adoption. So, we hope that that hits the mark there, recognizing that there are some statutory limitations as far as how far we can go into existing buildings require -- that would require retrofits.

But CARB as a State agency with expertise in green building standards, approached HCD during the pre-cycle of the current triennial code adoption cycle, to increase EV charging for multifamily buildings. HCD agreed, and we proposed -- we conducted two focus group meetings in early 2021 and solicited feedback.

Overall the feedback indicated there were needs for both low power electric vehicle charging and higher power EV charging, to allow residents of multifamily buildings to buy, own and charge their electric vehicles where they live. Since parking of personal vehicles where we live is among the longest dwell times for vehicles, so it only makes sense that there's charging access in newly-constructed residential buildings.

Next slide, please.

Some of the terminology in our proposal, the last three bullet points you're going to see EV Ready Space. This is a space where there is actually a plug or a charger available to plug in an electric vehicle. Also, Level 2 EVSE, or EV Supply Equipment. And something new, low power Level 2 EV Charging Receptacle. This is simply a 240 volt receptacle at a low power Level 2 charging. It still takes some time to charge, but it provides a number of different ranges.

Next slide, please.

So when we look at our new one- and two-family homes under the current code. All single-family homes are required to be EV capable, and have a raceway from the electrical panel to a parking area that allows somebody to install an EV circuit and connect a charger.

We didn't make any change. We were really focused on -- in this cycle multifamily dwellings.

So, next slide, please.

So when we talk about new multifamily dwellings, the current requirement is that 10-percent of those spaces are EV capable. This is to allow a future installation of electric

vehicle charging spaces and chargers. We did not make any change to this because we still think that that is a valuable way to ensure future expansion.

Next slide, please.

Now as far as hotels and motels, we did slightly increase in our proposal the number of EV capable spaces to -- from six-percent to 10-percent. But more importantly, if we look at the next slide, we're talking about grouping all of the requirements for multifamily and hotel and motels in the same, all in the same requirements. So there's no difference between multifamily dwellings or hotels and motels. So this is really the game changer right here. This is where EV charging becomes available. We are proposing that 25-percent of all parking spaces that are provided include low power Level 2 receptacles. And then five-percent of the parking spaces in buildings with 20 or more units will have full power Level 2 chargers, or Level 2 EVSE.

And then if somebody voluntarily installs more chargers, they can get a credit for that where they won't have to install the 10-percent

capable. So, this is a really big advancement on our proposal.

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And then, right, I talked a little bit about existing buildings. So this is where existing buildings with new parking facilities or alterations to existing parking could have some triggers for additional electric vehicle charging provisions.

Next slide, please.

And then we also go into voluntary measures. CalGreen has two tiers, Tier 1 and Tier 2, that allow for enhanced green building. And this is really ratcheting up those requirements from the mandatory provisions, and raising the bar considerably higher for Tier 1 and Tier 2.

Next slide, please.

These are images of some receptacles on the left, and then our portable Level 2 charger on the right. And then at the bottom a Level 2 receptacle. So this would be something that could be installed in a box in a parking lot, there would be available for people to use their portable charger or cord set to plug into that

receptacle.

And then the next slide has a picture of a Level 2 charger. This is something that provides higher power and faster charge for those that have larger batteries, for longer drive times and ranges.

And the next slide, please, goes into costs. So there's a range of costs for these, depending on the actual installation, distance from the electrical panel, et cetera. But Level 2 chargers, the EVSE range from $2,300 to 3,700, whereas as the low power receptacle is a lower cost up front, from about $780 to almost $1,500.

So overall though, the life cycle of the code, three-year code, we're looking at about a $104- to $182,000,000 impact statewide for the life of the code. And we anticipate in future code cycles going even further.

So that's it for me, and questions at the appropriate time. Thanks, Gabe.

MR. TAYLOR: Thank you so much, Kyle. We'll take questions at the end of the panel.

Next up I'd like to welcome Abhilasha Wadhwa and Rory Cox, my colleagues from the California Public Utilities Commission. Both are

Senior Analysts in the CPUC's Building Decarbonization and Renewable Gas Section.

Abhi.

MS. WADHWA: Hi, Gabe. Can you hear me?

MR. TAYLOR: Yes. Go ahead.

MS. WADHWA: Good afternoon. Thank you so much for the opportunity to present today. And good afternoon, Commissioners. It's an honor to be sharing the stage with you.

My name is Abhi Wadhwa, and I'm here with my colleague, Rory Cox. We are both Senior Analysts with the Public Utilities Commission in the Building Decarb and Renewable Gas Section. And I'm here today to give a broad brush overview of current building decarbonization activities and their policies at CPUC.

I am very notorious for going over time, so I am going to start my timer. And, Gabe, please feel free to shout out if I go over time. I know we are already a little bit over time, so I'm going to try to give as much back as I can.

So with that, can we please proceed to the next slide.

Okay. So I'm going to do what Mike Sokol did. I'm going to step into the carb GHG

inventory report, where I'm looking at a different dissection that they did. So the GHG inventory report, the emissions either by economy sector or by the scoping plan categorization.

In this particular one, so I wanted to give that caveat because the folks might be confused why that we say buildings account for 12-percent of GHG emissions, while Mike said 25-percent. It's just about whether you are counting electricity generation or not.

So, in this case, in this dissection by economic sector we count residential and commercial to basically make up -- they made up mainly building energy use. That comes to about 12-percent. Within that, 85-percent of the emissions come from space and water heating.

And, therefore, we come to why heat pumps nowadays have become the thing for the woke crowd. Why every woke state is going after heat pumps right now, because they really give us multiple opportunities for emissions reduction. They are 80- to sometimes 100-percent more efficient than gas or electrical counterparts. Electrified space and water heating offer opportunity for load shifting from peak hours,

and also gives us the opportunity to signal for low GWP refrigerants. That's a slice not shown in this graphic, but is also quantified by the CARB report, the GHG inventory report, under a different set of categorizations for high GWP gases, which make for about five-percent of the emissions in -- as for that report. And given that actual residential refrigerants makeup about 92-percent of -- within the high GWP. So that's why, you know, heat pumps have become such a big deal across programs.

We heard in the presentation of the workshop for the 2022 Code from Energy Commission -- when was it yesterday -- last week, that, you know, heat pumps are kind of become the default for new construction. That is very exciting to hear. And we are hoping this time around, because they are a 20-year-old technology, but this time around they're sure to stick.

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So with opportunity comes challenges, with challenges come opportunities. They both go hand in hand. So, in this slide I'm going to highlight just two few of the biggest ones. There are many other challenges that I think Mike

mentioned in his slides, you know, lack of awareness. Right now technical assistance, education, which Natalie mentioned we're going to be doing in the BUILD Program. CEC is going to be, you know, implementing that in the BUILD Program.

But here I want to pull out two that are high on the top of our mind. One is rates, due in large part to the recent wildfires. There's always an upward pressure on electric rates, which are rising faster than natural gas rates.

And this kind of creates this very, very challenging dichotomy, like how do we, you know, take electrification, which is really the low hanging fruit of decarbonization, and while also trying to keep an eye on those rising rates. So, again, I'll talk about some opportunities towards the end, but I wanted to flag this as one of our biggest concerns.

And retrofits is the other one. It's much more difficult to convert existing homes which already have natural gas appliances to electric heat pumps, which can be more expensive. It can have challenges like panel upgrades. Some of the older homes don't have the panel size

required to take on electric heat pumps. So, that's definitely a challenge that's unique to retrofit and not so much in new construction.

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So, to kick off things in 2018, Senate Bill 1477 approved two programs. You already heard about one of them from Natalie, which was the BUILD program. CPUC adopted these two programs, BUILD and TECH, as part of Decision 20-030-027. And I'm going to focus more on the TECH Program, since CEC is the implementor for the BUILD Program, and has been covered in Natalie's presentation.

Two-hundred-million dollars is the total funding approved, out of which 60-percent we allocated to TECH, and 40-percent to BUILD. And really, we -- you know, even though the statute sets up the two agencies, and CPUC being the oversight, it's really more of a partnership.

And there is some money carved aside in the decision for evaluation. So $5,000,000, a proportional share coming from both programs. And the evaluator is selected by now. It's, Opinion Dynamics is going to be the evaluator, and for TECH, Energy Solutions is the

implementer, for those who are tracking this.

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So, that was Phase 1 of the Decarbonization proceedings, which are launched or kicked off and gave the bookends to these programs, and now I'm going to talk about Phase 2 and where we stand with it. So mainly what we did so far in Phase 2 is we issued a staff proposal last year in August. And it dealt with three issues: incentive layering, wildfire rebuild, and increasing the baseline when electric water heating is chosen.

So the first one is incentive layering. This was a pretty significant issue that came out of the first phase when we were setting the stage for the pilot. The issue was, how should all the different programs for -- from all the different proceedings, like the Self-Generation Incentive Program proceeding, there is the energy efficiency proceeding, which had different disparate funding, not just us, they have different goals, and they have all started at different times. They didn't like come to our doorstep at the same time. They're also governed by different statutes, right, but there are

reporting requirements which can be different.

How do you -- in essence, almost all of them have some component of heat pumps, heat pump water heaters especially in them at point. So how do kind of make them symbiotically interact with each other? Some of these were designed for direct customer reimbursement, which we typically call downstream. Some are for distributor or contractor reimbursement. So how do you make sure that the incentives are distributed in a manner that actually helps within the market, is not causing market confusion?

