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STATE of CALIFORNIA

CALIFORNIA ENERGY COMMISSION

In the matter of:

2021 Integrated Energy Policy Report(2021 IEPR)	)	Docket No. 21-IEPR-06
	)	Re: Building Decarbonization Consumers, Financing Workforce

IEPR COMMISSIONER WORKSHOP

BUILDING DECARBONIZATION – CONSUMERS, FINANCING AND WORKFORCE

REMOTE ACCESS ONLY

MONDAY, JULY 12, 2021

1:30 P.M.

SESSION 2 OF 3: Financing Decarbonization

Reported by:

Martha Nelson

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PUBLIC COMMENT

John Shipman

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P R O C E E D I N G S

1:30 P.M.

MONDAY, JULY 12, 2021

MS. RAITT: Good afternoon and welcome to Session 2 of the 2021 IEPR Commissioner Workshop on Building Decarbonization: Consumers, Financing, and Workforce. I'm Heather Raitt, the Program Manager for the Integrated Energy Policy Report, or the IEPR for short.

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

To follow along with today's discussion, the workshop schedule and presentations are available on the CEC's website.

All IEPR workshops are recorded. And both a recording and written transcript will be linked to the CEC's website within a couple weeks.

Attendees will have the opportunity to participate today in a few different ways. You

may ask questions or upvote questions submitted by others through the Zoom Q&A feature. You may also make comments during the public comment period at the end of the afternoon. Please note: We will not be responding to questions during the public comment period.

Also, we welcome written comments. And those would be due by July 27th. And the meeting notice provides all the information of how to submit written comments.

And with that, I'm pleased to turn it over to Commissioner Andrew McAllister.

Thank you.

COMMISSIONER MCALLISTER: Okay. Heather, thank you again for organizing, you and your team, for organizing this day of workshops. This morning was terrific. And this afternoon is going to be terrific as well. We have some great people on our two panels this afternoon regarding financing decarbonization.

And I won't repeat my opening comments from this morning but just really gratified to have my colleagues on the dais here, Commissioner Patty Monahan, Commissioner Siva Gunda.

And Derek Chernow from CAEATFA, the --

well, long acronym, but thank you, Derek, for being here as well. Really appreciate your participation in this. And actually, this afternoon, I think, is right up your alley, so looking forward to your input as well.

With that, I think I would invite my colleagues, Commissioner Monahan, if you'd like to make some comments, and then Derek.

COMMISSIONER MONAHAN: I'm actually most interested in what Derek is going to say because, I mean, this is such a seminal issue around how do we make sure that we have the financing to support this transition to a lower-carbon energy system. And I know we, for transportation, we struggle with this a lot around infrastructure investments for zero-emission vehicle refueling.

And so, Derek, I want to pass the baton over to you and hear what you have to say about this topic.

MR. CHERNOW: Thank you. No, I appreciate that. And I'm really interested to hear what everybody has to say this afternoon and excited about the lineup that's in store for everybody.

You know, a couple of themes that we

heard about earlier today revolved around transparency and an all-of-the-above approach. And I think that's kind of where, you know, CAEATFA comes in. And again, apologize for the long acronym. Eventually we'll change that in time. But really, I think that's kind of one of the things that we're looking at, you know, in that all-of-the-above approach there's incentives and there's other funding mechanisms.

And then there's, you know, lending and borrowing, which is kind of where we come in. And I think it's just important to put out there at the beginning as we start to hear from some of the other panelists, that debt solutions are good for some customers, indeed they are, who want to pay privately for their building investment, whether it's their homes or their business. But debt is not a particularly great solution for all customers. It depends on your particular need and your particular means.

And you know, I think we're proud of the program that we're operating here at CAEATFA in driving down those costs, extending the length of the terms and making it an affordable option in a lot of respects. But it is not for everybody and

that should be kept in mind as we look at the all-of-the-above approach. So it applies, just not across the board in every circumstance.

So I think we're really excited about the growth in this space. I think we're excited about the increased investment from the lending community in energy efficiency, again, whether it's residential or small business. In our case, we're just seeing an increased demand on the consumer side, and we're seeing an increased interest on the lending side. And you know, we're happy to do that.

I think other part of this is the transparency and being part of a government agency, is that we do have to be transparent, which is good for the consumers and good for everybody involved. So people can see what the lending rates are. They can see what the average loan size is. They can see the growth of these programs. So it's all out there to be evaluated and looked at and, hopefully, spur additional investment and an additional demand. And, indeed, that's what we've seen.

So you know, again, I'm excited to hear what folks have to say today. I know our shop

will be presenting later on and go into greater detail. But you know, I think this is definitely part of the solution, not the only part but definitely a key part of the solution.

So thank you.

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

And, yeah, we live in a huge, complicated state. And I think we didn't really explicitly talk about it this morning, but we certainly could have, the need to segment, you know, really the need to focus on all the different market sectors that have individualized needs. And you know, we talked about different communities with different needs. Well, we could actually slice and dice across the building stock, as well, by ownership, you know, by, you know, sector, obviously. But you know, not all commercial is the same. You know, we have commercial A, B, C.

So I think there are just a lot of ways we can benefit from the knowledge and from the people in our panels today and really, you know, attack this problem in a multifaceted way, and they're going to help us do that.

So with that, I think, in advance, I want

to thank Staff for helping to put this day together. And Danuta and Deana for moderating our two sessions this afternoon.

And with that, I'll pass it off to Heather to kick us off on our next panel.

MS. RAITT: Great. Thank you, Commissioner. As you mentioned, so our panel is on decarbonizing programs, local programs, data, and lessons learned. And Danuta Drozdowicz is going to be our moderator. Thank you, Danuta. And she is an Energy Specialist in the Energy Commission's Building Standards Office.

Go ahead.

MS. DROZDOWICZ: Thank you so much, Heather.

A quick reminder before the session begins. Please type any questions that you have for our presenters into the Q&A.

And with that, I would like to introduce our first speaker, Andy Brooks from the Association for Energy Affordability.

Good afternoon, Andy, and welcome.

MR. BROOKS: Hi. Thank you again. Thanks. My name is Andy Brooks. I'm Senior Director of AEA's west coast office. First off,

thanks to the Commissioners for the opportunity to present.

You can actually go ahead and skip to slide three.

So just by way of background, we, AEA, is a nonprofit technical services and training organization. And we are dedicated to bringing the benefits of clean energy and energy efficiency to underserved communities. We work in a variety of different aspects of multifamily affordable housing. But a lot of what we do is implementing energy programs on behalf of state and local government agencies, utilities, community choice aggregators, and regional energy networks.

And these are just some of the programs that we're currently implementing, the first of which, the Low-Income Weatherization Program was really one of the first building electrification programs in the state and, for quite a while, was really where a lot of the multifamily existing building electrification work was happening. Now we're able to do electrification work in all of these programs, some of which are focused purely on electrification. So a lot has changed in a

very short period of time with relation to programs and our ability to integrate decarbonization measures.

But in all of these programs, our role is pretty much the same, so we're, effectively, the kind of the boots-on-the ground retrofit project managers. We are out in buildings every day. We do site assessments and determine what needs to be done at a property and then figure out kind of what the best approach is to get that work done. And then help the owners, leveraging additional financial resources as needed. So we basically scope the projects for the property owners and then work really closely with them and the contractors and property managers, maintenance staff, anyone who is needed to be involved to make that project happen.

So you can go ahead to the next slide.

So my focus is just going to be on sharing some data that has come out of these projects and programs as a way of illustrating kind of the current state of existing building electrification work. So this data is coming from a combination of LIWP, BAMBE, the Bay-run program, MCE, and SMUD programs.

And I have to caveat this because, A, I had to scramble to pull this data together pretty quickly, so it's pretty high level. And then, more importantly, it's really hard to parse a lot of this data, and project cost data in particular, because, for one thing, these are all whole-building retrofit programs, so we're always doing -- kind of treating the building holistically. And very often, a lot of the various components of the work get bid out as one big package. And so bidding contractors tend to kind of mash a lot of it together in a way that makes it very difficult to pull those costs apart in a perfectly accurate fashion.

And then, on top of that, there are just a lot of factors that impact costs, so we're looking at averages here, but the ranges can be pretty huge depending on, you know, how much electrical infrastructure work had to be done in order to facilitate the project, what, you know, what part of the state the project's in, whether prevailing wage is required or not, what kind of equipment was used, and just a whole host of other factors.

But just, so looking at this, first off,

at the top you can see we've done 77 multifamily electrification projects, 37 of those have involved just heat-pump water heating, 19 have heat-pump HVAC, and 21 have involved both. And then we have the total installed cost, the total number of units installed, the total cost per unit for each of those categories, so in-unit water heaters, central water heating, and in-unit HVAC. And then, just as a point of comparison, we have the equivalent for gas-based replacements. And that data is just coming from the LIWP Program. And really, the main data point to focus on here is the cost per unit.

So if we go to the next slide, we can see a better summary of that point.

So all of the subsequent graphs, by the way, are based on a subset of those projects that I just mentioned, not all 77, because we just -- we don't have all of that data for all of those projects pulled together yet. That is an ongoing project that we are actively working on right now.

But so this first one just illustrates what we've seen so far in the way of cost comparisons between heat pumps and the equivalent

gas system upgrades. And again, there's quite a bit of nuance to these comparisons.

So for example, in the case of the in-unit HVAC comparison on the right, any time you replace a gas heating system with a heat pump you are getting the added benefit of air conditioning. But that $3,891 on the gas system cost is inclusive of projects in which we just upgraded the heating system and they didn't get the additional added benefit of cooling. So not, necessarily, a direct apples-to-apples comparison. If we were to add air conditioning to those projects that only upgraded the heating systems we would get closer to parity on costs there. But generally speaking, so far, what we're seeing are higher costs on the electric options, which is, I think, not a surprise.

Now, obviously, as heat pumps installs become more commonplace we will see those costs come down, particularly because it's really on the labor side of the equation that we see the bulk of the cost difference. So as contractors become more familiar with the technologies and have more of these installs under their belts, we are going to see a decrease in labor costs there.

So you can go to the next slide.

So this graph shows just the average GHG reductions per project type, so DHW and HVAC, DHW only, and HVAC. So again, the pool of projects that this slide is based on, in that pool there were only three projects that had DHW and space heating, whereas with the DHW alone we had 13 or 14 projects in that pool. So you know, those two projects both had around, you know -- or those three projects that did both had around 30 to 40 percent savings, whereas in the larger pool of DHW-only projects, some of those had savings upwards of 60 percent. But this gives you a general idea of the kind of GHG reduction that we're seeing in those types of projects.

You can go to the next slide.

And this one is similar but it shows the GHG reduction impact by project. That one giant project in the middle kind of throws the scale off on the graph a little bit. But you can see that projects, like number four and number nine, have GHG reductions in the 60s, down to Project Number 10 which is currently as zero which is because the project is back running on gas due a problem with their central heat-pump water heater

plant. But the main takeaway here is that all of the projects, with the exception of that one, have seen very significant GHG reductions.

You can go to the next slide.

So this one is particularly important, and a little unnerving to see it first, but it's really important to understand. So this is pre and post utility costs. And what you can see is, while most projects have utility cost savings and, in many cases, pretty steep savings, there are some projects that are showing negative savings at this point. So it's important to understand why that is, where those projects are.

So first thing, a few things to note is this does not account for any kind of standard utility rate increases that have occurred over time. So we know that some of these projects have seen electricity rate increases that is kind of standard outside of whatever work we're doing.

And then, most importantly, a lot of the analyses periods that we're looking at here are during COVID. So we have, undoubtedly, seen an increase in, as you would all expect, in hot water and HVAC use, and it can be pretty significant. So in those cases, it's really hard

for us to know whether the increases in consumption is a result of increased occupancy, which is very likely the case, but it could also be, you know, underperforming systems or some other factor.

But for example, Projects 1, 2, and 10 there that show negative savings, those are all -- they all have hybrid central water heating plants, so those are heat-pump water heaters with the existing gas system left in place as backup. And these were kind of early stage central heat-pump water heating projects while the technology, in doing those projects, was still very new.

And one of the issues that we found is that if you have hot water crossover issues in a building, which is when you have faulty or failed shower or sink mixing cartridges and you end up getting hot water bleeding into the cold water line and cold water bleeding into the hot water line, that situation, if you have that, can impact the heat-pump water heater's ability to provide adequate hot water. And in those cases what ended up happening was that during much of the period of time that the analysis took place the heat pumps ended up getting bypassed and the

gas system was really the primary driver there.

Project 8 is an example where they just ran into funding issues throughout the course of the project where -- that ended up delaying the install of the PV, so the PV is still not complete. It's being installed now but there was no PV during that analysis period. Once that gets installed, that -- those numbers will invert there.

And then 16 and 17 are just not completed projects yet. They still have some more energy efficiency work that's being done and the PV is not turn on yet. So I could have just deleted those projects but it's important to show because what we see most commonly is that the energy efficiency and electrification work is being done first and PV is usually the last step in the process. And often that means there's, you know, 6 to 12 months in which the electrification has occurred but the PV hasn't been turned on yet.

Now in these cases these are all master-metered buildings, so it's the property owners that are seeing the utility cost impact. But this is -- this could just as easily happen in direct-metered buildings in which the tenants

could see the increase. So we have to take all of the precautions to make sure that these types of issues are, you know, avoided or addressed immediately as they arise. And that is one of the reasons why utility monitoring, and I heard this mentioned in the last presentation, but utility data monitoring really is so critical with this type of -- these types of projects.

You can go on to the next slide.

So just general project characteristics. One thing is, you know, very few projects can, at this point, fully electrify all end uses. That's typically a function of just cost and funding issues but, also, a function of building-level and apartment-level electrical capacity-related issues.

And then as far as savings go, all projects have significant GHG reductions, and all have energy reductions on a kind of net kBtu basis. But some projects, we are seeing larger increases in electricity use than the models are predicting. And we're seeing some, like I just showed, that don't yet have utility cost savings. And there are a variety of things that play into that. You know, actual operational performance

being lower than what the model calculates is one potential issue. Installation issues can play into that. And then the big one that we're seeing right now is just the COVID-related occupancy schedules that we're -- will hopefully not be an issue in the future.

So you can go on to the next slide.

So just in terms of barriers, I'm sure everyone is quite familiar with a lot of these, and it's been covered in some other sessions, but cost and financing challenges, obviously, this is still very kind of time intensive and logistically challenging work that requires a lot of expertise on the part of a lot of different people, a lot of different stakeholders, so there's that. Existing building conditions and the age play a big role in kind of how challenging the work is going to be, particularly with relationship, again, to the electrical infrastructure challenges. And then contractor familiarity. This is definitely still new work to most contractors, so there's still a great deal more education to be done on that front.

And then, again, building electrical infrastructures -- you can do to the next

slide -- this really is a major technical and cost barrier that we deal with kind of on a daily basis. I'm not going to go into detail on this slide because I'm running out of time here, and I know that Ben is going to be talking about infrastructure issues, too, but we can definitely cover some more of that on the Q&A if it comes up too.

So you can go to the next slide.

So just factors to consider specifically when we're dealing with multifamily affordable housing electrification.

So I did hear this mentioned earlier today, too, electrification has to be part of a comprehensive retrofit approach. It's got to include deep energy efficiency. And this is primarily to mitigate against the potential for utility bill increases. It also has to include solar. And, ideally, we need to be able to shift those project schedules to that the PV gets installed either first or at least in parallel with or immediately following the electrification work to avoid any potential further short-term cost increases.

And the inclusion of solar also means

that we need to make sure that VNEM systems can be installed in all situations, and that's currently not the case.

And it's also worth mentioning that, you know, there is NEM reform coming down the pike, net-energy metering, that could also impact solar feasibility and will have cost implications there as well.

But these technologies are still new to a lot of contractors, as I mentioned, so installation issues are more likely than in kind of a standard like-for-like replacement. And because the margins are tighter, you know, there's just -- the savings potential is smaller, essentially, then the risk associated with installation issues becomes larger. So we have to be very careful and really do a lot of kind of detailed oversight and QA, more so than with kind of standard energy efficiency projects.

And then, like I said earlier, benchmarking and ongoing utility tracking is more important than ever. You know, with energy efficiency retrofits you know utility costs are going to go down or, in the worst case scenario, they'll remain neutral. But you know, when you

introduce the risk of increased utility costs, ongoing tracking really becomes that much more important.

And then, finally, rate reform is going to be critical, I heard it mentioned, also, in the last session, and it's certainly not my area of expertise but it's going to be key.

So my time is up so I will end it there and pass it back to Heather.

Thank you.

MS. DROZDOWICZ: Thank you so much, Andy. That was a great presentation.

And now I'm pleased to introduce our second speaker, Ryan Gardner, Climate Action Program Manager from Rincon Consultants.

MR. GARDNER: Welcome Ryan.

MR. GARDNER: Thank you so much. Yeah, I'm Ryan. I'm with Rincon Consultants. And I'm going to be talking a little bit today about our Existing Building Electrification Strategy that we developed for the City of Berkeley.

Next slide.

So the scope of this project, we teamed up with Rocky Mountain Institute and the Ecology Center, who is a really great local nonprofit

whose been working in energy efficiency and waste and all kinds of stuff in the city for a long time. And the goal was to build off of Berkeley's new construction electrification ordinance, and also their fossil fuel-free goal, and help support their carbon neutrality targets.

The big focus of this project was how to equitably electrify the City of Berkeley, so all existing buildings, as quickly as possible. And for this project, we really ended up focusing on low-rise residential, so a little bit easier than the bigger multifamily units. But we looked at low-rise multifamily, and single-family and really tried to figure out, when was the fastest we could get this work done? The city is pretty progressive on that point and really looking for trying to get as much work done as quickly as possible. And then provide a set of short- and long-term policy recommendations to help the city move in this direction.

So we started off with a building stock analysis. Luckily, the city already had quite a bit of data on the buildings that are existing in the city right now, when they were built, and where they are. And then we moved into doing a

cost of savings model analysis using the Radiant Lab School, which is able to do geospatial analysis and build an energy model out for each of the buildings based on the square footage and the data that we had. And then a huge portion of this work scope was looking at -- doing community engagement and really hearing from the community on what their concerns were and how we can avoid equity impacts.

So next slide.

So the first part that any city really needs to do is understand what their building stock looks like because there's going to be a huge variable in the costs and the overall process that they're going to need to follow in order to electrify their building stock.

If we go to the next slide?

Berkeley is probably one of the harder places in California, I think, to do electrification work. Most of the buildings are really old. So we have, just looking at this histogram, almost all the buildings built before like 1963. We've got really poor envelopes, really low rate of heating and cooling currently, knob-and-tube wiring, asbestos, leaky ducts and,

again, that really mild climate, just not a ton of energy use for heating and cooling in general anyway.

So all of these are really challenging for the city. And I think it's, when we look at these numbers, it's a good caveat to say that this is probably one of the harder places to do this work.

Next slide.

So once we had all of our building segmentation analysis done, we were able to put the square footages and our energy consumption data into the Radiant Lab's model. We were then able to run a few different analyses.

So if we can go to the next slide?

We originally started this project off working at -- looking at whole building electrification packages. So we had six different electrification packages that we looked at. The first package was economy products only, so this is kind of forced -- or excuse me, it's just the basic electric floorboards using resistance heating for water and for HVAC. Package 2 bumped up to mid-tier products, so using nicer heat pumps and heat-pump hot water

heaters for both air conditioning and what water heating. And then Package 3 looked at mid-tier projects and envelope improvements so we could kind of try to figure out what the difference in payback would be between doing windows and shell and air sealing, on top of electrification.