And at the end of the day, you know, the programs are achieving their goals. Like the have a clear idea whether they were able to achieve their goals or not. So that is one issue that's discussed in the staff proposal. If anybody's interested to read that, it will be under this proceeding.

The other issue that's addressed in that is wildfire rebuild. So, you know, incentivizing all the homes that were, unfortunately, were impacted or red tagged is the technical term, by any of the wildfires since 2017. And to help them go beyond code and help them go all

electric, so that we can minimize the gas infrastructure expansion, and then you'd use this as an opportunity. These are also proposed to be funded through gas IOU cap-and-trade proceeds so far.

Finally, the third thing that -- proposal, staff proposal addresses is that currently there is no additional baseline amount given if you have electric water heating. So if -- for the customer who choose, who will be the early adopters and choose to replace their gas water heater with electric water heater, that energy use is not currently being calculated in the baseline that is allowed for their home.

So the proposal puts forward some, some impacts of that, and asks the IOUs to consider it in the future of general rate case proceedings. And the decision for this is anticipated in 2021.

Next slide, please.

Okay. I have to go really quickly. I'm so far behind. So, this is a general overview of our TECH Initiative activities. We are looking to move the supply chain, drive consumer demand. We apologize there's a little bit off -- an error on this slide. We'll be resubmitting it for

uploading to the docket.

The middle box should say create scalable models through regional pilots. Apologies for that. This will be in the docket. I won't have time to go over this.

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Beyond this proceeding, there is overall about $335,000,000 in additional funding to support building electrification. Mentioning some programs here, which you can look up on the CPUC website. As I mentioned, the Self-Generation Incentive Program now has about $45,000,000 for heat pump water heaters. Similarly, just in PG&E territory there is a Water Saver Program, which is to convert electric resistance water heaters and upgrade them to heat pump water heaters.

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The other -- some of the more important programs under CPUC domain right now are the San Joaquin Valley Pilot. This was approved in 2018. About 1,600 homes are eligible for the pilot. This pilot, interestingly, also did approve natural gas line extension, because the community demanded that. So 65 of homes have been taken

off of propane use and given natural gas appliances, while 21 were electrified.

Finally, then Mobilehome Park proceeding, the main focus on that is to get the mobile home market ready for electrification. So it's mainly looking at electrical service size upgrade.

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This is just a little bit of an overview in our energy efficiency portfolio. A little bit old news now, but just bringing you up to speed on what has recently been done on it. The three-prong test was gotten rid of, and replaced with a fuel substitution test that require that a measure not increase source energy and not harm the environment as measured in carbon dioxide emissions.

Very quickly, after that our technical guidance was issued and our calculator was released that would allow the IOUs to submit workpapers, calculate the GHG emissions from substituting, for example, natural gas to heat pump water heater. August 2020 was when one of these workpapers was approved.

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So as I said, there are some high

opportunity areas, low hanging fruit was discussed. It's not all challenges. We definitely see new construction as, you know, an early area of opportunity where new gas infrastructure investments can be curtailed. And, again, you know, our counterparts at CEC are doing a great job, not just with the code, but to BUILD program that's -- in their lap, and looking to electrify new construction as quickly as they can.

Updating electrical resistance equipment, again, up to 30-percent of multifamily units, and about five-percent of single family homes have this in the IOU territory. bill savings, my own home I'm sitting in right now is an example. I had an electric resistance water heater, used the Water Saver Program, and I'm seeing at least, just anecdotally speaking, about 40- to $50 a month in savings with PG&E.

Electrifying homes with solar, about seven-percent of California homes are solar. We see this as a huge opportunity. They already have upgraded electrical panels. It's the solar panels -- as more panels can be added to compensate for the added electric loads, that

makes the cost of the upgrade much, much lesser than it could be in older homes with older panels.

Homes with high AC loads, again, Inland, Central Valley, hot climate homes will see gains, because when the heat pump has been upgraded, then even the air conditioner, the old air conditioner is getting an upgrade.

And finally, rural areas that are not currently served by a natural gas utility, most of them, again, in wildfire territory, that rely on propane or are burning wood are great areas to offer high-efficiency electric

Next slide, please.

These are some of the other proceedings. Again, I won't have time to go through them, but this is our renewable gas proceeding, which basically establishes a standard for -- a standard renewable gas agreement, and approves $40,000,000 for biomethane monitoring incentives. That's the Phase 3.

And Phase 4 of it would be RNG procurement and integration of hydrogen. Those staff reports are anticipated in -- very shortly here.

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MR. TAYLOR: Thank you so much, Abhi. That's an incredible amount of information to cram into just a few minutes.

MS. WADHWA: Thank you. So sorry I ran over time.

MR. TAYLOR: It's quite all right.

Next up we have Amy Rider, who is the local government lead for the Building Decarbonization Coalition.

Amy?

MS. RIDER: Yeah, thanks so much, Gabriel. And thank you to everyone, Commissioners, panelists, and attendees for having me here today.

I wanted to come and speak with you from the Building Decarbonization Coalition. Again, I'm Amy Rider, the local government lead there. And if you're not familiar with the BDC, as we call ourselves, the Decarbonization Coalition, we are a membership-based not for profit. And today I'm going to be talking about largely local governments, but if you'll go the next slide, I also want to give you some context as to what we're seeing in the kind of the larger, the

larger space.

Our members include manufacturers and utilities, nonprofits, as well as local governments. So we definitely try to cover the full swath of potential stakeholders. And so I'll be going through these four major areas, the roadmap, local government's role, opportunities and where they need support.

So just in case you're not familiar with Building Decarbonization Coalition's roadmap for California, we do have a document that we published back in 2019, breaking it down really into three primary phases: market readiness, market deployment, and scaling in the market.

And as is evidenced by all of the presentations so far, there is a lot of activity that is helping to point the direction for all three of these things, and really move the entire market forward quickly.

Next slide.

So, for local governments in particular, there are really these primary areas where local governments can have a role in effecting decarbonization. They connect with stakeholders. They are able to be on the ground and talking

with folks, and really to ensure that local solutions meet whatever the needs are of those local players. So really ensuring equity that meets their community needs, while also utilizing the space for their buildings, the buildings that local governments control, municipal projects and so forth, to use as examples in the marketplace.

And then to innovate and pilot solutions so that we can establish best practices, and to inform the State as to what those practices are, so we can roll them up to state level, and I'll show you some examples of those as we go forward.

So those opportunities really break down again into these categories, community and project engagement. So not just talking with the users of the buildings, but those would build them as well, and identifying those communities' specific needs.

There's a lot of local government influence when it comes to regional regulatory matters, especially around the air quality and CEQA guidelines for new construction, as well as -- especially as we get more and more incentive programs that are regionally based, some advocacy at that level. Furthermore, we have the

municipal policy, which certainly there's leadership, as I mentioned on public buildings and more and more in the microgrid space. There are exciting opportunities that municipalities are looking forward to enhance their own resilience.

And then we see some potential both carrots and sticks for municipal policy. Some cities and counties are able to have incentive programs or impose fees to change the direction of new construction in particular, but also, potentially, existing buildings in their areas of influence.

And then, lastly, one of my favorite topics are the local building codes, both the energy related Reach Codes and the Health and Safety Codes.

So if you'll go to the next one. Great.

So just to kind of zoom out slightly from those areas where local governments are really already setting precedent. We've heard already today about how many Reach Codes in particular have been adopted around the State, and certainly many more activities are happening at the local government level. But those cities and counties

need help there -- and there's lots of opportunity for doing so.

Most importantly I would say, it's clear direction. So, directionality and scale, the ability to make this a bigger -- bigger solutions faster, regulatory support, of course, municipal practices and policies, which I'll get into in more depth, and those building codes as well.

So when it comes to directionality, I really can't overstate this enough, clear, time-bound expectations from the State are the key for making sure that everybody has certainty in the marketplace, and by which I mean everybody, I do mean everyone. Manufacturers love this, local planning departments love this, and developers and builders do, also. So that's just a really important point.

Furthermore, continuing to drive education in the marketplace. One of the biggest hurdles that we identified a couple years ago, and it's getting better, but there's still a gap in education and awareness in the marketplace.

And then lastly, really the ability to provide some mechanisms for -- not just incentives, although those are coming and they're

fantastic, but then financing opportunities that get at some of those hard-to-reach markets.

Regulatory support is another area, and as we've heard today, there's lots of movement in the regulatory space, but I just want to point out a couple that are very critical to make sure that they're aligned with our decarbonization efforts.

Rate reform, affordable rate reform to allow for electrification on a large scale is a really critical component. And as I already mentioned, funding for affordable housing and standards that are aligned with decarbonization. We talked a lot about incentive programs, but the need has not gone away yet, so continue to support those. And then of course technical assistance, which was also mentioned.

Actually if you'll go back one. Thank you.

I just want to point out here there are a couple places where regulatory support would also be helpful, specifically really recognizing electric appliances as distributed energy resources that can be grid integrated is one place similar to the vehicle-to-grid comment from

earlier. Wouldn't it be great if we also have grid-integrated everything, whether we're talking about our refrigerators or our washing machines or all of the technology in our buildings.

And then the need for clarified authority around unregulated appliances, because there are still a few appliances that it's not clear how we decarbonize, simply because it's not clear who regulates them, would be helpful.