And then for each one of those packages, we also modeled a solar package, with Package X.1 being no solar, and Package X.2 being offset solar, so just offsetting the new electrical load from the electrification. And then Package X.3 being net-zero energy solar array, so a larger array that would take up all of the new electricity and the prior electricity.

Next slide.

So this is a breakdown or a summary of all of the costs that we came up with. So, and again, this is for kind of the average building in the City of Berkeley. The first column, energy buildings, is the on-bill savings that we would expect from each of these packages. So you can kind of see right off the bat, economy appliances alone actually increase bills. But once you get into any other package you are seeing a bill savings, with substantial savings

around the economy appliances and zero-net energy solar.

One thing that we did try to keep in mind is that there -- with the potential changes to NEM, we tried not to use the net-zero energy solar in our kind of decision-making approach and stick with that offset solar, so kind of the 1.2, 2.2, and 3.2 packages, to try to come up with our suggested pathways based off of those.

You also see that, in our modeling, weatherization and efficiency upgrades did not really move the needle that much as far as costs or savings, or they increased costs substantially and the savings were pretty difficult, so they didn't increase payback very well. And I think that's primarily an artifact of just where Berkeley is situated. And we did get a lot of feedback that there's a lot of other things to take into account as far as like the ability of heat pumps to heat a home, and comfort, and that efficiency is still super important but, again, just wasn't super reflected in our costs.

And then getting into our gross costs is kind of the costs that we modeled to just go into a home and electrify everything. A lot of these

costs are kind of fixed costs around panel upgrades. We have seen that, after talking with contractors, almost every home in Berkeley is going to need a full panel upgrade. There's a lot of old-style fuse boxes, a lot of knob-and-tube wiring. So this includes panel upgrades, as well as new wiring for most appliances.

Once we get into the incremental costs we're able to kind of knock those costs down a little bit more. And then we add in some incentives and we get a little bit closer to parity. And then finally, once we start looking at incremental costs plus incentives, and then accessible funding and financing, we start getting down to some costs that are a little bit more reasonable but, again, pretty significant up-front costs.

And I think this was really -- once we started talking with the community about these and kind of daylighting these up-front costs, there was a real change in our approach overall to this project and to how aggressive we could be as far as our policies and ordinances and things like that.

Next slide.

So, yeah, some of the key takeaways, like I said, covered a lot of these already. Mild climate makes it really challenging. High labor costs in the Bay Area is also pretty difficult. And as the speaker before me was mentioning, this is pretty highly skilled labor. It is pretty expensive. High electricity rates overall. And again, these kind of upgrade costs around electric panels and wiring are pretty substantial with the older building stock, adding, you know, $5,000, $6,000, $7,000 to the overall cost.

Modeling trends, there's kind of not great payback on the envelope. Solar is a huge help but we're cautious on how long it will be that way with changes to NEM. And we did see, just in general, fairly long payback times, especially in multifamily.

And then some of the interesting things we saw doing this as a geospatial analysis, home size, home type, neighborhood, education, and race all had statistical correlations to payback with larger, more affluent houses having faster paybacks and better economics overall than some of the lower-income areas, which just adds to kind of the equity concerns we had going in.

Next slide.

So like I said in the beginning, community engagement was a huge piece of this project. And equity was really baked into the process from the beginning. So even while we were doing the building segmentation analysis and the modeling, we were going out and having conversations with disadvantaged and minority communities within Berkeley, we really focused on those communities, disabled communities and others. So it was a really long process but the feedback we got really ended up tailoring our approach.

So if you could go to the next slide?

So this is an interesting match kind of checkout. These are areas that were originally redlined in the City of Berkeley, one of the kind of birthplaces of redlining. So those areas within the red squares are areas were really not able to get funding or financing to do anything with homes. It's difficult to buy and sell homes there.

And when we skip over to the next slide and look at conditions today, we really see the same map. So Berkeley has lost, I think, 50

percent of its African American community to displacement. Gentrification is an ongoing concern. A lot of illegal units being rented. And we just heard over and over again that loss of their homes is a big concern when doing upgrades. Really high rental rates. And really, like I said, disincentives for retrofitting rent control buildings. That's another big issue.

So we kind of just see these same areas in Berkeley still having kind of disproportionate effects of substandard housing, and then seeing effects of displacement as costs continue to rise in the Bay Area for housing. So this really just added another concern to most of the community, even those who saw real value in it.

Next slide please.

And when we were out talking with the community and disabled community, to Spanish communities, kind of folks throughout Berkeley, they saw a lot of really great benefits to health and safety and comfort. The disabled community saw huge benefits for more resilience during power outages, like adding battery storage, making the grid more robust. But there is a lot of concerns, a lot of concern about up-front and

long-term costs, which is reflected in the modeling that we did. A lot of concern about displacement, education in general.

And then knowing that there needs to be more accessible funding and financing options. So it was interesting to hear that they're -- it's really hard to -- for those communities to apply for the funding and financing that's available right now.

And then a lot of just feedback, generally, about meeting with the health and safety side of things, not just the energy efficiency side.

So next slide.

So what we did was take this kind of big world of feedback we got from the community and distilled it down into our equity guardrails, which is to maximize our access to health and safety benefits, equitable access to economic benefits, equitable -- I'm sorry, maximizing the ease of installation, so making sure this work can be done efficiently and effectively. And then really being cognizant of promoting housing affordability and anti-displacement, and making sure the policies we put in place don't increase

that, those issues.

Next slide, please.

So through all of that, we pulled together our overall strategy which is really four key areas, and this kind of goes into our all-of-the-above approach that we've been hearing.

So time of replacement. Renovation is a key time to leverage those marginal costs.

Time of sale is a key time to leverage funding and financing terms -- or financing terms, like on your mortgage, kind of tricky in the Bay Area in the current housing market there but some good opportunities.

Looking at performance building -- or building performance standards for commercial buildings and larger buildings and kind of ramping down to smaller buildings over time.

And then neighborhood electrification and natural gas burning which, I think, has some really excellent opportunities for funding electrification but some kind of key hurdles we need to overcome before we get there.

And these are all supported by the kind of major pillars, which is education, accessible

funding and financing, and then regulatory changes, and then supported by the equity guardrails. And essentially, every action that we do underneath these have to support -- have to pass through the equity guardrails and be consistent.

So next slide.

So some of the key things that we found that needs to get addressed to make this cost effective in the City of Berkeley, panel upgrades, getting those costs down since they're kind of a fixed cost, policy changes around obligation to serve, and the ability to allocate a natural gas retrofit funds, so electrification, and then utility rates that reflect our priorities, and then funding and financing and keeping that equitable, like a tariffed on Bill Financing Program, are all super key.

So I will leave it there as my time is up but thank you for the opportunity.

MS. DROZDOWICZ: Thank you so much, Ryan. Another great presentation.

And now I'm pleased to introduce our third speaker, Scott Blunk, Strategic Business Planner at SMUD.

MR. BLUNK: Yeah. Okay. Thank you very much for having me here today.

We can go to the next slide.

SMUD does have a zero-carbon in its electricity supply by 2030. And I won't spend a lot of time on it but we have a plan to get there.

Go to the next slide.

There's a lot on this slide. But part of our -- or maybe in addition to our zero-carbon and our electricity supply is to electrify 100 percent of all our buildings by 2045, and to electrify our low-income households, specifically our EAPR is the program we call it, by 2040, so five years ahead of schedule. We are starting-- and my presentation is solely focused on the single-family, although we do have a multifamily program, as well, which Andy touched on briefly.

But starting off, 18 percent of all of our buildings in 2018 were all-electric. The goal is to get to 34 percent by 2030 and 80 percent by 2040.

And, yeah, the next slide.

So our Low-Income Electrification Program is a direct-install program. It's operated a lot

like a lot of other low-income programs out there. It started in 2019. We started electrifying in 2018. The Low-Income Program started long before that. And we've got about 40,000 single-family homes that, in our program, are qualified low-income. And about 8,000 of those started out as all-electric.

So far, in the last couple years, we've changed out about 1,000 gas appliances in low-income. With every touchpoint the goal is to electrify every single end use. Like I said, that's the goal. It doesn't always happen that way.

Next slide.

This shows the percent of those homes that are -- that have gas that we plan to electrify every year moving forward. So this is both single-family and low-income. Low-income -- so these percentages are based off the percentage of low-income versus non low-income. So really, what this is showing is we're really trying. The goal is really to -- for low-income to outpace the market-rate homes.

And so total equipment, single-family home equipment conversions over the years, is

that table that's listed on this slide, and kind of what we're doing on an annual basis, but that is both low-income and market-rate combined to date.

Next slide.

I think this has been mentioned a lot but panels are a big challenge. And our average cost to change a panel is $4,725 which when -- depending on the panel, it can be $9,000 or more per house, so that's an incredible barrier for us to overcome. As a utility, really, we get nothing for it other than the opportunity to electrify, and electrify not just the building but, also, the transportation, so vehicles.

And part of that -- part of those challenges and what drives up the price is going to be vegetation. There's going to be a lot of vegetation management in some of these older homes. And clearance requirements. At times it requires moving the panel to a different wall of the house so that there's proper clearance from where the line would droop over the roof.

And in timing panel changes, there's just a lot of coordination that has to happen internally, SMUD vegetation management, and then

SMUD just turning on and off the power and moving it, but also with the building officials. So there's just an incredible amount of coordination that is required on each of those.

One thing we have just started doing is we've started installing a simple switch. So a simple switch is -- it just allows you to wire two devices together and giving one priority. So for example, you can wire the induction cooking to be the main one that's going to be on, and EV would be the secondary. So if you turn on your stove, it turns off the EV charging at that same time. And they're really cheap, $250. We've installed about 25 of those so far, so not a ton but we're getting going in there. But what we've found is it can really just save thousands on a panel replacement if we can either avoid the panel replacement, number one, that's really the main savings from that.

And then the other real challenging one is induction, or cooking, electrifying cooking. And that stems from the fact that just the location of where it's at. Your water heater or your space heater is often in a closet or the garage or the attic where running another circuit

to it is less intrusive to the house, it destroys less drywall, just you're not inside the house quite as much. So that one has been a real, real challenge, and certainly the one that we haven't done as much as water heating and space heating to date. And there's a lot of issues with that.

We were told a couple years ago that induction prices would come down. We haven't seen that yet. Part of that is COVID and the supply shortage, we think, so availability, wiring, and just kind of the overall project costs. And when we can't electrify the gas cooking, we do leave the tenants at least with a portable induction unit. And from my own experience, just one portable induction unit can serve -- can replace about 75 percent of the gas use on the stove top.

The next slide.

Very data heavy on this slide. So there's kind of three things here, the market-rate market, then there's just the -- the bluish color is electrical efficiency, just for comparison, and then low-income is at the bottom. The SMUD incentive is listed there. For low-income, that's not necessarily the incentive,

that's our average cost per household. And then the next column there's lifetime carbon savings in tons. And then just dividing those two is kind of the cost to SMUD for that carbon savings and cost per ton.

And then Super RIM, we developed a metric with E3's help. This is the standard ratepayer impact measure cost but also includes the cost of the gas in that calculation, so it's really kind of directed more toward what's the consumer going to see. And so there's two RIMs there. There's the Super RIM in 2021 and the Super RIM kind of looking at holistically for what it's going to do for SMUD's customers, so a lower number is better. Negative numbers actually mean that it will -- SMUD being a community-owned not-for-profit utility, if it's negative that means there will be downward pressure on rates. So we should be able to lower rates and give that money back to our customers in some form or another.

Yeah. And then I think we can go to the next slide. Kind of -- yeah, and this is my last slide.

So the outlook and challenges is we just need the emphasis to be on the existing building

market, right, move the -- our emphasis. We've talked so much about new construction at the CEC and other places and we're making great strides there. And that's where we should have been working because it's the easiest. But we really need to kind of do an about-change and really look at what we can do to emphasize existing buildings.

And part of that is going to be improved code enforcement. At some point we're going to want to know that these buildings have been retrofitted or we're going to put some law in place that's going to require it. Right now to change a water heater, I think the estimate statewide is about less than ten percent actually pull the permits, and space heating and cooling is not much better than that. And those have to be changed dramatically. And there are jurisdictions that are having good compliance above 50, above 75 percent, so it can be done, but it's going to take a change in mindset for us.

We need to just create awareness, I would say raise awareness but there's not a lot there today, so really, it's creating that awareness to

both the consumers and the contractors. An earlier panelist from this morning was talking about, you know, really low-income, they were left behind. And so they've, for decades, wanted natural gas because that was always the solution to them for the last several decades. So now we have to change that mindset and help them understand that, you know, the next leap should be to electrification, and that we have the technology to make that happen today.

We need moderate-income programs. Just because you're not a qualified low-income household doesn't mean you don't need help, something we heard this morning, also. We typically have two -- we serve the low-income and then everyone else. And there's a portion of the everyone else category that has the money that can do this. But there's a humongous middle ground there where they're going to need help, and maybe that's a financing one. Certainly, financing, I think, will help. We just have to figure out what that is and get it going.

And I think we know what some of the solutions are, tariffed on-bill financing, we're going to hear about later on. I think that's a

good start. It may not be enough.

Of course, we need to balance the grid decarbonization with rates and, of course, reliability.

And then for our -- for just what we're projecting, we have a $300 million budget gap at the current prices of what it costs to convert a low-income household. Again, this is just low-income, it doesn't include all those market -- middle income and the M and the LMI people. But we've got a really huge gap that's going to grow every year as we get closer and closer to finishing this out because we're ramping up; right?

We're going to be doing more and more of these every year, so looking for solutions there. I know the TECH Program does have items there that can help but I think we're going to need a lot more, and especially if you magnify this out at a statewide level.

And that concludes my remarks. Thanks for having me.

MS. DROZDOWICZ: Thank you so much, Scott, for such a thoughtful presentation.

And now I'm pleased to present our final

speaker, Ben Cooper, the Program Manager at StopWaste.

Welcome Ben.

MR. COOPER: Hey everybody. I want to thank the CEC and the Commissioners for inviting me to be a panelist. And I'm excited to be here today. So, yeah, Ben Cooper, Program Manager at StopWaste based in Oakland. We're a public agency that helps Alameda County's residents, schools, and businesses waste less, recycle properly, and use water, energy, and other resources efficiently.

I'd like to note that I'm a bit old school and I have some paper notes that I'll be flipping through, so you may hear that ruffling during my presentation.

I managed the CEC Local Government Challenge Grant that began in late 2017 and concluded at the end of 2020. That produced four main deliverables, the Multifamily Electrification Readiness Report, and the Energy Pro Lite which is a modeling tool. I'll address those later in my presentation.

I also want to mention that we produced a Multifamily Benchmarking Report which was

published in March 2020 and was based on benchmarking technical assistance provided by the Association for Energy Affordability to over 70 multifamily properties of various vintages, sizes, and meter configurations. It identified challenges to complete accurate benchmarking data and provided recommendations for improvements and areas of further research.

A Rental Housing Potential Study surveyed and interviewed local jurisdiction rental housing inspection staff across the state to better understand their programs and to assess how energy efficiency assessments could be layered on. We also looked at out-of-state programs in Boulder, New York City, and Austin where energy efficiency programs have been integrated into their rental housing inspection programs.

My colleague, Emily Alvarez, also produced a white paper with, BAYREN funding, or the Bay Area Regional Energy Network, which was released in December 2020 and explores energy-related policies leveraged by cities, new concepts being pursued, and the impacts such policies could have on the residential single-family that are here in the East Bay.

And I want to note, too, that StopWaste, and myself included, administers the Bay Area Multifamily Building Enhancement Program, the flagship energy program for BAYREN. The Association for Energy Affordability and the SF Department of the Environment implement the successful program which was recognized by the American Council for an Energy Efficient Economy, or ACEEE, with an Exemplary Program Award as one of America's outstanding energy efficiency programs.

Next slide please.

Here's an overview of statistics for the BAMBE Program since its inception in 2014, so it has seven full program years of being implemented. And over those seven full program years the numbers equate to roughly 80 projects per year, or 5,800 units per year throughout the nine-county Bay Area. We've achieved roughly a 5.5 percent penetration rate for all multifamily units in the Bay Area, which is pretty impressive.

Relating these numbers to the SB 350 goal of doubling energy efficiency by 2030, it shows that there is a lot of room for growth and

improvement. But the average site energy savings for a traditional pathway project, on that first row, is 20 percent. Savings numbers for the clean heating pathway, or the electrification pathway of the program, which has only been in place for one full program year, are not yet available.

It's worth noting that a relatively modest increase in incentive or rebate funds for a project made electrification possible, as you'll note in the right two cells, where a traditional pathway project averaged $52,000 per project, and electrification or heat pathway project averaged roughly $60,000 per project. It should be noted that these early participants in the CHP pathway were cherrypicked a bit based on their viability for electrification.

Next slide please.

So recommendations to scale electrification programs, attractive incentives, we all know it, more money; right?

To overcome up-front material, labor, and electrical infrastructure costs, and to augment the limited reserves typically available to multifamily property owners.

Existing or planned programs to implement electrification, adder or kicker incentives for electrification measures, like heat pumps, but also definitely including necessary electrical infrastructure upgrades as those can be a significant part of the overall electrification project costs.

Robust technical assistance is critical to working with property owners, maintenance staff, contractors, and occupants to explain the benefits of electrification, assess the potential of electrification, develop scope of work options, including pros and cons of various approaches, and assist the owner and contractor in material procurement, construction management support, and post-installation quality assurance verifications.

I, myself, am going through electrification at my household, as is -- as are many of my colleagues. And we are energy professionals and the process is not easy. Robust technical assistance is really needed.

Increase education across the board. It's worth noting that some owners in technical assistance had issues getting bids from

knowledgeable contractors. It's a pervasive issue and highlights the need for extensive contractor training across the state.

Standardize and streamline permitting. Educating building departments and encouraging collaboration and coordination to reduce one-off interpretation or enforcement decisions. It's also on the project team for the electrification project to engage the building departments early and often through the permitting process to avoid costly electrifications later on. Where possible, departments should endeavor to work with projects to develop compromise solutions, especially when alternatives would result in electrification retrofits becoming infeasible, and the solution to be shared across the departments -- across building departments across the state.

And we should bring back PV incentives because they currently, generally, only exist in the multifamily sector for deed-restricted affordable housing and not the market rate or naturally occurring affordable housing.

And I also want to emphasize health and safety comfort advantages which include markedly

improved indoor air quality and lower rates of childhood asthma, and potentially lowered insurance costs, just to name a few. Buildings with older, poorly ventilated gas equipment should be targeted.

Next slide please.

So the Electrification Report which, again, was funded by a Local Government Challenge Grant from the CEC, was released in May of this year. And Part 1, it's a two-part report, Part 1 provides context with policy recommendations, while Part 2 is a functional technical deep dive into the nitty gritty of how to electrify existing multifamily buildings.

I want to give a quick shoutout to the Association for Energy Affordability, specifically Jack Aitchison, Aubrey Dority, and Nick Dirr, as well as my colleague at StopWaste, Heather Larson, who are all instrumental in producing this very useful report.

As mentioned, Part 1 is more relevant to local governments, regional organizations, and programs in development and design of ordinances or programs specific to existing multifamily electrification.

Part 2 is for implementers, technical assistance staff, consultants, contractors, both general contractors and electrical contractors, building departments looking for a deep dive on electrification, or as a glossary to look at specific parts of electrification, like heat-pump water heaters or mini-splits, to name a couple.

The specific policy recommendations we made were, one, electrical infrastructure upgrades are often crucial and costly parts of electrification projects. Though they don't save energy, per se, they make electrification-associated energy and greenhouse gas reduction possible, so it should be heavily incentivized.