And then related to municipal policy and practices, I think the most important point here is really leveraging the opportunity for the State to have bulk purchasing or procurement agreements that allow for municipalities to decrease their costs when electrifying. To be able to negotiate government contracts through leveraged procurement agreements would be enormously helpful to local governments across the State.

And then of course providing some centralized information, and having a resource that shares not just best practices, but also the actual, the data behind them. How many panel upgrades are in fact needed, and where are they? And permitting data as these projects are taking

place, so that we can inform the contractors and we can inform the utilities alike.

And then lastly, building codes just continue to be such an important part of this equation. As was already discussed, the Reach Codes for local governments continue to be a really interesting mechanism that more than 40 cities and counties have already adopted around the State. And moving those from the Reach Code level where there -- those individual jurisdictions to a statewide effort, as well as looking at not just carbon emissions, but other, you know, greenhouse gas as well as health considerations when we look at codes and appliance standards.

All of those are needed from the State, as well as the local governments, and continuing to give local governments opportunities for new Reach Codes under the new code cycle as well.

So, again, that really just summarizes as, in order to scale quickly, we need direction, we need regulation, municipal practices that are supported, and codes and standards to make it all happen. Thank you for your time.

MR. TAYLOR: Thank you so much, Amy. We

really appreciate the time you put into your clear message.

Next up I'd like to welcome Rachel Huang, the Director of Energy Strategy, Research and Development at the Sacramento Municipal Utility District.

Rachel.

MS. HUANG: Thank you, Gabriel.

Good afternoon, and thank you, Commissioners, panelists and participants for having me today.

You know, we at SMUD definitely share the Energy Commission's perspective that decarbonizing buildings is an essential part of meeting carbon goals, and we do believe that utilities play a key role in helping to make it happen for the benefit of our customers and our community.

Today I'll be talking to you about how accelerating building electrification is a key part of SMUD's strategy. How we think about electrification in our newly adopted 2030 Zero Carbon Plan. How we've progressed against our electrification goals, including bringing everyone along. And finally speak about a couple

areas of challenges we see in order to get to 100-percent electrification by 2045.

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So just about a month ago SMUD's Board of Directors adopted our 2030 Zero Carbon Plan, which is to achieve 100-percent zero carbon emissions from our power supply by 2030, the most aggressive goal of any large utility in the nation.

We intend to achieve this zero carbon while maintaining world-class reliability and our electricity rates within the rate of inflation. There's multiple pillars that make up the plan, and given the aggressive goal the plan is a flexible pathway.

The first place we're going to start is to repurpose our natural gas generation, including retiring two of our peaker plants, as well as converting our other plants to carbon-free fuels. We'll be adding a variety of renewable resources, both baseload and intermittent, utility scale and customer-sited.

The major expansion of renewables over the next 10 years, along with batteries to support them, in going to be a critical and key

component of this plan, especially since renewables are some of the most cost-effective proven resources to reduce carbon now.

We think that we can get about 90-percent of the way there with proven clean technologies, but we'll need to depend upon new technologies and business models to get us all the way there. That includes leveraging distributed energy resources, as well as researching game-changing technologies like carbon capture and long-duration storage.

We want to engage our customers in working towards zero carbon, and we'll work to partner and co-invest with them. We'll continue to invest in energy efficiency and our strong commitment to electrification, where we expect to exceed the statewide goal of doubling energy efficiency in the process.

We'll be looking to leverage load flexibility, including investments in virtual power plants, as well as vehicle-to-grid. So to speak to Commissioner Monahan's comment. To help us retire those peaker plants, and could potentially help us to reduce other utility scale investments as well, depending upon the cost and

availability of these customer-based resources.

Finally, it's imperative to us that we execute upon this plan in a way that maximizes benefits to our community, where we design offerings that are aligned toward just different customer segment needs, that we support the underserved, and we attract investment within our community and creation of jobs to enable the economic vitality in our region.

So as we work towards building decarbonization, we really need to think about all the pillars in our plan.

Next slide, please.

So as much as -- you know, I feel like I've been talking lately about our Zero Carbon Plan at SMUD, our building electrification journey actually started before the Zero Carbon Plan. With our 2018 Integrated Resources Plan, SMUD committed to helping drive building and transportation electrification to support decarbonization within our community. Recognizing the role of buildings and transportation as the low hanging fruit, as well as the opportunity to reduce emissions and improve air quality within our region.

With this commitment SMUD launched several market-leading incentive programs, first starting with residential in 2018, and expanding to commercial in 2020, and now we have program offerings in all sectors.

From our framework perspective, we move from a gigawatt-hour metric to a carbon-based goal, recognizing that as our grid got cleaner, we would need to think differently about our efficiency and electrification portfolio of programs. With these steps we're now at over 2,500 equivalent electric home conversions today.

As we look towards the next phase of our efforts, from now until we reach our goal of zero carbon emissions by 2030, we believe that it's important to have all electric codes for new construction. At the same time we need to make it easy for our customers to adopt these electrification technologies.

As such, we're working on full-service and turn-key programs, like a heat pump water heater program that can get a changeout done in 24 hours, knowing that people need hot water if they have a problem. We'll be developing financial options and incentivizing

infrastructure, including panel upgrades, for customers to make the switch. So by 2030 we'd like to have about 34-percent of all buildings to be electric in our territory.

We'll be working to support the path to have all new appliance and vehicle sales be electric by 2030. And by 2040 we're working to having 78-percent of all buildings being all electric, and partnering with others to accelerate the full electrification of our low-income customers. By 2030 we expect our zero -- we expect our power supply to be zero carbon. So the carbon reduction post-2030 to go electric will be substantial.

This is going to be a substantial investment for SMUD, and we know that we can't do it alone. We'll be working with partners and industry stakeholders, including the CEC, to make this happen, while keeping our rates reasonable for our customers.

Next slide, please.

I want to spend a minute to talk about SMUD's conversion to a carbon metric. Over the years SMUD has evolved the factors it considers relative to its goals for energy efficiency. In

previous years we started moving towards looking at load shape impacts of each program within our efficiency portfolio. And most recently in January of 2020, we moved from a gigawatt-hour metric to a carbon-based metric.

The driver of this was simple. As we looked towards the future, we knew that the time of day and season would start to have more impact on when the best times would be for equipment to be most efficient in order to reduce our carbon emissions, as well as times when there would be actually an excess of renewables, where we might actually want to use more electricity.

So with this change to a carbon metric we've incorporated consideration into the design of our program incentives, the choice of technologies that we choose to incentivize, as well as considering our rate designs to ensure success for our portfolio programs to minimize carbon emissions. This change now enables us to best align our program portfolio planning with our resource planning, and now our 2030 zero carbon goal.

Next slide, please.

I mentioned we started our efforts back

in 2018 actually, so how are we doing? We've made steady progress, and in each year we've actually been able to achieve or exceed our program goals.

Even last year with COVID, while we did see an initial dip in participation, we eventually saw interest in customers making improvements to their homes and actually caught up by the end of the year. We're also starting to see engagement from stakeholders in the supply chain.

One vendor actually took SMUD's generous heat pump water heater rebate and started advertising that if you switch from a gas to an electric heat pump water heater, you could do so for only $99, and that really enabled our program to take off.

We've revamped our residential new construction program to offer all electric and electric ready, and we now have 44 residential builders and developers participating in our Smart Homes construction program, equaling 58 developments, and have had -- and have 482 new construction units completed to date, the large majority of which are single family, but include

multifamily units as well. We also have several affordable multifamily housing communities that are going electric in our program pipeline.

What you can see here in the chart, which is actually percentage of single family home conversions, is that we've both set goals and made progress to actually electrify our low-income customers on a more rapid pace than our mass-market residential customers.

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We truly believe that it's important to leave no one behind as we pursue the goal of zero carbon emissions, and as such have set a goal to electrify 100-percent of our low-income customers ahead of the residential mass market. We believe that they're the ones who are going to end up being most susceptible to stranded asset costs in the transition, and as such are accelerating our efforts to electrify them.

We started our Low-Income Electrification Program in 2019, and have worked to transition our low-income offerings that originally were focused primarily on energy efficiency, to promote building electrification as well.

The approach that we've taken with the

low-income programs is to actually electrify every end use, even if it's early retirement, to make it easy for the customer, and recognizing that there's that opportunity we have when we're working with a low-income customer and we're in their home.

Through out efforts we've actually electrified over 1,000 gas end uses to date. And as we move forward, we'll be offering incentive adders for low-income multifamily electrification, as well as working to find partners to find innovative and cost-effective ways to ensure equity in our electrification efforts.

Next slide, please.

So as we look forward, in order to achieve our aggressive goals we know we need to do a number of things, but one of the biggest challenges we see to -- is actually transitioning existing buildings to electric. And we believe that this will take both customer and regulatory approaches.

You know, Amy talked a little bit about this before me, but on the customer front, awareness and education continue to be key in

order to engage both the customers and the contractors, and all the vendors throughout the supply chain.

Customers aren't necessarily clamoring for electric technologies yet, although in SMUD territory there's actually already benefits of reduced total energy bills and improved air quality for the very large majority of the residential customers.

People still do struggle with giving up their gas cooktops, heat pump water heaters need to be available, quote-unquote, "on the truck" to get that 24-hour turnaround time, and the contractors need to be able to install it, so that when the customer water heater breaks they don't have to wait to replace if they want to go all electric.

I've talked about our plans in place for low-income customers, but there's a large -- and there's a large focus on equity in SMUD's efforts. But there's also the moderate-income customer segment, that may still struggle to make the capital investments needed to make the transition. And we believe that providing options, including things like financing, we'll

be able to help make that transition.