Two, increase panel capacity demands can and should be offset by significant energy efficiency gains, measures, such as LED lighting, efficient electric appliances, and the heat pumps that are more efficient than existing AC systems.

And three, take into account non-energy benefits, like utility -- potential utility bill reduction for both owners and residents or renters, improve indoor air quality, increase resilience and effectiveness of PV and batteries, a thermal comfort in the air conditioning

installation where it was not previously existing, more accessible electric vehicle charging, and increased safety by removing gas.

Number four, in-unit spaces in a whole -- in-unit spaces in whole building electrification projects inherently address in-unit spaces, which address equity by providing the benefits of electrification to renters.

And five, coordinate incentive programs across incentive programs by coordinating on things like intake paperwork and rebate process. And in fact, a good example of this in the report is -- in the report is provided between the Bay Area Multifamily Building Enhancement Program, or BAMBE, and Marin Clean Energy's Multifamily Program.

Next slide please.

Part 2 of the report, Recommendations for Program Implementers. This is the nitty gritty, as I was mentioning before, of assessing and installing multifamily electrification projects.

I should note, before you start squinting at this slide, that I don't expect people to be able to read this decision tree. It provides guidance through the four essential steps of

multifamily electrification. If you're interested in seeing it later, the slide will be provided. One being evaluate existing conditions. Step two being analyze electrical load. Step three being select efficiency measures and appliances. And step four, evaluate infrastructure upgrade costs.

I should mention that the report generally follows the 80/20 rule where 80 percent of building types or scenarios, you know, vintages or construction types in the multifamily sector are addressed. And the other 20 percent or so, we reference other materials that may be helpful in assessing those buildings if we weren't able to provide detailed information.

Next slide please.

So regarding step four, evaluate upgrade costs and consider emerging alternatives, this table and its cost ranges were gleaned from completed projects and knowledgeable contractors for the report. This can be used on a project or a program basis for individual projects or program costs for multiple projects or buildings across the program. Electrification programs, as Andy noted earlier from AEA, to track of these

costs granularly and in a standardized fashion so that the ranges can be narrowed and become more usable and accurate over time. The higher ends of these cost ranges often correlate to red flags addressed on the next slide.

Next slide please.

Appendix C in the report flagged electrical infrastructure, including existing building conditions that directly impact electrification, with the icon showing the difficulty of each solution, explanation of each condition and why it matters, and actions to address. This section can be used to help prioritize or group multifamily buildings in order of need or likely incentive amounts needed to complete, and can aid in timeline planning as well.

Next slide please.

Emerging technology alternatives. The technologies listed above are ways of controlling load, not capacity, and other panelists have addressed measures that do this as well. Smart panels control load in residential applications that incorporate battery backup and solar, whereas splitters, or the simple twist that I

believe Scott referred to, limit the amount of energy that downstream loads can draw at any one time

One common splitter application is plugging both an electric dryer and an EV charger into the same high-capacity socket, but they can't be operated simultaneously. It reduces the need for far more expensive infrastructure upgrades and is a simple and effective solution.

Dialogue, as always, with local code enforcement is crucial, as mentioned before, early and often in collaborating on common sense solutions.

Next slide please.

Equity and workforce development. Electrification, and I want to stress this, does not mean lower energy bills. While well planned electrification, paired with deep energy efficiency, can very well reduce utility bill costs, utility bill reduction can not be assumed. There are case studies in the electrification report detailing projects that reduce overall energy utility bill costs. And I know that Andy highlighted a lot in his slides as well.

Policymakers should address the

possibility of negative effects on low-income renters, especially if owners are able to pass through electrification upgrade costs to renters in the form of higher rents, as lower-income Californians bear a very high energy burden, as you can see, over four times the state average, while also shouldering a significant housing burden.

Regarding workforce, we should incentivize contractors to participate in equitable workforce development. Andy touched on this as well, but Marin Clean Energy and the Association for Energy Affordability and the Workforce Education and Training Program, or WET, we could support and develop more programs like this and fund them with things like the Governor's $1.1 billion jobs package which comes from the May revision to the current budget.

Next slide please.

Energy Pro Lite is a paired down version of the state's Energy Pro Full compliance software specifically made for the existing multifamily sector and implemented with the BAMBE program. Recent CEC grant-funded updates, development updates, include the ability to model

electrification, estimate project costs, and produce utility bill savings estimates with automatically updated utility rates, as well as produce an owner-facing report that lists projects, that list project measures, estimated costs, and estimated utility savings.

I should also mention that I and my colleagues at StopWaste are working on pilot projects with Bay Area counties to identify naturally occurring affordable housing in the Bay Area through maps and data, and to qualitatively engage owners and renters to address their need and figure out how energy programs and equity programs may be able to address those needs.

Next slide please. Yeah.

And that leads us to the Q&A. I want to thank everybody for their time. And I've provided links to the grant deliverables, including the Multifamily Electrification Report (indiscernible) which will be provided.

Thank you.

COMMISSIONER MCALLISTER: Danuta, did you want to manage some Q&A? Do you have any questions of your own?

MS. DROZDOWICZ: I don't have any

questions.

COMMISSIONER MCALLISTER: Okay.

MS. DROZDOWICZ: I would appreciate it if the panelists would respond to the questions that are going to be presented. Thank you.

COMMISSIONER MCALLISTER: Okay. Well, I just want to say thank you, first of all, to you, Danuta, for ably moderating.

And to our four panelists, Andy, Ryan, Scott, and Ben, really lots to chew on there. And you're all just leading, I think really, you know, nitty gritty is the word, I think, that Ben used. And I think, you know, in a state as large and diverse as ours, your experience, really, on the ground is invaluable from all your different perches, so thank you very much.

I'm just going to ask a couple questions, and then ask my colleagues on the dais for their comments and questions.

I wanted to -- I really appreciate the calling out of kind of the unknowns around COVID. You know, I think we're, in the Building Code Update and in all of our various efforts on existing buildings and efficiency, this fuel substitution and its impacts on utility rates is,

you know, an ongoing question. And I think, you know, it's complex and we want to really get it right and sort of guide this ship forward in a way that's going to get the best for consumers and, also, reach our decarbonization goals, so I really appreciate that.

I'd invite any of you to comment on -- I think, Ben, you suggested in the report -- and I really appreciate that report. The Local Government Challenge, I think, is producing some really great results, and you are just a shining example of that. I would really like to get more resources into that program to work with many, many more local governments.

And I think that's -- the local governments are really a key linchpin here in moving the building stock for the existing buildings. And I guess I'd invite anyone to comment on how -- what local governments kind of need or can do to continue to lead this and get to their existing buildings? Acknowledging, Scott, you know, you're a publicly-owned utility and have -- you know, you are, basically, a local government, independent of the City of Sacramento, but you know, all of you have your

own perspectives here.

So how can -- what would be the most high-value thing the state could do to support local governments to reap, you know, do what they can to leverage all of their local jurisdictions to get this done?

MR. COOPER: I can jump in here. And one thing that I highlighted in my presentation that I think is relevant is the need for funding of education across the Board, both for building departments, the inspection staff, the permitting staff. Even though, as Scott noted, a lot of those don't have high compliance rates, we want to get those up. And they're going to need the education to review these electrification projects.

And then on the contractor side, there are a lot of contractors out there that still are not well acquainted with electrification and may be expected to do this work, so they need a lot of education as well.

And then on the building owner side, you know, I think we can highlight a lot of the successful projects that folks like AEA and his colleagues at AEA have successfully implemented

and get the owners of those projects that are bearing the fruits of the labor to share with the owner community, and also the renter or the residents of those buildings, to share in the benefits of electrification, so it's not just coming from the city or the people implementing or advocating for these programs, it's coming from the people who actually experience the install of these projects.

MR. BLUNK: And I'd just in there and just say that high-level leadership, right, like we have for EVs, we have a target for no new -- the sale of no new gas-powered vehicles, we should have that for buildings, but not only new construction buildings but also existing. We need the visibility in the contractors and the consumers. And if we had, maybe, the Governor setting a date or multiple dates based on the type of building, I think that could really help everyone understand that this is not some fringe thing but that we're really doing it and going there, and set a mandate to get there, a target date mandate.

MR. BROOKS: Yeah. And I'll just add that as implementers, you know, we see a lot of

the kind of innovation and nimbleness come from the local governments. That's where a lot of the stuff starts and moves quickly and then gets adopted elsewhere, so continuing to support in that way.

I mean, I think one of the things that clearly came up in all of our presentations is this infrastructure challenge. And I think there's a real opportunity there to address building decarbonization at scale by focusing in on that issue and addressing the panel upgrade, you know, issue head on by, you know, maybe a creation of local government programs that focus just on electrification readiness. Like we know we have to electrify all of these buildings, so we need to get them all ready for electrification, whether they're electrifying at this moment in time or not.

So we often joke about the creation of an electrification readiness army, just creating like a workforce development program that is focused on electricians scaling up panel upgrades in buildings that are, you know, going to be the tough ones. Like it's not too hard to identify those buildings but we would need funding at the

local level to support that type of program. It would be a combination of workforce development and implementation.

COMMISSIONER MCALLISTER: Is there an opportunity to pair that with distribution grid investments? Maybe this is more for Scott. But if we're going to really be investing in, you know, doubling, you know, and sort of meeting that capacity challenge, let's say doubling electric loads as we electrify transportation and building, is there -- you know, can that -- could that possibly be part of utility distribution planning and make it kind of systematic and sort of a handshake with that process?

MR. BLUNK: Yeah. I think that's possible. And, certainly, you know, if someone upgrades a panel, that goes into the calculation for, you know, all the upstream sizing. So the more panels that get changed out the more upstream infrastructure that's going to be updated.

But yeah, I mean, I want to second kind of what Andy said, like having -- you know, doing a block-by-block or house-by-house and just the electricians go from one house to the next house

and the next house and just upgrade panels, would really help. And that would also just kind of naturally trigger the utilities to also -- they have to up-size everything upstream from there as appropriate.

COMMISSIONER MCALLISTER: Great.

Ryan, did you want to jump in? I'm sorry to cut you off.

MR. GARDNER: Yeah. No. I agree with what everyone's been saying. There was one question in the Q&A about -- I made a comment about natural gas infrastructure pruning. And I think all of this plays into that. And I think there are opportunities to stop investing in infrastructure that we know we don't necessarily need or it doesn't meet our long-term goals, and prioritizing some of that money that would have gone there into, whether it's neighborhood electrification or, you know, just a spur of a natural gas line and there's constantly maintenance being done. And there's just no -- there's legislative hurdles to do that now that I think we need to get cleared out to open up that big source of potential funding or reallocate that funding.

COMMISSIONER MCALLISTER: Great. Thanks for those answers.

I wanted to just, maybe, get a reaction from this morning's panel, really. I don't know if you were all on for this morning's panel but there was, I think, really a consensus that getting into communities, particularly communities that are under-resourced, historically disadvantaged and the like, are in need of local organization from community-based organizations to help kind of move the needle in each place, and that that is a very highly specialized role that, you know, the state isn't that great at doing and really needs intermediaries.

I mean, yourselves are all in that kind of intermediary role, as well, as advocates who are kind of organizing on the project level. I guess I'd be interested in your take on the community-based partners that are needed to kind of carry the message and mobilize demand and whether -- and how, you know, how those could be best supported by the state?

MR. GARDNER: I'll just say, from our project in Berkeley, like it would not have been

possible to get the level of feedback we got without Ecology Center who is just so plugged into that community and knows what people have gone through, knows what people are thinking, knows who to talk to, and has the trust to get people to come to the table and kind of talk openly and provide that feedback.

So I would just second that I think it's got to be critical. And all the projects that we're proposing on and moving forward on, we're looking more and more to bring in more just local NGOs and community-based organizations to provide that connectivity. Yeah, I think it just makes a huge difference, and it's the difference between just saying the word equity in your report or in your plan and saying you're going to think about it and then like actually institutionalizing it and having a mechanism to deal with it in the policies you're developing.

MR. BROOKS: Yeah. I mean, this just has to be an all-hands-on-deck effort and can't just be top down. It's got to be top down and bottom up at the same time. And that's really the way I kind of look at it is, you know, the local governments have more connection to the

communities than the state. And the local CBOs have more connection to the communities than the local governments. So all of these people need to be engaged in order to get the consumers, you know, onboard and moving in the right direction.

So, definitely, the community-based organizations are going to play a key role and need more support moving forward. And particularly, what they mentioned in the morning session with regard to more rural communities that are further from resources, that's definitely something that we've seen as well, in terms of finding workforce to be able to do this work has been a challenge. And that's where the community-based organizations can really play a key role.

COMMISSIONER MCALLISTER: Great. Thanks.

MR. COOPER: Commissioner?

COMMISSIONER MCALLISTER: Does anybody else want to jump in?

MR. COOPER: Commissioner?

COMMISSIONER MCALLISTER: Oh, go ahead.

MR. COOPER: I just want to add, you know, the NOAH Identification work that I brought up at the end of my presentation has a plan to

work with city departments to connect with CBOs. Because, honestly, we don't really know who the CBOs are that we need to connect with right now. This is kind of a new space for us. And then it's a matter of building trust with them and, also, not being extractive. I think a lot of these organizations have been hit up for data or one-off engagements in the past and that doesn't build a long-term trusting relationship. These folks need to be integrated in the program design and development. And they need to be compensated for their efforts for us to get real results.

COMMISSIONER MCALLISTER: Um-hmm. Great. Thanks for that. That's very much in line, I think, with what we heard this morning. And I guess I'm thinking a model is emerging here that we really need to define and sell, you know, to be able to work with the legislature and others to sort of see the importance of this facilitative role on the community organization side, paired with the technical assistance that you all provide, you know, the Andys and Bens and Ryans and Scotts and Nicks kind of provide, that glue at the project level and the technical front but, really, the pairing is what's going to be

most powerful, it seems like. So maybe there's a further discussion to kind of define that.

I wanted to just see if any of my colleagues on the dais want to jump in, Commissioner Monahan or Mr. Chernow, if you have any questions for our panelists?

And we are getting some public -- some comment on the Q&A, as well, and I think we're probably going to have some public comment as well.

So anyway, wanted to just see if Commissioner Monahan or Mr. Chernow had anything to add?

COMMISSIONER MONAHAN: Well, I am really struck by how the economics only work when you're marrying it with solar. And the big concern there, as we heard, when there was what's called an En Banc between energy agencies on the issue of rates about how the CPUC is looking at net-energy metering. And I think, was it Andrew or Ryan, I can't remember, somebody referred to the fact that there's going to be changes afoot because of this concern that the cost of rooftop solar is being born by the lowest income families and that's causing an increase in rates across

the state.

I mean, so there are these big issues that the state is struggling with in terms of, you know, changes that will have to happen in order to make sure that our rate system is fair to low-income families. And I don't think we can count on rooftop solar always being the driver for energy efficiency investments.

And I'm wondering if any of the panelists can respond to that bigger issue around that energy metering, maybe it's Scott, maybe it's others, that's looming in terms of change, potential change in rate structure and what implications that would have then for being able to finance these investments?

MR. GARDNER: I'll say, and I'm sure Scott and some others have some feedback, as well, but I don't think it's an all or nothing. Like I think that there are ways. Like in our analysis we looked at just adding pretty moderate solar which maybe wouldn't even need NEM, or very little amounts of it, to pencil out.

So I think that there's, likely, a middle ground where NEM can be more fair to everyone in California, you know, low-income and those in

multifamily without solar, without completing ruining the economics of electrification. And I think batteries are going to play a big part in there, as well. So kind of how the economics all play out with that is going to have a big impact.

But yeah, even with just moderate amounts of solar, we did get to some pretty reasonable paybacks in Berkeley which, again, is not the best place. And once you start adding in -- I think Andrew mentioned, once you start looking at replacing air conditioners or adding air conditioners and during the heat-pump HVAC, the economics can actually look pretty great. And we're seeing more and more hot days and more and more AC being added. So I think there's some really great short-term opportunities there as well.

MR. BROOKS: And I should just clarify, I did definitely emphasize the need to pair it with solar, and that is definitely the case, but there are some projects. It really is project-by-project dependent. We have some projects that were neutral, you know, utility-bill neutral, even without the solar. It really depends on how atrociously inefficient the existing systems are

that you're replacing with heat pumps, and how much electrification work you're doing, so it's not always 100 percent required. But if we really want to play it safe, it generally is.

MR. BLUNK: Yeah. And I'll just jump on there. It also depends on what utility the building is located in. You know, I have to --

COMMISSIONER MCALLISTER: That's a good point.

MR. BLUNK: -- I have to throw that in there. Some utilities have lower rates, like SMUD. But, also, the rates discussion is an interesting one and I hear it all the time. And I know, at least for SMUD, it's a zero-sum game. We're not paying shareholders. So if we lower rates on some households, we have to raise rates on other households or buildings to make that pencil out; right? Any cost savings that SMUD gets goes to our customers. And rate or any cost increases are going to come out of rates and raise rates.

So SMUD's tried really hard to make it equitable. And I know we've been going through a VNEM process that's going to change some of the dynamics of solar, and I'll leave it at that.

COMMISSIONER MCALLISTER: Great. Let's see, I want to create -- well, we do need to move on from questions from attendees, and we have a few of those.

I wanted to give Derek a chance to ask any questions you might have, as well, just so we can -- if Heather and team can bear with us?

MR. CHERNOW: Yeah. Thank you. Just briefly, I appreciate the comments from the panelists and pointing out the success of some of the programs, and also some of the impediments and true costs associated with doing a lot of these measures. So I think it was really eye opening for everybody. And I think this is part of our program that we offer throughout CAEATFA is the financing does include costs beyond the energy efficiency measures. And I think that's a key component and one of the critical factors of our financing program. So I just want to add that in there because I know that was the topic of conversation for some of the panelists, and I appreciate that, so thank you.

COMMISSIONER MCALLISTER: Thanks very much.

Let's see. I guess I wanted to just ask,

you know, we talked a lot about rates with the assumption that a lot of these costs have to be borne by rates. And I guess, you know, that's not necessarily the case.

And I know, you know, Severin Borenstein from UC Berkeley and a member of the ISO Board, you know, brings this up, as well. If we have social goals that we're pursuing around -- that sort of dovetail with our decarbonization goals but really kind of aren't inherently related to energy but they are kind of necessary to reach our carbon goals, and we talked about a lot of those this morning in the low-income context and here today, and this afternoon, as well, so far, you know, I wonder there are any ideas about, you know, how -- you know, your thoughts about that; right?

Why do we always assume that this sort of payback has to be somehow borne by ratepayers when, really, we're talking about a broader set of societal goals that kind of have an energy component but are not completely related to energy and carbon?

Like has that conversation happened, you know, in the Sacramento context, for example,

Scott? Sorry to sort of finger-point you.

MR. BLUNK: Yeah. I mean, the problem is the non-energy benefits are so challenging to quantify, and especially at a building level is impossible; right? So there are these other benefits and I think everyone knows that and, otherwise, they wouldn't be pushing it through. Like in local jurisdictions, because even though it does save money, especially for SMUD customers and builders inside SMUD territory, they're not doing it. Like why did it -- why is it going to take a mandate for them to do it if it's cheaper to do it? And it's just -- that's not what they have been doing and/or they think their customers want, or various other reasons.

So, yeah, I -- yeah, it's just challenging.

MR. BROOKS: I heard some of the conversation this morning about that, as well. And we are involved in one project at the Bay Area Air Quality Management District that is focused on trying to quantify some of those non-energy benefits, the health benefits associated with electrification by targeting homes where they have children with a high preponderance of

asthma or severe asthma issues, and then doing electrification-related measures in those buildings, and then tracking hospital visits and nurse visits and other health parameters.