Finally, as we look towards decarbonizing our grid, we recognize that we need to keep electricity rates low. And so we've got this increased pressure of costs as we decarbonize, but we need to make sure we think about the rate design as well as the overall electricity rates to continue to provide those benefits for our customers.

Finally, as there's consideration of electrification of existing buildings and code, code enforcement will need to be -- will be needed to ensure that that transition is made. And we know that that's not exactly popular.

We're actually pretty good about code compliance in Sacramento, but it's because we have a lot of incentives throughout our programs and required as a condition of our incentives. So as the State works to decarbonize buildings, that's going to be a consideration to support the transition. And with that, thank you.

MR. TAYLOR: Thank you so much, Rachel. We really appreciate all the hard work.

Next up I'd like to welcome David Jacot, the Director of Efficiency Solutions at the Los

Angeles Department of Water and Power.

David?

MR. JACOT: Great. Thank you, Gabriel. Thank you, Commissioners and advisors, and everyone else who's attending, and also the hard work that went into pulling together these workshops. I know that's not easy. Rachel's a tough act to follow. SMUD's doing some great stuff up there.

We just recently completed our LA100 Study for how to fully decarbonize our grid, and we're -- we ran a number of scenarios, and the one that the mayor has adopted has us planning to be 100-percent carbon free by 2035. So, we're going to be watching very closely SMUD's progress and how -- to see if there's opportunities for us to even accelerate our pace beyond the 2035 target we've currently set.

I want to talk a bit about the greenhouse gas inventory in California. We've seen two presentations of it, and I appreciate that those came up. I don't have any -- my slides didn't make it in in time, so I'm working off them on my computer, but that was one of my slides. And it was the second one, the one presented by the CEC

CPUC presenter. That's the one I like to speak to, because the first one that lumps electricity in with onsite natural gas uses in buildings, is a little bit misleading in terms of how much carbon, greenhouse gas is due to buildings when you look -- when you take the electricity portion out of it. Twenty-five-percent, yes, but when you pull the electricity out of it, then it's 12-percent.

And I think that's important because there's two pathways to decarbonizing buildings. One is decarbonize the electricity supply, and the other is to decarbonize the onsite natural gas use. And those are so different from each other that it warrants separating them. And we -- the LA100 Study, SMUD's aggressive move to decarbonize fully by 2030, those are things, you know, the utilities are doing at a utility scale, with distributed energy resources of course. But that's different from what it takes to motivate building owners and occupants to work on the other 12-percent of onsite natural gas use. So I think that's important from a programmatic standpoint, to differentiates those two.

So, I want to talk -- I'm going to zoom

in pretty closely on one specific area of where we're focused on for building decarbonization, our first major foray into that space, programmatically. SMUD covered the portfolio approach excellently, and I'll zoom in a little bit more on the low-income multifamily sector.

A few words first on the importance of energy efficiency to decarbonization. And the greenhouse gas inventory really kind of points this out when we see 41-percent is from the transportation sector. Obviously we're working to decarbonize that as well.

We see tremendous load growth from electrification of transportation and to a lesser extent from the electrification of buildings. We are estimating through our LA100 Study that we will essentially double our retail kilowatt hours with the onset of mass electrification, and that's between transportation and buildings. And that's important. I know right now there's a time-of-use issue with energy efficiency is occurring at the wrong time. I hear this from my power system folks all the time. Don't give me energy efficiency at 4:00 p.m. I've got all this solar, having to run to ground or, you know, give

away. And LADWP's position on that is that that's a temporary, that's a temporary problem.

We have so much load coming from energy efficient -- from electrification that we're going to need, we're going to need energy efficiency in tandem with storage to smooth out those peaks and valleys in terms of the renewable oversupply during peak times, and of course the not undersupply, zero supply at night and off peak.

So energy efficiency coupled with utility scale storage, whether that -- and I say utility scale storage, it can be distributed and still be utility scale in the aggregate, and we see both happening. But energy efficiency covered with -- coupled with utility scale storage is key to making a decarbonized grid that essentially is delivering twice as much kilowatt hours in the future as it does today.

So you have that overgeneration in the afternoon, rather than, you know, just burning it, giving it away, you want to store it. And then at night that storage is going to power things, but the energy efficiency will help reduce the amount of storage. So it's a win-win

tandem, both at peak times and discharge times. The afternoon overgeneration gets more -- is left for storage when you have the energy efficiency during the day. And then having energy efficient overnight uses means that overall storage can be smaller than otherwise it has to be.

So, to that end, we're working on addressing our vast low-income needs, that why I say this is the first place we're getting started, programmatically. We have about 400,000 affordable housing units in the City of Los Angeles. That's out of 1.4 billion -- 1.4 million households, so almost a third. Almost a third is affordable housing.

And so we are very close to launching, we plan to launch in July, a program that's based on California's low-income weatherization program, but we've made some significant tweaks to it to meet specific L.A. needs. And we're calling it the Comprehensive Affordable Multifamily Retrofit Program, or CAMA -- CAMR for short. But it's focused on deep decarbonization of low-income multifamily buildings through retrofits for energy efficiency, building electrification, and onsite solar.

So this is kind of a three-legged stool program. And the idea behind it was multifaceted, as you'll see as I get into it. But deep energy efficiency, building electrification, onsite solar. This is focused on getting the economics of these projects to work for our customers.

I know that other utilities have -- may have different rate structures, and certainly different climates -- climate specifics, characteristics, but for us we do have a challenge of building electrification by itself, raising customer's bills between pre- and post-electrification coming off of natural gas.

And so the beauty of this program, by marrying these three approaches, energy efficiency drives the bill down, building electrification drives the bill up, specific to our service territory, and then onsite solar photovoltaic brings the bill back down. And at the very least, we want to say bill neutral, but obviously we want to be -- resulting in significant overall utility cost savings for our low-income tenants, and also the affordable housing property owners and managers, that's key.

And a third piece -- and that's the equity piece. You know, this is California. This is L.A. Equity is a huge topic right now, especially coming out soon hopefully the COVID impacts. And so, that's why we're starting our electrification with low-income multifamily, which has traditionally been the hardest, one of the hardest sectors to reach for a variety of reasons. And so that's where we want to start. We want to start there. If we can do it there, we can do it anywhere.

And then another -- the other leg of the stool is developing skilled family-supporting green jobs for the local workforce. So one of the things we've added into the program that's unique to L.A. is that we will be requiring the customers to hire contractors who pay prevailing wage. And for certain sized buildings on up, use skilled and trained labor that -- as specified by the agreement that the trades have with the State of California. Now that sounds like a barrier, and so to address it our incentive rates, which are based on GHG reduction on a CO2 equivalent avoided, will be significantly higher than the statewide rates typically have been. So we are

adding quite a bit more money to support that.

We're also including an incentive to upgrade the electrical infrastructure and/or the utility service as needed to support building electrification. And we're doing that at the rate of $750 per unit, which is, again, recognizing that employing -- mandating the employment of skilled labor will have some cost impacts to the customer that we're looking to offset through higher incentive rates.

So, one thing I wanted to focus on in terms of scalability here, just to kind of paint the picture of the need. You always want to think about, okay, we're trying to get to 100-percent, right. You know, well, what are you doing?

I really appreciated Rachel's slide with the bar graph getting into good, high percentages of penetration in the market, 10, 12, 15-percent. We want to get to 100-percent. What does that look like?

So, like I mentioned, we've got about 400,000 affordable housing units in Los Angeles. And the program we are getting ready to launch this summer, hopefully in July, is budgeted at

$75,000,000 in incentives across five years.

What do we get for that $75,000,000 in incentives? We're estimating about 12,500 units. So, 12,500 served. When you ratio that up to 400,000 units, that's $2.4 billion of incentives that would be roughly needed. That's on top of a customer contribution. This is not a direct-install program. This is a rebate program, a heavily subsidized rebate program, but a rebate program, nonetheless.

We anticipate that the customers will contribute probably between 30- and 50-percent of the project cost. And our model design, which follows LIWP, Low-Income Weatherization, has built in assistance to help customers find those funding sources, whether it's resynchronization that affordable housing managers do every few years, it's essentially a refi. We'd consider it a refi, and pull cash out for infrastructure type enhancements -- investments, or grants, or they have cash on hand perhaps, those types of things.

But the model's been successful as LIWP, so Low-Income Weatherization Program. We wanted to bring it into L.A. Make it specific to L.A.'s needs with an enhanced focus of equity and

skilled job creation. Level playing field as the unions say. The contractors don't have to be union, but they have to pay union, and have the same quality requirements in terms of skills and training. So we're supporting that as well.

And let's see if I wanted -- had anything else that I wanted to cover. I think that's really about it. I know we're low on time, so I don't want to overextend us any further. But I really do appreciate the opportunity to speak and present what L.A.'s working on here.

This will be the first of our major electrification initiatives beyond what we're already doing with transportation and chargers. But this is, this is our first major foray into buildings. And we wanted to start with an opportunity to be as comprehensive as possible, and then take the lessons learned from that and apply them in other sectors. Thank you.

MR. TAYLOR: Thank you so much, David. Really appreciate it.

Now I'd like to welcome all five panelists back to the virtual stage for a conversation with the Commissioners. If the panelists could turn their cameras on, and I

welcome the Commissioners back for questions.