I think it's going to be really hard but I think that's just one of a variety of different projects that I think are focused on trying to do that. So I think it's going to take a long time to get some of those benefits quantified. But I think as soon as we start to have some data that we can point to, it will allow us to add those social goals more easily.

COMMISSIONER MCALLISTER: Great. Thanks a lot. So we're going to move on to questions from the audience, the attendees. We're just a couple minutes over, so apologies for that.

But why don't, Kristy, you take it away?

MS. CHEW: Hi. Yes, there's a question from Mohid (phonetic).

"As you noted, very few projects aim for full electrification due to costs. With this in mind, how do we solve for or even quantify the shift in cost for gas system users since the gas distribution system will still have to be operated, yet the costs would be spread

over fewer therms?"

That might be a question that we take up in the next panel, but in case anybody wants to respond to that in this panel?

MR. BROOKS: I mean, I think, again, it comes back to the infrastructure issues. If we can address those electrical -- building-level electrical infrastructure issues it will make it much easier for us to fully disconnect the gas lines there. And right now, for the most part, the capacity issue really comes into play, like Scott mentioned earlier, with the cooking appliances, that's generally. We can almost always manage to make the water heating done and, very often, can actually do water heating and HVAC. But it's the cooking appliance that really kicks us over the capacity issue.

And you know, so if that's the only appliance that we leave in the building, if, worst case scenario, we don't disconnect the gas and we only have the cooking, fortunately, it is a relatively small, you know, the smallest of all gas loads in a home and the least cost impact. So, of course, we don't want that to be the scenario. But in the worst case scenario where

gas costs go up but we're able to electrify everything except for cooking, maybe it's not the end of the world.

MR. BLUNK: And it's the smallest load but it's also the most harmful to the occupants. So it's --

MR. BROOKS: True.

MR. BLUNK: -- not like we want to leave that one either.

But, yeah, I completely agree with Andy. If we had the infrastructure in the building ready at the time of the retrofit, I think most of these would be fairly easily done, you know, 100 percent converted over. That's usually the stumbling block.

COMMISSIONER MCALLISTER: I'd actually also point out that -- we may get some of this in the next panel, but also the PUC, obviously, does rates and manages the transition of both the electric system and the gas system in terms of what the investor-owned utilities do, which is a big chunk of the state. So I'm not -- we may not be the best forum for that long-term infrastructure discussion but I appreciate the question for sure.

Maybe we can do one more question with respect to the permitting and streamlining permitting processes that Jeanne asks.

"Are there any successful examples of how two educate and streamline -- education building officials and streamline permit processes, for example, with PV?"

And maybe some of you, any of you, who have some insight on how to improve the permitting process?

MR. BLUNK: I don't -- being a contractor myself and having done that, there's -- I don't know that there's a lot we can do to improve the permitting process. I think, however, if we improve the enforcement, people would wrap the permitting into the job. So it would just be, oh, I have to do it, instead of now. Since there's very little enforcement it's -- the contractor, I've seen it where they'll come and say, well, oh, if you want a permit, I'm going to charge you extra.

I mean, why isn't that just included in the permit? It's not included because, frankly, you don't have to pull it because there's very little compliance, at least in single-family.

COMMISSIONER MCALLISTER: Great. Thanks.

I think we have to wrap up this segment. We're a few minutes over, so let's just -- I'll thank our panelists, unless Commissioner Monahan or Derek, you have any other questions? None? Okay. Great. All right.

Thanks a lot to all of you.

MR. BROOKS: Thank you.

COMMISSIONER MCALLISTER: This was super enlightening. And you know, I definitely want to make sure that folks build on this in their comments to the record and the IEPR docket, the building decarbonization docket, a lot of great stuff to help us vet and help us work through as we move forward through this track in the IEPR and beyond. So really appreciate all your expertise, all four of you. Thanks very much.

And thank you, Danuta, for moderating.

MR. BLUNK: Yeah. Thank you.

COMMISSIONER MCALLISTER: Great.

MR. GARDNER: Thank you.

COMMISSIONER MCALLISTER: Perfect. All right.

So let's move on to our next speaker --

MS. RAITT: All right.

COMMISSIONER MCALLISTER: -- Meredith Fowlie from UC Berkeley.

You want to kick us off, Heather?

MS. RAITT: Sure. Thanks.

So, yes, so next we have Meredith Fowlie from -- she's an Associate Professor in the Department of Agricultural and Resource Economics at UC Berkeley. She's also a Faculty Director at the Energy Institute at Haas, and a Research Associate at the National Bureau of Economic Research.

So thank you for being here, Meredith. Go ahead.

MS. FOWLIE: Great. Thank you. And can you hear me okay?

MS. RAITT: Perfect.

MS. FOWLIE: Perfect. Okay. Thank you. Thanks for inviting me to be part of this panel. It's a real honor to be part of this important discussion. I wanted to be sure to mention that the work I'll be presenting today is joint with Severin Borenstein, who was just mentioned, and Jim Sallee. We're all faculty at UC Berkeley and affiliates at the Energy Institute at Haas.

And I also wanted to draw attention to

the fact that Next 10 has generously supported this work, not only the report that we presented, released in the spring, which I'm going to be focusing on primarily today, that content, but also continues to support our work on this longer project which is looking at both the efficiency and equity implications of how we pay for electricity in California, which was just brought up in recent comments. And I'm going to try and dig in to some of the really good questions that were raised.

And this is a work in progress, so really appreciate being able to present to this crowd. And we would love to get comments, both in the Q&A, but also afterwards from this group.

Okay. Next slide please.

So I think with this crowd I don't need to state this explicitly, but it seems like there's growing consensus that the most promising path to decarbonization is to green the grid and electrify as much as we can from buildings, transportation, to some industrial applications. And when you think about the policies and programs and tools that we'll need to accelerate progress along this path, and that's been the

focus of the whole day, electricity rate structure may not be the first thing to come to mind. But in this paper, we're arguing that rate reform is going to be a critical consideration as we move forward.

So as several people have recently mentioned and everyone is aware, retail prices in California are high and increasingly out of line with the rest of the country. And these high costs may well be justified by conditions in the state, so we're not going to be commenting on the appropriateness of the costs. But we are -- have been arguing in this work, and in subsequent papers we'll make the same argument, that these prices are high to the point of being really inefficient.

And so bringing it back to the topic that we're talking about here today, these high prices are going to be a barrier on our path to electrification. And it's going to be really hard to convince customers into electric cars or to adopt an electric water heater if prices, electricity prices, are high and rising.

And so I thought the recent discussion -- the whole day has been interesting, but those

last questions that were raised, including by Commissioners Monahan and McAllister, those teed up the work I'm going to present today.

Next slide.

So I have a short period of time so I figured I would be -- I'm just going to get all my points on this early slide while I, hopefully, have your attention. And then if we don't get to them, at least they're in your mind.

So the work we've done so far makes some basic points. And the point of departure is that residential electricity prices in California are too high. And a primary reason why they're so high is because we choose to recover a lot of fixed costs through our per kilowatt hour rates. And what this amounts to is an electricity tax. It's a tax on electricity to raise revenues, to pay for all sorts of things from investments in grid modernization, to investments in adaptation to increasing wildfire risks, to public programs, but it's a really regressive tax.

And so we could foster decarbonization by lowering our per kilowatt hour prices and recovering the fixed costs we can't recover in more efficient prices through fixed charges. If

those fixed chargers were the same across household, they would be equally or more regressive.

Instead, what we've been suggesting is to either, building on Commissioner McAllister's point, ask why or whether we can't pay for some of these costs by state revenues and put them on the state budget, or if we are constrained to covering all these costs with electricity rates or bills, using an income-based fix charge that scales with income to relieve some of the pressures on the households who can least afford to pay? So either of the approach -- those two approaches would improve both efficiency and foster equity. So that's what I'm going to be working through in my short time with you today.

Next slide please.

So this slide makes a point that I think everyone is aware of, and that is residential retail electricity prices are high in California. So we've just summarized data from the utilities that report to FERC Form 1, so that's over 80 percent of retail sales in the country. And we've called out the three investor-owned utilities in green, yellow, and red. And you can

see that California prices have always been higher than the national average but they're increasingly out of line. And again, we're not commenting on the appropriateness of the costs we're recovering here. We just want to really bring top of mind of just how much higher our rates have become.

Next slide please.

So if economists called the shots, and we don't, really, but if we did we would set retail electricity prices at social marginal costs of electricity consumption. And that's kind of jargon.

So if you think about what the social marginal cost is capturing, if my dishwasher uses about a kilowatt-hour to run, when I turn on that dishwasher, what is the social cost of that dishwasher load? It's the value of the fuel that we burn to generate the electricity that runs my dishwasher. It includes the environmental impacts of any emissions that are released in generating that electricity. If I'm doing my dishwasher load on peak, which I should not be, but suppose I do, it includes the marginal capacity investment costs required to make sure

that there was enough transmission, distribution, generation infrastructure to provide the electricity I need.

So the social marginal cost is capturing all of these incremental costs, the full incremental cost to society, per kilowatt hour.

And so what we did in this report, and we continue to refine this going forward, is we estimate this efficiency benchmark for the three major investor-owned utilities over the last decade.

Next slide please.

So I'm going to show you PG&E as our sort of representative utility but, in the report, we do it for all three. So this picture is just showing us -- you our annual average social marginal cost, so averaging across the 8,760 hours per year. So, of course, an efficient price would vary across hours to signal temporal variation, but we're not focusing on that in this paper. We're just showing you annual average efficient prices as a benchmark.

So as you can see from PG&E, these have been coming down a little bit over time. And partly that's because our grid is getting

greener, so the marginal emissions impact is declining. But you can see, it was around ten cents, and now we're estimating it at about eight cents per kilowatt hour.

Next slide please.

So then what we're going to do -- what we do in the report, and sweeping a lot of details under the rug in the interest of time but happy to answer questions, either after the presentation or come find me later, is we say, okay, this is our estimate of the social marginal cost, our, you know, efficient price per kilowatt hour. Let's compare that to the retail prices that California households are actually paying, and that's what this picture does. And it's showing again for PG&E. The red is our social marginal cost estimate. The yellow is the non-CARE price. And the green is the CARE price.

So one thing that's jumps out for me, looking at this graph, is the gap between our estimate of the efficient electricity price and what people are actually paying is widening and large. So if you look at that non-CARE price, it's three times our estimate of the efficient social marginal cost price.

And the other thing that really struck me that I didn't expect going into this is that the CARE price, so this is the price paid by the lowest income households in California who receive a subsidy on their electricity rates, is still double that social marginal cost. So these rates are inefficiently high.

Next slide please.

This slide is just quickly showing you, we did it for the other two utilities. And you can see, PG&E is sort of the middle utility. The gap for SCE is smaller. The gap for SDG&E is higher for reasons we can talk about, but they're all significant. All retail prices are significantly higher than our estimate of the social marginal costs.

Next slide please.

So this is a colorful graph with way too many things going on. I'm not going to be able to unpack all the boxes in this short presentation but I do want to -- I did want to show you this picture because it summarizes, I think, some important insights and information.

So, basically, the purpose of this, we call this the waterfall graph, but this graph is

to sort of explain why our retail prices are, you know, in this case, PG&E, 2019, the average retail price was over 25 cents. So we've already talked about the social marginal cost. You can see that benchmark around eight cents. And the staircase below is just a breaking down that social marginal cost into different pieces.

But it's the staircase above the social marginal cost that we're trying to explain, why are prices so much higher than our efficient benchmark? And the short answer is there's a number of reasons. So the blue, purple, and pink boxes are basically showing you in the fixed non-incremental costs associated with generation, think, you know, power plant investments that we've made, transmission and distribution, grid modernization, wildfire grid hardening going forward, those fixed costs that we recover on a per kilowatt hour basis.

And then to the far right, that brown box and green lines, are different public purpose programs. There was mention about subsidies for rooftop solar. All of these programs, when we recover those costs in rates, drive up electricity prices for California households.

Next slide please.

So why worry about high electricity prices? For this crowd, it's probably obvious, but I want to elucidate two things I worry about, one is efficiency, so burdening retail electricity prices with costs that are not going forward, incremental costs of supplying and consuming electricity, is going to discourage efficient substitution from other energy sources towards electricity.

So our household just bought an electric water heater and it wasn't an easy decision given high electricity prices and knowing that those prices are projected to get even higher.

So these high prices are going to be a barrier to building electrification.

And the other concern related but, also, really a burden is that higher electricity prices can impose a large economic burden on low-income households in an increasingly and unequal economy.

And I know it's late in the day -- next slide, please -- but I'm going to throw one more sort of multicolored graph to really elucidate this point because I think it's an important one.

So what this is showing you is responses to the consumer expenditure survey. So there's a random sample of households that answer questions about income and expenditures every year. And so all we've done is summarize the approximately 2,500 California respondents to that survey in 2017 and 2018. And we're reporting in this graph average responses by income quintile. And we're sort of relating everything or normalizing everything to the lowest category. So, for example, a value of two implies that the average income reported in the second quintile would be twice that of the first category.

So the first thing you see is that blue which is telling you what you already know which is income is unequally distributed, very unequally distributed across households in California.

But the line I want you to look at and what was surprising somewhat to us is that green line, which is showing you electricity expenditures by income quintile, it's pretty flat; right? So you can see that electricity expenditures don't rise very steeply with income. And put differently, that means that lower-income

households are spending a much larger share of their income on electricity.

Next slide please.

So what does that mean? It means that we're taxing electricity consumption to pay for infrastructure and needed climate change adaptation investments and public purpose programs. At this point, because wealthier households consume only slightly more of their electricity from their grid than poor households, this means that this is a really regressive way to raise revenues to pay for needed programs and investments. And I will say that that relationship between income and grid electricity consumption, it's almost, you know, as more and more wealthier households adopt solar, it's getting flatter and flatter.

Next slide please. Okay.

So what do we do about this? And this was sort of a question that was teed up by Commissioner McAllister, you know, do we need to keep paying for these programs on electricity rates? So one solution would be to pay for some of the state policy priorities, such as building electrification, put it on the state budget.

I'll give you an example from climate adaptation. If you cut down a tree in the spirit of vegetation management that's far from the grid, far from the power lines, that's on the state budget. But if you're cutting down that tree, if you're a utility managing vegetation close to your electricity infrastructure, that shows up in electricity rates. So I think we need to, you know, think about what costs we could move onto the state budget.

But alternatively, if we need to continue to recover the revenues that we're recovering today from electricity consumers, we could do it differently.

And so what we propose in this, in our work, and I really invite all sorts of, yeah, comments and critiques, is a system that we set the electricity price efficiently or closer to our efficient benchmark. That's not going to recover as much revenues, although it will send efficient price signals to consumers. And we'd make up the difference with an income-based fixed charge.

So our report goes into all sorts of nitty-gritty details, which I'm not going to bore

you with.

But if you can go to the next slide?

I'm going to show you sort of some for-example alternative rate structures to generate some conversation and discussion, I hope.

So there's no universal agreement about what fairness looks like or how progressive we should make this fixed charge schedule. So what we do in this picture is sort of provide three-four-examples.

So to put this in perspective, we're looking at PG&E 2019, just to make this more concrete. In 2019, the cost recovery gap, sort of the revenues that we'd still need to recover if we priced electricity at our social marginal cost estimate exceed $4 billion. And there are almost 5 million residential PG&E accounts. So it works out to about $75 per month in terms of the fixed charge we would need to charge to make up that revenue recovery gap if everyone was paying our social marginal cost lower price per kilowatt hour.

So one thing you could do is you could charge that uniformly across customers, but that wouldn't really improve the equity properties of

the situation. So against that uniform charge, we consider two alternative structures, one that's as progressive as the sales tax, and the other that's as progressive as income. So you can see those green and yellow staircases.

So for example, if you look at the yellow staircase that says, "Progressive as Sales Tax," we're suggesting that the lowest income class would pay no fixed charge and only the volumetric rate. In contrast, the highest income group would pay a monthly fixed charge of $150.

Next slide please.

Before people get really anxious about that big increase in fixed charge, I want to just remind you that, whereas our proposal raises fixed charges, it significantly lowers the per kilowatt hour rate. So many households would see bill decreases, even as fixed charges increase.

So this is a super coarse calculation using, you know, coarse averages that illustrates how lower-income customers on balance would benefit on average, seeing lower monthly bills. There are some households who have low incomes and yet don't quality for CARE, so they might see an increase in their annual bill -- in their

monthly bills. But the real increase in monthly bills, as a consequence of moving to this income-based fixed-charge structure would be in the higher income categories.

Next slide please.

So in conclusion, California electricity rates are being used to raise revenues for all sorts of important investments. And I haven't mentioned this yet but I've heard a couple of references to the En Banc. The PUC is forecasting that rates will continue to rise as we need to recover investments in grid modernization and wildfire risk mitigation, et cetera. This amounts to a regressive tax with negative implications for both efficiency and equity. So changing the way electricity-related costs are recovered can make it easier for us to convince households to electrify. And this is important as the state looks to rapidly increase usage on this promising path to decarbonization.

And the income fixed based charges that we're proposing here could also lighten the burden of cost recovery on households that can least afford to pay. But other alternatives, such as moving some of these cost onto the state

budget, could achieve the same ends.

So I'll stop there and invite questions and comments and reactions from the audience.

COMMISSIONER MCALLISTER: Great. Thank you so much, Meredith. That was super. Sorry to partially steal your thunder.

MS. FOWLIE: No, not at all. You helped tee up our presentation. It was perfect. Thank you.

COMMISSIONER MCALLISTER: Yeah. No. So thanks of that. And really, really thought provoking and interesting.

I guess I do have one question, just to kick it off. We've got about, not quite, ten minutes, probably, to ask questions. So I want to invite, also, if Commissioner Monahan is still on, and Derek also. I see she is. That's great.

But let's see, so if I'm understanding, this would require sort of, you know, across the board means testing in order to implement this. And I guess I'm wondering if you have any models or how you envision that actually happening?

MS. FOWLIE: Yeah.

COMMISSIONER MCALLISTER: You know, we do means testing to a certain extent for low-income

and et cetera, but not sort of comprehensively in this area, at least. I wonder if you have any models in mind?

MS. FOWLIE: Yeah. So that is a great question. And we start to scratch the surface in the report. And I thought it might be too wonky for this crowd, but I should have known better. These are really important details to dive into. So we have some suggestions, and we've been talking to a couple of the utilities, about what might be able to work and what couldn't.

So for example, one proposal, but I would love a reality check from this crowd, is to have the Franchise Tax Board transfer information on income categories of households to utilities. And then utilities wouldn't be getting the sensitive information about income but would know the category and would be able to assign you to that category for the purpose of the fixed charge assessment.

Another option that we've talked about but it's imperfect, of course, would be a presumptive fixed charge by location.

So those are two of the for-example ideas that we've been thinking about as in terms of how

you could actually implement this kind of fixed charge.

COMMISSIONER MCALLISTER: Interesting. Interesting. So, yeah, thanks for that.

And then I did have a question about the waterfall.

MS. FOWLIE: Yes.

COMMISSIONER MCALLISTER: Maybe we could go back to the waterfall slide, just to make sure I was --

MS. FOWLIE: Um-hmm.

COMMISSIONER MCALLISTER: -- understanding it properly. But whoever is managing the slides, maybe they can show that one again?

But the big blue box at the left that's, let's see, was on --

MS. FOWLIE: Yeah.

COMMISSIONER MCALLISTER: -- was, I think, generation or --

MS. FOWLIE: Yeah.

COMMISSIONER MCALLISTER: Yeah. So there was part of that that was below, you know, sort of within the cost of service, and the other was well above it. And I guess I'm wondering --

MS. FOWLIE: Yeah.

COMMISSIONER MCALLISTER: -- I wasn't quite clear what you were trying to say with that box. Was that sort of arguing for some kind of a binomial tariff or something, or what?

MS. FOWLIE: Okay. Let me be clear. So if -- I don't know if it's possible to get to the waterfall but (indiscernible).

COMMISSIONER MCALLISTER: Yeah. So let me --

MS. FOWLIE: So there's -- so generation had three pieces. Two are below, like the lower case here --

COMMISSIONER MCALLISTER: Yeah.

MS. FOWLIE: -- because one was about -- so the two below. One was just the fuel cost, like the cost of generating the energy.

And I think for whoever is like -- slide six, I think, is the slide.

There is a little -- there's a small bar --

COMMISSIONER MCALLISTER: Yeah, right there.

MS. FOWLIE: Got it.

COMMISSIONER MCALLISTER: Excellent.

MS. FOWLIE: Next one. It's kind of like --

COMMISSIONER MCALLISTER: There it is.

MS. FOWLIE: -- a greenish color. And so what that is, is we are using a methodology that's very similar to the E3 Avoided Cost Calculator where we look at utility rate filings. And in those rate filings, you know far better than I, utilities point to investments that could be avoided or deferred if peak was reduced. So those -- that bar --

COMMISSIONER MCALLISTER: Um-hmm.

MS. FOWLIE: -- is our marginal investment -- generation investment cost, if that makes sense? So that's like --

COMMISSIONER MCALLISTER: Yeah. Right.

MS. FOWLIE: -- the demand sensitive, the value. You know, when you -- when I'm running my dishwasher --

COMMISSIONER MCALLISTER: Yeah. Got you.

MS. FOWLIE: -- on peak there, you know, if I hadn't done that, there is some investment that could have been (indiscernible). So that's what that think green bar is.

And then the blue bar --

COMMISSIONER MCALLISTER: Yeah. So the big blue one?

MS. FOWLIE: Yeah. Does that make sense?

COMMISSIONER MCALLISTER: Yeah. The big blue one, though, what's that?

MS. FOWLIE: The big blue one is like --

COMMISSIONER MCALLISTER: Is it cost that --

MS. FOWLIE: -- all the generation, what's classified as generation by utilities, infrastructure, investments in power plants, contracts, et cetera, that are non marginal, so like all those fixed --

COMMISSIONER MCALLISTER: Oh, okay.

MS. FOWLIE: -- (indiscernible).

COMMISSIONER MCALLISTER: But you're not arguing that those -- you're not arguing that those don't need to be recovered by virtue of --

MS. FOWLIE: No, no, no.

COMMISSIONER MCALLISTER: -- (indiscernible)?

MS. FOWLIE: We're just showing you like --

COMMISSIONER MCALLISTER: Okay. I was just --

MS. FOWLIE: -- here are all --

COMMISSIONER MCALLISTER: -- (indiscernible).

MS. FOWLIE: -- the pieces.

COMMISSIONER MCALLISTER: I got you.

MS. FOWLIE: Yes. Sorry. This is just like --

COMMISSIONER MCALLISTER: Okay. Got it.

MS. FOWLIE: -- a decomposition, like why am I --

COMMISSIONER MCALLISTER: Yeah. Okay

MS. FOWLIE: -- you know, 25 cents, eight cents, that's a piece of the puzzle.

COMMISSIONER MCALLISTER: Okay. So generation, transmission, distribution, and then pollution, externalities. And then the ones over on the right are really the ones that you're focusing on --

MS. FOWLIE: Well --

COMMISSIONER MCALLISTER: -- or perhaps finding other sources for?

MS. FOWLIE: -- the other, well, the other one, and this is again a question for you, is like the purple box is about to get bigger, same with distribution, to the extent --

COMMISSIONER MCALLISTER: Yeah.

MS. FOWLIE: -- that wildfire mitigation and grid hardening is -- are in those. We found it really hard to disentangle. And I think that they're --

COMMISSIONER MCALLISTER: Okay.

MS. FOWLIE: -- this is going to change, but to pull out of those boxes what's wildfire mitigation and what is, you know, power system infrastructure investment and maintenance. And I think you could argue that some of that is wildfire --

COMMISSIONER MCALLISTER: Yeah.

MS. FOWLIE: -- because it's expected to get high, to get bigger. That's also --

COMMISSIONER MCALLISTER: Okay. Great. So I --

MS. FOWLIE: -- (indiscernible).

COMMISSIONER MCALLISTER: -- so I got my sort of context questions answered. Sorry for making you go into the weeds a little bit --

MS. FOWLIE: No, it was great.

COMMISSIONER MCALLISTER: -- but I kind of thought --

MS. FOWLIE: That's great.

COMMISSIONER MCALLISTER: -- it was important. So --

MS. FOWLIE: I appreciate the clarification.

COMMISSIONER MCALLISTER: -- so, great.

Commissioner Monahan or Mr. Chernow, do you have any questions?

COMMISSIONER MONAHAN: Well, I have probably a related question. But the social marginal cost, I mean, that's like really setting everything. And, yet, I was a little confused about how you calculate that accurately. It seemed like there's going to be a lot of --

MS. FOWLIE: Absolutely. Yeah.

COMMISSIONER MONAHAN: --

MS. FOWLIE: There's (indiscernible).

COMMISSIONER MONAHAN: -- hand wavy

MS. FOWLIE: Yeah. So I mean, I think in the -- no, it's right. And I think we were just trying to get a benchmark. And then in the appendix we show like how it moves around with different assumptions. I mean, some of it is not very hand-wavy in terms of like we know the wholesale electricity price in a given hour, and so we can get a sense of what the marginal fuel

cost was and we can get a sense of what the marginal emissions rates are. So some of those pieces are not that hand-wavy when we've got the hourly data and we're working with it. So I think some of those, I think, I'm fairly confident and I'm willing to stand behind.

Where there's way more -- where there's more uncertainties, exactly what I was just talking about with Commissioner McAllister, what share of the transmission, distribution, generation costs are deferrable if we reduce peak? I mean, it's the front and center issue; right? If we reduce peak, how much of that could be deferred and how much of it is like that's non incremental and we're going to have to -- so in the appendix, we play around with that under different assumptions because very smart people disagree as to what those numbers should look like.

And then the other one is the social -- like the social cost of carbon that we -- right? So we can -- if we move that around. The grid is getting so much greener that the, you know, different assumptions about the social cost of carbon don't move the social cost of electricity

around as much as you might expect because our marginal emissions rate is getting lower.

But, yeah, point well taken. And in this short presentation, I gave you a colorful graph that, you know, that swept aside, these important questions about how sensitive these are to different assumptions. But I you look at the key drivers, some of those you can pin down with some degree of certainty.

COMMISSIONER MONAHAN: And this is outside of the scope of what you presented. I'm just curious as to if you've considered ways to evaluate sort of beneficial electrification versus other forms of electrification, and whether there's any lead thinking out there in terms of how rates could be reflective of beneficial electrification, like heat pumps and electric vehicles and, you know, just where we want to electrify versus just buying another, I don't know, big screen TV or something?

MS. FOWLIE: Yeah. I'm not --

COMMISSIONER MONAHAN: Are you aware of any thinking around that?

MS. FOWLIE: I'm not sure if I understand your question. I'm sorry. So I guess --

COMMISSIONER MONAHAN: Um-hmm.

MS. FOWLIE: -- one thing I will say is, and this is, you know, a thrust of the paper, is you want to send -- and I'm telling you what you already know -- you want to send these consumers a really good estimate or signal, like what it costs to consume electricity. And right now we're sending the signal that it's way too high. You ask a really good question --

COMMISSIONER MONAHAN: Um-hmm.

MS. FOWLIE: -- about social marginal cost. Maybe it's a little bit higher, maybe it's a little lower, but it's not 25 cents. So electricity looks more expensive to consumers than it actually is. And so that means consumers will be underinvesting in electrification because electricity looks more costly. And Severin Borenstein --

COMMISSIONER MONAHAN: Yeah.

MS. FOWLIE: -- has done related work. Because then you might say, well, but they're comparing it to gas and natural gas and what happens if those fuels are more expensive than they actually are? And Severin and Jim have done some really interesting work to show that this

mispricing, this retail price above true price, is much more amplified in the electricity context versus other fuels that consumers would be substituting between.

So I don't know if that answers your question. It sort of glosses over. But I do think that sending these really high price signals is discouraging good electrification insofar as, you know, consumers see a higher cost of electricity than is actually being accrued.

COMMISSIONER MONAHAN: Yeah. I think --

COMMISSIONER MCALLISTER: Great.

COMMISSIONER MONAHAN: -- my question is a little distinct but I don't -- it's not part of your research, so I don't think that --

MS. FOWLIE: Okay.

COMMISSIONER MONAHAN: -- it's relevant. But that is, you know, in terms of we want to send these signals that you want to increase electrification for certain end uses, but not necessarily for all end uses.

MS. FOWLIE: I see. I see.

COMMISSIONER MONAHAN: In fact, we want to discourage it for -- I mean, not -- discourage is the wrong word, but we want to just make sure

that rates send a signal that, on the one hand, yes, electrify your car. On the other hand, maybe, you know, don't willy-nilly buy a bunch of electronics that are really going to be costly. Like we want to send different signals --

MS. FOWLIE: Yeah.

COMMISSIONER MONAHAN: -- depending on the end use.

MS. FOWLIE: Yeah. Yeah. I mean, I think the only -- one thing I will say which, again, is tangential but relevant is my colleague, Lucas Davis, you may have seen his work on what determines building electrification choices, and the most important factor that explains electrification patterns across the country is electricity rates; right? You drive the electricity rates up, you're less likely to electrify.

COMMISSIONER MONAHAN: Yeah.

MS. FOWLIE: So, yeah, I guess I can't speak to the bad electrification. But I think some of the good electrification we have in mind, empirical evidence is coming in and it's suggesting a result that's not surprising, which is electricity rates too high, electrification

rates lower.

COMMISSIONER MONAHAN: Yeah. Thank you.

COMMISSIONER MCALLISTER: Great.

Mr. Chernow, did you have any questions you wanted to ask? Otherwise, we will move on to the next panel.

MR. CHERNOW: No. I think I'll stay on Heather's good side and move it along.

COMMISSIONER MCALLISTER: Oh, yeah. Sorry. Yeah.

MR. CHERNOW: Thank you.

COMMISSIONER MCALLISTER: You're a better man than I. So, Professor Fowlie, thank you so, so much.

MS. FOWLIE: All right.

COMMISSIONER MCALLISTER: This was really nice. I'm looking forward to reading the paper in more depth. And this conversation is not going away, obviously, because we really do have to figure out how we're going to balance cost, not only within the electric sector and across electric customers, but also, you know, between electric and natural gas infrastructures, as well, so very relevant going forward. So --

MS. FOWLIE: Well, thanks for having me.

COMMISSIONER MCALLISTER: -- all right. Great.

MS. FOWLIE: And I'll just reiterate the invitation to email me with questions or comments that occurred for the audience because we are inviting all feedback any time we can receive it.

COMMISSIONER MCALLISTER: Great.

MS. FOWLIE: Thanks.

COMMISSIONER MCALLISTER: Great. Thanks so much.

All right, Heather, let's move on to the next panel.

MS. RAITT: Awesome. Thank you, Commissioner.

And thank you, Meredith. That was terrific.

So next panel is on Financing Decarbonization. And Deana Carrillo from the Energy Commission's Local Assistance and Financing Office where she's the Manager will be -- she'll be moderating this panel for us.

So go ahead, Deana.

MS. CARRILLO: Thanks so much, Heather. I'm happy to be part of this conversation on financing today and join this amazing panel of

colleagues who are deploying innovative financing approaches targeted to those hard-to-reach and underserved markets that we've been talking about in both the residential and commercial sectors.

And I really appreciate the point that Scott from SMUD made, mentioned earlier. As we work toward decarbonization, there are segments of our population where direct installation and deep assistance is the most effective. And there's these other segments of the population where financing with a repayment stream may be a more viable option. And so as we look at this with an equity lamp lens, I think that distinction between funding and financing is really important to call out.

I'd also like to just quickly mention, a quick friendly reminder, that if anyone has any questions, please type them into the Zoom Q&A.

And with that, I'm going to introduce Holmes Hummel from Clean Energy Works.

And Holmes, you're muted. That won't be the last time.

DR. HUMMEL: Great. I may be double muted there. So can you hear me now, Deana?

MS. CARRILLO: Yes, we can hear you now.

DR. HUMMEL: Okay. Terrific. Well, thank you so much. It's always lovely to be at a California Energy Commission event with you in particular. And I know that we have last been invited to participate in workshops on similar topics but maybe not for a few years.

My name is Holmes Hummel and I'm the founding Executive Director of Clean Energy Works, a public interest-oriented nonprofit founded after my years of service as an appointee to the Department of Energy as the Senior Policy Advisor in the Policy Office during the last slug of federal financial deployment funding for clean energy technologies during the Recovery Act from 2009 through 2013.

I'm here today because there's unfinished business in my career related to that body of work, now almost more than ten years ago. Financing decarbonization at scale remains an unsolved problem, not just in California but nationwide, and it grows more urgent by the year. And the equity implications of not resolving it also make it more urgent.

I'm contributing to the workshop today a growing body of literature that's based on

evidence moving out of the field where there's experience to show that utility investments offered on inclusive terms can actually produce a pathway to ownership for site owners while protecting owners that need the protection most, and allow all (indiscernible) forward in a clean energy economy on equitable terms.

I'll use a few visual aids to offer a frame of reference. While some of this will be familiar to Commissioner Monahan, Commissioner Gunda, Commissioner McAllister, I hope it will be a contribution to the record and serve further discussion.

Please go right ahead to the next slide.

One thing that we know is that for almost 20 years utilities in various states, and I'll show you a map momentarily, have been capitalizing site-specific upgrades on terms of service that assure full cost recovery with site-specific terms for a fixed charge that's less than the estimated savings for those upgrades. The most common set of upgrades are around building energy efficiency.

But if you tap forward one more time you will see a whole host of possible distributed

energy resource solutions that can be capitalized the same way.

And while you might say, well, wait a second, not everything on the right side of this graph is cost effective, so maybe it won't work, please suspend your disbelief and walk with us through a line of logic that shows how much unleashing is possible when the utility is allowed to capitalize what would be cost effective on the customer side of the meter.

Before we leave this visual aid, I also want to underscore, after a whole day of listening to the workshop participants so far, that we should, I think, be talking more about transportation electrification as part of the decarbonization puzzle, and that the integration of the vehicle grid integration activities that the California Energy Commission leads, with the building electrification and building decarbonization activities that the Commission is, obviously, motivated by, might make both of those problems easier to solve.

Let's go ahead to the next slide.

The basic status quo across the United States today is that we have a whole set of clean

energy upgrades that presents us with an up-front cost barrier. And then we use ratepayer funding or taxpayer funding or polluter-payer funding, any kind of funding, to help pay down that up-front cost barrier. And then we try to entreat the customers to jump over the pole vault despite themselves, or whatever other competing priorities their household may have.

And so households basically face the multiple choice of paying cash, paying on their credit lines, or just bypassing the credit -- the option for the upgrades altogether, which is what the vast majority of consumers do all over the United States.

If you fast forward one more slide you'll see that inclusive utility investment is essentially adding another option to that multiple choice. And where it's available it's producing dramatic field results that show that the majority of customers, when given the opportunity to access a cost-effective upgrade with no up-front cost to them and no debt obligation that they have to bear personally on their personal lines of credit, will accept the utilities offer to capitalize those upgrades at

that site and recover their cost with a charge on the bill that's less than what would be estimated to be saved by those upgrades.

And the utility is able to draw in, literally, billions of dollars from the wholesale capital markets on competitive terms, deploy that down to thousands of dollars worth of equipment, like HVAC upgrades. And that is a ticket to scale that we don't see through many other mechanisms.

Let's go forward one more slide.

This familiar diagram shows the contours of the major policy frames. With these upfront costs, we use rebates or other types of buydowns to try to entreat people to move forward. But I want to move to the next slide that's an iteration on this one to show that we have always been combining funding and financing. It's just that we've been using public forms of funding and induced people to use their private forms of finance, and that that actually is producing some of the clean energy divide that we can observe in everything from electric cars to electrification of houses to rooftop solar.

But when we switch from using public

funding and personal lines of credit that some people have and some people don't have and we think about expansively inclusive options for utilities to capitalize all cost-effective upgrades and recover their costs within the estimated life of those upgrades while producing that net savings stream from the very beginning that we see in green, that is a value proposition that's widely accepted.

Let's go ahead to the next slide.

Here I want to show you three types of classic sources for money for funding. And for all of our experts today who have been pointing out that building electrification doesn't pencil out easily in California markets, that's so. And for any source of capital that you have in these categories, there are many reasons to make the public policy argument to maximize the availability of funding to low-income households in particular, on equity grounds, no doubt.

And also, this cannot be our complete picture because after we have calculated how much would be needed for electrification in California, there is not enough money through any or all three of these streams to sustain the

level of investment that's required. Grants are not scalable or sustainable, even if they are popular and necessary at initial scales of market transformation.

Let's go to the next slide.

So complementing those three categories of funding broadly up top are your debt financing and lease service agreements, both of which require creditworthy counterparties. There are many Californians that will not pass the tests that are necessary to become creditworthy counterparties, and that creates another hazard to our aims to achieve an equitable clean energy economy.

So I'm going to continue forward with the last line here, the utility tariffed on-bill investment option, tariffed on-bill investment being a technical term for the inclusive utility investments that we have seen introduced in all of the places on the next map.

Go right ahead. There you go.

Dark blue on this map is a state where a utility commission has already evaluated the terms of a site-specific investment with site-specific cost recovery under the terms of a

tariff and determined that those terms are just, reasonable, and fair.

California is a shade of lighter blue, along with a dozen other states on this map, because there's an earlier stage of deliberation. The California Public Utilities Commission hasn't even had an opportunity to determine whether or not it would consider a tariffed on-bill program just, reasonable, and fair because it hasn't been proposed to the utility commission yet. But it's light blue on this map because more than one investor-owned utility is now turning its attention to whether or not that might be an option for one of the instruments they could use in the future.

It's a long conversation and it didn't just start yesterday. So if you move forward, I want to remind all of us who are part of today's workshop how far we've come since SB 350 was passed, mandating the California Energy Commission in 2015 to complete within 18 months the landmark Low-Income Barrier Study.

In December of 2016, the California Energy Commission did conclude that financing was, well, in fact, the barrier to low-income

customers in the clean energy economy. Now while that was not surprising, I think it's important to revisit the language of the California Energy Commission's recommendations at that time, directly advising the California Public Utilities Commission to consider developing a tariffed on-bill pilot for investments in energy efficiency that target low-income customers regardless of their credit score or renter status so that they, too, would have that option without having to take on a debt obligation.

It also recommended that the Energy Commission itself should use its resources to offer technical assistance to the publicly-owned utilities. In other words, the ideas that I'm representing today in the workshop for decarbonizing buildings and electrification have been talked about in California for half a decade at this point.

Let's move forward to the next slide.

This is the only cashflow diagram that I will present. And if you imagine starting at the capital provider at the top and rotating around clockwise, you will see that the capital provider can deploy money through the utility's site-

specific investments while preserving open competition and consumer choice, and also allowing customers to come and go from the sites where the live, work, and play without being saddled with a personal debt obligation. Tariffed on-bill investments have continued to perform well in contrast, in terms of scalability, to debt-based products. In the next slide, we'll show you why, because they have substantially different attributes.