COMMISSIONER MCALLISTER: Thanks to all of you. I'll say just by way of really brief commentary, and then I'll pass it to my colleagues on the dais for their questions first.

But just really great to see this progress. I mean, kudos to all of you, in particular SMUD, DWP, you know the rubber's really hitting the road and you're showing how it can be done, beginning to scale -- more than beginning to scale, really.

And it's great to see just the real numbers, including the dollars, you know, realistic ground truthed number for the, you know, many billions of dollars if we scale that across the State, that it's going to take to really get to our affordable housing community. And I think probably all of us today agree that that's top of the list in terms of priorities for attacking our existing building stock with decarbonization.

So, with that, just thanks to all of you. Really thought-provoking and with so much going on, it's heartening actually.

So, I'll open it up to my colleagues. Commissioner Monahan, Gunda, Rechtschaffen. I

don't know if anybody else was joined.

COMMISSIONER MONAHAN: Well, I have a question. Thanks everybody. So this is really informative. And my question is to Rachel around SMUD's investment. You said there were 2,500-plus electric home conversions. And I'm curious about this question around low-income families that David highlighted, too, that their focus is going to be really laser -- laser focused on low-income, which is the hardest.

Did you – of the twenty-five hundred, were there any like specifically targeted to low-income families?

MS. HUANG: Yeah. So, we have -- and I don't know exactly what the equivalent homes is, but we have electrified through our low-income programs over 1,000 gas-to-electric end uses. So, I don't know exactly how many that is in terms of customers, because we didn't necessarily do all electric for all of them. But we've -- since we've started our low-income program, we've electrified over 1,000 end uses.

I really commend David for approaching multifamily first, because that is the most challenging. And to be -- you know, we actually

started with single family low-income first, and are then moving into, how do we serve multifamily. We do have offerings as it relates to incentives for new construction affordable housing, and we do have a number of projects in our service territory in the pipeline.

They haven't been built yet. I think many of them are starting to come on-line in 2022. So we do have a number of new construction multifamily affordable housing coming on-line. But we started focusing on single-family low-income first, but we are going to need to move into multifamily, thus, looking at incentive adders as it relates to multifamily low-income, but it's a challenge.

So, to the point of the cost, to electrify an all -- basically, to fully electrify a low-income single-family home is on the order of magnitude of $11,000. We know that that's not financially sustainable to get everybody electrified. So we need to -- and that's the partnership, right, how do we work with stakeholders? How do we look -- how do we think about innovative models? How do we look at financing options, such as, you know, things like

Pay-as-You-Save, and things like that?

We know that we need innovation in that space to really be able to electrify in a way that's cost-effective, and right now it is very expensive to fully electrify low-income single family.

COMMISSIONER MONAHAN: Yeah, that's actually -- that was going to be my question about the cost, so there you go. Eleven thousand for the average household or did you say for the average --

MS. HUANG: For the low-income to electrify --

COMMISSIONER MONAHAN: -- low-income household?

MS. HUANG: -- to convert. To fully convert gas to full electric, low-income for the, you know, the hundreds of homes that we've done, it's -- if you do all of the end uses it's $11,000.

COMMISSIONER MONAHAN: And can you give me a sense of just the scale of the different solution sets in terms of cost from your experience?

MS. HUANG: In terms of, you know, by

technology or?

COMMISSIONER MONAHAN: Yeah. You've -- in terms of -- so, heating, cooling, kitchen, cooking.

MS. HUANG: Yeah. So the large majority is the heating and cooling, and then it's the water heating. And, you know, from a greenhouse gas reduction standpoint, the -- we're getting the most greenhouse gas reductions through electrifying the heating and the cooling and the water heating.

The induction cooking or the gas-to-induction cooking, one, that's a barrier from a customer adoption standpoint, but it's also a challenge as it relates to -- it's just not as cost-effective.

So heating's about $9,500, so maybe this is a little bit more than 11,000, but it's -- you know, heating is about 9,500. Heat pump, water heaters is about 2,200, and induction cooking is about 1,700.

So that does add up to more than 11,000 I think, but that's sort of ballpark of sort of the magnitudes of what -- the large majority is heating and cooling. Then you've got water

heating, and then you've got, then you've got the cooking piece, so.

COMMISSIONER MONAHAN: Thank you.

COMMISSIONER MCALLISTER: Commissioner Gunda have a question as well?

COMMISSIONER GUNDA: Yes. Thank you, Commissioner McAllister. Thank you to all the panelists. That was excellent presentations and I just want to thank by name, Kyle, Sarah, Abhi, Amy, Rachel and David, thank you so much for each of your presentations.

I kind of have a couple of questions. I think maybe Rachel and David can start, and maybe others can chime in. I think I'm just going to -- thinking through the carbon metric that you talked about, Rachel, as we move forward as an integrated way of planning for both efficiency and electrification. I wanted to get your thoughts on kind of how the -- how do you see the evolution of the grid, right? I mean, like so -- and I see you smiling there.

So, there's so many moving pieces here, right? I mean, like we have the electrification of the end uses are not really clear yet, what we know kind of. We don't how the behind-the-meter

storage of the distribution resources are going to be coming in. And more broadly, what the clean, firm power options are going to be, right?

So looking at all of that, if you want to expand a little bit on your thinking on how do you see these incentives, especially as you think about seasonality, you know, like for -- I mean, different end users, you have, you know, seasonality in the same ones, right, I mean, same end users.

How do you apportion those incentives and how do you ultimately incentivize to get us to this clean future in kind of that -- in a comprehensive way that this metric -- and maybe, David, you could chime in too, because you kind of commented on kind of this, you know, this interim stage or transition stage.

MS. HUANG: Sure. I'll take -- you know, one thing I know that there was a lot of discussion by CEC staff about the role of load flexibility and how important load flexibility is going to be playing a role in the decarbonization.

And as I think about our Zero Carbon Plan and the role of an opportunity to

partner with customers to help support that, I think that's going to be a big part of it, right? Load flexibility -- you know, the CEC has the load management standards proceeding going on as it relates to dynamic pricing.

So, to the point of incentives, you know, that's also a transition for customers, right, is, you know, traditionally energy efficiency programs have been, you get an incentive for buying an efficient light bulb, and efficient HVAC system, an efficient, you know, refrigerator, an efficient, you know, whatever. And then they were just more efficient. And then their -- you know, their bills went accordingly.

And so now what we're really asking customers to do is to be partners with us. And this goes to, you know, how do we set up for incentives to help reduce that upfront capital investment that customers need to make, but what's the ongoing payment that they get, whether it's through rate design, or rate design coupled with, you know, capacity payments and things like that, to really get them to think about how they can change their behavior if it's a value to them. So that payment has to be enough.

So, I mean, your point about there's so many moving parts. It is very -- it can kind of make my head spin sometimes. So there are definitely a lot of moving parts.

And so that's really why over the next three years, when I was talking about our Zero Carbon Plan kind of our trajectory is, is that based upon contracts and sort of utilization of some of our peaker plants, we're going to start looking at, okay, probably in that 2024 or 2025 timeframe that we could start potentially retiring some of our -- first of our peaker plants.

But in order to do so, we're going to have to learn, you know, how cost-effective are these customer-based resources? How much do we need to pay them to reliably respond? You know, how much are technology costs going to come down as it relates to, you know, battery storage or any of these different technologies, because they might still be expensive.

How do we think about IT systems and cybersecurity, and what we have to pay the aggregators or IT systems to make this all work and orchestrate in a way that is cost-effective

for the utility, but enough value for customers to change their behavior, or have technologies that make it easy for customers to change their behavior.

So, there's a lot of moving parts, but I think that that's where it's no longer the, I pay you an upfront incentive to buy an equipment, and then it happens to be efficient and you save on your bill.

It's really becoming more of what's that ongoing relationship that customers have to have with the utility. Where we have shared value in there for the utility, we'll provide that value to customers through different sources of payments, not necessarily just upfront, but ongoing payments or through rate signals, to be able to really utilize these resources in a way that we hope that will play out.

COMMISSIONER GUNDA: So, David, before you jump in, Rachel, thank you so much for that, kind of putting that together. Just wanted to ask a kind of clarifying question that I meant to ask you earlier. Is as you were thinking through this kind of like a universal metric, right, I mean, like thinking through how do we set this up

in a way we could do an integrated planning. Has SMUD considered indoor air quality issues? And if yes, did it make it, not make it, why? If you could just add to that it would be great.

MS. HUANG: So indoor air quality is definitely a consideration for us. You know, when we were looking at our 2018 Integrated Resources Plan, that's really when we said, hey, we really think both building and transportation electrification is important. It's important from a greenhouse gas reduction standpoint, but we don't get to count that towards our own footprint, right. We're the electric utility. We're -- you know, that's our carbon -- that's our power supply.

But, you know, being a municipal utility, wanting -- you know, being in an air attainment district having -- you know, I think we're like the sixth worst like air quality, and we've gotten like an F on, you know, scorecards about our air quality, is that indoor air quality is important. And we know that being able to switch those gas-fired end uses in the home, like cooking, like water heating, right, can provide some benefit of indoor air quality to our

customers.

In terms of factoring it into the actual cost of value, we haven't pinpointed exactly what the value is, but we do believe that it provides value, and therefore, have been willing to really lead with market-leading incentives. Making those first incentives really rich to get the market going for the end goal of, one, helping to start transforming the market, but also recognizing that that has huge value to our customers and our community.

MR. JACOT: Yeah, those considerations apply to us as well. I think our approach is slightly different based on the fact that our business model's a little bit different from SMUD's. We are fully decoupled in terms of revenue versus our retail. So we follow kind of what the IOUs do in terms of revenue requirement to operate and provide the power.

So we are retaining a very strong focus on energy efficiency. We bill in kWh. We don't see us getting out of billing in kWh. From a customer standpoint, GHG is great, but, you know, they get billed on their kWh usage.

So -- but what we are doing with this new

program I described, CAMR, is putting our toe in the water of having a carbon-based metric for an electrification program, because electrification is, obviously it's load growth, but also, you know, we want to put the metrics on an even playing field between the solar generation and the energy efficiency.

One thing that happens over time is we get to that 100-percent clean grid if we value it solely in terms of CO2, the value of that intervention goes to zero, and that's something that we're conscious of. And we don't feel that that intervention goes to zero if you look at it in terms of other metrics,

Specifically, in terms of being a vertically integrated utility that is, you know, wholly and solely responsible for what the rates wind up being based on the decisions we make in all levels of that vertical integration.

You know, the -- we -- the buck stops with us in terms of, you know, who's on the hotseat if the rates double if, you know, if we do this wrong, and have to overbuild, have to significantly overbuild and rate-base all that, then there could be significant rates impacts

that we don't want to have happen.

So, again, just to reiterate, we see electrification is inevitable. It's policy. We support it, but we also have to plan for its impacts on our grid. And so the idea of having shifting load, demand response, that's absolutely growing. We're doing that with thermostats. We're planning to do that with heat pump hot water heaters and some other load-shift strategies.

But really, you know, if you have enough storage, you've got to the theoretical limit of storage in terms of the needs of the grid fully with all -- economic sectors fully electrified, if you have enough storage, then you take the time-value issue, the time value of energy efficiency out of the equation.

It's valuable at any time, like I said, it's valuable during the day because that leaves more renewable overgeneration to be stored, that is storage. And then by having energy efficiency off peak, then that's -- that lessens the amount you have to store in the first place.

So yes, very complicated. Many different ways of looking at it. For the most part, you

know, SMUD's approach and ours is probably 95-percent aligned. There's just a few, you know, peculiarities due to our differing business policies.

COMMISSIONER GUNDA: Thank you, Rachel and David so much for those comments. A really, really helpful presentation.

Commissioner, I know -- I don't know how we're doing on time, if you would entertain, I just have a quick question for Amy.

COMMISSIONER MCALLISTER: Yeah, please go ahead. I have one quick question as well or, Gabe, I'm sorry -- great. We've got a few minutes until we want to, you know, ease towards audience questions.

COMMISSIONER GUNDA: Surely. Amy, I think this could be a short question. Just, you know, you kind of commented specifically on data needs, kind of the -- you know, you kind of mentioned the kind of information as simple as kind of adding electric panel upgrade information to really track, you know, the overall kind of improvements towards decarbonization.

Maybe, you know, if you want to just comment at a very high level any other data needs

that you see, that would be great to hear from you.

MS. RIDER: That could potentially be a big question, too. On a high level I would say that, you know, in addition to those items I mentioned already, just more information about actual contractor costs, you know, Rachel's data point of it costs $11,000 to convert to fully electric.

I would love to have more transparency about the conversion costs for existing buildings across the State, frankly. That could be a pipe dream, I don't know, but that's one place where I can see there being other advantages to maybe ground truth some of our assumptions, but also to help for more competitive bidding on the part of contractors.

MR. JACOT: Yeah, I can comment on that briefly. So all these are projections. You know, I said 1,200 -- 12,500 units at 75,000,000. These are projections. Once we actually get these projects going, we'll get data. And so we'll be constantly refining the projections based on the real-world data that comes in. SMUD has it already for these homes, but of course

it's an aggregated blend.

Ours would be for this particular program a little bit more complicated because we're starting with multifamily, and we will be including very comprehensive central system upgrades, like central boiler conversions to heat pump boilers, you know, commercial grade upgrades. Same thing with chillers and other types of commercial grade equipment on these centralized projects.

We will also have smaller projects, maybe 60 units, 20 units, and, you know, those are just all unitary equipment, window ACs, things like that, but they usually still have a central boiler. So we'll be seeing those types of projects.

And so, to try to forecast those costs on anything but the highest level aggregated spread is very difficult. We'll get real-world data from various projects that we do, and then we'll be able to tighten those up.

COMMISSIONER GUNDA: Thank you.

MR. JACOT: Sure.

COMMISSIONER GUNDA: Commissioner McAllister, to you.

COMMISSIONER MCALLISTER: Yeah. Thanks, everyone. I just have a quick question. It sort of seems to be implied -- I guess I'm mostly talking again to our two utility representatives, Rachel and David, but I think anyone should be able to express themselves on this.

It seems to be implied that, you know, mostly we're talking about automated devices, and I want to just get clarity on what -- you know, if you're going to electrify, you know, load flex is important. What are you thinking in terms of just pervasive automation and how that -- you know, how you bring customers along with that. Is that -- you're planning basically 100-percent automation, just make it a hardware solution and a communications solution, or is there -- is it more complicated than that?

MS. HUANG: I can start. I would say that as we think about load flexibility, you know, and as we think about equity, we know that we need to bring everybody along. And as I've given with my figures, it's super expensive to pay for everything, or do the direct install for everything.

You know, one thing that we are looking

at and is -- as it relates to load flexibility is also, how do you think about behavioral approaches? And so, while -- from a customer experience standpoint, having the automation makes it a lot easier to be able to participate, but you have to have money to be able to buy the equipment that can be automated, unless someone basically pays for all of it.

And so, we're actually going to be launching this summer a behavioral demand response pilot for the summer to look at behavioral approaches, and see how behavioral approaches -- now, it's not novel. I mean, utilities across the nation have looked at launching behavioral approaches, but we actually have a time-of-use rate.

So it's going -- at least for the vendor that we're working with, it's actually going to be the first time they're doing behavioral approaches, which they've done for years with other utilities on the East Coast, but have not done it with a time-of-use rate.

So I think this is where -- and if you think about rates signals, that's also behavioral demand response. We have a price, and customers

choose how they want to manage things. Now, again, customers may have technology in the background, but the question is, is, you know, do they have the capability to shift certain things if they don't have all the automation? And how reliable is that resource? You know, how interested are people able to participate on the fifth day of a heat storm, what are they going to do?

So I think that's where we really want to see what is possible as it relates to no technology options, but recognize that there's going to be a spectrum of people to be able to participate and wanting to have options for everyone.

COMMISSIONER MCALLISTER: Thanks for that.

I guess I'm wondering how different maybe LADWP is. In the morning we had a -- in the morning we had an interesting presentation from Vincent Barnes from the Alliance to Save Energy, and he really I think forcefully linked broadband access with the things that we're talking about.

And so I know you're from two relatively urban areas, but, you know, maybe -- especially

at DWP where, you know, you just have incredible diversity and not comprehensive smart meters, maybe you can comment on the complementary nature of those two in your realities.

MR. JACOT: Yeah, we don't have widespread smart meters yet, although it's in our five-year plan. Of course it's been in our five-year plan since I started here nine years ago, so we will see.

You know, broadband is not our core business, but we understand the equity concerns and the, you know, the imperative on the part of the city to even out those inequalities, in terms of access to technology and broadband. In fact, we often work with the city to help them implement policy initiatives that aren't really, you know, within our core business. So I definitely expect that will be a component of it as it moves forward, but what that looks like as yet -- and right now in its most basic sense, we host other utilities, meaning telecom and the like, on our poles and facilities in a lot of cases. But how that's going to integrate with smart meters, that's an interesting question. You know, we see -- we've seen so much, so much

evolution in smart readers in the last 15 years, it's kind of a party you almost want to be late to. I think we're overly late now, but certainly the utilities that adopted it early on, the IOUs, did a lot of it in '08, '09, in a lot of ways their structure is already obsolete. So, you know, that's something we're also very conscious of, these are 50-year -- the utility makes 50-year infrastructure investments. We don't want to drop a billion-and-a-half dollars on something and have it be obsolete in 10 years.

So factoring something like broadband support for -- you know, across the City, for our communities is something that's much easier done if we've already optimized what the smart metering infrastructure and equipment itself is going to look like.

COMMISSIONER MCALLISTER: Thanks a lot. I just realized that -- Mr. Rechtschaffen, did you have your hand up?

COMMISSIONER RECHTSCHAFFEN: I did, but don't worry, it wasn't up for very -- it wasn't up for that long, so --

COMMISSIONER MCALLISTER: Go ahead. Go ahead, yeah.

COMMISSIONER RECHTSCHAFFEN: -- no need to feel bad.

I had a comment and then a question. I just wanted to let folks know that last week in our energy efficiency proceeding, we changed the way we -- there's a broad directive to change the way utilities measure system benefits or efficiency, direct benefits of their portfolio investments. And we're moving away from kilowatt hours and therms saved to something closer to what SMUD's doing.

Where we're -- the goal is to provide system benefits, which include GHG reductions, as well as peak load reductions, and other grid benefits. So we are moving in that direction in a significant way.

I had a question for David probably, maybe -- it's following up on what you said, and Rachel maybe can jump in if SMUD's done anything.

The discussion you had -- or the description you had of the program you're launching for low-income, low-income properties where you're doing the comprehensive retrofits. And you're requiring that developers hire contracts -- contractors that use prevailing

wage, and also is -- for certain tasks, as I understood it, or at a certain point they need to use skilled workers.