Given that I just received the two-minute warning, I want to hurry on, knowing that you can revisit these slide and this grid diagram, to the next slide to show you why there's a game changer in moving from personal indebtedness to utility site-specific investment. It's because expansive inclusion can double the size of the addressable market. And the acceptance rate is at least five times higher than the close rate for loans.

Just here, these two factors are multiplying, two times five is ten. That gets you an order of magnitude more capital flow into the areas where the underserved market segments both for the California Public Utilities Commission and the Disadvantaged Communities

Advisory Group for the California Energy Commission know that money is really not flowing at all.

Now let's move to the next slide because that concern about inequity and access to capital to overcome those upfront costs, especially in the context of decarbonization, was the subject of the equitable building electrification framework championed by our keynote speaker today, Carmelita Miller from Greenlining Institute. Now while Carmelita did not hail her own accomplishment in leading the stakeholder process that led to this framework, I want to underscore it as part of the record for the workshop. And it includes a chapter on funding and financing that calls on California policymakers to find a way to support alternative and more inclusive financing, such as tariffed on-bill investments.

The following year, the Building Decarbonization Coalition conducted a six-month stakeholder process that not only came to the same conclusion, it introduced a series of recommendations.

And I'd like you to move to the next

slide.

This is a screenshot of the conclusion of that report, which is still the top internet search result for accessible financing today. Anyone can find it with the two words, accessible financing. And this slide and the next slide -- go ahead -- are the concluding pages of that report. I want to conclude my remarks by underscoring this point, time is a critical factor. It won't work to wait to try to tariffed on-bill investments sometime later in the decade. It's already been discussed for half a decade so far.

And my closing slide shows you that there are validators and potential partners at the federal level who are calling California's name. In fact, at the Better Building Solutions Summit that was held just about six weeks ago, the new EPA administrator called for more utilities to offer inclusive utility investment using pay-as-you-save or other tariffed on-bill investment approaches.

And the head of the DOE-loan program addressing a keynote audience in VERGE Electrify specifically called on California's name in

welcoming applications for tariffed on-bill programs, offering the potential for federal backing for any amount of risk up to, what I suppose is in his portfolio, upwards of $4 billion to provide risk mitigation for those who may be having concern about inexperience in the state for something that's been working in Kansas, Kentucky, and Arkansas now for several years.

I know I've exceeded my time. I appreciate your patience. It's an honor to participate in this process. And I'd be happy to take any questions at the end of our panel.

Thank you.

MS. CARRILLO: Thanks Holmes. That was very well articulated. And I appreciate you making up a little bit of time there for everybody.

Next, I'm going to introduce Diane Schrader with ThirdACT.

Diane?

MS. SCHRADER: Let me say, it is so hard to come after Holmes. That is brilliant. That's amazing. And one of the things that I love about it is that it is really looking through the lens,

also, of institutional investment which needs to write large checks. And when you can write large checks that then can be aggregated to finance these smaller projects, I personally find that to be a brilliant application of capital. And this is kind of where we're coming from as well. So anyway, so thank you. Thank you everyone for having me today.

So my name is Diane Schrader. I am the Founder and CEO of ThirdACT. And I'm speaking here today primarily about a program that we developed last year and that we just launched in January that focuses on underserved communities in major metros.

Next slide please.

So this is a bit about us. ThirdAct is at the intersection of real estate and institutional climate finance. The company was founded in 2015 as a public benefit corporation. And our public benefit statement is that we drive resiliency in communities through better buildings. I think what differentiates us from some of the other presentations that we've seen today is that we're looking at energy efficiency and clean energy technologies through a real

estate perspective. And you'll see more about that as we go.

Next slide please.

So what drives us kind of puts the rest of my talk into context. The first is fair by design. To us, this is about respect and service. As a financier, we do not offer predatory products, nor do we charge egregious fees.

The next point is that we emphasize that we're entrepreneurs. We do and learn and do and learn. For us to get to scale and move quickly we have to accept the fact that the risk up front is that we don't always know where we're going or what the outcomes are going to be, but we're going to learn along the way. And this is particularly important as we get towards our climate goals.

And lastly, in all that we do we think about what we do 100 times over, and that's how we get to scale.

Next slide please.

And so our story starts here. California is a leader when it comes to clean energy, yet these programs that we've created mainly benefit

the rich. And now that there's public data and research highlighting this, we can no longer ignore those that have been left behind.

Next slide please. Let me see. Just a second. I lost my slide. There we go. So I'm so sorry. If you could back up one please?

And so we're here in the context today of talking about why does decarbonization matter in low-income communities?

Next slide please.

So I want to start with data. There are roughly 9.2 million single-family homes in California; thirty-two percent of these homeowners live on income at $40,000 per year. And what's really interesting about this is in every major metro in California the living wage for a family starts at twice to three times that, it's $87,000 for Los Angeles, it's $105,000 for the Silicon Valley, and $115,000 for San Francisco.

Next slide please.

And so next we look at the ages of these homes. About 40 percent of these homes were built before there were Energy Standards in the Building Code. And as a matter of fact, 100

percent of the communities that we're currently targeting fall into this category. And most of these homes will exist in 2030, many into 2050 as well. They're a critical piece to our overall climate strategy.

Next slide please.

So a lot of homeowners earn at or below the living wage and also live in older homes. So it's no surprise that our team learned that most of these older homes also have outdated systems. So when we think about decarbonization we take a systematic view. We do not stop with electrified appliances. We look at how these appliances will perform in the context of a home. A home that lacks insulation and has original windows means that the heating and cooling systems will have to work harder, and that's a waste of energy, even if the technology is efficient. So we think about the whole house.

We also know that deep retrofits cost a lot of money, so we had to get creative. And, again, we have to think about scale. As we transform more and more homes, what impact will this have on the grid, on cities, and on the state at large?

Next slide please.

And this is where we come in. We remove the barriers to clean energy. And rather than take small steps or offer piecemeal solutions, we boldly take these homes all the way to net-zero.

And I want to pause here because there's been a lot of mention and such of the expense of energy. From the conversations that we've had with homeowners we've seen utility rates as low as $150 per month, but on average they're averaging between $200 and $500 per month, just to give you a sense.

And just this last week, we actually talked with a homeowner who pays as much as $1,200 regularly per month. Some of these people are saying that, look, in COVID, their homes have turned into intergenerational homes which has increased some of these costs.

But these are expensive costs and such, certainly kitchen-table issues when it comes to these homes.

So next slide please.

So when we look at what net-zero means, quite simply, we want to make a home so efficient that it can produce most, if not all, of the

energy that it consumes. So we start with energy efficiency improvements and the home's basic systems. We add solar, onsite energy storage, and then we swap out natural gases -- or natural gas applications for modern all-electric. And then the cherry on top, which has been discussed a number of times here, is EV charging to prepare these homes for the next wave of transportation.

Next slide please.

So as we get into financing, I want to share this quote from Darren Walker from last summer. I heard Darren speak about the financing gap for disadvantaged communities. And this particular statement hit me like a brick, that is that we cannot think about finance without placing equity and asset-building at the center when we're thinking about these disadvantaged communities. And I've heard equity mentioned today, a number of times, but I can't emphasize enough that asset-building is also something that has to be front and center. This has certainly guided my team ever since.

Next slide please.

So here are the basic ingredients of how we transform existing communities to net-zero

energy. And like I've heard many times today, we start with community. We learn about their needs. We meet with their leaders. And then we help them, or let them help us, I should say, shape the program, and that's what we do. We then provide private capital to pay for all of the up-front costs of those improvements. And then we manage the projects and the contractors from start to finish, then pay the contractors directly.

When it comes to all the benefits and such of these improvements, we let all of these accrue to the homeowners. This means that they get to keep all the energy savings, any of the utility rebates -- and by the way, we love utility rebates -- and any of the tax incentives. And that's immediate asset-building. They don't pay a dime back until they sell their home. And we can adjust that repayment amount to suit the community, often at a discount.

And then we add a little bit of magic, and that is that if the families stay in their home through the term, which is typically 20 years, the financing is forgiven and the homeowner owes nothing. Again, more asset-

building.

All this helps the owners to afford to stay in their communities, to age in place, and to even pass on a net-zero home to their children. We can do this because we anticipate that many homes will sell. When we aggregate these homes together at scale, investors get paid along the way. And in some cases, we get to recycle --

MS. CARRILLO: So was that loss impactive to everybody?

MS. D'AMICO: Yeah. I lost her, Deana.

MS. CARRILLO: Okay.

COMMISSIONER GUNDA: Yeah, I can't hear either.

COMMISSIONER MCALLISTER: It looks like, Diane, you got cut off. I'm seeing her video frozen as well.

MS. CARRILLO: Give it a minute. I think the discussion of asset-building is so important as we actually think about wealth creation and not just paying rent, but actually growing a family wealth. Give this a few more minutes.

COMMISSIONER MCALLISTER: Anyone from the team in touch directly with Diane right now,

Heather? Just wanting to see whether we give her a minute --

MS. RAITT: Yes.

COMMISSIONER MCALLISTER: -- or whether we move on and come back to her later?

MS. RAITT: We can try. I suspect, maybe, we need to move on.

MS. CARRILLO: Okay. Well, as Heather mentioned and sent a note out to all panelists, the slide decks are available to everyone. And until Diane come back, maybe we'll pass the virtual microphone to -- and I'll introduce Mark -- oh, Mark, I had this earlier, Mark Shahinian with Gridium.

Sorry about that. I was all excited.

MR. SHAHINIAN: Nicely done. Can you all hear me?

MS. CARRILLO: Yeah.

MR. SHAHINIAN: Great. Super. Well, I'm Mark Shahinian. I'm the Vice President here at Gridium, helping run our project development arm where we're doing physical retrofits in commercial buildings. And I'll tell you all about what we're doing.

I'm honored to be here. It's such a

thrill to be able to contribute to this group's important thinking about how this is all going to evolve in the future. And a lot of the groundwork that's been laid by people here over the last decade, we're now able to put into motion and make real progress against real projects. And that's what I want to share with everybody here today. So thank you for all your hard work over time.

Our perspective at Gridium is one of hope that there's a way to serve classically underserved markets in efficiency with some of the innovative programs that we've pulled together over the last decade or so.

I'll tell you about a sector today that is the core of our customer base, not normally thought of as classically underserved but, in fact, that's what's happened to them. And this is privately-owned commercial buildings, so think office buildings, think hospitals even, think biotech, that sort of thing. It's very hard. And I'll go through why, despite their best intentions and what they'd like to do, it's very hard for these entities to normally go and do energy efficiency. And because of financing on

the bill, it's become possible for that market to really take off.

So what we're seeing is something that can -- that is starting to scale with utility capital now and can scale in an extraordinary -- to an extraordinary degree as private capital starts to come in through some of the chief programs and other programs you have and will hear about.

So let's take a look at the pressure this sector is facing.

And you can flip to the next slide please.

So here's a customer of ours. This is right across from the old Bank of America building in San Francisco. And they are facing the classic pressures that most of the building owners and operators in this sector are facing. Let me be clear, our customers are the building owners and operators. Tenants are usually along for the ride, with a couple of exceptions to do with triple-net leases that we can talk about if we have time.

But you know, there's real pressure to cut costs now. Unlike in the last ten years,

commercial real estate is under a lot of pressure and continues to be. I don't know if anybody's been in downtown San Francisco recently. I haven't. And the reason that these buildings are under pressure is for that very reason. I'm working from home, as are a lot of people.

And this building here, or buildings like it, have, you know, three to five to ten percent occupancy, and they're still incurring 80 to 90 percent of the energy costs they were before the pandemic. You can't just shut the whole building down because a few floors are empty or less occupied. So they're really feeling pressure to cut costs, both because of declining demand for leases and because of the energy costs. They talk about energy is the biggest costs and these buildings.

And I can't remember who mentioned earlier, yes, energy prices are going up. I think our forecast is for five percent a year in PG&E territory, and probably higher across the other IOUs, at least San Diego, and they'll continue to go up.

Another interesting trend we're seeing, especially after November of 2020, is there's a

lot of pressure from the big capital partners that own these buildings. So, classically, there's an operator of a building, maybe it's a minority partner, and they will own, you know, something like five percent of the building. They'll go and operate it and hire the JLLs or the CBREs of the world to actually go run the building.

And then there's a big capital partner behind it. It's a pension fund, like STRS Ohio, or it's JP Morgan, or it's, you know, name any big bank or pension fund or investment fund, these are the groups that own these buildings. And they are putting a lot of pressure on their assets and asset managers to reduce their carbon emissions, and so we're seeing that a lot. And it's a great tailwind for this industry because it's really -- it is trickling down, if that's the word, to what's happening on the ground.

And historically, because of the split incentive problems that most of you know, but just briefly, tenants pay for the energy in these buildings, either directly or indirectly, and landlords own the equipment that uses the energy, in other words, the lights and the HVAC systems.

And so there's this split incentive where any investment in efficiency in the equipment doesn't accrue to the person or group that made the investment, the landlord, it accrues to the tenants. So there's not much incentive, generally, for landlords to make those investments. So that's left a lot of stranded improvements that would otherwise be profitable for building owners.

And you know, the tenants in these buildings are everyone from nonprofit law firms to investment funds to design shops to architecture firms to processing operations. It really runs the spectrum. So we're talking about nearly every business in California, and not all on the main corner here in San Francisco, but nearly every business in California is exposed to these issues because they're leasing space from commercial buildings. So as we think about equity, I think we want to think about how all the small businesses that make up this economy are treated within it.

And just to understand why these projects haven't been done, given all these pressures in these buildings, let's take a look at the next

slide. So it's really the financial structure of these buildings that has not allowed them to take advantage of the high electricity prices that they would love to reduce; right?

So there are single-entity LLCs to protect the parent investment funds from bankruptcy at the building level. And this means there's very small capital budgets. You know, the engineers in these buildings do not have the money to go and upgrade the systems as they would like. And there are creditworthiness issues. The previous building is something-something 43 LLP, you know, names that I can't remember. It's not the parent company of that building. And so no one is going to loan money to something-something 43 LLP, and so it's hard for them to get financing normally to do a project.

The second issue or set of issues is around how leases are structured. They allow passthrough of operating costs, or utility costs or maintenance, but not generally and not very completely of capital expenditures. And so if you can change what would have been a capital expenditure into an operating cost, you can pass it through to the tenants sort of magically. And

so when you take an energy efficiency project and put it on the bill, you're changing it into an operating cost in a way that owners of these buildings can then use to pass on the costs to the people who benefit from them, the tenants.

And the third piece is that mortgages in these buildings are sacrosanct. No one ever, ever, ever, ever is going to touch a mortgage. It's too much trouble. It's too much trouble. It's not worth it. It's lots of lawyer costs. And the banks will not allow it. And so it makes commercial pace very impractical for these buildings because that starts to get into the actual underlining financial structure of the building.

So biggest issues, creditworthiness and small capital budgets. And then, also, you have to be able to pass on the costs which is really determined by the leases. You can go Google commercial building office leases on the SEC's website, or just through Google, and that will give you the language that we're referring to. It's pretty transparent.

Okay, and then let me show you what happens in one of these projects that we've been

involved with in the next slide.

Here's a project we're about to start on in Southern California. It's a five-building campus. We're going to take about two gigawatt hours out of this campus, two annual gigawatt hours. That's a 20 percent IRR (phonetic) for the building. It's a large reduction in load. And about 8,000 tons of lifetime carbon savings. And this is all accretive to the building owners, as well, because they drop their costs. And, eventually, accretive to the tenants after these loans pay off and they see lower common-area maintenance or CAM charges.

And in the long run, we really think the way this goes is the place with the chief group with David and Jonathan are pushing, which is the ability to bring in outside private capital and put it against these projects. There's clearly a limit to how much ratepayers can and should and will fund. But the wide availability of private capital for these projects is apparent to us in our discussions with lenders. And we're excited to move in that direction.

We also have found to be super important limiting how much exposure these projects have to

traditional energy efficiency regulatory processes. They take a long time. They're very expensive. They weigh down these projects. To really make this market go, we will have to move away from that sort of older paradigm about all the checks and balances you see in one of these giant projects. Because these are sophisticated commercial entities, they make decisions with lawyers and engineers and don't have quite the same need for protection as some of the other residential customers that we're, for sure, concerned about.

And so let me talk you through kind of how this looks at a broader scale for us in the next slide. So here's a run of our projects. We find we do about roughly $4.00 a square foot in these buildings in terms of the capital costs. And we save 20 to 30 percent of the energy, roughly. There's one in here, I think that medical office in San Francisco, that's actually a 45 percent savings of the energy use in that building, but generally about 20 to 30 percent.

And you can see here that there's a wide range of savings amounts, mostly, honestly, to do with square footage here. Biotech labs will tend

to save a little bit more just because they're so energy intensive and a pretty wide range of types of buildings that we're going into and seeing these opportunities.

And this a pretty big savings, so this is 28,000 tons over a lifetime. I just did a 15-year lifetime on these projects. And that's about 1,000 Teslas worth in California. In other states, it would be a lot more, but we have a pretty clean grid, so it's about 1,000 Teslas worth -- or Tesla lifetimes.

And what we really want to say is this is a small group of projects. Our pipeline is about five times bigger than this coming up. And you know, there's possibilities for dozens more companies our size to go and do this. And this will explode as OBR comes on and becomes a big thing. And we're really excited to be a part of that. And maybe we can talk about the CEC's role could be here.

If we could go to the next slide.

It sounds like I'm done but let me flash this. This is going to move, I think, things away from the traditional CPUC IOU realm. And I want to think as a group how this comes together

and how this starts to play out.

So thank you very much.

MS. CARRILLO: Thank you so much. Apologies for my delayed response on that end. I think bringing up those issues in the commercial sector is really important.

So next, we're going to go ahead and go to our fourth speaker, and then we'll loop back because we've gotten reconnected. I'm going to introduce Kaylee D'Amico. She is with the California Hub for Energy Efficiency Financing. And she also has a colleague with her, David Gibbs, who might -- who will be available to answer some questions as well.

Kaylee?

MS. D'AMICO: Thanks Deana. And hello everybody. Before I get started I just want to thank Mark for mentioning our forthcoming on-bill repayment program. I won't be talking much about that in our presentation today. But if anyone has any questions about that, please feel free to reach out to me.

So thanks for the opportunity to join you for this panel discussion. As Deana said, my name is Kaylee D'Amico and I'm the Marketing,

Education, and Outreach Specialist at the California Hub for Energy Efficiency Financing, of the CHEEF. And I'm excited to share some data from our programs and talk with you all about how we finance decarbonization.

It looks like the team is still pulling up my slides, so I'll just pause for a second. Let me know if you have any questions or want me to pull it up on my end. Perfect. There they are. And you can go ahead to the next slide please.

So I want to start with some background information about our programs and what we do at the CHEEF. We were created to facilitate attractive financing options using private capital. And we do that using a ratepayer-funded credit enhancement which I'll talk more about in a few slides. We currently run three financing programs in the residential, small business, and affordable multifamily sectors. I'll be focusing primarily on our residential program today which is called the REEL Program. And all of this is done in service of California's climate goals, particularly the goal to reduce GHG emissions by 40 percent by 2030.

Next slide please.

So here's a little bit more context as to where we sit among other state agencies. The CHEEF was created by the CPUC with the goal of bringing private capital into the energy efficiency marketplace. And through the CHEEF, we offer those three financing programs I mentioned. The CHEEF, as a whole, is housed under CAEATFA which was authorized as the CHEEF's administrator by the CPUC when they developed the programs. And CAEATFA is an authority of the State Treasurer's Office and runs the two other programs related to energy and finance, in addition to the CHEEF.

And just to throw one other name into the mix here, GoGreen Financing is our public platform for the programs which we use so that participants can easily access the financing options without having to navigate through multiple state agencies to get there.

Next slide please.

So as I mentioned, we use a ratepayer-funded credit enhancement to leverage private capital. And we offer it to lenders as a form of risk mitigation in exchange for better rates and

terms for the loans that they offer through these programs. So in the REEL Program, specifically, the credit enhancement has led to a number of customer benefits.

The minimum credit score to qualify for a REEL loan is 580. Payback terms can be extended out to 15 years which helps lower monthly payments significantly. And interest rates range from just under three percent to just over eight percent, compared to the average rate for a similar loan on the national market which is around 12 percent, so we're significantly under the national average.

I also want to mention that the financing that we offer is unsecured, which means no property liens and a very different operating structure from (indiscernable). And, in practice, contractors are able to present these more appealing financing options to their customers who are then able to take on and complete deeper energy upgrades without any upfront cost.

Next slide please.

So I want to preface the next few slides with some context in our authorization and what

the CHEEF does and doesn't do.

So CHEEF was not designed to be a decarbonization program. We were created to leverage private capital for energy efficiency. But we have adapted to try and support decarb goals wherever we can within the current scope of our authorization. We're currently funded by IOU ratepayers and we must deliver benefits to those customers specifically. And our financing source is earmarked for efficiency purposes, so we're unable to finance distributed generation or battery storage which, thus, excludes comprehensive decarb measures, like solar-thermal water heating, from our programs.

We're also not connected to any specific IOU program. We've found that the financing itself doesn't generate its own demand. Customers have motivations beyond efficiency for completing these types of projects.

And I also just want to add some context here that we recognize that financing is not going to be the best option for all utility customers. And other tools, like tariffed on-bill financing, as Holmes mentioned, are going to be needed to fill the gaps. All that being said,

we do see financing as an important tool for reaching decarbonization goals.

Next slide.

So this slide includes some overall program data from REEL. I won't go into detail on all the data points here but I do want to highlight a few of them.

As of June 25th, the program has enrolled over 1,300 loans and financed more than $22 million. For every $1.00 of ratepayer-funded credit enhancement that we receive, the program leverages over $6.00 in private capital. And as you can see on the tables in the middle of the slide, the average interest rate and interest paid over time for a REEL loan is significantly less than what a customer would pay if they secured the same loan from the same lender without using the program.

Finally, I want to highlight our contractor network. There are over 500 contractors participating in REEL across the state. And fun fact, over 99 percent of Californians live in an area serviced by at least one REEL contractor.

Next slide.

So dialing down a little bit more into our heat-pump data specifically, you can see that about 14 percent of all of the HVAC projects we do through REEL include heat pumps. And 44 percent of those heat-pump projects were for underserved customers.

We have noticed a few trends about heat-pump HVAC projects compared with our overall project pool. The project size tends to be larger. And customers tend to apply rebates to them more often.

The piece I want to focus on here, though, is the table in the bottom right which shows what this all looks like for a customer at the end of the day. This calculation uses the average loan amount, interest rate, and term lengths for the 111 heat-pump HVAC projects we've done through REEL so far.

And we found that the average monthly payment for a customer seeking to complete this type of project with REEL financing is $228 a month. Compare that with the same loan size but using the average national interest rate for unsecured loans which is 12 percent, and the maximum term length for market-rate products

which is 5 years, the customer would be looking at a payment of over $400 a month. So the program is helping them save significantly on their financing for these projects.

Next slide please.

So let's talk now about what's working in regards to financing decarbonization for our programs. Heat-pump equipment has always been on our list of eligible measures. And as Derek mentioned earlier, our financing is flexible enough to allow customers to include the legal and practical costs commonly associated with heat pump installs, including electric panel upgrades and water heater relocation. That lower monthly payment also helps make these projects more accessible to customers while eliminating the upfront cost barrier to getting their equipment installed.

Next slide please.

I think another panelist mentioned earlier that contractor education is needed in this space. And we have been able to share educational materials on decarbonization with our network of contractors. The screenshot on the left here is from a newsletter that we sent out a

few months back on decarb measures to our contractors. So far, over 40 companies enrolled in our program have installed heat pumps using REEL. And there's also been consistent organic growth in the number of heat pumps installed through the program each year.

Next slide please.

So transitioning into challenges. Complexity that arises from funding silos and utility jurisdictions is the main obstacle to more widespread financing of decarb measures through our programs. We currently can't support fuel switching if the customer's electricity is provided by a POU, which creates some difficult eligibility issues to navigate on the ground.

So for example, in the Sacramento area, heat pumps are encouraged in West Sacramento, on one side of the bridge, because PG&E provides both gas and electricity to those customers. But we can't install heat pumps in the City of Sacramento because their electricity is provided by SMUD. So this makes it difficult for the programs to scale and makes them much more complex for lenders and contractors to use because they're not looking at these projects

through the lens of utility territory. They want to install projects for eligible customers.

Right now there's more than 8 million Californians who are unable to install decarb measures through our programs for this reason. But there is a possibility that this will change in the near future thanks to a recent proposed decision on this matter from the PUC.

Next slide please.

There are also some contextual challenges to financing decarb through our programs, and more generally. Comprehensive decarb projects that include solar and battery storage are not eligible for our programs at present. And there are some broader challenges related to economics and evaluation as well. But I want to talk specifically about some of the program coordination challenges we've experienced, primarily due to the fact that most heat pumps require electric panel upgrades, as others have mentioned today.

Electricians don't necessarily see themselves as efficiency contractors in the way that HVAC contractors do. So we're thinking about how we can get them in the fold as we

pursue more decarb projects in the future. And there's also some complexity involved when multiple contractors are working on the same project, which is often needed for a heat pump install.

Next slide.

There are some really exciting opportunities on the horizon that I am really excited to share with you today. The first of which is the launch of a point-of-sale micro-lending product through the online utility marketplaces. So this product is going to allow customers to finance efficiency equipment purchases, including heat pumps and heat-pump water heaters through the utility's online marketplace using our program at the point of sale.

The financing is expected to have the broad credit approvals and low rates that have been seen in our program to date in a format that's super convenient for customers to access. This financing is expected to launch first in SoCalGas territory this month, with other utilities to follow soon.

Next slide please.

And we also have some exciting opportunities ahead for growth that may arise from the CPUC's Clean Energy Financing proceeding, which I alluded to earlier in the presentation. A proposed decision related to our programs was released a few weeks ago. And the PD tentatively approved the incorporation of non-IOU ratepayer funding which would allow us to leverage new funding sources and then use them to expand into POU territories. So if this gets approved it would help immensely with some of the challenges we're currently facing with territory restrictions that impact our ability to scale decarb measures financing programs.

We're also advocating for CPUC approval to expand the program's eligibility to include solar storage and EV charging, which is going to be determined later on in the proceeding.

And we also have some opportunities to integrate more deliberately with IOU and REN programs and have been doing so through marketing cross-promotion related to decarb.

All this to say, I think there's a real opportunity here to have a truly statewide program where we can finance comprehensive decarb

projects and support decarbonization on a broader scale.

Next slide please.

So with that, I encourage you to visit our website to learn more about our programs. And thank you so much for your time today. And please feel free to email me with any follow-up questions.

MS. CARRILLO: Thank you so much, Kaylee.

And with that, we believe that Diane is back online.

So Diane --

MS. SCHRADER: Hi.

MS. CARRILLO: -- great magic trick there. We're glad you're back.

MS. SCHRADER: Thank you. Thank you.

MS. CARRILLO: And if you can --

MS. SCHRADER: Well, I'm back.

MS. CARRILLO: -- We'll pull up your slides?

MS. SCHRADER: Sure. Sure. And I'm back on the computer and on the phone. I think, hopefully, we have all the bases covered. I'll keep my camera off for now just to make sure.

So I think we were on slide 13, which is

labeled "Minimal grid impact."

MS. CARRILLO: Great. Give us a minute to pull that up.

MS. SCHRADER: All right. So if we kind of hop from that last slide back in and such, I'm sure that there will be some additional questions and such. But I think that I finished that one. And I just wanted to kind of tie in some of the questions that I think have come up throughout the day as well, where we've been more focused generally on, you know, on what's happening in the home.

And I think it's also really important to think about what's going to happen around the grid, as well, and that is that -- and certainly touched up on this but, you know, as we decarbonize more appliances, this only shifts reliance, you know, onto electricity. And, of course, there are additional costs and such related to that as well. So to ensure minimal impact on the grid, we also provide onsite energy renewables plus storage.

So keep going. Keep going down. A little bit further. Let me see. I think you're three or four more slides. There we go. Okay.

And now I get to say, next slide. Perfect.

So let me see, so the grid, then, is at scale. So of course, when we do this at scale the grid can rely less on peaker plants, so there's certainly some interest. But also, these homes can be leveraged it the future for demand response, virtual power plants, and also for microgrids, which makes this super interesting. And then, lastly, this supports grid efforts in decommissioning of natural gas, which is something that's also been touched upon throughout the day.

So the next slide please.

So it also leaves open a lot of questions that I don't know that we're going to get to necessarily inform. But at scale and in the future, what is the home's relationship with the grid? What are the utility and the public costs of granting natural gas systems? And then lastly, and this is more of a legislative question, how might this change the regulatory requirements for utilities to provide natural gas as an energy source?

Next slide please.

And this touches upon some phenomenal

research that has just come out of Stanford on the cost of building decarbonization. And so I'm just going to kind of feature one specific here.

So if you look into the blue square what you'll see is that while we're balancing the goals of reducing carbon emissions with a clear understanding that the costs in doing so have to be borne by someone, according to their research the most cost-effective strategy for achieving carbon emission reductions is to limit the future sale of natural gas appliances. And for us in what we're doing, you could actually imagine this is more so that homeowners are voluntarily giving up their natural gas appliances.

But no matter, as parties electrify their homes, ratepayers who cannot electrify will, of course, bear a greater cost of energy. So this goes back to one of my first slides. I mentioned, you know, numerous times today that the clean energy revolution has left out low-income communities. And you know, from my perspective, how on earth can they pay more when some of their families are already paying 10 percent, even as much as 20 percent of their income on energy?

So I think leave you with this thought is, you know, when I hear the CEC, the CPUC, all these Cs, the key word that comes to mind for me is "complicated," and that is that all of these are not, excuse me, easy issues to solve.

Next slide please.

And so I kind of leave us with this, and that is that everything that everyone has talked about today is tremendously important. And, personally, I look forward to working with everyone. And change is slow until it's not. These are very important decisions and, you know, conversations and such that we need to have.

Next slide please.

And I want to thank you for including me today. At the end of this presentation, of course, there's the link to the Stanford study, as well as some additional article links, as well.

Thank you.

MS. CARRILLO: Thanks Diane.

Heather, how are we doing on time?

MS. RAITT: We have some time for Commissioner discussion remaining. We have about ten minutes.

MS. CARRILLO: Great.

Oh, and Commissioner McAllister, it looks like you're muted.

COMMISSIONER MCALLISTER: Yeah. Sorry about that. Thanks a lot. Actually, double mute.

So thanks to you, Deana, and our speakers. Another great panel. And I want to give much of the time here, I think, to Derek just to -- you know, this is right up your alley, Derek.

So I did have one question, just sort of at a high level. I mean, all these models have so much promise. We know that the tariffed on-bill is ready for prime time and is happening. And I guess maybe it's a two-part question.

One is just how -- so there are lots of different flavors of capital. We know that we need lots of sort of non-state capital to build on the state program monies to really make this happen at scale. And I guess each of you talked about a different model. And I guess if you could just help us understand, you know, the stack or the kind of different flavors of capital, you know, how much -- you know, the

hardcore Wall Street capital that's looking for a certain rate of return, and more social capital that maybe is a little more fuzzy around the edges? You know, your models, what sort of is your capital partner or partners so that -- just to sort of help us understand that? I think that if we see the first few there, that's instructive.

And then the second part is specifically for Holmes. Over the weekend, I was thinking about this session and I'm like, you know, we had almost the same conversation, you know, five years ago. And so, you know, and here we are, and you made that point. What is happening in Kansas and Tennessee and other places that sort of has spurred them to action? And what barriers maybe don't exist there that have enabled us to really be put in place in places that we think of as more sort of hands off in terms of their policy environment?

So number one, flavors of capital. Number two, tariffed on-bill contexts around the country.

MS. D'AMICO: I can kick things off by summarizing where the CHEEF is drawing capital

from. So I mentioned we have the ratepayer-funded credit enhancement which is supporting the feature of the financing that makes the loans possible. But in our residential program, we currently have eight credit union lenders, so they're all nonprofit credit unions, either regionally based or statewide. We are expanding into other models for that program.

So the point-of-sale financing that I mentioned is launching soon. That is a-- a FinTech company is the closest thing you could call the capital provider for that. And then for our small business program, we have four participating finance companies. They are all a bit larger, operating nationally, and some even globally. And all of them have more traditional FinTech models involved as well.

So it's kind of a broad range of where we're pulling capital from. And interestingly, you know, we have recruited the majority of them, but there has been, you know, significant interest in these specific types of finance companies and participating in the programs.

MS. CARRILLO: And Diane, could you take a crack at answering that question too? Because

that question came in through Q&A on capital sources and their repayment stream.

MS. SCHRADER: Yeah. Yeah. You know, what I can say is that it goes back to that first comment that I made about the size of checks. So when we're doing any of these smaller place space initiatives where for us is looking at 100 or so projects, those are funded by individuals and corporations. And these are parties that have pledges, particularly towards affordable housing, so this notion of social capital is definitely in line with that. But the other thing that the institutions require is larger checks, which also means, often times, more diversification.

So what we're doing now is we are launching, not only our next community in Los Angeles, but three other communities up here in Northern California. And as we do that, then we're meeting some of those prerequisites for that institutional capital. And so what we see kind of going forward as we scale is that it takes, certainly, a blend, depending upon the design of what we're doing for each community.

DR. HUMMEL: Commissioner McAllister, I'll take your question about some of the current

events that are shaping our field, a couple things of note.

In March of last year the Southeast Energy Efficiency Alliance published a report called The Utility Guide to Tariffed On-Bill Programs. And it's kind of amazing how such a very approachable summary guide opened up the levels of attention that I think middle managers and utilities in many states had not been able to scale. And so in March, when that document came out, we saw quite a stir among middle manager and executive ranks, like, oh, I finally see the onramp.

So that just goes to show how important it is to provide technical assistance and to make sure that people with experience are available to utility executives who may actually, most deeply have misgivings about their own inexperience, and not about the business model but about their ability to be a captain for that new business model.

In California, I would say that we have seen, very recently, the Utility Commission ask all of the investor-owned utilities to disclose all of the programs that they either offer

directly or coordinate with that have a financial component. And I you haven't yourself yet seen that report, for me, it's just staggering.

And what it shows is that California's Underserved Market Segments Customer Working Group at the PUC and the Disadvantaged Communities Working Group to the California Energy Commission are both telling each of the Commissions that despite all of those programs, in fact, those are the policies that are producing the inequity in the distribution of benefits from the publicly-funded programs, whether the polluter payer, ratepayer, or taxpayer funded programs.

And so the reconciliation with everything that we have, producing what we've got, is finally, I think, turning attention to the reality that, by deduction and since 2014, the Department of Energy has known that financing insurance that require creditworthy counterparties will systematically bifurcate the market and disadvantage people who are already disadvantaged. And that compounding inequity is intolerable, even in red states, even in places that are characterized by longstanding persons of

poverty without very many social programs to support it because of the pragmatic and, I think, very sober view that this is an unacceptable way to mobilize capital into the renovation and modernization of our country's most essential infrastructure moving into the 21st Century.

COMMISSIONER MCALLISTER: Well, thanks for that. I might follow up with you to talk about sort of -- get a little bit more play by play of how those programs sort of got traction and came about in these relatively lightly regulated states; right? I mean, that's, you know -- our contexts are different, right, in terms of the --

DR. HUMMEL: Yes.

COMMISSIONER MCALLISTER: -- the assertiveness of policy in some of those places, like they pick their battles very carefully.

DR. HUMMEL: Yes. Well, I do want to say, it was a relatively simple line of logic. It didn't involve --

COMMISSIONER MCALLISTER: Um-hmm.

DR. HUMMEL: -- you know, extravagant head-locking maneuvers. In general, the consumer advocates and utility commissioners agreed to

look at the data about the distribution of benefits and burdens in the economic part, in a part of the economy that they regulated, and they were dissatisfied with the distribution. They called for a financial analysis. The University of Minnesota performed one in the Energy Transition Lab for utilities in Minnesota. (Indiscernible) performed those for all of the for-profit utilities in Missouri. In every case that I've ever seen the financial analysis shows that it's actually a win-win for the utility and the --

COMMISSIONER MCALLISTER: Yeah.

DR. HUMMEL: -- customers to make the option available. And after that, it's just a hop, skip, and a jump before the utility regulators say, the next time you bring --

COMMISSIONER MCALLISTER: Yeah.

DR. HUMMEL: -- me something that asks --

COMMISSIONER MCALLISTER: Go for it.

DR. HUMMEL: -- us to give you a yes, make sure it includes something that we already know works.

COMMISSIONER MCALLISTER: Yeah. Right. Okay. Great. Thanks a lot. I appreciate that.

And Diane, did you want to answer at all?

And then, Derek, I'll invite you to ask any questions you have.

MS. SCHRADER: Yeah. I'm fine. Is there any particular part of that question that you wanted me to answer, Commissioner McAllister?

COMMISSIONER MCALLISTER: Well, yeah, just, you know, we -- previously we had talked about, you know, your different access, your access to different kinds of capital that have, you know, maybe not, you know, a Wall Street-level need for a return on investment, and you mentioned this a little bit in your presentation. But I guess I was just wondering, you know, if you could sort of let folks here know kind of where you're finding your capital and what your constraints are --

MS. SCHRADER: Yeah. So --

COMMISSIONER MCALLISTER: -- in broad brush terms? Right.

MS. SCHRADER: Yeah. Yes. And for generally speaking, everyone's looking for a market rate return. That's the fascinating thing about this. It's just that some parties are certainly more forgiving and/or looking for the

ability to have a deeper impact and such. And so that's one of the reasons why, you know, we can build in some really interesting components, you know, into what we do, such as the forgiveness after 20 years.

If you look at the data and, you know, the underlying performance of these properties over time, you can begin to develop a product that is actuarial by nature, which is something that Wall Street is quite used to, and so that's really what we're doing.

COMMISSIONER MCALLISTER: Great. Thanks a lot. And that opening for impact investing, I think, was an important point as well. So great. Thanks a lot.

So Derek, I'll give the floor to you.

MR. CHERNOW: Thank you. I appreciate that. And I would be remiss if I didn't recognize and appreciate our Moderator, Deana Carrillo, for her fantastic work at CAEATFA and getting these programs off the ground, up and running and poised for the growth that we're starting to see today. So thank you very much to today's moderator.

You know, I think what we just heard were

a number of innovative approaches to the same goal, which is, you know, getting our energy efficiency measures in place in decarbonization and making it work for -- across the board for all segments, from residential to multifamily to commercial.

So you know, I'm really encouraged with the creative approaches that are taken, and the view of what's been working outside of California and how that might be applied here. And you know, frankly, I think we're doing our best to try to kind of catch up in some places and lead in others, and I think today's workshop highlighted some of those. So I'm encouraged and, you know, appreciate everybody's input and, again, thinking outside the box in our approach here.

So no major questions, I think, for some of the folks here, just, you know, as we're looking forward, and this question has kind of come up a couple times today, but for this panel, what can the state or what should the state be doing as we are moving forward to move quicker, faster with our state policies and directives?

MR. SHAHINIAN: I think to -- I can't

remember if it was Holmes or who made the point that programs that depend on the creditworthiness of the electricity customer tend to not go very well. And so the corollary to that, of course, is there's some need of credit support from some source.