Have you required those kinds of conditions in other programs, and if so, do you have any experience with that?

And, Rachel, maybe you could also comment to the extent that SMUD's done that.

MR. JACOT: This is the first time we're doing it in a rebate program. We do that, we've done that in several of our direct install programs, where we're hiring the contractors, or we have a third-party implementer who hires the contractors.

Direct -- commercial direct install, which is primarily lighting, we mandated that the third-party implementer only use IBEW electrical contractors, and it's worked very well. It's been a very successful program, very large results. We've also expanded it to cover L.A. Unified School District, and where we've done I want to say almost 50 schools, and there's been significant energy savings on those.

But this is the first time we're doing it where we're mandating that the customer hires

that, you know, that type of labor to execute the project. Of course we're going to have a third-party implementer for CAMR, who will help the customer through that process, just like our implementer for commercial direct install does for bringing on union contractors. But it is a pilot. It's definitely piloting a new approach.

You know, we -- for a long time we've touted some of our efforts. We do a door-to-door distribution of LED lightbulbs do it again. That's 2.8 million bulbs to 1.4 million households. And, you know, we bring in, we bring in a company that essentially delivers telephone books and they do this for us, but that's not skilled labor. You know, it's great, it's good. We give some people temporary jobs for six months, but that's not really what we're trying to do from the broader workforce development standpoint here in Los Angeles and greater Los Angeles. So this is our first foray into this on a rebate program, as opposed to a direct install.

MS. HUANG: Yeah. In the case of SMUD, our low-income program, particularly the electrification efforts, is the direct install program. And so we are using prevailing wage for

that program as well.

MR. JACOT: Yeah. And we do have a low-income direct install program -- I should point this out. We do have a low-income direct install program that uses DWP employees. We actually have a construction crew -- several crews that do the work, and of course our workforces are unionized.

It's free, and so we plan to marry these programs together, where it's more -- in other words, the customer only pays for the complex stuff through the CAMR Program. The low-income direct install program, if the project is suitable, we'll come and do all the free stuff first. So while that program's competing, they're complimentary. Give them the free stuff first, build the rebate program on top of that. And that's unique as well.

It's challenging to have programs that aren't synced up. And, you know, you get half a bowl here and three cups there, but you can't mix them together, which do you choose? That's what we're trying -- that's one thing we're trying to overcome in the program.

COMMISSIONER MCALLISTER: Great. Well,

thanks a lot for --

COMMISSIONER RECHTSCHAFFEN: Thank you.

COMMISSIONER MCALLISTER: Thanks for those answers. We're -- I wanted to -- we want to point out that this moving towards carbon aligned metrics is a great trend, and point out that we are doing that at the Energy Commission with this building code update actually.

We pivoted to a cost-effectiveness metric that -- and an energy metric that's based on source energy, which really is aligned very tightly with emissions. And so it's great to see us all kind of pivoting in unison on that.

Let's see. I'm going to -- I think we're over time, but I think we don't have so much public comment, or perhaps even Zoom comment, that it's going to take all the time we have allotted. So I think we should be good.

So, Heather, how do you want to do this? You want to -- questions from the attendees first and then we'll open public comment after that?

MS. RAITT: Yeah.

COMMISSIONER MCALLISTER: Great.

MS. RAITT: So, Kristy, if you could go ahead and moderate some of those questions,

that'd be great. Thank you.

MS. CHEW: Good afternoon. This is Kristy Crew with the Efficiency Division of the California Energy Commission. A couple of questions have come in.

The first one is from Tom Paine. Does renewable propane get any coverage among the renewable fuel considerations? Rural homes tend to be the hardest to electrify, and the most likely to use propane.

Anyone want to take on propane?

MS. NEUMANN: Well, I can just say what we're thinking about as far as further electrification analysis. That would fall under our additional fossil fuels. But then maybe if somebody from the CPUC could speak to how this is really fuel switching, rather than fuel substitution and may -- you know, it's not a utility-based fuel, so that might be treated differently.

MR. COX: This is Rory. I'll take it real quickly. So we don't regulate propane of any type. So it's not something that we've really addressed. I mean it is, in general, as one of these slides said, we do want to electrify

rural homes that are propone dependent. But in terms of a propane substitute of any type, that's not something -- we do have an RNG Program for natural, renewable natural gas, because we do regulate that because it's a utility fuel, but not propane.

MS. WADHWA: The San Joaquin Valley pilot do switch customers from propane to either electrification or natural gas fuel. So, it's not that we don't recognize the GHG potential there, it's just something we don't regulate. So as such, we cannot go setting standards for renewable propane.

MS. CHEW: Okay. Thank you.

Next question has to do with workforce. Does the CEC have a workforce development initiative for California community colleagues, curriculum, career pathways, et cetera?

MS. CHEW: Is there anyone on the CEC panel that would like to respond to that?

COMMISSIONER MCALLISTER: I'm not sure if one of the staff wants to jump in. We certainly pay attention to the workforce issues on -- in any work we do on this topic, including the AB 32 or, I'm sorry, the -- yeah, AB 3232 report that

Mike mentioned and that we talked about a little bit this morning.

And Sarah White from the Office of Planning and Research was slated to be with us today, and I think the workforce issue is something that they're working directly on. So, we didn't have anybody in that sector today. But we certainly could follow-up with you.

MR. COX: (Indiscernible.)

MS. CHEW: Sorry.

MR. COX: I was just throwing in that the PUC does regulate an energy efficiency program which does have a workforce education and training component. And workforce and training -- workforce training will also be a big part of the TECH initiative when it gets off the ground. So we're doing a couple things on our end.

COMMISSIONER MCALLISTER: And maybe I'll just throw in that the investor-owned utilities actually have helped quite a bit. At each code cycle when we view up -- when we refresh the code, as we're doing for 2022 now, often there's an education period to adjust any new technology, building practices, et cetera, and often that has a -- you know, that's a workforce component that

is kind of routinely done. So, not necessarily revolving around the community colleges, but there is some overlap there.

MS. CHEW: Great. Next question has to do with the space needed for hot water heat pumps. The space restrictions for hot water heat pumps will hinder my ability to replace my traditionally gas water heater.

That's not really a question, but maybe somebody would like to talk about what kind of requirements are needed for hot water heat pumps.

MR. JACOT: Yeah, I'll chime in a little bit there. So, you know, one of the things we run into in looking at which appliances -- how to electrify appliances, there's a lot of challenges like that. A heat pump hot water heater is typically bigger than a gas-fired hot water heater of the same capacity and performance characteristics.

There's also the reservice requirement for the -- as we mentioned, for our affordable multifamily program, we'll be adding 750 per unit for panel upgrades, service upgrades, as needed, which will be substantial for a 100-unit building. But in the home, and Rachel had a lot

of experience there, in single family homes quite often the hot water heater is in a closet that's only slightly bigger than the hot water heater. So you get into a carpentry situation as well.

MS. CHEW: Anyone else want to add to that?

Amy, it looks like your hand's up?

MS. RIDER: Yeah. I'd just like to add, actually more in response to David's comment than to the question itself, because certainly, you know, the bigger units do take up space and they require adjacent space in order to pull the heat in. That's how the heat pump works.

But we did just hear last week, there was a presentation for -- through the Building Decarbonization Coalition where three manufacturers presented their plans for 120-volt plug and play heat pump water heater. So that -- all of which are expected to be out by the end of the year. So the retrofit-ready technology is quickly evolving. I don't know how large they are, but just something to keep on the radar.

MR. JACOT: Great. It's fast evolving. It's a very fast evolving technology space, just like LEDs were five or six years ago. So,

definitely want to stay on top of it.

MR. COX: Amy, did you say there were three different manufacturers doing the plug and play by the end of the year?

MS. RIDER: That's correct. At least the three I know of. It doesn't mean there aren't more.

MS. CHEW: This next question goes to Ingrid. Why doesn't the gas system decarbonization scenario contemplate 100-percent decarbonization?

MS. NEUMANN: So, I am not sure that there would be 100-percent available, you know, like renewable gas to replace all of the fossil gas used in California right now. We import -- it's certainly more than 80-percent that we use in the State. And so we've heard from some renewable gas advocates that they could replace up to 20-percent. So that's the maximum value that we chose there for that analysis.

MS. CHEW: Great. Thank you.

Next question, I believe is for the PUC, for Abhilasha. Does the gas new construction bullet refer to looking at gas line extension allowances, when and where?

MS. WADHWA: The proceeding -- or the venue is non-decided yet. It's just something we would consider looking deeper into in the future, but we don't have a venue for it yet.

MS. CHEW: Thank you.

We have a question for SMUD. Is it true that a SMUD customer can convert a gas water heater to a heat pump water heater for $99? It sounds too good to be true. Are there other costs that can be shared easily here?

MS. HUANG: So, the reality is -- and I said that, you know, more from an anecdote standpoint, just to see -- just to illustrate how people in the supply chain, like vendors and contractors, are starting to engage. And I think that's the most important thing, is that we need to educate and engage not just the customers, but all the stakeholders along the way.

So, there was a vendor that was offering the $99. On average we're seeing the -- both with the heat pump water heater and the installation, to average about $3,800. And at that time that the person was running a $99 deal, our incentives were at $3,000. So they've since dropped down to $2,500. Now still that's about

an $800 difference, so I'm sure -- I think some of those were -- you know, which are the best and easiest installations that didn't require a lot of additional work. And then I don't believe that vendor's offering that right now, but it was just to illustrate that if you can engage people within the supply chain, they'll start to get creative on how to push these things as well.

MS. CHEW: I have a question from the same person, please, was, have you considered offering match funding programs for conversion?

MS. HUANG: So I'm not exactly sure what "match funding" means. Like I said, our low-income programs we're currently doing direct install, but for our regular mass-market residential customers, we offer an incentive. So, it helps them buy down the cost, but they are also making an investment as well.

MS. CHEW: Sounds good. Last question so far is, is there any discussion of using smart main breaker panels to act as air traffic control for electricity usage as a way to circumvent service upgrades that would otherwise be needed for building electrification?

MS. HUANG: So I can chime in since I've

got our Research and Development Department. So my R&D team has been looking at this concept of smart panels and smart breakers. We haven't initiated an R&D project yet, but we've been talking to EPRI, and we've been looking at what we might possibly do.

MS. CHEW: Anyone else want to chime in on that one? If not, that was our last Q&A.

MS. RIDER: Yeah. I'll add -- I'll just add to that. In terms of -- I'm not familiar with smart panels. I think it sounds like a fantastic idea, but certainly the opportunity for a watt diet, for whether it's through -- there's switching technologies, where you can actually share a breaker across multiple technologies through a common -- for example, for a dryer and an electric vehicle charger, to maximize the space constraints on a smaller size panel.

There are lots of other opportunities out there, and we continue -- the market continues to innovate, and so.

MS. CHEW: One more question just popped in if we have time. Outside of SMUD and L.A., are there incentives for heat pump space heating, or just water heaters for the general market?

MS. RIDER: Does anyone want to talk about TECH, other than me? TECH is coming. Later this year the TECH program will be rolled out statewide, and they are focused on space and water heating.

Anybody else want to add to that?

MR. COX: Yeah, you're right --

MS. WADHWA: Yeah. I thought I heard it was for L.A., that's why I didn't answer, but Rory --

MR. COX: Yeah. I think the question was outside of L.A. and Sacramento. So, yes, that's correct. The TECH initiative is -- will be on-line in -- if -- I think it's a few months away. And then there are also some local, like I know BayREN has a program, and I think Marin Clean Energy has a program. There are a lot of, you know, regional players that are offering incentives.

I think that if you go to the Switch Is On, there's a rebate finder at that website. I'm not sure if that's actually -- Amy, you would know.

MS. RIDER: Yes. Switchison.org. Thank you, Rory, for that plug. Yes, you can look up

by zip code your rebates available in your area, as well as find contractors in your area. Switchison.org. Thank you.

MS. CHEW: Great. Thank you, everyone. That was all the question and answers that have come in.

MS. RAITT: Great. Thank you, Kristy, and thank you to audience attendees that submitted questions.

And so, Commissioners, if you had any last burning questions, otherwise we'll move on to public comment.

COMMISSIONER MCALLISTER: No. Go ahead, Heather. No.

MS. RAITT: All right. So, RoseMary Avalos from the Energy Commission's Public Advisor's Office is here to help moderate questions. I don't see any hands up, but go ahead, RoseMary.

MS. AVALOS: Thank you, Heather. If anyone wishes to speak, go ahead and raise your hand. On the phone, again, it's star-nine.

I don't see any raised hands, Heather, so I'll go ahead and close public comment and pass the mike back to you.

MS. RAITT: All right. Well, thanks. So, can you just advance one slide, please? Can you go back to the slides?

I'm just going to make one quick announcement before we close, go to closing remarks.

I just wanted to mention that the Energy Commission is seeking nominations for its Clean Energy Hall of Fame Awards. And the awards honor individuals and entities making exceptional contributions to help California achieve 100-percent clean energy future for all. Categories include Lifetime Achievement, Clean Energy Champions, and Youth Game Changer. And nominations are open and they're due on June 25th. And just go to the Energy Commission's website for more information.

And then, finally, I will also just add that if you wanted to make comments and didn't chime in this afternoon, feel free to submit written comments, and they're due on June 8th. And that's it. So I'll pass it back to Commissioner McAllister.

COMMISSIONER MCALLISTER: Thank you very much, Heather. Wow, what a terrific day actually

today, both the morning and the afternoon. And I want to just thank Heather and your team, all the staff that was behind this. You know, it's deceptive when things go smoothly like they invariably do in these workshops because there's so much skill behind them. But it's deceptive how much work goes into it because they make it look really easy. But staff in both the Substance Division and the Efficiency Division teed up a lot of great topics, and got wonderful speakers lined up and prepped to do today.

And so I want to thank them, and all the speakers and all the attendees. We had really good participation today, really good attendance, so I'm extremely happy about that.

And I think the big takeaways are, you know, we -- this is a mammoth undertaking that we're all involved in. And there are many pieces to this puzzle, and they're starting to take shape in a way that they fit together, and that's really heartening.

You know, yes, it's a large, it's a large enterprise, but there's also a lot of creativity, a lot of innovation here in California and beyond, far beyond, and boldness. There's a

willingness to be bold, and we've heard a lot of that today. And I think that's what we have to do, we have to be bold. We have to think big, and bring big capital and bring major players to, you know, get involved here. And I think it's becoming very clear that we're serious about this and we're going to make it happen. And there's a lot of upside to folks who get in and help it happen.

And so, you know, not to diminish some of the barriers and challenges that we've heard about today, but I really am leaving today heartened by all the -- by just the good energy I'm feeling from all of you, and seeming optimism and sort of can-do mentality that everybody's brought to the fore today.

So thanks again, everyone, and I just want to poll -- you know, thank you also to my colleagues, Commissioner Gunda, Commissioner Monahan and Commissioner Rechtschaffen, for being here much of the day, and want to see if any of them have any final comments.

COMMISSIONER GUNDA: Yeah. Commissioner McAllister, just want to thank you again for really kind of visioning this out for us today,

and extend my thank yous to the staff and the technical team, the IEPR team, and everyone present today, and the panelists and the attendees. And definitely if I don't do this, Commissioner Rechtschaffen would be unhappy. A special thanks to Commissioner Rechtschaffen for being here.

So, I mean, I think -- I kind of wanted to share the same spirit. I think, you know, there's a few different threads that came together. I think the importance of the program design, the importance of kind of the overarching vision statement and the underpinning of the analytics.

And I feel like, you know, throughout the presentations this morning and this afternoon, directionally it seems like we're all aligning on a lot of different principles, along with a strong foundation for equity and fairness. So I think, you know, most of you implicitly or more exclusively talked about that, and I just am really heartened, too, that it feels like we are at a moment that we can make this happen.

And so I just want to thank all of you for your leadership and just kind of your passion

and vision for making this happen every day. So, I'm really glad to be a part of the conversation and continue to support all of it. Thank you.

COMMISSIONER MCALLISTER: Thank you very much.

I think Commissioner Monahan had to jump, so you get the last word, Commission Rechtschaffen.

COMMISSIONER RECHTSCHAFFEN: The only reason I stayed the whole time was to hear Commissioner Gunda thank me. I see Commissioner -- I want to thank you, Commissioner McAllister, Commissioner Gunda, for a great workshop. I learned a lot. I think I'm going to end with what Commissioner Gunda said. It's so heartening to see that equity is now being interwoven at the foundation, the heart of what different jurisdictions are doing, not as an afterthought, not as a separate track.

And I for one take away I learned a lot from our colleagues at SMUD, who have a really fascinating challenge goal that they want to electrify all low and moderate -- or low-income consumers 100-percent before the rest of the market. That turns the way -- turns on its head

the way we've done things traditionally. And I think we at the PUC need to think seriously about goals like that, and we certainly will. So, that's one of the insights I learned from our colleagues, and I really appreciated all the discussion and dialogue today. Thank you very much.

COMMISSIONER MCALLISTER: Thanks a lot, Commissioner. I have to second that, that thought about really, you know, historically we've kind of gone top down, you know, the sort of cream skimming, you know, expensive technologies, and then got the cost down as we go up in volume. Well, we really do have to reverse it, as you said, and start at the, you know, in the low-income and disadvantaged, you know, the affordable sector, and that's -- if we move the market there, then it will grow really fast.

I also want to commend you, Commissioner Rechtschaffen, for the equity metrics that you led at the PUC and guided through adoption. Because I think that was a really big lift and a substantive lift, and will really change, change things for the better. So, thank you for that.

COMMISSIONER RECHTSCHAFFEN: Thank you.

COMMISSIONER MCALLISTER: So, with that, I think we are done.

Heather, any wrap-up comments? We have well, we want comments by June 4th, I believe it was, correct?

MS. RAITT: June 8th.

COMMISSIONER MCALLISTER: Sorry, June 8th. Okay. June 8th is the comment deadline. Please submit your written comments everyone. We read every one, and they really help us guide the conversation. And it just gets a better outcome all around when we get more participation. So, thanks a lot.

Anything else, Heather, before we wrap up?

MS. RAITT: That's it. Thank you.

COMMISSIONER MCALLISTER: All right. Well, thanks everybody for a great day, and take care.

MS. RAITT: Have a good night.

(The workshop concluded at 4:48 p.m.)

CERTIFICATE OF REPORTER

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

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

IN WITNESS WHEREOF, I have hereunto set my hand this 17th day of August, 2021.

Elise Hicks

ELISE HICKS, IAPRT

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MARTHA L. NELSON, CERT**367

August 18, 2021