And so thinking through what that will look like at scale, where the sources are from, how much is needed, et cetera, I think that's going to be a big deal. We see it with the banks that we talk to, you know, what's my recourse? First question out the gate because they're a bank. And so I think that's going to be really important.

MS. SCHRADER: I think, personally, we love rebates. Rebates are fantastic. All of those, the rebates, accrue, again, directly to the property owners. But again, that goes back to this asset-building component that I can't emphasize more as a function of what we do, particularly in these lower-income communities. It's a fantastic driver.

COMMISSIONER MCALLISTER: Great. Thanks for that, Derek.

And I neglected to see that Commissioner

Gunda has his hand up, and then -- or his hand up. And then we'll move to Commissioner Monahan.

COMMISSIONER GUNDA: She, I believe, raised her hand indirectly, so I'm going to give her first and then --

COMMISSIONER MCALLISTER: Oh, okay.

COMMISSIONER MONAHAN: Oh. Oh. I didn't do it the right way. You did it the right way, though, because I was like, well --

COMMISSIONER MCALLISTER: You're both telling the other to go first, so you've got to just duke it out then.

COMMISSIONER MONAHAN: We don't fight.

COMMISSIONER MCALLISTER: Yeah, I know. Go ahead.

COMMISSIONER MONAHAN: I will take that door opening.

So on, on-bill financing, I'm curious, like, Holmes, why isn't it happening? Like why aren't we doing it in California? What's the barrier?

DR. HUMMEL: Well, there is actually an official explanation for that that's been underway for several years. Remember that in 2013, the Public Utilities Commission made a

decision that involved $70 million for seven different pilot programs, and then came to a decision that the residential versions of those pilots needed to be ported over to the Treasurer's Office for the reasons that relate to consumer lending laws. And CAEATFA has done a phenomenal job of standing up the Residential Energy Efficiency Loan Program, but it had to run for two years before it could be evaluated for another year, before it could be read for another year.

And before you know it, like five or six years go by and $20 million allocated to the residential sectors, you know, evaporated into all of the effort that went into the blood, sweat and tears to put it out in the street.

But even today's data presented by Kaylee shows that in all of that effort, the debt-based product, the on-bill financing product that's still not on-bill in California, reached less than 0.1 percent of the population in more than five years. And that's not the ticket to scale that California needs. That doesn't mean that the Residential Energy Efficiency Loan Program doesn't belong in a suite of portfolio policies

for the state but that that's not going to be an adequate response to what this workshop is really facing in terms of the requirement to scale.

But the Public Utilities Commission acted very swiftly. The moment that it received the evaluation report that showed that the Residential Energy Efficiency Loan Program didn't have a high-growth scenario that was going to tip past one percent, even if it was growing ten times faster than it was expected to, they voted five to nothing to have an order for a new rule on clean energy financing. And that was on Labor Day of 2020. We're almost up to the 12-month mark.

And what I mentioned in a prior remark is that we're still in the midst of the staging sequence let out -- set forward by the scoping memo. And Track 2 and Track 3 of that proceeding are expected to be paced out over the next four quarters.

Almost exactly at the same time, or overlapping, I should say, is a new sweeping proceeding called by the California Public Utilities Commission and covered in Utility Dive as "the mother of all proceedings" for all

distributed energy resources. And I think that these two proceedings, though separate, actually are implicating each other. And the new proceeding on high deployment of distributed energy resources names the clean energy finance proceeding as one that could be affected. And all of us on the service list received that new proceeding.

I say this because the Integrated Energy Policy Report for the State of California should definitely behold these landmark proceedings that are now finally underway at the Commission after almost seven years of procedural delay.

MS. CARRILLO: Holmes, for providing that context. I just want to tease out some issues, just for folks that might be new to the subject, because there's a lot of terms being used.

You know, Holmes's presentation was on tariff billed -- tariff-based financing, which is between the utility and the customer. There is also on-bill financing, which the utilities are carrying out today, where it's a loan only to the commercial -- only to commercial properties from the utility directly to the customer, and those are zero percent loans that are going in the

commercial sector.

And then there's on-bill repayment which is what was in that original -- not the original, one of those prior decisions to actually come up with a standardization between private capital and the utility bill. And that is a challenge to coordinate with all those utilities, with private lending laws as well. And so it's really taking those two most regulated entities or agencies and trying to get them to coalesce.

So not sure if the question was on the on-bill repayment, on-bill financing, or tariff-based financing, which was one of those equity focuses that Holmes has been focusing on for several years.

Sorry to pause there, just wanted -- they're easy to conflate.

COMMISSIONER MONAHAN: (Indiscernible.) Thank you.

DR. HUMMEL: I do think that the report on accessible financing sets forward a pathway for California that is worthy of revisiting. It's about a year old. There have been plenty of meetings, discussions, workshops, back channels about the recommendations that are there. And

it's gratifying to see people pick them up. There's more than one investor-owned utility that is interested in making these types of investments.

And the California Energy Commission may be in an enviable place to address any of the gaps that may be apparent to them in the path to implementation, whether that's data access, estimation software, best practices development, or other types of integration that we've heard about from many of the stakeholders in these proceedings looking for stackable, streamlined, one-stop-shop kind of coordination. All of that would improve the user experience and the prospects of success.

And if there's any doubt about the competency of California executives to move forward in a more inclusive way, I think that the Department of Energy is an excellent partner, and they are looking for partnership.

MS. D'AMICO: Holmes, I do just want to complement what you said. You know, I think tariffed on-bill and all of the other programs that Deana mentioned are all ways in which these gaps can be filled. And not one solution is

going to be the best solution for every customer. And I think it's important to distinguish the fact that, you know, what CAEATFA and the CHEEF are doing in terms of our financing and what's going to happen through tariffed on-bill financing, what the OBR will do, with the IOUs OBF will do, they are all meeting different needs within the market. And I think, you know, it's fair to say that all of them are welcome.

And you know, I think at CAEATFA, specifically, you know, we champion all options that increase accessibility of financing to individual consumers.

DR. HUMMEL: Indeed.

COMMISSIONER MCALLISTER: Great. Thanks.

Commissioner Monahan, did you have any other questions you want to ask?

COMMISSIONER MONAHAN: I think it's Commissioner Gunda's turn. And I'm worried about time because --

COMMISSIONER MCALLISTER: Okay.

COMMISSIONER MONAHAN: -- I do have one more question for Mark, but only this.

COMMISSIONER MCALLISTER: Okay. Great.

COMMISSIONER GUNDA: Commissioner

Monahan?

COMMISSIONER MCALLISTER: Go ahead, Commissioner Gunda. Thank you.

COMMISSIONER GUNDA: Commissioner Monahan, please go forward. We can follow up with a number of these. Okay. I will do that. Okay.

So I think I'll just use this to first, I think, say thank you to Deana, as well, and I think Derek kind of raised her previous contributions to this work. So Deana, just great to have you on the team and help facilitating this.

So I think, you know, I just want to bring it a little bit back to the start of the day today, just on equity and kind of the important role that financing plays in this whole paradigm. So in the morning, there was a couple of areas that came up, specifically kind of de-siloing the programs, you know, an opportunity to kind of provide a more comprehensive one-stop-shop. And I think a number of you just mentioned those.

And there was also this discussion around potentially having a rotating potential of money

available. And I think Kaylee's presentation was probably the closest in trying to kind of, you know, dial up that model too. I mean, some of the things that Kaylee mentioned about advocating for increasing the diversity of the pot of money that, you know, organizations can work with, and also bringing solar and storage and such into a comprehensive kind of setting.

So I just wanted to ask, you know, as you are all kind of looking at this as financing experts, kind of how do we -- how do we -- I mean, like I'm going to put this in the SB 100 context. For us to get to carbon neutrality SB 100 goals, we need to expand electrification very, very rapidly, especially towards the tail end of this decade, and then it's going to just continue to grow. So to really unlock that level of kind of aspiration, I feel like there is a role that the public policy plays in this. But as Commission McAllister kind of properly set this up, it is a huge place for financing.

If you can just kind of talk about how we can come with a pot of money that's accessible equitably, and then kind of dial up the integrated programs? Maybe start with Kaylee.

And then anybody else want to add to that?

MS. D'AMICO: Sure. And I'm happy to defer to Derek on this one. But my personal response, I think during the Commission, the PUC specifically, excuse me, the clean energy financing proceeding, there were a number of suggestions in the prior comment periods leading up to the proposed decision that was released a few weeks back. And there were specific suggestions from other agencies of other pots to pull from.

I think there were some questions about -- oh, gosh, I'm going to mess this up -- but there were other pots of money that were suggested by commenters specifically used for solar funding, so suggesting that part of the funding for the CHEEF could come from a solar fund, as well as an efficiency fund. I think there was also discussion of a potential pollution or carbon tax credit. There were a couple other options listed. But I think the goal, in general, was just to move away from and beyond funds earmarked for efficiency if the program was also to be approved to finance other measures, like distributed generation.

But Derek, I'm sure, has a much more eloquent response than that.

MR. CHERNOW: No. I'll just add to that.

As we move forward and we go through the Public Utility Commission proceedings, we have asked for and are looking to get the ability to expand, not just geographically but, also, our program into non-ratepayer funds. And with everything that's going on at the federal level, as Holmes had mentioned earlier, with the Department of Energy and other potential partners out there, it gives us a chance to scale up a lot more rapidly, reach more people, and really run a more effective statewide program.

MS. CARRILLO: On that note, if anyone else has questions, feel free to put them in -- type them in the Q&A.

MS. SCHRADER: May I make a quick comment on this? And that is that there's also ways to blend capital that I think is quite fascinating in that you can have first-class capital, you know, be a higher risk, and then layer into that, again, more institutional capital that, you know, is relying upon predictable yield in such a way that I think you can also achieve this.

And what I've seen over the last year-and-a-half to two years is tremendous interest in this space. And I think it's, again, going back to aligning that capital with a source is tremendously important.

COMMISSIONER MONAHAN: So --

COMMISSIONER MCALLISTER: Thanks. Thanks to all of you.

Yeah, go ahead, Commissioner Monahan.

COMMISSIONER MONAHAN: Yeah. Well, I had a question for Mark.

So Mark, I was really excited by the fact that you're dealing with this major market failure which is, you know, the owner of the building is the one that has to invest but the benefits accrues to the renter. And so are there other spaces, besides big commercial buildings in San Francisco, that this could apply to? Is there any? I mean, of course, multifamily dwellings is our hardest nut to crack. But are there other buildings that this could apply to, besides big commercial buildings?

MR. SHAHINIAN: Well, yeah. And just to be clear, we do large commercial because that's our existing customer base. This could work in

small commercial, as well, it just has to be served differently.

But we do across large commercial. We do everything from hospitals to medical office buildings to biotech lab space to office buildings, it kind of cuts across. We tend, again, not to deal with government entities because they're not our customer base. There are a ton of other ESCOs that serve governments in the same capacity. City of San Jose just pulled down an OBF loan for, I don't know, $20 million or something from PG&E.

So I think it cuts across in that sense. Does that answer your question?

COMMISSIONER MONAHAN: Yes. Thank you.

MR. SHAHINIAN: And I think what everybody, just to reemphasize what I think you already know, is what everyone is surprised by is, oh, that's a $2 billion office building, why don't they have money to fix their systems? Why don't they have a million or two lying around to fix their systems? Well, they just don't the way they're structured. And it surprises us every time that they don't. And so -- but if you can align all the incentives, it can go.

COMMISSIONER MCALLISTER: Yeah. I think we've heard that in different forms throughout the day where, you know, getting it off the balance sheet and letting a professional who does this for a living kind of do the project and make sure they've got the right capital for the right job is kind of what we need to let happen. We need to encourage that to happen and create the program structures, or get out of the way sometimes; right? But assist that in happening. And I really appreciate everyone's expertise on this topic.

The last thing I think we want to do, assuming no other folks on the dais have questions? Let me just get a confirmation of that. Okay. Great. Terrific

So I think we want to open the phone lines. We don't have any public comment or hands raised, I think, on the Zoom, but let's open the phone lines just to make sure we don't have any public comment -- or ask for public comment. Let us know if they do so --

MS. RAITT: Go ahead, Dorothy, if you want to?

Maybe Dorothy could give some

instructions for folks.

COMMISSIONER MCALLISTER: Oh, great. Okay. We're going to run a couple minutes over, it looks like.

MS. MURIMI: Yes.

COMMISSIONER MCALLISTER: So apologies for that.

Go ahead, Dorothy.

MS. MURIMI: All right folks. Thank you.

And thanks Heather.

I'll go over the instructions. So one person per organization may make a comment and it's limited to three minutes per speaker. But if there's a lot of folks who want to speak, we'll reduce that to one-and-a-half minutes per speaker. If you're using the Zoom, use the raise-hand feature and let us know if you'd like to make a comment. And if you're on the phone, dial star nine to raise your hand and star six to un-mute on your end, and we'll un-mute on our end.

So just looking for folks on Zoom right now. I don't see any. Again, that's the raise-hand feature if you're on Zoom. Oh, I see one, John Shipman. John Shipman.

And you can speak now, John Shipman. Your lines been opened.

MR. SHIPMAN: Yes. No. Thank you very much. Well, I just want to say I'm really -- was really excited about the time-of-sale financing option that's going to pilot in the SDG&E territory. And so I want to -- I can't wait to see what that looks like because that could have a significant impact in helping to build asset value in low-income family housing, especially with homeowners in disadvantaged communities. So just applaud your efforts there, the CHEEF Program, and just looking forward to see how this pans out in San Diego, and if it can become a statewide program.

That was it, just a comment.

MS. MURIMI: Thank you, John.

Checking for more hands on Zoom. Again, you can raise your hand using the raise-hand feature. It looks like a high five. And if you're on the phone, again, that's star nine to raise your hand, again, star nine. I'm going to give that one moment. All right. It doesn't look like we have any comments.

Commissioner McAllister, I'll hand the

mike back to you.

COMMISSIONER MCALLISTER: Great. Thank you so much, Dorothy, for being here and helping us throughout the day alongside the IEPR Team and Heather, and our moderators, and our panelists throughout the day, and our couple keynotes, as well, that we had. So I won't run through the whole list but it's been an amazing day.

And before I wrap up, I'll invite anyone on the dais to make any wrap-up comments and maybe highlight any key takeaways they learned before wrapping it up myself and passing it off to Heather for the final details. It's been quite a long day.

COMMISSIONER GUNDA: Yeah. Commissioner McAllister, I just, yeah, I just want to note a sincere thank you for pulling this together.

And Staff, I think this is an extremely important conversation. I mean, I feel like, you know, for the last -- before I started the energy assessment side of it, my work was in buildings and kind of looking at kind of steady progress in the buildings, but also the kind of the challenges that continued to persist is kind of an eyeopener; right? I mean, like we know the

slog that we're in for, for the next, you know, several years here, and decades.

And I think I really enjoyed the equity conversation this morning and the importance of de-siloing the programs, and I just took that to heart, as well as trying to think through, you know, the hard nut to track, the non-energy benefits, but how do we really think about non-energy benefits is an important part of our thinking moving forward, you know, in terms of both equity but broader planning? And also, I think the reemphasis of the panelists that efficiency is at the core. We cannot forget efficiency as we dial up the building decarbonization track.

So thanks to Heather. Thanks to the Efficiency staff. Thanks to you and to all the panelists and public today. Thank you.

COMMISSIONER MCALLISTER: Thank you, Commissioner Gunda, for being here.

Commissioner Monahan, any wrap-up comments?

COMMISSIONER MONAHAN: Yeah. Well, I mean, a couple of eyeopeners --

COMMISSIONER MCALLISTER: Okay.

COMMISSIONER MONAHAN: -- for me were really the fact that solar is what makes a lot of these investments pencil out. But just that, you know, as I said earlier, that's a little concerning, just given the potential for changes in our rate structure. So that's just something I think we need to be really mindful of.

I hope one day to be on a panel where Holmes is talking about how her work actually is being implemented here in California. But it was a really interesting day. I learned a lot.

And I appreciate your work, Commissioner McAllister, in organizing these really thoughtful IEPR workshops, as well as the whole team. It was really a great day, so thank you.

COMMISSIONER MCALLISTER: Derek, do you want to --

MR. CHERNOW: Yes. Thank you.

COMMISSIONER MCALLISTER: -- wrap up at all?

MR. CHERNOW: I'll just --

COMMISSIONER MCALLISTER: Yeah. Perfect.

MR. CHERNOW: -- I'll echo the appreciation to Energy Commission staff and everybody for including us and inviting us here

today. You know, it was a real encouraging and eye-opening look at some of the exciting programs that are taking place throughout California.

And so it's a good reminder that some of these programs can move with alacrity and some do take time, depending on the type of financing and the intricacies they have to go through to be implemented. And that's not a condemnation, it's just a statement of fact. And you know, some of these programs have rulemakings associated with them and, you know, agreements that have to be struck, and all those other things before they are actually implemented.

But at the end of the day, they're moving toward the same goal which is, again, you know, deep decarbonization and energy efficiency in our buildings and in our residences.

So you know, it's been a very positive day for me. And the takeaway is that there's a lot of good people doing a lot of good things, some quick, some not as quick, but all towards the same goal. And I think that's something that is very encouraging moving forward, so thank you for having us.

COMMISSIONER MCALLISTER: Great. Well,

thank you very much. And just, I'll be super brief but I just want to thank everyone again. And I also look forward to being, you know, hopefully not five years from now, but being -- having Holmes on another panel saying -- looking -- just a retrospective of how tariffed on-bill has scaled and really is moving the needle in California. There's really, I think, a lot of reasons to be optimistic that we're going to get that done in California and really create a fat pipe for good capital to make it to these excellent, you know, decarbonization projects. And you know, we all want that to happen.

But across the board, I think today, we've seen a lot of -- we've heard a lot of expertise informing this conversation and it's really great. And just really that's one thing we have in California is smart people with a public service commitment who are asking great questions and bringing a lot of insight, and we've seen that in spades today, so thanks everybody again.

I will highlight, tomorrow we have the third of three workshops over these two days. Tomorrow morning at nine o'clock we're going to

talk about decarbonization and workforce.

And you know, to Holmes's point about the DOE as a partner, we are trying, whenever we can, to bring in Department of Energy and other federal representatives to really start to build better, I think, broader and longer bridges between state and federal, you know, especially now that we have good alignment with the Biden Administration and California Administration.

So we are having Tony Reames tomorrow from the Department of Energy who focuses on equity in buildings, and he's going to give us our opening keynote, so looking forward to that, but please come.

We'll also have Sarah White from the Governor's Office of Planning and Research to talk about her work there and giving us an overview of the Just Transition.

So you know, we've talked about workforce and equity issues today and just, really, I think it's weaved throughout everything we're doing for both morning and afternoon today, for sure. And we'll really dig on in that further tomorrow, so please be with us at 9:00.

And with that, I think you're seeing the

written comment guidance there from Heather on that final slide. And with that, I'll pass it back to Heather, just for any final comments that you might have on the logistics for tomorrow.

MS. RAITT: No. You covered it all. Thank you so much. And thanks everybody --

COMMISSIONER MCALLISTER: Okay. Great.

MS. RAITT: -- for everybody being here today.

COMMISSIONER MCALLISTER: Great. That coffee is looking really good about now, so thank you for that.

MS. RAITT: Okay.

COMMISSIONER MCALLISTER: All right. All right. Well, take care. We'll see everyone tomorrow. Appreciate it.

(Off the record at 5:08 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 1st day of October, 2021.

MARTHA L. NELSON, CERT**367

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

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

MARTHA L. NELSON, CERT**367

October 1, 2021